RFB NO. 312026

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. 312026
AIR HANDLING UNITS REPLACEMENT
VERTICAL EXPANSION, UNITS 1 & 2
CITY-COUNTY BUILDING
MADISON, WISCONSIN

Bid Due Date / Time: **THURSDAY, SEPTEMBER 6, 2012/ 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:

ROB NEBEL, PROJECT MANAGER
TELEPHONE NO.: 608/267-0119
FAX NO.: 608/267-1533
E-MAIL: NEBEL@CO.DANE.WI.US

DOCUMENT INDEX FOR RFB NO. 312026

PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

DIVISION 26 - ELECTRICAL

26 05 00 – General Electrical Provisions
26 05 02 – Electrical Demolition and Alterations
26 05 04 – Inspection and Testing of Electrical Equipment
26 05 19 – Low Voltage Wires, Cables, and Connectors
26 05 19.4 – Motor Wiring
26 05 26 – Grounding
26 05 29 – Supporting Devices
26 05 33 – Conduits
26 05 33.1 – Electrical Boxes
26 24 16 – Electrical Panelboards
26 24 19 – Motor Control Centers (MCCs)
26 27 02 – Equipment Connections
26 27 28 – Motor and Circuit Disconnects
26 28 00 – Low Voltage Overcurrent Protective Devices

DRAWINGS

To be printed to correct scale or size, plot sheets on 30” x 42”.
H0.0 – Symbols, Abbreviations, and Sheet Index
H1.8 – Penthouse Demolition Plan
H2.8 – Penthouse New Construction Plan
H8.0 – Details
H9.0 – Details
E0.1 – Symbols, Abbreviations, and Sheet Index
E2.8 – Penthouse New Construction Plan

LEGAL NOTICE

INVITATION TO BID

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

2:00 P.M., THURSDAY, SEPTEMBER 6, 2012

REQUEST FOR BIDS NO. 312026

AIR HANDLING UNITS REPLACEMENT

VERTICAL EXPANSION, UNITS 1 & 2

CITY-COUNTY BUILDING

Dane County is inviting Bids for replacement of two existing air handling units in the City-County Building.

Request for Bids package may be obtained at Dane County Public Works, Highway & Transportation Dept., 1919 Alliant Energy Center Way, Madison, WI 53713, by calling 608-266-4018, or downloading it from www.countyofdane.com/pwht/bid/logon.aspx. Please call Rob Nebel, Project Manager, at 608-267-0119, for any questions or additional information.

Pre-bid meeting is scheduled for Tuesday, August 28, 2012 at 9:00 A.M., Starting in Room GA - 8, City-County Building, 210 Martin Luther King, Jr. Blvd., Madison, WI. Attendance is strongly encouraged.

All Bidders must be a registered vendor with Dane County & pay an annual registration fee before award of Contract. Complete Vendor Registration Form at www.danepurchasing.com or obtain one by calling 608-266-4131.

PUBLISH: AUGUST 23 & AUGUST 30, 2012 – WISCONSIN STATE JOURNAL

AUGUST 23 & AUGUST 30, 2012 – THE DAILY REPORTER

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

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 at the date and time specified in the Invitation to Bidders at City-County Building, 210 Martin Luther King Jr. Blvd. Attendance by all bidders is optional, however bidders and subcontractors are strongly encouraged to attend.

D. Visits at other times can also be arranged. Coordinate site access activities with Project Manager, Rob Nebel, 608/575-0890.

E. Failure to visit site or failure to examine any and all Construction Documents will in no way relieve successful Bidder from necessity of furnishing any necessary materials or equipment, or performing any work, that may be required to complete the Work in accordance with Drawings and Specifications. Neglect of above requirements will not be accepted as reason for delay in the Work or additional compensation.

2. DRAWINGS AND SPECIFICATIONS

A. Drawings and Specifications that form part of this Contract, as stated in Article 1 of General Conditions of Contact, are enumerated in Document Index of these Construction Documents.

B. Complete sets of Drawings and Specifications for all trades will be issued 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) 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 Consultant / 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 five (5) 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 Engineer within three (3) days after Bid Opening. 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 Engineer 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 Engineer or designee all such information and data for this purpose as County's Public Works Project Engineer 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) 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 lowest qualified, responsible bidders, will be returned to their makers within three (3) 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) 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 $7,500.00 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 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 Officer within twenty-four (24) hours after 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 twenty-four (24) hours after Bid Due Date. Bidder who fails to submit Emerging Small Business Report shall be deemed not responsive.

D. **ESB Goal.** Ten percent (10%) ESB participation is goal of this project. 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 will solicit bids from ESB listing provided by Dane County.

G. **ESB Certification.** All contractors, subcontractors and suppliers seeking ESB certification must complete and submit Emerging Small Business Certification Application 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 Officer
City-County Building, Room 421
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
608/266-5623

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 Officer 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) working 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 Officer 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. 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 a 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.

11. TAXES

A. Bidder shall include in Bid, all Sales, Consumer, Use and other similar taxes required by law.

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.

12. PREVAILING WAGE RATES

A. Prevailing wage rates as established by Wisconsin Department of Workforce Development and Federal Davis-Bacon Act are applicable to this project. Successful bidder shall ensure that wages paid to employees shall satisfy both wage determinations. Successful bidder is responsible for submitting certified payroll records to both agencies. Wage rate determinations can be found in Supplementary Conditions.

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 will 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 time of closing 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 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. Bidder shall carefully read requests for Alternate Bids, and thoroughly examine Drawings and Specifications to determine extent various changes and conditions will affect Bid.

B. Space is provided in Bid Form for requested Alternate Bids. Failure to submit bid for any requested Alternate Bids may result in rejection of entire Bid.

C. Bidder shall state amount to be added / subtracted to Base Bid for providing alternates, including all incidentals, omissions, additions, and adjustments as may be necessary or required by such changes. If there is no difference in price, Bidder shall state, "No Change".

D. Bidder shall honor Alternate Bid amount for a period of one hundred (120) days.

E. Descriptions of requested Alternate Bids are as set forth in Construction Documents.

16. INFORMATIONAL BIDS

A. Bidder shall state amount that is included in Base Bid for all equipment, materials and labor required to complete the Work described. Informational bids are amounts requested for accounting purposes and for allocation of funds only. It is not intended to omit any of the Work described or related items from this project.

B. Description of requested Informational Bids, if any, is as set forth in Construction Documents.

17. UNIT PRICES

A. Provide unit prices where requested on Bid Form. Unit prices will include all costs for materials, labor, insurance, taxes, overhead and profit necessary to perform specified work. Estimated quantities are approximate only. Payment will be based upon actual quantities placed, provided or installed. Failure to provide requested unit prices may result in rejection of entire Bid.

B. Owner reserves right to accept or reject any unit prices as given in Bid.

C. Bidder shall refer to Bid Form and applicable specification section to determine basis of unit measure and detailed information related to each unit price item requested.

18. COMMENCEMENT AND COMPLETION

A. Successful Bidder shall commence work when schedule and weather permit, but no later than stated in Bid Form. Contractor shall pursue the Work regularly and continuously at reasonable rate to insure completion of the Work within time stated in Bid.

B. Should it be found impossible to complete the Work on or before time specified for completion, written request may be submitted for extension of time setting forth reasons believed to justify granting of such request. Refer to Article 20 of General Conditions of Contract, titled "Time for Completion".

19. WORK BY OWNER

A. 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 24 hours after Bid Due Date.

PROJECT NAME: _____

_____

BID NO.: _____ BID DUE DATE: _____

BIDDER INFORMATION

COMPANY NAME: _____

ADDRESS: _____

_____

TELEPHONE NO.: _____

CONTACT PERSON: _____

FORM B

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - INVOLVEMENT

(Copy this Form as necessary to provide complete information)

COMPANY NAME: ____________________

PROJECT NAME: ____________________ BID NO.: ____________________

ESB NAME: ____________________ CONTACT PERSON: ____________________

ADDRESS: ____________________ PHONE NO.: ____________________

CITY: ____________________ STATE: __________ ZIP: __________

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

ESB NAME: ____________________ CONTACT PERSON: ____________________

ADDRESS: ____________________ PHONE NO.: ____________________

CITY: ____________________ STATE: __________ ZIP: __________

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

ESB NAME: ____________________ CONTACT PERSON: ____________________

ADDRESS: ____________________ PHONE NO.: ____________________

CITY: ____________________ STATE: __________ ZIP: __________

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

FORM C

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CONTACTS

(Copy this Form as necessary to provide complete information)

COMPANY NAME: _____

PROJECT NAME: _____ BID NO.: _____

	ESB FIRM NAME CONTACTED	DATE	PERSON CONTACTED	DID ESB BID?	DID YOU ACCEPT BID?	REASON FOR REJECTION
1)						
2)						
3)						
4)						
5)						
6)						
7)						

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

BID FORM

BID NO. 310039
PROJECT: AIR HANDLING UNITS REPLACEMENT
VERTICAL EXPANSION, UNITS 1 & 2
CITY-COUNTY BUILDING

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

BASE BID – LUMP SUM:
Work includes the provision and installation of two new air handling units, including temperature control, electrical, and piping. Work also includes demolition and proper disposal of existing units. 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

The undersigned further agrees to add the alternate(s) portion of the Work as described, for the following addition(s) to or subtraction(s) from the Base Bid stipulated below. They further agree to honor the alternate(s) bid for 120 days from date of Award of Contract.

ALTERNATE BID 1:
Provide deduct price to delete all Work pertaining to replacement of AHU 1. Reduced scope of work includes the provision and installation of new air handling unit (AHU 2), including temperature control, electrical, and piping. Work also includes demolition and proper disposal of existing unit.

_____ and _____ /100 Dollars
Written Price

$_____
Numeric Price (Deduct)

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

Addendum No(s). _____ through _____

Dated _____

Dane County Department of Public Works must have this project completed by February 15, 2013. Assuming this Work can be started by October 15, 2012, 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 Due Date of Bids to another bidder or competitor; that the above statement is accurate under penalty of perjury.

SIGNATURE: _____
(Bid is invalid without signature)

Print Name: _____ Date: _____

Title: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Contact Person: _____

THIS PAGE IS FOR BIDDERS' REFERENCE AND NEED NOT BE SUBMITTED WITH BID FORM.

BID CHECK LIST:
These items **must** be included with Bid:
☐ Bid Form ☐ Bid Bond ☐ Fair Labor Practices Certification

BIDDERS SHOULD BE AWARE OF THE FOLLOWING:

DANE COUNTY VENDOR REGISTRATION PROGRAM

Any person bidding on any County contract must be registered with the Dane County Purchasing Division & pay an annual registration fee. A contract will not be awarded to an unregistered vendor. Obtain a *Vendor Registration Form* by calling 608/266-4131 or complete a new form or renewal one online at:
www.danepurchasing.com/registration

DANE COUNTY BEST VALUE CONTRACTING PRE-QUALIFICATION

Contractors must be pre-qualified as a Best Value Contractor with the Dane County Public Works Engineering Division before the award of contract. Obtain a *Best Value Contracting Application* by calling 608/266-4018 or complete one online at:
www.co.dane.wi.us/pwht/BVC_Application.aspx

EQUAL BENEFITS REQUIREMENT

By submitting a Bid, the contractor acknowledges that a condition of this contract is to provide equal benefits as required by Dane County Code of Ordinances Chapter 25.016. Contractor shall provide equal benefits as required by that Ordinance to all required employees during the term of the contract. For more information:
www.danepurchasing.com/partner_benefit.aspx

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 proposal, bid or application for a contract 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.nlrb.gov and werc.wi.gov.

For reference, Dane County Ordinance 25.11(28)(a) is as follows:
(28) 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 purchasing manager 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.

DANE COUNTY DEPARTMENT of PUBLIC WORKS, HIGHWAY and TRANSPORTATION

County Executive
Joseph T. Parisi

1919 Alliant Energy Center Way ◆ Madison, Wisconsin 53713
Phone: (608) 266-4018 ◆ FAX: (608) 267-1533

Commissioner / Director
Gerald J. Mandli

BEST VALUE CONTRACTING APPLICATION

CONTRACTORS / LICENSURE APPLICANTS

The Dane County Department of Public Works requires all contractors to be pre-qualified as a best value contractor with the County prior to being awarded a contract. In addition, the County pre-qualifies potential contractors and sub-contractors who wish to work on County contracts. Subcontractors must become pre-qualified ten (10) days prior to commencing work under any Dane County Public Works Contract. Potential subcontractors are urged to become pre-qualified as early as possible. 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 pre-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 pre-qualification application. Failure to do so could result in suspension, revocation of the contractor's pre-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: dwd.wisconsin.gov/apprenticeship/.

EXEMPTIONS

- Contractors who employ less than five (5) apprenticeable trade workers are not required to pre-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 possesses 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, pre-qualified subcontractors?	Yes: ☐ No: ☐
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: ☐ No: ☐
3	Will your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: ☐ No: ☐
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: ☐ No: ☐
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: ☐ No: ☐
6	Does your firm acknowledge that it must pay all craft employees on public works projects the wage rates and benefits required under Section 66.0903 of the Wisconsin Statutes?	Yes: ☐ No: ☐
7	Will your firm fully abide by the equal opportunity and affirmative action requirements of all applicable laws, including County ordinances?	Yes: ☐ No: ☐
8	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: ☐ No: ☐ If Yes, attach details.
9	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: ☐ No: ☐ If Yes, attach details.
10	In the past three (3) years, has your firm been debarred by any federal, state or local government agency?	Yes: ☐ No: ☐ If Yes, attach details.
11	In the past three (3) years, has your firm defaulted or failed to complete any contract?	Yes: ☐ No: ☐ If Yes, attach details.
12	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: ☐ No: ☐ If Yes, attach details.
13	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: ☐ No: ☐ If Yes, attach details.
14	Is your firm Executive Order 108 precertified with the State of Wisconsin?	Yes: No: ☐
15	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: ☐ No: ☐
16	Is your firm exempt from being pre-qualified with Dane County?	Yes: ☐ No: ☐ If Yes, attach reason for exemption.
17	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 pre-qualified with the County or become so ten days prior to commencing work?	Yes: ☐ No: ☐
18	Contractor has been in business less than one year?	Yes: ☐ No: ☐
19	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: ☐ No: ☐
20	Not applicable. My firm does not intend to work on Best Value Contracts. Note: Best Value Contracting is required to bid on most Public Works Contracts (if unclear, please call Jan Neitzel Knox 608-266-4029).	Yes: ☐ No: ☐

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 _____ Date _____

Printed or Typed Name and Title _____

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

REMEMBER!

Return all to forms and attachments, or questions to:

JAN NEITZEL KNOX
EMAIL: NEITZEL-KNOX@COUNTYOFDANE.COM
OFFICE: (608)266-4029, FAX: (608)267-1533

DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HGHWAY & 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

COUNTY OF DANE

PUBLIC WORKS CONTRACT

Contract No. _____ Bid No. 312026

Authority: Res. _____, [2012-13]

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

W I T N E S S E T H :

WHEREAS, COUNTY, whose address is c/o Associate Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR provide materials and labor necessary for Air Handling Unit Replacements (Vertical Expansion, Units 1 & 2) in the City-County Building ("the Project"); and

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

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

1. CONTRACTOR agrees to construct, for the price of $_____ the Project and at the CONTRACTOR'S own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence labor, insurance, and other accessories and services necessary to complete the Project in accordance with the conditions and prices stated in the Bid Form, 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 _____ (hereinafter referred to as "the Architect / Engineer"), and as enumerated in the Project Manual Document Index, 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 Conditions of Contract, and to make payments on account thereof as provided in Article entitled, "Payments to Contractor" of the 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 Officer in accord with Chapter 19 of the Dane County Code of Ordinances. CONTRACTOR must file such plan within fifteen (15) 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 Contract Compliance Office, 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 comply with provisions of Chapter 25.016 of the Dane County Code of Ordinances, which pertains to domestic partnership benefits.

7. CONTRACTOR agrees to furnish all information and reports required by COUNTY'S Contract Compliance Officer 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.

8. CONTRACTOR agrees that all persons employed by CONTRACTOR or any subcontractor shall be paid no less than the minimum wage established under Chapter 40, Subchapter II, Dane County Code of Ordinances. CONTRACTOR agrees to abide by and comply with the provisions of Chapter 40, Subchapter II of the Dane County Code of Ordinances, and said Subchapter is fully incorporated herein by reference.

9. 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.

10. 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.

11. CONTRACTOR must be pre-qualified as a Best Value Contractor with Dane County Public Works Engineering Division before award of Contract. Subcontractors must be pre-qualified ten (10) days prior to commencing 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 Associate Public Works Director.

FOR COUNTY:

Kathleen M. Falk, County Executive Date

Robert Ohlsen, County Clerk Date

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A310

Bid Bond

Bond No.

KNOW ALL MEN BY THESE PRESENTS, that we

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called the Principal, and

(Here insert full name and address or legal title of Surety)

a corporation duly organized under the laws of the State of WI as Surety, hereinafter called the Surety, are held and firmly bound unto

(Here insert full name and address or legal title of Owner)

as Obligee, hereinafter called Obligee, in the sum of ( ) Percent of total amount bid

Dollars ($ Percent of attached bid).

For the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for Project No.:

(Here insert full name, address, and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee 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.

Signed and sealed this day of , 20 .

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

ATTORNEY-IN-FACT

THE AMERICAN INSTITUTE OF ARCHITECTS

Bond No.

AIA Document A312

Performance Bond

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

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name 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 Page 3

CONTRACTOR AS PRINCIPAL
COMPANY: (Corporate Seal)

SURETY COMPANY:
(Corporate Seal)

Signature: _____
Name and Title:

Signature: _____
Name and Title:
Attorney-in-Fact

(Any additional signatures appear on page 3)

FOR INFORMATION ONLY-Name, Address and Telephone AGENT OR BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

1. The Contractor and the 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 to participate in conferences as provided in Subparagraph 3.1.

3. If there is no Owner Default, the Surety's obligation under this Bond shall arise after:

3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. 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; and

3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and

3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.

4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

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

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

4.3 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 the 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 Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or

4.4 Waive its rights 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, tender payment therefor to the Owner; or

2. Deny liability in whole or in part and notify the Owner citing reasons therefor.

5. If the Surety does not proceed as provided in Paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen 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 Subparagraph 4.4, and the Owner refuses the payment tendered 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.

6. After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1, 4.2, or 4.3 above, 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. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, the Surety is obligated without duplication for:

6.1 The responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

6.2 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 Paragraph 4; and

6.3 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.

7. 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, or successors.

8. 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.

9. 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 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.

10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.

11. 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 here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12 DEFINITIONS

12.1 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.

12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

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		SURETY	
Company:	(Corporate Seal)	Company:	(Corporate Seal)
Signature: _____		Signature: _____	
Name and Title:		Name and Title:	
Address:		Address:	

THE AMERICAN INSTITUTE OF ARCHITECTS

Bond No.

AIA Document A312

Payment Bond

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

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name 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 Page 6

CONTRACTOR AS PRINCIPAL
COMPANY: (Corporate Seal)

SURETY COMPANY:
(Corporate Seal)

Signature: _____
Name and Title:

Signature: _____
Name and Title:
Attorney-in-Fact

(Any additional signatures appear on page 6)

FOR INFORMATION ONLY-Name, Address and Telephone
AGENT OR BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

1. The Contractor and the 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.

2. With respect to the Owner, this obligation shall be null and void if the Contractor:

2.1 Promptly makes payment, directly, or indirectly, for all sums due Claimants, and

2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for the payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.

3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2 Claimants who do not have a direct contract with the Contractor:

1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.

5. If a notice required by Paragraph 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2 Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. 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 the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

9. 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 payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

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. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2.3, 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.

12. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

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. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor

shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1 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 Contract. 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.

15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

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		SURETY	
Company:	(Corporate Seal)	Company:	(Corporate Seal)
Signature: _____		Signature: _____	
Name and Title:		Name and Title:	
Address:		Address:	

EQUAL BENEFITS COMPLIANCE PAYMENT CERTIFICATION

PURPOSE

25.016(8) of the Dane County Ordinance requires that each contractor receiving payment for contracted services must certify that he or she has complied fully with the requirements of Chapter 25.016 "Equal Benefits Requirement" of the Dane County Ordinances. Such certification must be submitted prior to the final payment on the contract.

This form should be included with a copy of the final contract invoice forwarded to your contract representative at Dane County.

CERTIFICATION

I, _____ certify that
Printed or Typed Name and Title

_____
Printed or Typed Name of Contractor

has complied fully with the requirements of Chapter 25.016 of the Dane County Ordinances "Equal Benefits Requirements".

Signed _____

Date _____

For questions on this form, please contact Chuck Hicklin at 608-266-4109 or your contract representative at Dane County.

GENERAL CONDITIONS OF CONTRACT

TABLE OF CONTENTS

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 Engineer 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 Engineer is appointed by and responsible to Department. Public Works Project Engineer 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 Engineer 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 omission 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 time 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 shall pay all Sales, Consumer, Use and other similar taxes required by law.

E. Contractor shall promptly notify Architect / Engineer of any variances of Drawings or Specifications with that of any State of Wisconsin, federal or local law, code, rule or regulation. Upon such notification, Architect / Engineer will require correction of variance to comply with applicable law, code, rule or regulation at no additional cost to Contractor.

F. Work under this Contract shall comply with all applicable State of Wisconsin, Federal and local laws, codes and regulations.

G. Contractor shall pay charges for water, sewer and other utility connections made by municipalities where required by Specifications.

13. CONTRACTOR'S OBLIGATIONS AND SUPERINTENDENCE

A. Contractor shall provide and pay for all materials, labor, tools, equipment, transportation and superintendence necessary to execute, complete and deliver the Work within specified time. Contractor agrees to secure at their own expense all personnel necessary to carry out the Work. Such personnel shall not be deemed County employees nor shall they have or be deemed to have any direct contractual relationship with County.

B. Performance of any work necessary after regular working hours, on Sundays or Legal Holidays shall be without additional expense to County. Performance of any work at site at other than normal working hours must be coordinated with Public Works Project Engineer.

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 Engineer 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 be 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 Engineer's instructions require any work to be specially tested or approved, Contractor shall give Architect / Engineer and Public Works Project Engineer 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 Engineer 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 Engineer 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 Engineer 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 Engineer'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) 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 Engineer 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) 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) 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) 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 Engineer.

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 manpower 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 Engineer.

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 Engineer.

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.

   Submit these estimates for approval first to Architect / Engineer, then to Public Works Project Engineer. 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.

B. 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.

C. Contractor shall submit for approval first to Architect / Engineer, and then to Public Works Project Engineer 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.

D. 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) days from receipt of payment.

E. Payments by County will be due within forty-five (45) days after receipt by Department of Application and Certificate for Payment.

F. 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 Engineer find that progress of the Work corresponds with Construction Schedule. If Architect / Engineer and Public Works Project Engineer 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.

G. 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.

H. County will make final payment within sixty (60) days after final completion of the Work, and will constitute acceptance thereof.

I. 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.

J. 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. If Wisconsin Prevailing Wage Rate Determination is required for this Work, use "Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination" and "Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination" (if applicable). If Wisconsin Prevailing Wage Rate Determination is not required for this Work, use "Dane County, Wisconsin Contractor Wage Affidavit". Forms of such affidavits are included in Supplementary Conditions.

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, workmen, 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 (5^{th}) 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) 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. PUBLIC WORKS PROJECT ENGINEER'S AUTHORITY

A. Public Works Project Engineer 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. ARCHITECT / ENGINEER'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 Engineer.

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 Engineer.

D. Where guarantees or warrantees 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 no 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) 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 effect 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) 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. Contractor agrees to provide same economic benefits to all of its employees with domestic partners as it does to employees with spouses, or cash equivalent if such benefit cannot reasonably be provided. Contractor agrees to make available for County inspection Contractor's payroll records relating to employees providing services on or under this Contract or subcontract. If any payroll records of Contractor contain any false, misleading or fraudulent information, or if Contractor fails to comply with provisions of Chapter 25.016, Dane County Ordinances, contract compliance officer may withhold payments on Contract; terminate, cancel or suspend Contract in whole or in part; or, after due process hearing, deny Contractor right to participate in bidding on future County contracts for period of one year after first violation is found and for period of three years after second or subsequent violation is found.

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 Engineer, 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.

E. Submit required affidavit(s) to Department of Public Works, Highway & Transportation, as requested and with final application for payment for work under said contract. Affidavit(s) shall clearly indicate name, trade or occupation, and paid wages of every laborer, workman or mechanic employed by Contractor and all subcontractors during billing period including accurate record of number of hours worked by each employee and actual wages paid as stipulated in Wisconsin Statue 66.0903. If Wisconsin Prevailing Wage Rate Determination is required for this Work, use "Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination" and "Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination" (if applicable). If Wisconsin Prevailing Wage Rate Determination is not required for this Work, use "Dane County, Wisconsin Contractor Wage Affidavit". Forms of such affidavits are included in Supplementary Conditions.

48. CLAIMS

A. No claim may be made until Department's Associate 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 Associate Public Works Director, 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 then $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 sub-contractors' insurance policies.
   c) Obligations of Contractor under Article 48.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 48.A.2 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) days written notice has been received by Risk Manager."

B. Builder's Risk:
1. County shall provide Builder's Risk policy. Terms of this policy will be made available by County's Risk Manager, upon Contractor's request. By executing this Contract, Contractor warrants it is familiar with terms of said policy.

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.

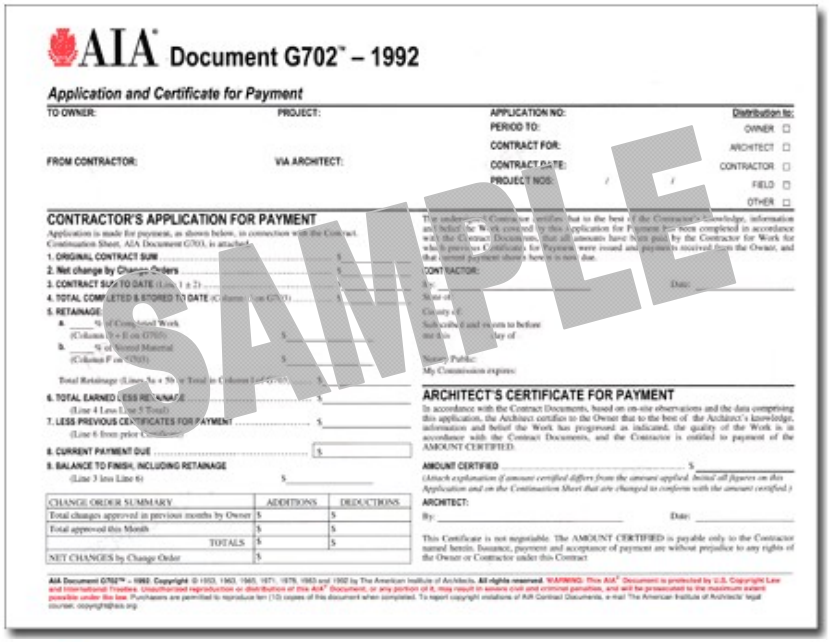
51. WISCONSIN LAW CONTROLLING

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.

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 Engineer for approval.



AIA Document G702™ – 1992

Application and Certificate for Payment

TO OWNER: PROJECT: APPLICATION NO: Distribution to:
PERIOD TO: OWNER ☐
CONTRACT FOR: ARCHITECT ☐
FROM CONTRACTOR: VIA ARCHITECT: CONTRACT DATE: CONTRACTOR ☐
PROJECT NOS: / / FIELD ☐
OTHER ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet, AIA Document G703, 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 (Column 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 Less 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 less Line 6)

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$	$
Total approved this Month	$	$
TOTALS	$	$
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

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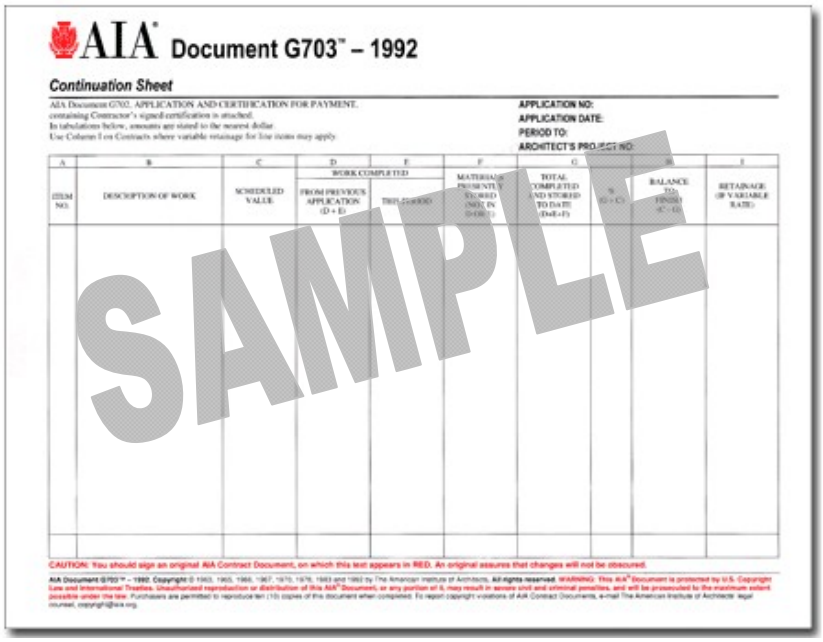

AIA Document G703™ – 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.
In tabulations below, amounts are stated to the nearest dollar.
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: FROM PREVIOUS APPLICATION (D + E)	E WORK COMPLETED: THIS PERIOD	F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G TOTAL COMPLETED AND STORED TO DATE (D+E+F)	H % (G ÷ C)	I BALANCE TO FINISH (C – G)	J RETAINAGE (IF VARIABLE RATE)

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 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.

2. BUY AMERICAN PROVISIONS

A. The Buy American provision in the American Recovery and Reinvestment Act of 2009 (section 1605 of Title XVI), provides that, unless one of three listed exceptions applies (nonavailability, unreasonable cost, and inconsistent with the public interest), and a waiver is granted, none of the funds appropriated or otherwise made available by the Act may be used for a project for the construction, alteration, maintenance, or repair of a public building or public work unless all the iron, steel, and manufactured goods used are produced in the United States.

B. Contractors may use the attached affidavit to certify that a manufactured good meets the Buy American Act Requirements. The following Buy American Affidavit shall be submitted to Public Works Project Engineer. If contract chooses not to use the attached affidavit it is their responsibility to adhere to the reporting requirements of the American Recovery and Reinvestment Act of 2009. Refer to Attachment A-2 for complete details.

DANE COUNTY, WISCONSIN

BUY AMERICAN AFFIDAVIT

COMPANY NAME: _____

ADDRESS: _____

_____

CONTRACT NO.: _____ DIVISION(S) OF WORK: _____

AFFIDAVIT

STATE OF WISCONSIN)
) ss.
DANE COUNTY)

I, _____, being
name and title of person signing affidavit
first duly sworn at _____,
city & state of company incorporation
on oath, depose and say that with respect to the Buy American requirement have used American, Steel, and Manufactured Goods as required under Section 1605 of the American Recovery and Reinvestment ACT of 2009 by

_____, (sub)contractor on the _____
contractor company name division(s) of work
_____, at the _____
building or site of project
that during the period commencing _____, and ending _____.

Product(s) Description: (If necessary add attachment)

Item or product	Manufacturer	Specification Section

_____
Print Name

_____ _____
Signature Title

Sworn to before me this ___ day of _____, 20__.

_____ My Commission expires _____
Notary Public Date

3. PREVAILING WAGE RATE DETERMINATION

A. WISCONSIN DEPARTMENT OF WORKFORCE DEVELOPMENT: These supplements shall modify, delete, and / or add to General Conditions of Contract. Where any article, paragraph, or subparagraph in General Conditions of Contract is supplemented by one of these paragraphs, provisions of such article, paragraph, or subparagraph shall remain in effect and supplementary provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in General Conditions of Contract is amended, voided, or superseded by any of these paragraphs, provisions of such article, paragraph, or subparagraph not so amended, voided, or superseded shall remain in effect.

1. General Conditions of Contract Article 45, "Minimum Wages", paragraph B. Following Prevailing Wage Rate Determination No. 201202195is added to General Conditions of Contract.
2. These State of Wisconsin forms, hereinafter set forth in this section, shall be filled out and submitted to Department of Public Works, Highway & Transportation:
    a. Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination (ERD-5724)
    b. Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination (ERD-10584)
    c. Disclosure of Ownership (ERD-7777)
    d. Request To Employ Subjourneyperson (ERD-10880)

B. GENERAL DECISION – Wisconsin Prevailing Wages Determination:

1. Prevailing Wage Rate Determination No. 201202195is attached to the end of Supplementary Conditions.

C. UNITED STATES DEPARTMENT OF LABOR: These supplements shall modify, delete, and / or add to Conditions of Contract. Where any article, paragraph, or subparagraph in Conditions of Contract is supplemented by one of these paragraphs, provisions of such article, paragraph, or subparagraph shall remain in effect and supplementary provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in Conditions of Contract is amended, voided, or superseded by any of these paragraphs, provisions of such article, paragraph, or subparagraph not so amended, voided, or superseded shall remain in effect. Refer to Attachment A-3 for complete details.

1. Conditions of Contract Article 45, "Minimum Wages", paragraph B. Following Davis Bacon Wage Determination No. WI100005 12/03/2010 is added to Conditions of Contract.
2. These U.S. Department of Labor forms, hereinafter set forth in this section, shall be filled out and submitted to Department of Public Works, Highway & Transportation:
    a. Certified Payroll Request (Form WH-347), http://webapps.dol.gov/libraryforms/go-us-dol-form.asp?FormNumber=38
    b. Statement of Compliance

State of Wisconsin Department of Workforce Development Equal Rights Division	**DEPARTMENTAL ORDER**

ISSUE DATE: 8/24/2012

PROJECT:

AIR HANDLING UNITS REPLACEMENT
MADISON CITY, DANE COUNTY, WI
Determination No. 201202195 [Owner Project No. 312026]

PROJECT OWNER:	**REQUESTER:**
ZACH SAGESER, ENGINEERING INTERN DANE COUNTY PUBLIC WORKS 1919 ALLIANT ENERGY CENTER WAY MADISON, WI 53713	ZACH SAGESER, ENGINEERING INTERN DANE COUNTY PUBLIC WORKS 1919 ALLIANT ENERGY CENTER WAY MADISON, WI 53713
ADDITIONAL CONTACT:	**NOTE:** The Requester must provide a copy of this Project Determination and enclosures to the Project Owner and Additional Contact.

The department received an application for prevailing wage rate determination for the above-captioned project. The department conducted a survey to determine the prevailing wage rate for the trade(s) or occupation(s) needed to complete the project. The survey's findings appear in the attached project determination.

If you believe that the wage rate for any trade or occupation does not accurately reflect the prevailing wage rate in the city, village or town where the project is located, you may ask the department to conduct an administrative review of such wage rate. You must submit this request in writing within 30 days from the date indicated above. Additionally, your request must include wage rate information from at least three similar projects in the city, village or town where the proposed project is located and on which some work has been performed by the contested trade(s) during the current survey period and was previously considered by the department in issuing the attached determination. See DWD 290.10 of the Wisconsin Administrative Code and either s. 66.0903(3)(br), s. 66.0904(4)(e), or s. 103.49(3)(c), Stats., for a complete explanation of the administrative review process.

Enclosures

It is hereby ordered that the prevailing wage rates set forth in the attached project determination shall only be applicable to the above referenced project. This order is a **FINAL ORDER** of the department unless a timely request for an administrative review is filed with the department.

ISSUED BY:

Equal Rights Division
Labor Standards Bureau
Construction Wage Standards Section
PO Box 8928 Madison, WI 53708-8928
(608)266-6861

Web Site: http://dwd.wisconsin.gov/er/

PREVAILING WAGE RATE DETERMINATION
Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Wis. Stats.
Issued On: 8/24/2012

DETERMINATION NUMBER: 201202195

EXPIRATION DATE: Prime Contracts MUST Be Awarded or Negotiated On Or Before 2/20/2013. If NOT, You MUST Reapply.

PROJECT NAME: AIR HANDLING UNITS REPLACEMENT

PROJECT NO: 312026

PROJECT LOCATION: MADISON CITY, DANE COUNTY, WI

CONTRACTING AGENCY: DANE COUNTY PUBLIC WORKS

CLASSIFICATION:	Contractors are responsible for correctly classifying their workers. Either call the Department of Workforce Development (DWD) with trade or classification questions or consult DWD's Dictionary of Occupational Classifications & Work Descriptions on the DWD website at: dwd.wisconsin.gov/er/prevailing_wage_rate/Dictionary/dictionary_main.htm.
OVERTIME:	Time and one-half must be paid for all hours worked: - over 10 hours per day on prevailing wage projects - over 40 hours per calendar week - Saturday and Sunday - on all of the following holidays: January 1; the last Monday in May; July 4; the 1st Monday in September; the 4th Thursday in November; December 25; - The day before if January 1, July 4 or December 25 falls on a Saturday; - The day following if January 1, July 4 or December 25 falls on a Sunday. Apply the time and one-half overtime calculation to whichever is higher between the Hourly Basic Rate listed on this project determination or the employee's regular hourly rate of pay. Add any applicable Premium or DOT Premium to the Hourly Basic Rate before calculating overtime. A DOT Premium (discussed below) may supersede this time and one-half requirement.
FUTURE INCREASE:	When a specific trade or occupation requires a future increase, you MUST add the full hourly increase to the "TOTAL" on the effective date(s) indicated for the specific trade or occupation.
PREMIUM PAY:	If indicated for a specific trade or occupation, the full amount of such pay MUST be added to the "HOURLY BASIC RATE OF PAY" indicated for such trade or occupation, whevenever such pay is applicable.
DOT PREMIUM:	This premium only applies to highway and bridge projects owned by the Wisconsin Department of Transportation and to the project type heading "Airport Pavement or State Highway Construction." DO NOT apply the premium calculation under any other project type on this determination.
APPRENTICES:	Pay apprentices a percentage of the applicable journeyperson's hourly basic rate of pay and hourly fringe benefit contributions specified in this determination. Obtain the appropriate percentage from each apprentice's contract or indenture.
SUBJOURNEY:	Subjourney wage rates may be available for some of the trades or occupations indicated below with the exception of laborers, truck drivers and heavy equipment operators. Any employer interested in using a subjourney classification on this project MUST complete Form ERD-10880 and request the applicable wage rate from the Department of Workforce Development PRIOR to using the subjourney worker on this project.

This document **MUST BE POSTED** by the **CONTRACTING AGENCY** in at least one conspicuous and easily accessible place **on the site of the project** . A local governmental unit may post this document at the place normally used to post public notices if there is no common site on the project. This document **MUST** remain posted during the entire time any worker is employed on the project and **MUST** be physically incorporated into the specifications and all contracts and subcontracts. If you have any questions, please write to the Equal Rights Division, Labor Standards Bureau, P.O. Box 8928, Madison, Wisconsin 53708 or call (608) 266-6861.

The following statutory provisions apply to local governmental unit projects of public works and are set forth below pursuant to the requirements of s. 66.0903(8), Stats.

s. 66.0903 (1) (f) & s. 103.49 (1) (c) "PREVAILING HOURS OF LABOR" for any trade or occupation in any area means 10 hours per day and 40 hours per week and may not include any hours worked on a Saturday or Sunday or on any of the following holidays:

1. January 1.
2. The last Monday in May.
3. July 4.
4. The first Monday in September.
5. The 4th Thursday in November.
6. December 25.
7. The day before if January 1, July 4 or December 25 falls on a Saturday.
8. The day following if January 1, July 4 or December 25 falls on a Sunday.

s. 66.0903 (10) RECORDS; INSPECTION; ENFORCEMENT.
(a) Each contractor, subcontractor, or contractor's or subcontractor's agent performing work on a project of public works that is subject to this section shall keep full and accurate records clearly indicating the name and trade or occupation of every person performing the work described in sub. (4) and an accurate record of the number of hours worked by each of those persons and the actual wages paid for the hours worked.

s. 66.0903 (11) LIABILITY AND PENALTIES.
(a) 1. Any contractor, subcontractor, or contractor's or subcontractor's agent who fails to pay the prevailing wage rate determined by the department under sub. (3) or who pays less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor is liable to any affected employee in the amount of his or her unpaid wages or his or her unpaid overtime compensation and in an additional amount as liquidated damages as provided under subd. 2., 3., whichever is applicable.
2. If the department determines upon inspection under sub. (10) (b) or (c) that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the department shall order the contractor to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages within a period specified by the department in the order.
3. In addition to or in lieu of recovering the liability specified in subd. 1. as provided in subd. 2., any employee for and in behalf of that employee and other employees similarly situated may commence an action to recover that liability in any court of competent jurisdiction. If the court finds that a contractor, subcontractor, or contractor's or subcontractor's agent has failed to pay the prevailing wage rate determined by the department under sub. (3) or has paid less than 1.5 times the hourly basic rate of pay for all hours worked in excess of the prevailing hours of labor, the court shall order the contractor, subcontractor, or agent to pay to any affected employee the amount of his or her unpaid wages or his or her unpaid overtime compensation and an additional amount equal to 100 percent of the amount of those unpaid wages or that unpaid overtime compensation as liquidated damages.
5. No employee may be a party plaintiff to an action under subd. 3. unless the employee consents in writing to become a party and the consent is filed in the court in which the action is brought. Notwithstanding s. 814.04 (1), the court shall, in addition to any judgment awarded to the plaintiff, allow reasonable attorney fees and costs to be paid by the defendant.

BUILDING OR HEAVY CONSTRUCTION

Includes sheltered enclosures with walk-in access for the purpose of housing persons, employees, machinery, equipment or supplies and non-sheltered work such as canals, dams, dikes, reservoirs, storage tanks, etc. A sheltered enclosure need not be "habitable" in order to be considered a building. The installation of machinery and/or equipment, both above and below grade level, does not change a project's character as a building. On-site grading, utility work and landscaping are included within this definition. Residential buildings of four (4) stories or less, agricultural buildings, parking lots and driveways are NOT included within this definition.

SKILLED TRADES

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
101	Acoustic Ceiling Tile Installer	29.06	15.16	44.22
102	Boilermaker	31.09	23.75	54.84
103	Bricklayer, Blocklayer or Stonemason Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80 on 6/1/2013 Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.26	16.60	48.86
104	Cabinet Installer	29.06	15.16	44.22
105	Carpenter	29.06	15.16	44.22
106	Carpet Layer or Soft Floor Coverer	29.06	15.16	44.22
107	Cement Finisher	32.03	15.13	47.16
108	Drywall Taper or Finisher	26.10	13.65	39.75
109	Electrician Future Increase(s): Add $.50/hr on 6/1/2012. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.55	18.68	51.23
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	25.50	0.26	25.76
112	Fire Sprinkler Fitter	36.39	16.75	53.14
113	Glazier	36.23	11.22	47.45
114	Heat or Frost Insulator	33.28	22.51	55.79
115	Insulator (Batt or Blown)	23.62	11.55	35.17
116	Ironworker	30.90	19.11	50.01
117	Lather	29.06	15.16	44.22

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
118	Line Constructor (Electrical)	35.97	18.08	54.05
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	32.66	16.20	48.86
121	Metal Building Erector	22.00	4.11	26.11
122	Millwright	30.66	15.21	45.87
123	Overhead Door Installer	18.00	4.86	22.86
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
127	Pipeline Fuser or Welder (Gas or Utility)	29.54	18.84	48.38
129	Plasterer	29.03	15.16	44.19
130	Plumber	36.20	15.02	51.22
132	Refrigeration Mechanic Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
133	Roofer or Waterproofer	28.06	0.00	28.06
134	Sheet Metal Worker	34.23	20.19	54.42
135	Steamfitter Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
137	Teledata Technician or Installer	21.26	6.99	28.25
138	Temperature Control Installer	32.55	18.68	51.23
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	23.77	16.00	39.77
142	Tile Setter Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	29.71	16.00	45.71
143	Tuckpointer, Caulker or Cleaner Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	32.01	16.85	48.86

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	25.32	15.30	40.62
147	Siding Installer	16.74	2.58	19.32
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	18.00	6.98	24.98
203	Three or More Axle Future Increase(s): Add $1.57/hr on 6/1/2012.	18.00	13.83	31.83
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	18.00	13.68	31.68

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $.50/hr. on 06/04/2012; Add $.75/hr. on 06/03/2013 Premium Increase(s): Add $1.00/hr for certified welder; Add $.25/hr for mason tender	24.14	13.45	37.59
302	Asbestos Abatement Worker	23.96	12.88	36.84
303	Landscaper	17.00	6.36	23.36
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	20.39	12.20	32.59

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
501	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Milling Machine; Boring Machine (Directional, Horizontal or Vertical); Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Backhoe (Track Type) Having a Mfgr's Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Crane, Shovel, Dragline, Clamshells; Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Grader or Motor Patrol; Master Mechanic; Mechanic or Welder; Robotic Tool Carrier (With or Without Attachments); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Tractor (Scraper, Dozer, Pusher, Loader); Trencher (Wheel Type or Chain Type Having Over 8 Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40
502	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Environmental Burner; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Jeep Digger; Screed (Milling Machine); Skid Rig; Straddle Carrier or Travel Lift; Stump Chipper; Trencher (Wheel Type or Chain Type Having 8 Inch Bucket & Under).	31.89	14.44	46.33
503	Air Compressor (&/or 400 CFM or Over); Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Greaser; High Pressure Utility Locating Machine (Daylighting Machine); Mulcher; Oiler; Post Hole Digger or Driver; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
504	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
505	Work Performed on the Great Lakes Including Crane or Backhoe Operator; Assistant Hydraulic Dredge Engineer; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder; 70 Ton & Over Tug Operator. Premium Increase(s): Add $.50/hr for friction crane, lattice boom or crane certification (CCO).	37.45	19.45	56.90
506	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
507	Work Performed on the Great Lakes Including Deck Equipment Operator, Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	27.75	19.15	46.90

HEAVY EQUIPMENT OPERATORS
EXCLUDING SITE PREPARATION, UTILITY, PAVING LANDSCAPING WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
508	Boring Machine (Directional); Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.50/hr at 200 ton: Add $1.00/hr. at 300 ton; Add $1.50/hr at 400 ton; Add $2.00/hr at 500 ton.	34.62	17.98	52.60
509	Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Boring Machine (Horizontal or Vertical); Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With A Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Pile Driver; Versi Lifts, Tri-Lifts & Gantrys (20,000 Lbs. & Over). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.25/hr for cranes with lifting capacity of 45 ton or over.	33.62	17.98	51.60

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
510	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump (Over 46 Meter), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Dredge (NOT Performing Work on the Great Lakes); Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Hydro-Blaster (10,000 PSI or Over); Milling Machine; Skid Rig; Traveling Crane (Bridge Type). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40
511	Air, Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Pump (46 Meter & Under), Concrete Conveyor (Rotec or Bidwell Type); Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Environmental Burner; Gantrys (Under 20,000 Lbs.); Grader or Motor Patrol; High Pressure Utility Locating Machine (Daylighting Machine); Manhoist; Material or Stack Hoist; Mechanic or Welder; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yd or More Capacity; Screed (Milling Machine); Sideboom; Straddle Carrier or Travel Lift; Tining or Curing Machine; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type Having Over 8-Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
512	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Grout Pump; Hoist (Tugger, Automatic); Industrial Locomotives; Jeep Digger; Lift Slab Machine; Mulcher; Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames.	35.59	19.10	54.69
513	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Boatmen (NOT Performing Work on the Great Lakes); Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Elevator; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Forklift; Generator (&/or 150 KW or Over); Greaser; Heaters (Mechanical); Loading Machine (Conveyor); Oiler; Post Hole Digger or Driver; Prestress Machine; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Robotic Tool Carrier (With or Without Attachments); Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	29.19	17.98	47.17

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
514	Gas or Utility Pipeline, Except Sewer & Water (Primary Equipment). Future Increase(s): Add $2/hr. on 1/1/2013.	34.89	19.68	54.57
515	Gas or Utility Pipeline, Except Sewer & Water (Secondary Equipment).	30.32	17.40	47.72
516	Fiber Optic Cable Equipment	22.00	7.27	29.27

SEWER, WATER OR TUNNEL CONSTRUCTION

Includes those projects that primarily involve public sewer or water distribution, transmission or collection systems and related tunnel work (excluding buildings).

SKILLED TRADES

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	16.20	48.86
105	Carpenter Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	33.43	19.31	52.74
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; Add $1.87 on 6/1/15; Add $1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	30.68	15.68	46.36
109	Electrician Future Increase(s): Add $1.40/hr on 6/1/2012. Add $1.60/hr on 6/1/2013. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year’s Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	31.54	20.95	52.49
111	Fence Erector	25.50	0.26	25.76
116	Ironworker Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	31.31	22.22	53.53
118	Line Constructor (Electrical)	35.97	18.08	54.05
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
130	Plumber	36.20	15.02	51.22
135	Steamfitter	39.90	15.76	55.66
137	Teledata Technician or Installer	21.26	6.99	28.25

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
143	Tuckpointer, Caulker or Cleaner	32.66	16.20	48.86
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	24.22	14.80	39.02
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	23.00	8.64	31.64
203	Three or More Axle	21.17	9.51	30.68
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	22.50	16.19	38.69
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	21.17	9.51	30.68

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $.70/hr. on 06/04/2012; Add $.80/hr. on 06/03/2013 Premium Increase(s): Add $.20 for blaster, bracer, manhole builder, caulker, bottomman and power tool; Add $.55 for pipelayer; Add $1.00 for tunnel work 0-15 lbs. compressed air; Add $2.00 for over 15-30 lbs. compressed air; Add $3.00 for over 30 lbs. compressed air.	25.28	13.44	38.72

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
303	Landscaper	17.00	6.36	23.36
304	Flagperson or Traffic Control Person	12.00	17.89	29.89
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
SEWER, WATER OR TUNNEL WORK

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
521	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity Of Over 4,000 Lbs., Crane With Boom Dollies; Master Mechanic; Pile Driver. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.25/hr for cranes with lifting capacity of 45 ton or over.	33.62	17.98	51.60
522	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Boring Machine (Directional); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump (Over 46 Meter), Concrete Conveyor (Rotec or Bidwell Type); Concrete Spreader & Distributor; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity of 4,000 Lbs. & Under; Dredge (NOT Performing Work on the Great Lakes); Milling Machine; Skid Rig; Telehandler; Traveling Crane (Bridge Type). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
523	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Boring Machine (Horizontal or Vertical); Bulldozer or Endloader (Over 40 hp); Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Concrete Pump (46 Meter & Under), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Hydro-Blaster (10,000 PSI or Over); Manhoist; Material or Stack Hoist; Mechanic or Welder; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yd or More Capacity; Screed (Milling Machine); Sideboom; Straddle Carrier or Travel Lift; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type Having Over 8-Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
524	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Environmental Burner; Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Hoist (Tugger, Automatic); Grout Pump; Jeep Digger; Lift Slab Machine; Mulcher; Power Subgrader; Pump (3 Inch or Over) or Well Points; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Tining or Curing Machine; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames.	30.89	17.16	48.05
525	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Loading Machine (Conveyor); Post Hole Digger or Driver; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	29.19	17.98	47.17
526	Boiler (Temporary Heat); Forklift; Greaser; Oiler.	29.19	17.96	47.15
527	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
528	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	36.20	18.81	55.01

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
529	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
530	Work Performed on the Great Lakes Including Deck Equipment Operator; Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under), Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	26.80	18.52	45.32

LOCAL STREET OR MISCELLANEOUS PAVING CONSTRUCTION

Includes roads, streets, alleys, trails, bridges, paths, racetracks, parking lots and driveways (except residential or agricultural), public sidewalks or other similar projects (excluding projects awarded by the Wisconsin Department of Transportation).

SKILLED TRADES

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	16.20	48.86
105	Carpenter	29.06	15.16	44.22
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; Add $1.87 on 6/1/15; Add $1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	30.68	15.68	46.36
109	Electrician Future Increase(s): Add $.50/hr. effective 06/04/2012. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year’s Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	28.74	17.86	46.60
111	Fence Erector	25.50	0.26	25.76
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
133	Roofer or Waterproofer	28.06	0.00	28.06
137	Teledata Technician or Installer	21.26	6.99	28.25
143	Tuckpointer, Caulker or Cleaner	32.66	16.20	48.86
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.42	12.90	48.32

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	29.64	14.64	44.28
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.18	13.07	38.25
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	15.00	0.00	15.00
203	Three or More Axle	19.50	4.97	24.47
204	Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
205	Pavement Marking Vehicle	19.25	10.84	30.09
206	Shadow or Pilot Vehicle	15.00	0.00	15.00
207	Truck Mechanic	19.50	4.97	24.47

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer	26.15	12.29	38.44
303	Landscaper	23.71	15.07	38.78
304	Flagperson or Traffic Control Person	12.00	17.89	29.89
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
CONCRETE PAVEMENT OR BRIDGE WORK

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
541	Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity Of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	34.22	18.90	53.12
542	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity of 4,000 Lbs. & Under; Crane, Tower Crane Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	33.72	18.90	52.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
543	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Automatic Subgrader (Concrete); Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Boring Machine (Directional, Horizontal or Vertical); Bridge (Bidwell) Paver; Bulldozer or Endloader; Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Post Hole Digger or Driver; Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Sideboom; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Straddle Carrier or Travel Lift; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Trencher (Wheel Type or Chain Type); Tube Finisher; Tugger (NOT Performing Work on the Great Lakes); Winches & A-Frames. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	33.22	18.90	52.12

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
544	Backfiller; Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Jeep Digger; Joint Sawer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (WIth or Without Attachments); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	33.22	18.90	52.12
545	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Concrete Proportioning Plant; Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack.	30.42	17.58	48.00
546	Fiber Optic Cable Equipment.	22.00	7.27	29.27
547	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
548	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	36.20	18.81	55.01
549	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or more); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
550	Work Performed on the Great Lakes Including Deck Equipment Operator; Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	26.80	18.52	45.32

HEAVY EQUIPMENT OPERATORS
ASPHALT PAVEMENT OR OTHER WORK

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
551	Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads and/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic.	34.62	17.96	52.58
552	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With a Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Dredge (NOT Performing Work on the Great Lakes); Licensed Boat Pilot (NOT Performing Work on the Great Lakes); Pile Driver. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	33.72	18.90	52.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
553	Air, Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boring Machine (Directional, Horizontal or Vertical); Bulldozer or Endloader; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Laser/Screed; Concrete Slipform Placer Curb & Gutter Machine; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Gradall (Cruz-Aire Type); Grader or Motor Patrol; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Post Hole Digger or Driver; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Sideboom; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Trencher (Wheel Type or Chain Type); Tube Finisher; Tugger (NOT Performing Work on the Great Lakes); Winches & A-Frames. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14.	32.67	18.55	51.22
554	Backfiller; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self-Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler.	31.52	17.89	49.41
555	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14.	32.67	18.55	51.22
556	Fiber Optic Cable Equipment.	22.00	7.27	29.27

********** END OF RATES **********

Department of Workforce Development
Equal Rights Division
P.O. Box 8928
Madison, WI 53708-8928
Telephone: (608) 266-6860
Fax: (608) 267-4592
TTY: (608) 264-8752

STATE OF WISCONSIN
DWD
Department of Workforce Development

The documents following the Prevailing Wage Rate Determination consist of 18 pages of various forms/documents that will be used throughout the completion of the project. The chart below lists the form number, form/document name, the party who uses the document, and the document's number of pages. If you have any questions regarding these forms please call the Prevailing Wage Office at (608)266-6861.

ERD Form Number	Form Name	Party Who Uses the Form	Pages
16056	Post the White Sheet	Contracting agency	1
16770	Substance Abuse Prevention on Public Works and Publicly Funded Projects, §103.503, Wis. Stats.	All contractors working on public works and publicly funded private construction projects	1
10908	Consolidated List of Debarred Contractors	Any party contracting someone to complete work on a prevailing wage project	2
7777	Disclosure of Ownership	Contractors that meet the criteria set out in (3)(A)&(B) of the form	1
5724	Prime Contractor Affidavit of Compliance	Prime contractor files with contracting agency upon completion of the work before receiving final payment	2
10584	Agent or Subcontractor Affidavit of Compliance	Subcontractors file with their awarding contractor upon completion of their work on the project before receiving final payment	2
10880	Request to Employ Subjourneyperson	Contractors wishing to employ a subjourneyperson(s)	1
	Prevailing Wage - Public Entity Project Owners	Explanation of project owner responsibilities	2
	Prevailing Wage – Contractors	Explanation of contractor responsibilities	2
	Summary of Prevailing Wage Law Changes Effective July 1, 2011	Information for public entity or any other interested party	4

01/13/12

State of Wisconsin
Department of Workforce Development
Equal Rights Division
Labor Standards Bureau

POST THE WHITE SHEET

As the public entity receiving this prevailing wage rate determination, YOU ARE REQUIRED by law to post the prevailing wage rate determination (i.e., white sheet) in at least one conspicuous and easily accessible place on the project site that is available to all construction workers. The white sheet must remain posted from the onset of the project until all construction labor on the project has been completed.
[*See,* Wis. Admin. Code §DWD 290.12(1)]

Posting the white sheet inside the general contractor's trailer does not meet this requirement. That placement is not available/accessible to all workers and is not a location over which you have control.

If you have questions about posting, please call (608)266-6861 and ask for prevailing wage intake.

Disclaimer

Employers performing work on public works and publicly funded private construction projects in Wisconsin are required to have a written substance abuse testing program in place. The provisions of this requirement are contained in Sec. 103.503, Wis. Stats. The Department of Workforce Development is neither responsible for enforcement of this law nor authorized to answer questions concerning its provisions. For legal advice on complying with Sec. 103.503, Wis. Stats., you may wish to consult with a private attorney.

103.503 Substance abuse prevention on public works and publicly funded projects. (1) DEFINITIONS. In this section:

(a) "Accident" means an incident caused, contributed to, or otherwise involving an employee that resulted or could have resulted in death, personal injury, or property damage and that occurred while the employee was performing the work described in s. 66.0903 (4), 66.0904 (3), or 103.49 (2m) on a project.

(b) "Alcohol" has the meaning given in s. 340.01 (1q).

(c) "Contracting agency" means a local governmental unit, as defined in s. 66.0903 (1) (d), a state agency, as defined in s. 103.49 (1) (f), or an owner or developer under s. 66.0904 that has contracted for the performance of work on a project.

(d) "Drug" means any controlled substance, as defined in s. 961.01 (4), or controlled substance analog, as defined in s. 961.01 (4m), for which testing is required by an employer under its substance abuse prevention program under this section.

(e) "Employee" means a laborer, worker, mechanic, or truck driver who performs the work described in s. 66.0903 (4), 66.0904 (3), or 103.49 (2m) on a project.

(f) "Employer" means a contractor, subcontractor, or agent of a contractor or subcontractor that performs work on a project.

(g) "Project" mean a project of public works that is subject to s. 66.0903 or 103.49 or a publicly funded private construction project that is subject to s. 66.0904.

(2) SUBSTANCE ABUSE PROHIBITED. No employee may use, possess, attempt to possess, distribute, deliver, or be under the influence of a drug, or use or be under the influence of alcohol, while performing the work described in s. 66.0903 (4), 66.0904 (3), or 103.49 (2m) on a project. An employee is considered to be under the influence of alcohol for purposes of this subsection if he or she has an alcohol concentration that is equal to or greater than the amount specified in s. 885.235 (1g) (d).

(3) SUBSTANCE ABUSE PREVENTION PROGRAMS REQUIRED. (a) Before an employer may commence work on a project, the employer shall have in place a written program for the prevention of substance abuse among its employees. At a minimum, the program shall include all of the following:

1. A prohibition against the actions or conditions specified in sub. (2).

2. A requirement that employees performing the work described in s. 66.0903 (4), 66.0904 (3), or 103.49 (2m) on a project submit to random, reasonable suspicion, and post–accident drug and alcohol testing and to drug and alcohol testing before commencing work on a project, except that testing of an employee before commencing work on a project is not required if the employee has been participating in a random testing program during the 90 days preceding the date on which the employee commenced work on the project.

3. A procedure for notifying an employee who violates sub. (2), who tests positive for the presence of a drug in his or her system, or who refuses to submit to drug or alcohol testing as required under the program that the employee may not perform work on a project until he or she meets the conditions specified in sub. (4) (b) 1. and 2.

(b) Each employer shall be responsible for the cost of developing, implementing, and enforcing its substance abuse prevention program, including the cost of drug and alcohol testing of its employees under the program. The contracting agency is not responsible for that cost, for the cost of any medical review of a test result, or for any rehabilitation provided to an employee.

(4) EMPLOYEE ACCESS TO PROJECT. (a) No employer may permit an employee who violates sub. (2), who tests positive for the presence of a drug in his or her system, or who refuses to submit to drug or alcohol testing as required under the employer's substance abuse prevention program under sub. (3) to perform work on a project until he or she meets the conditions specified in par. (b) 1. and 2. An employer shall immediately remove an employee from work on a project if any of the following occurs:

1. The employee violates sub. (2), tests positive for the presence of a drug in his or her system, or refuses to submit to drug or alcohol testing as required under the employer's substance abuse prevention program.

2. An officer or employee of the contracting agency has a reasonable suspicion that the employee is in violation of sub. (2) and requests the employer to immediately remove the employee from work on the project.

(b) An employee who is barred or removed from work on a project under par. (a) may commence or return to work on the project upon his or her employer providing to the contracting agency documentation showing all of the following:

1. That the employee has tested negative for the presence of drugs in his or her system and is not under the influence of alcohol as described in sub. (2).

2. That the employee has been approved to commence or return to work on the project in accordance with the employer's substance abuse prevention program.

(c) Testing for the presence of drugs or alcohol in an employee's system and the handling of test specimens shall be conducted in accordance with guidelines for laboratory testing procedures and chain–of–custody procedures established by the substance abuse and mental health services administration of the federal department of health and human services.

(5) LOCAL ORDINANCES; STRICT CONFORMITY REQUIRED. A local governmental unit, as defined in s. 66.0903 (1) (d), may enact an ordinance regulating the conduct regulated under this section only if the ordinance strictly conforms to this section.

History: 2005 a. 181; 2009 a. 28.

Consolidated List of Debarred Contractors
Prepared and Issued By
State of Wisconsin
Department of Workforce Development

This list has been prepared in accordance with the provisions of s. 66.0903(12), s. 66.0904(10) and s. 103.49(7), Stats. and Chapter DWD 294 of the Wisconsin Administrative Code. All contractors on this list were found to have committed a "debarable offense" related to certain labor standard provisions determined or established for a state or local public works project or publicly funded private construction project. No state agency, local governmental unit or owner or developer may knowingly solicit bids from, negotiate with or award any contracts to or approve or allow any subcontracts with a debarred contractor, including all divisions, affiliates or other organizational elements of such contractor that are engaged in construction business activities, until the debarment is terminated. The name of each debarred contractor must remain on this list for a period of three (3) years from the termination date indicated below. The contractor is, however, only "debarred" from the "effective date" through the "termination date" indicated for that contractor. Questions regarding this list should be addressed to Julie Eckenwalder, Equal Rights Division, P. O. Box 8928, Madison, WI 53708 or call (608) 266-3148. Deaf, hearing or speech-impaired callers may contact the department by calling its TDD number (608) 264-8752.

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Atkins, Scott	*See,* Freedom Insulation, Inc					
Boecker, Roger	*See,* R-Way Pumping, Inc					
Castlerock Commercial Construction, Inc.	PO Box 11699 Milwaukee, WI 53211-0699	2/1/12	1/31/15	1, 2 and 4	2009 & 2010	None
Custom Heating & Air LLC	283 Tony Lane Green Bay, WI 54304	12/1/06	11/30/09	1, 2 and 4	2003 & 2004	None
Dem/Ex Group, Inc	805 S Adams St Manito, IL 61546	12/1/11	11/30/14	1 and 2	2010	None
Fisher, Ed &/or Fisher, Rhonda	*See,* Dem/Ex Group, Inc					
Freedom Insulation, Inc	117925 219th Ave Chippewa Falls, WI 54729	9/1/11	8/31/14	1	2008-2010	None
JT Roofing, Inc	350 Tower Dr Saukville, WI 53080	6/1/11	5/31/15	1,2 and 4	2007 & 2008	None

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Jinkins, Richard	*See,* Castlerock Commercial Construction, Inc.					
Joseph Stoller Company	N8426 Hwy 42 Algoma, WI 54201	2/1/07	1/31/10	1 and 2	2004 & 2005	None
Keiver, David	*See,* Custom Heating & Air LLC					
Ofstie, Darin	*See,* Precision Excavating and Grading, LLC					
Precision Excavating and Grading, LLC or Precision Excavating Enterprises, LLC	2104 Pierce Saint Croix Rd Baldwin, WI 54002	5/1/11	4/30/14	1, 2 and 4	2006-2008	None
R-Way Pumping, Inc	3023 Lake Maria Rd Freeport, MN 56331	3/1/12	2/28/15	1, 2 and 4	2008	None
Stoller Enterprises LLC	N8426 Hwy 42 Algoma, WI 54201-9552	2/1/2007	1/31/10	1 and 2	2005 to 2006	None
Stoller, Joseph	*See,* Joseph Stoller Company					
Stoller, Patrick J	*See,* Stoller Enterprises LLC					
Thull, Gerald T	*See,* JT Roofing, Inc.					

Cause Code: 1 = Failure to Pay Straight Time 2 = Failure to Pay Overtime 3 = Kickback 4 = Payroll Records.

State of Wisconsin
Department of Workforce Development
Equal Rights Division

Disclosure of Ownership

The statutory authority for the use of this form is prescribed in Sections 66.0903(12)(d), 66.0904(10)(d) and 103.49(7)(d), Wisconsin Statutes.
The use of this form is mandatory. The penalty for failing to complete this form is prescribed in Section 103.005(12), Wisconsin Statutes.
Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1) (m), Wisconsin Statutes]

(1) On the date a contractor submits a bid to or completes negotiations with a state agency, local governmental unit, or developer, investor or owner on a project subject to Section 66.0903, 66.0904 or 103.49, Wisconsin Statutes, the contractor shall disclose to such state agency, local governmental unit, or developer, investor or owner, the name of any "other construction business", which the contractor, or a shareholder, officer or partner of the contractor, owns or has owned within the preceding three (3) years.

(2) The term "other construction business" means any business engaged in the erection, construction, remodeling, repairing, demolition, altering or painting and decorating of buildings, structures or facilities. It also means any business engaged in supplying mineral aggregate, or hauling excavated material or spoil as provided by Sections 66.0903(3), 66.0904(2), 103.49(2) and 103.50(2), Wisconsin Statutes.

(3) This form must ONLY be filed, with the state agency project owner, local governmental unit project owner, or developer, investor or owner of a publicly funded private construction project that will be awarding the contract, if **both (A) and (B) are met.**

(A) The contractor, or a shareholder, officer or partner of the contractor:
(1) Owns at least a 25% interest in the "other construction business", indicated below, on the date the contractor submits a bid or completes negotiations.
(2) Or has owned at least a 25% interest in the "other construction business" at any time within the preceding three (3) years.

(B) The Wisconsin Department of Workforce Development (DWD) has determined that the "other construction business" has failed to pay the prevailing wage rate or time and one-half the required hourly basic rate of pay, for

Other Construction Business

Name of Business			
Street Address or P O Box	City	State	Zip Code
Name of Business			
Street Address or P O Box	City	State	Zip Code
Name of Business			
Street Address or P O Box	City	State	Zip Code
Name of Business			
Street Address or P O Box	City	State	Zip Code

I hereby state under penalty of perjury that the information, contained in this document, is true and accurate according to my knowledge and belief.

Print the Name of Authorized Officer	
Signature of Authorized Officer	Date Signed
Name of Corporation, Partnership or Sole Proprietorship	

Street Address or P O Box	City	State	Zip Code

If you have any questions call (608) 266-6861

State of Wisconsin
Department of Workforce Development
Equal Rights Division

Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination

Authorization for this form is provided under Sections 66.0903(9)(c), 66.0904(7)(c) and 103.49(4r)(c) Wisconsin Statutes.
The use of this form is mandatory. The penalty for failing to complete this form is prescribed in Section 103.005(12), Wisconsin Statutes.
Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m), Wisconsin Statutes].

This form must **ONLY** be filed with the **Awarding Agency** indicated below.

State Of))SS County Of)	Project Name	
	DWD Determination Number	Project Number (if applicable)
	Date Determination Issued	Date of Contract
	Awarding Agency	
	Date Work Completed	

After being duly sworn, the person whose name and signature appears below hereby states under penalty of perjury that

- **I am** the duly authorized officer of the corporation, partnership, sole proprietorship or business indicated below and have recently completed all of the work required under the terms and conditions of a contract with the above-named awarding agency and make this affidavit in accordance with the requirements set forth in Section 66.0903(9)(c), 66.0904(7)(c) or 103.49(4r)(c), Wisconsin Statutes and Chapter DWD 290 of the Wisconsin Administrative Code in order to obtain FINAL PAYMENT from such awarding agency.
- **I have** fully complied with all the wage and hour requirements applicable to this project, including all of the requirements set forth in the prevailing wage rate determination indicated above which was issued for such project by the Department of Workforce Development on the date indicated above.
- **I have** received the required affidavit of compliance from each of my agents and subcontractors that performed work on this project and have listed each of their names and addresses on page 2 of this affidavit.
- **I have** full and accurate records that clearly indicate the name and trade or occupation of every worker(s) that I employed on this project, including an accurate record of the hours worked and actual wages paid to such worker(s).
- **I will** retain the records and affidavit(s) described above and make them available for inspection for a period of at least three (3) years from the completion date indicated above at the address indicated below and shall not remove such records or affidavit(s) without prior notification to the awarding agency indicated above.

Name of Corporation, Partnership, Sole Proprietorship, Business, State Agency or Local Governmental Unit				
Street Address	City	State	Zip Code	Telephone Number
Print Name of Authorized Officer			Date Signed	
Signature of Authorized Officer				

List of Agents and Subcontractors

Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number			Telephone Number		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number			Telephone Number		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
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Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number			Telephone Number		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number			Telephone Number		

If you have any questions call (608) 266-6861

State of Wisconsin
Department of Workforce Development
Equal Rights Division

Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination

Authorization for this form is provided under Sections 66.0903(9)(b), 66.0904(7)(b) and 103.49(4r)(9b), Wisconsin Statutes. The use of this form is mandatory. The penalty for failing to complete this form is prescribed in Section 103.005(12), Wisconsin Statutes.
Personal information you provide may be used for secondary purposes [Privacy Law, Section 15.04(1)(m), Wisconsin Statutes].

This form must **ONLY** be filed with the **Awarding Contractor** indicated below.

State Of _____)	Project Name	
	DWD Determination Number	Project Number (if applicable)
)SS	Date Determination Issued	Date of Subcontract
County Of _____)	Awarding Contractor	
	Date Work Completed	

After being duly sworn, the person whose name and signature appears below hereby states under penalty of perjury that

- **I am** the duly authorized officer of the corporation, partnership, sole proprietorship or business indicated below. We have recently completed all of the work required under the terms and conditions of a subcontract with the above-named awarding contractor. We make this affidavit in accordance with the requirements set forth in Section 66.0903(9)(b), 66.0904(7)(b) or 103.49(4r)(b), Wisconsin Statutes and Chapter DWD 290 of the Wisconsin Administrative Code in order to obtain FINAL PAYMENT from such awarding contractor.
- **I have** fully complied with the entire wage and hour requirements applicable to this project, including all of the requirements set forth in the prevailing wage rate determination indicated above which was issued for such project by the Department of Workforce Development on the date indicated above.
- **I have** received the required affidavit of compliance from each of my agents and subcontractors that performed work on this project and have listed each of their names and addresses on page 2 of this affidavit.
- **I have** full and accurate records that clearly indicate the name and trade or occupation of every worker(s) that I employed on this project, including an accurate record of the hours worked and actual wages paid to such worker(s).
- **I will** retain the records and affidavit(s) described above and make them available for inspection for a period of at least three (3) years from the completion date indicated above at the address indicated below and shall not remove such records or affidavit(s) without prior notification to the awarding contractor.

Name of Corporation, Partnership, Sole Proprietorship, Business, State Agency or Local Governmental Unit				
Street Address or PO Box	City	State	Zip Code	Telephone Number ( )
Print Name of Authorized Officer			Date Signed	
Authorized Officer Signature				

List of Agents and Subcontractors

Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number ( )			Telephone Number ( )		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number ( )			Telephone Number ( )		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number ( )			Telephone Number ( )		
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Telephone Number ( )			Telephone Number ( )		
Name			Name		
Street Address			Street Address		
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Telephone Number ( )			Telephone Number ( )		
Name			Name		
Street Address			Street Address		
City	State	Zip Code	City	State	Zip Code
Telephone Number ( )			Telephone Number ( )		

If you have any questions call (608) 266-6861

State of Wisconsin
Department of Workforce Development
Equal Rights Division
Labor Standards Bureau

Request to Employ Subjourneyperson

The use of this form is mandatory. The penalty for failing to complete this form is prescribed in Section 103.005(12), Wisconsin Statutes.
Personal information you provide may be used for secondary purposes (Privacy Law, s. 15.04(1)(m), Wisconsin Statutes].
The employer indicated below requests that the Department of Workforce Development (DWD) determine the prevailing wage rate(s) and related qualifications to enable such employer to use a subjourneyperson(s) on the following prevailing wage project, in accordance with the provisions of Section DWD 290.025, Wisconsin Administrative Code.

1. Name of Project Appearing on the Project Determination			
County	City, Village or Town		
DWD Project Determination Number	Project Number (if applicable)		
2. Job Classification(s) for which you request a subjourney rate (i.e., carpenter, electrician, plumber, etc.)			
a.	b.		
c.	d.		
3. Employer Name (Print)	Requester Name (Print)		
Address	City	State	Zip Code
Telephone Number ( )	Requester Title		
Email address (if you prefer to receive your response via email)	Fax Number (if you prefer to receive your response via fax) ( )		

READ CAREFULLY: I understand that this request is ONLY applicable to the project and job classification(s) listed above and that subjourney employees primarily work under the direction of and assist a skilled trade employee by frequently using the tools of a skilled trade and will NOT regularly perform the duties of a general laborer, heavy equipment operator or truck driver. If the subjourney employee regularly performs the work of a different trade or occupation, he/she will be compensated for such work at the applicable journeyperson prevailing wage rate. I agree to compensate subjourney employees in strict accordance with the directions received from the DWD.

Requester Signature	Date Signed

MAIL the completed request to:
EQUAL RIGHTS DIVISION, LABOR STANDARDS BUREAU
PO BOX 8928, MADISON WI 53708
OR
FAX the completed request to: (608) 267-0310 / **DO NOT e-mail your request.**
Call (608) 266-6861 for assistance in completing this form.

ERD-10880 (R. 11/2010)

Department of Workforce Development
Equal Rights Division
P.O. Box 8928
Madison, WI 53708-8928
Telephone: (608) 266-6860
Fax: (608) 267-4592
TTY: (608) 264-8752

STATE OF WISCONSIN
DWD
Department of Workforce Development

PREVAILING WAGE – Public Entity Project Owners

Any public works project that has a total estimated project cost that equals or exceeds single-trade or multiple-trade project thresholds requires a prevailing wage rate determination issued by the Department of Workforce Development (DWD). Public works include erecting, constructing, remodeling, repairing, demolishing, alterations, painting and decorating projects for a local governmental unit or state agency. State law excludes minor service or maintenance work, warranty work, or work under a supply-and-installation contract. There is a statutory definition for each of these exclusions. The prevailing wage law that applies to local governmental units is §66.0903, Wis. Stats. The prevailing wage law that applies to state agencies is §103.49, Wis. Stats. The applicable administrative rules for all public entities are DWD 290 and DWD 294, Wis. Adm. Code.

Thresholds

A "single-trade project of public works" means a project in which a single trade accounts for 85% or more of the total labor cost of the project. The single trade threshold is $48,000.

A "multiple-trade project of public works" means a project in which no single trade accounts for 85% or more of the total labor cost of the project.

(a) The multiple-trade threshold is $100,000, unless a municipality falls under the description in (b).

(b) The multiple-trade threshold of $234,000 applies to public works projects erected, constructed, repaired, remodeled, or demolished by a private contractor for •a city or village with a population less than 2500 or •a town.

Effective July 1, 2011, a local governmental unit or state agency that has a public works project that equals or exceeds the prevailing wage thresholds must do all of the following:

- Request a prevailing wage rate determination for the project from DWD at least 30 days before soliciting bids or negotiating contracts. An Application for Prevailing Wage Rate Determination is available on the DWD website: http://dwd.wisconsin.gov/er/prevailing_wage_rate/default.htm
  To avoid waiting for a project determination use the on-line application system that permits the user to generate a determination immediately and save all documents in PDF form to the user's computer. Use this project determination on line application at the following address:

http://dwd.wisconsin.gov/er/prevailing_wage_rate/pw_online_determinations.htm

- Tell potential contractors the project is subject to state prevailing wage law when soliciting bids.

- Include the prevailing wage rate determination in the construction contract, or if there is no written contract, provide a copy of the project determination to each prime contractor.

- Award contracts to contractors who do *not* appear on the "Consolidated List of Debarred Contractors."

- Post the prevailing wage rate determination on the project site. (This document is often referred to as "the white sheet.")

- Notify project contractors that if DWD finds that a contractor violated the prevailing wage law, DWD will assess liquidated damages of 100% of the wages owed to employees.

- Obtain an Affidavit of Compliance from each prime contractor before making final payment for the project.

If the total estimated cost of the project exceeds the prevailing wage thresholds, a local governmental unit or state agency also must obtain a prevailing wage rate determination under the following circumstances:

- when a completed facility is leased, purchased, lease-purchased or otherwise acquired by or dedicated to a public entity in lieu of the public entity contracting for the project,

- when one public entity does work for another public entity,

- when a *private* entity will construct a road, street, bridge, sanitary sewer or water main project and dedicate it to a local governmental unit or the state for its ownership or maintenance (except for some residential subdivisions).

For more information, visit the prevailing wage website: http://dwd.wisconsin.gov/er/prevailing_wage_rate/default.htm. For further assistance, call the Equal Rights Division at 608-266-6861 and ask for prevailing wage.

Department of Workforce Development
Equal Rights Division
P.O. Box 8928
Madison, WI 53708-8928
Telephone: (608) 266-6860
Fax: (608) 267-4592
TTY: (608) 264-8752

STATE OF WISCONSIN
DWD
Department of Workforce Development

PREVAILING WAGE – Contractors

Any public works project that has a total estimated project cost that equals or exceeds prevailing wage project thresholds requires a prevailing wage rate determination issued by the Department of Workforce Development (DWD). Public works include erecting, constructing, remodeling, repairing, demolishing, alterations, painting and decorating projects for a local governmental unit or state agency. State law excludes minor service or maintenance work, warranty work, or work under a supply-and-installation contract. There is a statutory definition for each of these exclusions. The prevailing wage law that applies to local governmental units and their contractors is §66.0903, Wis. Stats. The prevailing wage law that applies to state agencies and their contractors is §103.49, Wis. Stats. The applicable administrative rules for all prevailing wage projects are DWD 290 and DWD 294, Wis. Adm. Code. These laws include provisions that apply to all contractors and subcontractors working on prevailing wage projects.

Effective July 1, 2011, any contractor or subcontractor working on a local governmental unit or state agency's public works project that equals or exceeds current prevailing wage project thresholds must do all of the following:

- Receive and review the project's prevailing wage rate determination (i.e., white sheet).
- Tell subcontractors the project is subject to state prevailing wage law and include the prevailing wage rate determination in the construction contract, or if there is no written contract, provide a copy of the project determination to each subcontractor.
- Hire subcontractors who do *not* appear on the "Consolidated List of Debarred Contractors."
- Notify subcontractors that if DWD finds that a contractor or subcontractor violated the prevailing wage law, DWD will assess liquidated damages of 100% of the wages owed to employees.

- Apply to DWD for subjourney wage rates prior to employing these individuals on the project.

- Receive and retain a completed Affidavit of Compliance from each subcontractor brought on to the project before providing final payment to those subcontractors.

- Submit a completed Affidavit of Compliance to the contractor who brought the subcontractor on to the project before receiving final payment for the project.

- Maintain payroll records for 3 years that comply with §§66.0903(10)(a) or 103.49(5)(a), Stats. and DWD 274.06.

- Respond to requests from DWD or the project owner to provide payroll records and/or respond to prevailing wage complaints filed by employees or third parties.

For more information, visit the prevailing wage website: http://dwd.wisconsin.gov/er/prevailing_wage_rate/default.htm. For further assistance, call the Equal Rights Division at 608-266-6861 and ask for prevailing wage.

SUMMARY OF PREVAILING WAGE LAW CHANGES EFFECTIVE JULY 1, 2011

(This document updated 07/27/11)

For further updates on this topic, refer to the prevailing wage website at:
http://dwd.wisconsin.gov/er/prevailing_wage_rate/default.htm

The recently approved State budget bill (2011 Wisconsin Act 40) includes major changes to prevailing wage laws (§§66.0903, 66.0904, 103.49 & 103.50, Wis. Stats.) effective JULY 1, 2011. Significant changes are described below.

Topic	Who's affected?	Brief description of requirement under §66.0903 or §103.49
Thresholds	All public entities & Contractors	The $25,000 threshold for public works projects has been changed to single-trade and multiple-trade project thresholds as noted below. The new thresholds apply to prevailing wage projects whose prime contract is awarded after June 30, 2011.
Non-applicability: Threshold for Single-Trade Projects	All public entities & Contractors	Any single-trade project of public works with an estimated cost of completion of less than $48,000 does not require a prevailing wage rate determination. "Single-trade project of public works" means a project of public works in which a single trade accounts for 85 percent or more of the total labor cost of the project.
Non-applicability: Threshold for Multiple-Trade Projects	All public entities except cities, towns & villages as noted below & Contractors	Any multiple-trade project of public works with an estimated cost of completion of less than $100,000 does not require a prevailing wage rate determination. "Multiple-trade project of public works" means a project of public works in which no single trade accounts for 85 percent or more of the total labor cost of the project.
Non-applicability: Threshold for Multiple-Trade Projects	Cities or villages with a population less than 2500 & Towns & Contractors	A multiple trade project of public works erected, constructed, repaired, remodeled, or demolished by a private contractor for a city or village with a population less than 2500, or a town with an estimated cost of completion of less than $234,000 does not require a prevailing wage rate determination. "Multiple-trade project of public works" means a project of public works in which no single trade accounts for 85 percent or more of the total labor cost of the project.
Non-applicability: Minor service & maintenance work	Towns & Contractors	The following TOWN projects only do not require a prevailing wage rate determination: • A project not funded under §86.31, Stats. (TRIP projects) that is limited to minor crack filling, chip or slurry sealing or other minor pavement patching, not including overlays. • The depositing of gravel on an existing gravel road applied solely to maintain the road; • Road shoulder maintenance; • Cleaning drainage or sewer ditches or structures; • Any other limited, minor work on public facilities or equipment that is routinely performed to prevent breakdown or deterioration.
Non-applicability: Work which a contractor or individual donates to a public entity	All public entities	Prevailing wage laws §§66.0903 & 103.49, Stats., do not apply to work performed on a project of public works for which the local governmental unit or the state or the state agency contracting for the project is not required to compensate any contractor, subcontractor, contractor's or subcontractor's agent, or individual for performing the work.

Topic	Who's affected?	Brief description of requirement under §66.0903 or §103.49
Non-applicability: Residential	All public entities	A prevailing wage rate determination is not required for the erection, construction, repair, remodeling, or demolition of a residential property containing 2 dwelling units or less.
Non-applicability: Residential subdivision infrastructure	All public entities	A prevailing wage rate determination is not required for a road, street, bridge, sanitary sewer, or water main project that is a part of a development in which at least 90 percent of the lots contain or will contain 2 dwelling units or less, as determined by the local governmental unit at the time of approval of the development, and that, on completion, is acquired by, or dedicated to, a local governmental unit (including under §236.13(2), Stats.), or the state, for ownership or maintenance by the local governmental unit or the state.
Non-applicability: Certain nursing homes	All public entities	Prevailing wage law §66.0903, Stats., does not apply to a project of public works involving the erection, construction, repair, remodeling, or demolition of a nursing home in a county having a population of less than 50,000 when the project commences no later than July 1, 2012.
Electronic certified payroll record	Contractors	The requirement that every contractor on a prevailing wage project submit to DWD monthly a certified record of employees who worked on the project and that DWD post these certified records on its Internet website is discontinued effective July 1, 2011. However, contractors who worked on prevailing wage projects during the period January 1, 2010 through June 30, 2011, must comply with the repealed law for work completed on projects during that period of time.
Payroll record inspection request by any person	Contractors & Complainants	Any person may request DWD to inspect the payroll records of any contractor working on a prevailing wage project. On receipt of such a request, the contractor must submit to DWD a certified record of its payroll records, other than personally identifiable information relating to an employee of the contractor, for no longer than a 4-week period. DWD may request records from a contractor under this provision no more than once per calendar quarter for each project of public works on which the contractor is performing work. The department may not charge a requester a fee for obtaining that information. DWD must make these certified records available for public inspection.
Complaints	Complainants	There are no longer investigation fees.
Statewide uniformity	Local govern-mental units	A local governmental unit may not enact & administer a prevailing wage ordinance/provision for public works or publicly funded private construction projects. Any extant laws to that effect are void.

Topic	Who's affected?	Brief description of requirement under §66.0903, §103.49 or §103.50
Covered employees	Truck drivers & Other workers & Contractors	A laborer, worker, mechanic, or truck driver who is employed to process, manufacture, pick up, or deliver materials or products from a commercial establishment that has a fixed place of business from which the establishment supplies processed or manufactured materials or products or from a facility that is not dedicated exclusively, or nearly so, to a project of public works is NOT entitled to receive the prevailing wage rate UNLESS any of the following applies: 1) the laborer, worker, mechanic, or truck driver is employed to go to the source of mineral aggregate such as sand, gravel, or stone and deliver that mineral aggregate to the site of a project of public works by depositing the material directly in final place, from the transporting vehicle or through spreaders from the transporting vehicle. 2) the laborer, worker, mechanic, or truck driver is employed to go to the site of a project of public works, pick up excavated material or spoil from the site of the project, and transport that excavated material or spoil away from the site of the project.
Annual Prevailing Wage Survey	All public entities	When establishing yearly prevailing wage rates, DWD may not use data from any construction work that is performed by a local governmental unit or a state agency.
Prevailing Wage Rates	DOT & Contractors & Employees	For state highway prevailing wage rates, DWD is required to include wage rates for work performed on Sundays, holidays and shift differentials based on the time of day or night when work is performed.

The 2009-2011 State budget bill (2009 Wisconsin Act 28) created a new prevailing wage law (§66.0904, Wis. Stats.) for PUBLICLY FUNDED PRIVATE CONSTRUCTION PROJECTS effective January 1, 2010. The current 2011-2013 State budget bill (2011 Wisconsin Act 32) REPEALS this law. So the publicly funded private construction projects law only applies to projects that awarded the prime contract during the period January 1, 2010 through June 30, 2011.

SINGLE & MULTIPLE TRADE PROJECT THRESHOLDS FOR §§66.0903 & 103.49, Wis. Stats. Effective July 1, 2011

The $25,000 threshold for public works projects has been changed to single-trade and multiple-trade project thresholds as described below. Projects of public works with total estimated costs of completion that equal or exceed these thresholds require a prevailing wage rate determination.

SINGLE-TRADE THRESHOLD

A "single-trade project of public works" means a project in which a single trade accounts for 85 percent or more of the total labor cost of the project.

The single trade threshold is $48,000.

MULTIPLE-TRADE THRESHOLDS

A "multiple-trade project of public works" means a project in which no single trade accounts for 85 percent or more of the total labor cost of the project.

(a) The multiple-trade threshold is $100,000, unless a municipality falls under the description in (b).

(b) The multiple-trade threshold of $234,000 applies to public works projects erected, constructed, repaired, remodeled, or demolished by a private contractor for:

- a city or village with a population less than 2500, or
- a town

APPLYING THE NEW THRESHOLDS

The department will apply the new single-trade & multiple-trade prevailing wage thresholds to projects of public works for which the prime contract is awarded on or after July 1, 2011.

SECTION 01 00 00

BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SECTION SUMMARY

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

1.2 SUMMARY OF THE WORK

A. Project Description: Perform the Work as specified and detailed in Construction Documents package. Contractor to provide all materials and labor necessary for the installation of a new air handling units, including temperature control, electrical, and piping. Work also includes demolition and proper disposal of existing units.

B. Schedule of Alternates:
   1. Alternate Bid 1: Reduction in scope of work. Delete all work pertaining to the AHU 1. Work shall only include materials and labor necessary for the replacement of AHU 2, including temperature controls, electrical, piping, and disposal.

C. Work by Owner: Not applicable.

D. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy.

1.3 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow work by Contractors or Subcontractors and access by Owner.

1.4 APPLICATIONS FOR PAYMENT

A. Submit two (2) copies 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

1.5 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.

1.6 CUTTING AND PATCHING

A. Employ a 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.

1.7 CONFERENCES

A. Dane County Department Public Works, Highway & Transportation will schedule a preconstruction conference after Award of Contract for all affected parties.

B. When required in individual Specification section, convene a pre-installation conference at project site prior to commencing work of the section.

1.8 PROGRESS MEETINGS

A. Owner shall schedule and administer meetings throughout progress of the Work on as needed basis.

B. Owner shall preside at meetings, record minutes, and distribute copies within two (2) days to those affected by decisions made.

1.9 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.

1.10 PROPOSED PRODUCTS LIST

A. Within fifteen (15) 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. All products being proposed are subject to the Buy American Provisions described else where in the specifications. Contractor responsible for product compliance to these provisions.

1.11 SHOP DRAWINGS

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

1.12 PRODUCT DATA

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

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.

1.13 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Public Works Project Engineer's selection.

1.14 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.

1.15 MANUFACTURERS' CERTIFICATES

A. When specified in individual Specification sections, submit manufacturers' certificate to Public Works Project Engineer 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.

1.16 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.

1.17 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 Engineer before proceeding.

1.18 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.

1.19 PROTECTION OF INSTALLED WORK

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

1.20 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. Parking at the Work Site is extremely limited and cannot be guaranteed.

1.21 STAGING AREAS

A. Coordinate staging areas with Public Works Project Engineer prior to starting the Work.

B. On-site space for use as staging areas and storage of materials is limited. Each Contractor shall be responsible for safety and security of equipment and materials that are stored on site.

1.22 OCCUPANCY DURING CONSTRUCTION AND CONDUCT OF WORK

A. Areas of existing facility will be occupied during period when the Work is in progress. Work may be done during normal business hours (7:00 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. 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.

B. Contractor shall provide adequate protection for all parts of facility, its contents and occupants wherever the Work under this contract is to be performed.

C. Each Contractor shall arrange with Owner to make necessary alterations, do new work, make connections to all utilities, etc., 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.

D. 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.

1.23 PROGRESS CLEANING

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

1.24 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.

1.25 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.26 PRODUCT OPTIONS

A. Where definite material is specified, it is not intention 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 Department of Public Works, Highway & Transportation for approval at least seven (7) days prior to Bid Opening.

B. Products and materials that are not specified, but have been approved for use by Public Works Project Engineer shall be identified in addenda to all bidding contractors.

C. Requests for material or product substitutions submitted after Bid Opening may be considered. Dane County reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.27 SUBSTITUTIONS

A. Public Works Project Engineer shall consider requests for Substitutions only within fifteen (15) days after date of Public Works 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 Opening.

1.28 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.

1.29 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 videotape demonstration session; demonstration and demonstrator shall be to level of satisfaction of Owner.

1.30 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 Engineer's inspection.

B. Submit final Application for Payment identifying total adjusted Contract Sum / Price, previous payments, and amount remaining due.

1.31 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.

1.32 ADJUSTING

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

1.33 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data for all mechanical and electrical equipment supplied and installed in project.

1.34 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.

1.35 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 Engineer with original tracings of drawings and prints of specifications in reproducible format, one set of Drawings and Specifications and one set of record drawings in AutoCAD 2007 (or lower) format and entire record specification in Word 2000 (or lower) format on CD.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01508
SECTION 01 74 19

RECYCLING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Waste Management Goals
2. Waste Management Plan
3. Reuse
4. Recycling
5. Materials Sorting and Storage On Site
6. Lists of Recycling Facilities Processors and Haulers
7. Waste Management Plan Form

B. Related Sections:
1. Section 01000 - Basic Requirements
2. Section 01500 - Temporary Facilities and Controls: Progress cleaning and waste removal
3. Section 02221 - Building Demolition
4. Section 02225 - Minor Demolition for Remodeling

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 The Dane County Green Building Policy, Resolution 299, 1999-2000.

B. Contractor shall develop, with assistance of Public Works Project Engineer and Architect / Engineer, Waste Management Plan (WMP) for this project. 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.

1.3 WASTE MANAGEMENT PLAN

A. Contractor shall complete WMP and include cost of recycling / reuse in Bid. WMP will be submitted to Public Works Project Engineer within fifteen (15) days of Notice to Proceed 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.

1.4 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.

1.5 RECYCLING

A. These materials can be recycled in Dane County area:
1. Wood.
2. Wood Pallets.
3. Fluorescent Lamps.
4. Foam Insulation & Packaging (extruded and expanded).
5. PVC Plastic (pipe, siding, etc.).
6. Asphalt & Concrete.
7. Bricks & Masonry
8. Corrugated Cardboard.
9. Metal.
10. Carpet Padding.
11. Gypsum Drywall.
12. Shingles.
13. Barrels & Drums.
14. Solvents.

1.6 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.

1.7 LISTS OF RECYCLING FACILITIES PROCESSORS AND HAULERS

A. Web site www.countyofdane.com/pwht/recycle/categories.aspx lists current information for Dane County Recycling Markets. Contractors can also contact Dane County's Recycling Manager at 608/267-8815, 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 http://www4.uwm.edu/shwec/wrmd/search.cfm.

1.8 WASTE MANAGEMENT PLAN FORM

A. Contractor Information:
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:_____
Glass	_____ 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:_____
Fluorescent Lamps	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Foam Insulation	_____ 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:_____
PVC Plastic	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Corrugated Cardboard	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Metals	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Carpet Padding	_____ cu. ft. _____ lbs.	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Gypsum / Drywall	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

Shingles	_____ cu. yds. _____ tons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Barrels & Drums	_____ units	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Solvents	_____ gallons	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____
Other	_____	_____ Recycled _____ Reused _____ Landfilled _____ Other	Name:_____

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

B. All Division 23 work as specified herein shall be provided by the HVAC Contractor unless otherwise specified on the Bid Form.

1.02 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

C. Section 23 33 00 – Air Duct Accessories

1.03 REFERENCE

A. Provisions of Division 01 govern work under this Section.

B. This Section of Work applies to all work specified under Division 23.

1.04 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1. AABC Associated Air Balance Council
2. ADC Air Diffusion Council
3. AGA American Gas Association
4. AMCA Air Movement and Control Association
5. ANSI American National Standards Institute
6. ARI Air-Conditioning and Refrigeration Institute
7. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
8. ASME American Society of Mechanical Engineers
9. ASTM American Society for Testing and Materials
10. AWS American Welding Society
11. EPA Environmental Protection Agency
12. IEEE Institute of Electrical and Electronics Engineers
13. ISA Instrument Society of America
14. MCA Mechanical Contractors Association
15. MICA Midwest Insulation Contractors Association
16. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
17. NBS National Bureau of Standards
18. NEBB National Environmental Balancing Bureau
19. NEC National Electric Code
20. NEMA National Electrical Manufacturers Association
21. NFPA National Fire Protection Association
22. SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
23. UL Underwriters' Laboratories Inc.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. The Contractor shall review his own work for compliance with the construction documents. Prior to punch list activity by A/E, the contractor shall provide documentation to the A/E that a review has taken place and shall issue a letter indicating that the work has been performed in compliance with the construction documents. In the event that the contractor does not satisfactorily review his own work and results in additional site visits by the A/E, the contractor shall reimburse the A/E for the additional time required to close out the project.

1.06 QUALIFICATIONS OF BIDDERS

A. All bidders must meet or exceed the following minimum requirements:
   1. Have been in business for a minimum of 5 years.
   2. Have satisfactorily completed a project having the following features:
      a. Low Pressure Steam
      b. Hot Water Heating Systems
   3. Can be bonded for the proposed project if requested.
   4. Has access to necessary equipment and has organizational capacity and technical competence necessary to do the work properly and expeditiously,
   5. Provides a sworn financial statement upon request, which demonstrates that the bidder has adequate financial resources to complete the work being bid, as well as the other work the bidder has under contract.

B. Personal experience while working for another company is not acceptable for the experience requirements.

1.07 ABBREVIATIONS

A. A/E Architect/Engineer

B. GC General Contractor

C. FPC Fire Protection Contractor

D. PC Plumbing Contractor

E. HC Heating Contractor

F. EC Electrical Contractor

G. TCC Temperature Contractor

H. DDC Direct Digital Controls

I. BAS Building Automation System

J. TCS Temperature Control System

1.08 DEFINITIONS

A. Furnish
   1. Supply and deliver to the project site ready for unpacking, assembly and installation

B. Install
   1. Operations at the site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting all related devices required for a product that is fully functional for its intended use after its installation.

C. Provide
   1. Furnish and install product as required to be fully functional for its intended use.

1.09 DRAWINGS

A. The drawings show the general arrangement of piping, equipment and appurtenances and shall be followed as closely as actual building construction and work of other trades permits. Work shall conform to requirements shown on the drawings. Architectural and structural drawings shall take precedence. Because of the scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. Investigate structural and finish conditions affecting work and arrange work accordingly, providing offsets, fittings and accessories as may be required to meet as constructed conditions.

B. HVAC equipment and systems, including piping and ductwork shall be installed as high as possible unless otherwise noted on drawings. Equipment and systems shall also be installed to maintain required operation and maintenance clearances.

1.10 CAD DRAWINGS

A. Drawings in an electronic format can be made available to the successful HVAC contractor at a non-refundable cost as specified under Division 01 of the specifications. If no cost is specified in Division 01, the default cost shall be $75 per drawing. The drawings provided may or may not be updated to reflect all addenda items. The use of the drawings is limited to this project and may not be forwarded to any other party, or used for any other purpose. Use of the files will be at the contractor's sole risk and without liability or legal exposure to Arnold & O'Sheridan, Inc or its employees. Architectural drawings or any other drawings not produced by Arnold & O'Sheridan will not be provided.

1.11 CODES AND STANDARDS

A. All materials and workmanship shall comply with applicable codes, specifications, local ordinances, industry standards and utility company regulations. In case of differences between building codes, specifications, state laws, local ordinances, industry standards and utility company regulations and contract documents, the most stringent shall govern. Promptly notify A/E in writing of differences.

B. Non-compliance
   1. If the Contractor installs materials or performs any work that does not comply with above requirements, he shall correct the work and shall bear all costs arising from correcting deficiencies.

1.12 CONTINUITY OF EXISTING SERVICES

A. Refer to Division 01 of the Project Manual.

B. Do not interrupt or change existing services without prior approval from the Owner, Architect, Engineer or Construction Manager. When interruption is required, coordinate the down-time with the Owner to reduce disruption to his activities. The scope of this work is indicated on the Contract Documents or described herein. Unless specifically stated, work involved in interrupting or changing existing services is to be done during normal working hours.

1.13 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01 of the Project Manual.

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

1.14 SUBMITTALS

A. Refer to Division 01 and the General Conditions of the Contract.

B. Shop drawings are to be reviewed by the lead contractor and the HVAC contractor before submission to the A/E. Submittals shall be stamped by the contractor and clearly indicate all corrections made by the contractor during their review process. Submittals not reviewed and stamped by the contractor will be automatically rejected.

C. Submit for equipment and systems as specified in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and number, as identified in the contract documents. Include the plan designation mark (i.e. "AHU-1") on the submittals. Include dimensions, capacities, ratings, and installation instructions.

D. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor schedule on the HVAC and electrical drawings. Include a statement on the shop drawing transmittal to the Architect/Engineer if the equipment submitted and the motor schedules are not in agreement, indicating any discrepancies. See related comments in Section 23 05 13, Part 1 under Electrical Coordination.

E. Include wiring diagrams of electrically powered equipment.

F. Submit the quantity of shop drawings as specified under the Division 01 Specification Section titled “Submittals.”

G. Submittals shall be legible, clear and complete. Shop drawings submitted that are incomplete, illegible or are not specific to the project will be returned as “not reviewed”. In addition, equipment installed without having approved shop drawings will be considered defective and shall be removed and replaced with approved equipment at no expense to the project.

1.15 SPECIFIED MATERIALS AND EQUIPMENT

A. The design is based on the equipment specified by the manufacturer and model number as specified on the plan schedules. Where certain items are specified by manufacturer or trade name, Contractor's bid shall be based on use of the named item. Where one make is described and other makes are listed, comparable models of other named equipment may also be used, provided that they meet all requirements of the specifications.

B. When equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those on the plan schedules, the Contractor shall be responsible for costs involved in integrating the equipment or accessories into the system. The Contractor shall also be responsible for obtaining the original design performance from the system into which these items are placed, regardless of whether the manufacturer/model is a specified equivalent or a substitute. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

C. If the Contractor wishes to use items other than those named in specifications in his base bid, request for approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids. Including complete technical and descriptive data with the request. If approved, an addendum will be issued notifying all plan holders of the approval.

1.16 EQUIPMENT INSTALLATION

A. The drawings show the general arrangement and location of equipment and appurtenances. It is the Contractor’s responsibility to install equipment in a location and manner that allows for proper service and maintenance access to equipment. Work shall generally conform to requirements shown on the drawings. However, the location of equipment may require field adjustments to obtain the required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment. Also, because of the scale of the drawings, it is not possible to indicate the exact routing of ductwork and piping, and offsets, fittings and accessories that may be required to provide proper service access to equipment. The Contractor shall route and install ductwork and piping to provide required service access to equipment.

B. If during the construction phase of the project the contractor feels that inadequate space exists, or that equipment locations must be substantially modified to provide the proper service and maintenance access, prior to installing the equipment the contractor shall notify the engineer in writing, outlining the general concerns and the proposed modifications. Equipment installed without providing the manufacturer’s required maintenance and service clearance shall be considered defective. The Contractor shall remove and relocate piping, ductwork and equipment, to provide the required service clearances at the Contractor’s expense.

1.17 OFF SITE STORAGE

A. Refer to Division 01 of the Project Manual.

1.18 CERTIFICATES AND INSPECTIONS

A. Refer to the General Conditions of the Contract, Article 13.

B. Obtain and pay for required Federal, State and local installation inspections, certificates and permits required, except those provided by the Architect/Engineer in accordance with State and local Codes. Deliver originals of these certificates to the Architect or Construction Manager.

1.19 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01 of the Project Manual.

B. Provide HVAC systems and equipment operation and maintenance manuals in accordance with the requirements of the project specification.

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

1. Copies of all approved shop drawings.
2. Manufacturer’s instructions for installation, operation, and maintenance.
3. Manufacturer's wiring diagrams for electrically powered equipment.
4. Records of tests performed to indicate compliance with system requirements (system start-up reports).
5. Temperature control record drawings and control sequences.
6. Parts lists for manufactured equipment.
7. Valve schedules.
8. Lubrication instructions, including list/frequency of lubrication done during construction.
9. Warranties.
10. Testing, adjusting and balancing data.

1.20 TRAINING OF OWNER PERSONNEL

A. Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as part of this project, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for equipment. Training shall be during normal working hours.

1.21 RECORD DRAWINGS

A. Refer to Division 01 of the Project Manual.

B. Maintain record drawings on a daily basis to be turned over at the completion of the project.

C. Maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.22 PROJECT CLOSEOUT

A. Refer to Division 01 of the Project Manual.

B. The Contractor shall complete and provide items and materials, training and start-up associated with project closeout as specified under Division 1 of the Project Manual. In addition to these items, the Contractor shall provide the following items prior to acceptance of the installation as specified in accordance with COMM Chapter 64.0313:

1. Final air and water system balancing, completed in accordance with the requirements of Section 23 05 93 and code, including the submission of testing, adjusting and balancing reports. Reports shall indicate the amount of total supply air, return air and outside ventilation air being provided to the spaces and to the air handling system(s).

2. Submission of Operating and Maintenance instructions in accordance with the requirements of Division 01, of this Section and code. Operation and maintenance manuals shall include a copy of the completed testing, adjusting and balancing report for the Owner's records.
3. Submission of start-up report for the temperature control system, signed by the technician in responsible charge of the control system, indicating that the system has been adjusted, calibrated and put into operation in accordance with the requirements of the specification and code.

PART 2 - PRODUCTS

2.01 PIPE PENETRATIONS

A. FIRE, SMOKE AND FIRE/SMOKE RATED SURFACES
1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.
2. UL listed or tested by an independent testing laboratory, approved by the State and Local Code jurisdictions. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Sleeves in concrete to be schedule 40 steel pipe with integral water stop unless the fire stop material used includes a sleeve that is an integral part of the rated assembly.

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

2.02 DUCT PENETRATIONS

A. FIRE, SMOKE AND FIRE/SMOKE RATED SURFACES
1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.
2. UL listed or tested by an independent testing laboratory, approved by the State and Local Code jurisdictions. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Sleeves in concrete to be minimum 16 gauge galvanized steel sleeves.

B. NON-RATED SURFACES
1. Fiberglass insulation fill at voids with galvanized steel sheet metal bank-off on both side of duct penetration thru walls. Caulking for sealing and sound proofing shall be fire resistant.

2.03 IDENTIFICATION

A. STENCILS
1. Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. ENGRAVED NAME PLATES
1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply ® Style 2060 by Seton Name Plate Company, Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

C. VALVE TAGS
1. Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady.

D. PIPE MARKERS
1. At least 3/4" high legend for piping under 3" diameter and at least 2" high legend for piping 3" diameter and larger. Include flow arrows. Manufacturers: W.H. Brady Co., EMED Co. or Seton Name Plate Company.

PART 3 - EXECUTION

3.01 DEMOLITION

A. Perform demolition as specified on the drawings or otherwise to accomplish new work.

B. Carefully examine the present building and site, together with the drawings and specifications. Within areas involving remodeling, each contractor shall be responsible for removal of, relocation of, or revisions to existing equipment, wiring, piping fixtures and other existing facilities which is necessary to accomplish the arrangement indicated on plans. To assist the contractor in meeting the above requirement, drawings note certain items, but absence of notes shall not limit responsibility of each Contractor to perform the work as described in this paragraph.

C. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, provide measures to limit the amount of contamination of the occupied spaces. Where piping or ductwork is removed and not reconnected, cap ends of existing services as if they were new work. Coordinate work to avoid disruption to the existing building occupants.

D. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. Piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. Designated equipment is to be turned over to the Owner for his use at a place and time he so designates. Maintain the condition of material and equipment that is indicated to be reused.

3.02 CONCRETE WORK

A. Provide all cast-in-place concrete pads. Provide layout drawings, anchor bolts, metal shapes, and templates required to be cast into concrete or used to form concrete for support of mechanical equipment.

3.03 CUTTING AND PATCHING

A. Refer to Division 01 requirements.

B. This Contractor shall be responsible for cutting and patching of the existing general construction to accommodate installation of the new HVAC system(s) unless otherwise noted.

C. Patching includes repairing the openings remaining from the removal or relocation of existing system components and painting the surface to match existing. Painting means covering the entire wall where patching is to be done unless indicated to be done by other trades.

D. Required cutting and patching shall be performed by personnel skilled in cutting and patching work.

E. Do not pierce, modify or affect beams or columns without permission of the Architect/Engineer. If piping is required to pass through walls or floors where no sleeve has been provided, use a core drill to avoid unnecessary damage and structural weakening.

3.04 BUILDING ACCESS

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

3.05 EQUIPMENT ACCESS

A. Install piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for equipment and specialties. Where access is required in plaster walls or ceilings, furnish and install access doors required. Coordinate for installation of access doors utilizing the General Contractor and other appropriate on-site Subcontractor for access door installation.

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

3.06 COORDINATION OF WORK

A. Verify that devices are compatible for the surfaces on which they are used. This includes, but is not limited to, diffusers, registers, grilles, and recessed or semi-recessed heating and cooling terminal units installed in/on architectural surfaces.

B. Coordinate work with other contractors prior to installation. Installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Verify system completion prior to start of the testing and balancing. Work to be completed prior to testing and balancing shall include, but not be limited to the following: flushing, pressure testing, chemical treatment, filling of hydronic systems, proper pressurization and air venting of hydronic systems, cleaning and replacement of filters, cleaning of strainers, duct and pipe system cleaning, adjusting and calibration of controls, controls cycled through their sequences. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls

for fully functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work. Provide the appropriate sections of work with required wall, roof and floor opening locations and dimensions. If this Contractor neglects to coordinate this information, openings shall then be the responsibility of this Contractor.

3.07 PIPE PENETRATIONS

A. GENERAL
1. Coordinate the location of building surface penetrations with the appropriate contractors. Furnish sleeves, inserts, and other devices that are to be built into the structure to the contractor performing that work. Prepare shop drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until shop drawings are approved.

B. FIRE RATED SURFACES
1. Install products in accordance with the manufacturer's instructions where a pipe penetrates a fire rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier. Where a sleeve must be installed in an existing floor, grout area around sleeve to restore the floor integrity. In a wet area floor penetration, top surface of penetration to be 2 inches above the adjacent floor with the additional height obtained by means of a concrete pad poured integral with the floor; wet areas for this paragraph are rooms or spaces containing air handling unit coils, convertors, pumps, chillers, boilers, and similar equipment.

C. NON-RATED SURFACES
1. Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when the insulation completely covers the wall opening and the insulation end is trimmed in a neat manner. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
2. Install the galvanized sheet metal sleeve in hollow wall penetrations to provide a backing for the sealant. Apply sealant to both sides of the penetration in a manner that the annular space between the pipe sleeve and pipe or insulation is completely blocked.
3. Completely seal pipe penetrations, as specified below, for walls of the following rooms below:
   a. Conference rooms
   b. Private offices

3.08 DUCT PENETRATIONS

A. GENERAL
1. Coordinate the location of building surface penetrations with the appropriate contractors. Furnish sleeves, inserts, and other devices that are to be built into the structure to the contractor performing that work. Prepare shop drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until shop drawings are approved.
2. In a wet area, the top surface of penetration to be 2 inches above the adjacent floor. The additional height shall be obtained by means of a concrete pad or pipe sleeve poured integral with the floor. Wet areas are mechanical equipment rooms or spaces containing air handling unit coils, convertors, pumps, chillers, boilers, and similar equipment.

B. FIRE RATED SURFACES
1. Install products in accordance with the manufacturer's instructions where a duct penetrates a fire rated surface. When duct work is insulated, use a product which maintains the integrity of the insulation and vapor barrier. Where a sleeve must be installed in an existing floor, grout area around sleeve to restore the floor integrity. In a wet area floor penetration, top surface of penetration to be 2 inches above the adjacent floor with the additional height obtained by means of a concrete pad poured integral with the floor; wet areas for this paragraph are rooms or spaces containing air handling unit coils, convertors, pumps, chillers, boilers, and similar equipment.

C. NON-RATED SURFACES
1. Completely seal duct penetrations, as specified below, for walls of the following rooms below:
a. Conference rooms
b. Private offices
2. Install sheet metal blank - off plates and caulk where ducts penetrate non-fire rated surfaces. Size units to accommodate insulation, where applicable.
3. Duct penetration thru smoke partitions shall be caulked and sealed to prevent the passage of smoke.

3.09 CLEANING

A. Contractor shall at all times keep premises free of waste or surplus materials, rubbish and debris which is caused by his employees or resulting from his work.

B. After equipment and fixtures have been installed, Contractor shall remove all stickers, stains, labels and temporary covers.

C. All foreign matter shall be removed from pipes, tanks, pumps, fans, motors, devices, switches, fixtures, panels and ductwork before acceptance of systems.

D. Contractor shall leave his portion of the work in a safe and clean condition ready for operation.

E. In case of dispute, Owner may remove rubbish, excess materials or do cleaning, and charge the cost to Contractor.

3.10 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms and above ceilings, including terminal heating devices by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment in occupied spaces (for example cabinet heaters and ceiling fans).

B. Identification plates on equipment shall be free of excess paint and shall be legible.

C. Where stenciling is not appropriate for equipment identification, engraved nameplates shall be used.

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

E. For steam piping systems, include in the pipe identification the design pressure of the piping system. For example, a high pressure steam piping system designed to operate at 125 PSI shall be labeled "HIGH PRESSURE STEAM 125 PSIG". The design pressure shall also be identified on low-pressure steam piping systems.

F. Identify valves with brass tags bearing 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 shall be framed under clear plastic.

G. Use engraved nameplates to identify control equipment and motor starters. Motor starters shall be provided with an engraved nameplate identifying the piece of equipment it serves by plan identification (i.e. "AHU-1").

H. Identify all fire and smoke dampers. Dampers shall be permanently identified on the exterior of the duct with a label (or painted) having a minimum letter height of 1”. Identification shall read either ”FIRE DAMPER”, “SMOKE DAMPER” or “FIRE/SMOKE DAMPER”.

3.11 LUBRICATION

A. Lubricate 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 Owner accepts the work. Maintain a log of all lubricants used and frequency of lubrication. Include this information in the Operating and Maintenance Manuals at the completion of the project.

3.12 PROJECT CLOSEOUT

A. Contractor shall provide the following submittal data prior to final site walk-through review (found on next page). If this closeout work is not completed or is inaccurately completed, the Contractor shall be responsible for the expense of additional site reviews made by A/E.

END OF SECTION

CLOSEOUT DATA SUBMITTALS
Record drawing submission
Air and water balance test reports
Operating and maintenance manuals
Instructional walk-through and training
Piping and valve identification charts
Inspectors test reports - HVAC inspector
Pipe pressure test report - Building hot water heating piping - Building steam piping - Building cooling piping
System startup reports - Heating equipment - Cooling equipment - Temperature control equipment
Closeout statements - Work completion - Warranty statements - Punch list completion

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes requirements for single and three phase motors that are used with equipment specified in other sections. Also included are general requirements for electrical wiring and electrical connections. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 14 - Variable Frequency Drives

C. Section 23 09 23 – Direct Digital Control Systems for HVAC

D. Division 26 – Electrical

E. All electrical and temperature control wiring installation shall conform to the requirements of the applicable electrical sections of these specifications.

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A.	ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
B.	ANSI/NEMA MG-1	Motors and Generators
C.	ANSI/NEMA MG1-31	
D.	ANSI/NFPA 70	National Electrical Code

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Submit shop drawings for motors and motor starters.

B. For stand alone motors and equipment furnished with motors, include with the equipment which the motor drives, the following motor information: motor manufacturer, horsepower, voltage, phase, hertz, RPM, full load efficiency, related power factor and installation and maintenance instructions.

C. Submit wiring diagrams for motors and HVAC equipment requiring wiring by the Electrical Contractor for this project. Wiring diagrams shall be prepared by the Contractor specifically for this work.

1.07 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Include manufacturer's instructions in the manuals with the specific equipment to which they apply. Also include the following information if not previously documented on shop drawings: full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.08 ELECTRICAL COORDINATION AND GENERAL REQUIREMENTS

A. All starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, push-buttons, pilot lights, and other devices required for the control of motors or electrical equipment will be furnished and installed by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

B. The drawings and specifications show number and horsepower rating of motors furnished by this Contractor, together with their actuating devices if these devices are furnished by the HVAC Contractor. Any discrepancy in size, horsepower rating, electrical characteristics, or means of control for motors or other electrical equipment after contracts are awarded, and shall be addressed with the A/E.

C. Costs involved in changes required due to equipment substitutions initiated by this contractor will be the responsibility of the contractor. See related comments in Section 23 05 00, Basic HVAC Requirements, under Submittals.

D. The Contractor shall be responsible for providing control wiring (line and low voltage) for the project unless noted otherwise, including but not exclusive for the following:

1. Interlock wiring of line and low voltage motorized automatic dampers associated with fans.

E. Furnish project specific wiring diagrams to Electrical Contractor for equipment, starters and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor.

F. Provide on the front enclosure face of starting equipment, selector switches and push-buttons stations, a securely mounted, laminated plastic engraved name plate which shall identify the motorized equipment served by the respective starter. The name tags shall be constructed of black and white plastic (black face and white lettering) with ¼" high lettering. The lettering shall identify the unit served by the plan identification mark (example: "Exhaust Fan EF-1").

1.09 PRODUCT CRITERIA

A. Motors to conform to applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by UL for the service specified.

B. Select motors for conditions in which they will be required to perform; i.e., general purpose, splash-proof, explosion proof, standard duty, high torque or other special type by the equipment or motor manufacturer's recommendations and as specified on the drawings and as specified herein.

C. Furnish motors for starting in accordance with utility requirements and with compatible starters as specified.

D. All motors over 1 HP shall be premium efficiency motors. Coordinate with the respective supplier(s) of motors for the project to meet efficiency requirements.

PART 2 - PRODUCTS

2.01 MOTORS

A. SINGLE PHASE, SINGLE SPEED MOTORS

1. Use NEMA rated 120 volt, single phase, 60 hertz motors for motors 1/3 HP and smaller.
2. Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class B insulation. Service factor to be not less than 1.35. Motors are to be provided with internal overload protection.

B. THREE PHASE, SINGLE SPEED MOTORS

1. Use NEMA rated three phase, 60 hertz motors for motors ½ HP and larger unless specifically indicated. Refer to plans for voltage requirements.
2. Use NEMA general purpose, continuous duty, Design B, normal starting torque, T-frame or U-frame motors with Class B or better insulation unless the manufacturer of the equipment on which the motor is being used has different requirements. Use open drip-proof motors unless totally enclosed fan-cooled, totally enclosed non-ventilated, explosion-proof, or encapsulated motors are specified in the equipment sections or otherwise indicated on the drawings.
3. Use grease lubricated anti-friction ball bearings with housings equipped with plugged/capped provision for lubrication, rated for minimum AFBMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at the end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
4. Open drip-proof motors shall have a 1.15 service factor. Other motor types may have minimum 1.0 service factors.
5. All motors 1 HP and larger, except specially wound motors and inline pump motors 56 frame and smaller, to be premium efficiency design with full load efficiencies which meet or exceed the values listed below when tested in accordance with NEMA MG 1.

FULL LOAD NOMINAL MOTOR EFFICIENCY BY MOTOR SIZE AND SPEED

	-----Open Drip-Proof Motors------		
MOTOR	-------Nominal Motor Speed-------		
HP	1200 rpm	1800 rpm	3600 rpm
1	82.5	85.5	80.0
1-1/2	86.5	86.5	85.5
2	87.5	86.5	86.5
3	89.5	89.5	86.5
5	89.5	89.5	89.5
7-1/2	91.7	91.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0

MOTOR HP	----Totally Enclosed Fan-Cooled---- -------Nominal Motor Speed------ 1200 rpm	1800 rpm	3600 rpm
1	82.5	85.5	78.5
1-1/2	87.5	86.5	85.5
2	88.5	86.5	86.5
3	89.5	89.5	88.5
5	89.5	89.5	89.5
7-1/2	91.7	91.7	91.0
10	91.7	91.7	91.7
15	92.4	92.4	91.7
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	93.6	93.0

C. MOTORS FOR USE WITH VARIABLE FREQUENCY DRIVES

1. In addition to the requirements specified above, the motor must be suitable for use with the drive specified in Section 23 05 14, including but not limited to motor cooling. Motor shall comply with NEMA MG1 Part 31 to provide windings capable to withstand up to 1600 peak Volts with a rise time of 0.1 µs. Provide bearing protection grounding rings to bleed current from the motor shaft to the motor casing. Manufacturers: Aegis SGR, Inpro/Seal CDR, or equal.

PART 3 - EXECUTION

3.01 MOTOR INSTALLATION

A. Mount motors on a rigid base designed to accept a motor, using shims if required under each mounting foot to get a secure installation.

B. When motor are connected to the driven device by means of a belt drive, mount sheaves on the appropriate shafts in accordance with the manufacturer's instructions. Use a straight edge to check alignment of the sheaves; reposition sheaves so that the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so that the belt(s) can be added and tighten the base so that the belt tension is in accordance with the drive manufacturer's recommendations. Frequently recheck belt tension and adjust if necessary during the first day of operation and again after 80 hours of operation.

C. Lubricate motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

D. Replace existing fan motors and pulleys for return fans RF-1 and RF-2.

END OF SECTION

SECTION 23 05 14
VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes variable frequency drives, bypass starters when needed by the system.

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

C. Section 23 09 23 – Direct Digital Control System for HVAC

D. Section 23 73 13 – Modular Indoor Central – Station Air Handling Units

E. Division 26 – Electrical

1.03 REFERENCE

A. Provisions of Division 01 govern work in this section.

1.04 REFERENCE STANDARDS

A. ANSI/IEEE 519 Guide for Harmonic Control and Reactive Compensation of Static Power Convertors

B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)

C. NFPA 70 National Electrical Code (NEC)

1.05 SUBMITTALS

A. Include physical, electrical, and performance characteristics of each variable frequency drive and associated components, including dimensions; weight; input and output performance; voltage, phase, current and overcurrent characteristics; installation instructions; protective features; wiring and block diagrams indicating specified options; electrical noise attenuation equipment where required to meet the criteria specified; line side voltage notch waveform and line side current harmonics; certified efficiency versus load and speed curves; and required operating environment.

1.06 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Instructions to include recommended maintenance procedures, maintenance schedules, recommended spare parts list, and vendor name for those parts.

B. Provide an electronic copy of the final programmed parameters and set points for each VFD.

1.07 DELIVERY, STORAGE AND HANDLING

A. Ship, handle, and store equipment in original factory shipping cartons/crates until time of installation. Store inside and protected from the weather or other conditions which may be harmful to the equipment.

1.08 EQUIPMENT STARTUP AND TRAINING

A. Provide the services of a factory trained engineer to review the installation, start-up, test and adjust for proper operation. Upon completion of the equipment startup, submit a report, including startup and test log, signed by the factory trained engineer.

1.09 WARRANTY

A. The variable frequency drive shall be covered by the manufacturer's standard 2 year warranty.

1.10 MOTOR COMPATIBILITY

A. Motors in HVAC equipment shall be compatible for use with VFD applications.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable manufacturers are ABB provided that specification requirements are satisfied.

2.02 DESIGN AND CONSTRUCTION

A. Unit to be constant or variable torque, solid state, modular design for control of standard squirrel cage, induction, alternating current motors.

B. Use solid state electronics to provide specified performance, control specified parameters, and protect motor and drive under abnormal conditions.

C. Drive enclosure shall be NEMA 12, and be provided with a hinged and lockable door. Provide door mounted fused disconnect switch to prevent access to enclosure with power on. Drives under 100 HP shall be wall mounted.

D. Include the following operating and monitoring devices mounted on the front cover:
1. Fused disconnect switch with door interlocked handle,
2. Operating mode selector switch marked "manual-off-automatic",
3. Manual speed control adjustment,
4. Manual transfer switch to select power through drive or bypass.
5. "Power on" indicator light and inverter fault indicator light.
6. Speed indicating meter reading from 0% to 100%.

E. Variable frequency drive assembly to be listed by Underwriters Laboratories, Canadian Standards Association, or ETL Testing Laboratories.

F. Electrically and physically isolate control circuitry and conductors from power circuitry and power conductors. Use shielded control conductors.

G. Provide partitioning within drive enclosure to separate and isolate bypass section from variable frequency drive section and to house bypass wiring, contactors, relays, and manual transfer switch so that devices within the drive compartment are able to be serviced with no live power in the drive section.

H. Provide a manual switch and bypass starter to transfer from variable frequency drive operation to bypass operation.

I. Full nameplate motor horsepower plus specified service factor to be available to the driven device when motors are being operated in the variable frequency drive mode. Coordinate proper drive capacity with the motor manufacturer.

J. Design control circuitry on a plug-in, plug-out modular basis.

K. Use a full wave diode bridge rectifier in the convertor.

L. Provide RFI clamping device to eliminate 3^{rd} harmonic on single phase drives, 5^{th} and 7^{th} harmonic on three phase six pulse drives, and 11^{th} and 13^{th} harmonic on three phase twelve pulse drives.

M. Use a pulse width modulated (PWM) inverter, incorporating power transistors; SCR components are not acceptable. DC bus shall have a capacitive filter to reduce the ripple of the rectified voltage to maintain near constant DC voltage.

N. Units shall function in an operating environment from 0°C to 40°C temperature and humidity up to 90% non-condensing.

2.03 PERFORMANCE REQUIREMENTS

A. Units shall be rated for input power as scheduled on the plans and shall have a tolerance of ±10% on input voltage and ±2% on input frequency.

B. Limit harmonic content, as measured on the line side, to a voltage distortion factor of 5% or less and a line notch depth of 25% or less as defined in IEEE Standard 519, latest edition. Provide additional line reactors and power conditioners to meet these criteria.

C. Use a fixed or adjustable current limiting control device to limit output current to 100% continuous and 120% for one minute; also refer to Protection Features in this section. Full load output current available from drive shall not be less than motor nameplate amperage.

D. Output power shall be capable or driving standard NEMA B design, three phase alternating current induction motors at full rated speed with capability of 10:1 turndown.

E. Additional performance capabilities to include the following:
   1. Ride through a momentary power outage of 3 cycles,
   2. Start into a rotating load without damage to drive components or motor,
   3. Capable of automatic restart into a rotating load after a preset, adjustable time delay following a power outage.

F. Input power factor: Min 0.95 throughout the speed range.

G. Minimum efficiency: 97% at 100% speed.

2.04 CONTROL FEATURES

A. Use control circuits compatible with input signal from temperature control system in the automatic mode and from manual speed in the manual mode. Vary motor speed in response to the input control signal. Include components necessary to accept the signal from the temperature control system in the form that is sent.

B. Include the following additional control features:
   1. Vary the acceleration and deceleration rate so that the time period from start to full speed and from full speed to stop can be field adjusted;
   2. Adjustable minimum and maximum speed settings for both automatic and manual modes of operation;
   3. Field adjustment of minimum and maximum output frequency.

C. Contacts for remote control of start/stop function;
   1. Auxiliary contact for remote indication of variable frequency drive fault condition;
   2. Control logic for automatic transfer from variable frequency drive operation to the bypass starter in case of drive failure or shutdown;
   3. One normally open and one normally closed auxiliary contact in each drive for use in remote monitoring of drive operation by a central energy management system; activate contacts on drive failure of any kind.

2.05 PROTECTION FEATURES

A. Use electronic protection circuitry in the power circuits to provide an orderly shutdown of the drive without blowing fuses or tripping circuit breakers and prevent component loss under the following abnormal conditions:
   1. Activation of any safety device;
   2. Instantaneous overcurrent or over voltage of output;
   3. Power line overvoltage and undervoltage protection;
   4. Phase loss;
   5. Single and three phase short circuit protection;
   6. Ground fault protection for all three phases;
   7. Control circuit malfunction;
   8. Overtemperature protection; and
   9. Output current limit.

B. Provide a visual indication of item causing the drive to be de-energized.

C. Provide the following additional protective features:
   1. Input transient overvoltage protection up to 3000 volts per ANSI 37.90A;
   2. DC bus fusing or other electronic controls which limit the rate of rise of the DC bus current as well as de-energizing the drive at a predetermined current level;
   3. Fusing for the control circuit transformer;
   4. Grounded control chassis; and
   5. Devices and control circuitry to interlock the variable frequency drive and bypass starter so that both are not energized and driving motor simultaneously.

2.06 DIAGNOSTICS

A. Provide diagnostic light emitting diode [LED] indicators for the following:
   1. Phase loss;
   2. Ground fault;
   3. Overcurrent;
   4. Overvoltage;
   5. Undervoltage;
   6. Overtemperature;
   7. Overload; and
   8. DC bus status.

2.07 QUALITY ASSURANCE TESTS

A. Use a factory heat stress test to verify proper operation of drive functions and components under full load.

B. Variable frequency drive manufacturer or designated representative to perform a field test of each drive, in the presence of the Owner's representative, for the following items:
   1. General inspection to verify proper installation;
   2. Drive reaction to simulated power interruptions of two seconds and sixty seconds;
   3. Adequate protection during switching from variable frequency drive operation to bypass starter operation and back again;

2.08 MOTOR CONTROL EQUIPMENT

A. BYPASS STARTERS
   1. Use across-the-line magnetic bypass starters in NEMA 12 enclosures.
   2. Provide thermally actuated heaters and temperature compensated overload relays in each phase. Select heaters on measured full load amps of the particular motor with the motor and driven device in bypass operation. Provide temporary heaters until the final heaters have been sized.
   3. Use a 120 volt control transformer with fused primary in each magnetic starter. Size control transformer per starter manufacturer's recommendations. All starter control circuit components to be 120 volt.
   4. Equip each starter with two normally open and two normally closed auxiliary contacts for interlocking and control wiring.

PART 3 - EXECUTION

3.01 VARIABLE FREQUENCY DRIVES

A. Install where indicated on drawings and in accordance with approved submittals and manufacturer's published recommendations.

B. Drives shall be set for the following minimum speeds unless the installed motor manufacturer requirements are different, coordinate this minimum requirement with actual motor manufacturer prior to startup:
   1. Fan applications - 12 hertz (20%)
   2. Pump applications - 20 hertz (30%)

END OF SECTION

SECTION 23 05 15
HVAC VALVES AND PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for hydronic valves and piping specialties for HVAC hydronic piping systems on this project.

1.02 RELATED WORK

A. Section 23 07 00 – HVAC Insulation

B. Section 23 21 13 – Hydronic Piping

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A. ASTM B650 Electro-deposited Engineering Chromium Coatings on Ferrous Substrates

B. ASTM E814 Fire Tests of Through-Penetration Fire Stops

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Required for all items in this section.

B. 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 and pressure ratings specified are for continuous operation.

C. Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and on the drawings.

1.07 DESIGN CRITERIA

A. Where valves are specified for individual mechanical services all valves shall be of the same manufacturer unless prior written approval is obtained.

B. Valves and piping specialties shall be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 PSIG at 240°F unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.01 VALVE MANUFACTURERS

A. The following Manufacturers and Models are considered acceptable subject to compliance with the specified requirements.

B. STANDARD VALVES
1. Standard valves are based on models and styles as manufactured by Nibco. Equivalent valves as manufactured by the following are acceptable: Apollo, Bray, Centerline, Crane, DeZurik, Hammond, Jamesbury, Keystone, Milwaukee, Powell, or Stockham.

C. SPECIALTY VALVES
1. Specialty valves are based on the manufacturers and models as specified under each section of valves, or as specified in the following list.
2. Calibrated Balancing Valves: Armstrong, Bell & Gossett, Flowset, Mueller, Nibco, Taco, or Tour and Anderson.

2.02 GATE VALVES

A. The use of gate valves will not be accepted in water systems. Where isolation valves are shown, provide ball valves or butterfly valves as specified below:

2.03 GLOBE VALVES

A. The use of globe valves for water service will not be accepted, except in temperature control applications.

2.04 BALL VALVES

A. 2" and Smaller
1. Nibco T/S 585-70; Two piece bronze body; threaded or soldered ends to match the appropriate pipe material; stainless steel or chrome plated brass/bronze ball; conventional port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in insulated piping.

B. 2½" and Over
1. Ball valves will not be accepted in sizes over 2 inch.

2.05 BUTTERFLY VALVES

A. 2" and Smaller
1. Use ball valves; butterfly valves will not be accepted in sizes 2 inch and smaller.

B. 2½" to 12"
1. Nibco LD series, lug style with a ductile iron body; stainless steel shaft; Teflon, nylatron, or acetal bearings; EPDM resilient seat. Disk to be bronze, aluminum-bronze, nickel plated ductile iron, or stainless steel. Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Provide valve stem extensions for valves installed in insulated pipe. Use lug type valves for all applications, permitting removal of downstream piping while using the valve for system shutoff. Valves shall be rated for dead-end service.
2. Provide hand wheel, worm gear operators for valves 2-1/2" and larger.

2.06 SPRING LOADED CHECK VALVES

A. 2" and Smaller
   1. Nibco T480; Bronze, threaded, bronze trim, stainless steel spring, teflon seat unless only bronze available, 250 psig WOG.

2.07 DRAIN VALVES

A. Use ¾ inch ball valve with threaded hose adapter, unless a larger size valve is specified on the plans. For drain valves used as blowdown valves on strainers, valve shall be the same size as the blowdown connection.

2.08 GAUGE VALVES

A. Use ¼" ball valves of brass, bronze or steel construction.

2.09 BALANCING VALVES

A. 2" and Smaller
   1. Nibco Model 1710, globe style valve with bronze body, with calibrated scale to register degree of valve opening, adjustable memory stop, two integral metering/test ports with internal check valve and caps. Valve shall

2.10 THERMOMETERS

A. MANUFACTURERS
   1. Ashcroft, Marsh, Taylor, H.O. Trerice, U.S. Gauge, Weiss, Weksler.
   2. Equivalent to Trerice Industrial Thermometer, stem type, with black finish cast aluminum case, 9 inch scale, clear acrylic window, adjustable angle brass stem with stem long enough so the end of the stem is near the middle of a pipe without reducing the thickness of the insulation, red indicating fluid and black lettering against a white background having a minimum increment of 2°F. Scale ranges shall be as follows:

Service	Scale Range, °F
Chilled Water	0 to 100

2.11 THERMOMETER SOCKETS

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

2.12 TEST WELLS

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

2.13 PRESSURE/TEMPERATURE PLUGS

A. Provide Pete's Plugs, Fairfax or approved equal combination pressure/temperature sensing plugs. Plugs shall include ¼" NPT connection, Nordel valve core, cap and gasket. Plugs shall be rated for 250°F and 200 PSIG. Provide one pocket test kit for the project.

2.14 STRAINERS

A. MANUFACTURERS
1. Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

B. STANDARD WATER SYSTEMS
1. Y type; cast iron body; 304 stainless steel screens; bolted or threaded screen retainer tapped for a blowdown valve; threaded body in sizes through 2 inch and rated at not less than 175 PSI WOG; flanged body in sizes over 2 inch and rated at not less than 125 PSI WOG at 240° F.
2. Screen perforations shall be:
   a. 2” and less 0.033 inch perforations (20 mesh)
   b. 2½” through 4” 0.100 inch perforations

2.15 AIR VENTS

A. MANUAL TYPE
1. Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.
2. Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 PSIG at 220°F.

B. AUTOMATIC TYPE
1. Amtrol/Thrush Model 720, Bell and Gossett Model 107, Watson McDaniel Model 830.
2. Cast iron body with nonferrous internal parts, designed to vent air automatically with float principle without allowing air to enter the system, rated at not less than 125 PSIG at 220°F.

PART 3 - EXECUTION

3.01 GENERAL

A. Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

C. Install all temperature control valves.

D. Install valves with the stem in the upright position. Valves installed with the stems down, will not be accepted. Where valves 2½" and larger are located more than 10'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator.

E. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT-OFF VALVES

A. Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair. For piping 2” and smaller use ball valves. For piping larger than 2” use butterfly valves.

B. Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

C. Install rotary shut-off valves in the recommended flow direction.

3.03 SPRING LOADED CHECK VALVES

A. Install a spring loaded check valve in each pump discharge line.

3.04 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, other locations required for drainage of systems.

3.05 BALANCING VALVES

A. Provide balancing valves for major equipment, individual terminal equipment, at the discharge of each pump and where indicated on the drawings and details for balancing of hydronic systems.

B. Balance valves shall be sized according to the manufacturer's recommendations.

3.06 THERMOMETERS

A. Stem Type
   1. Install in piping systems as specified on the drawings and details using a separable socket in each location. Thermometers shall be readable by person standing on floor.
   2. Provide a thermometer for the outside air, return air, mixed air, and supply air of each air handling unit.

3.07 THERMOMETER SOCKETS

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

3.08 TEST WELLS

A. Install in piping system as specified on the drawings and details wherever provisions are needed for inserting a thermometer or DDC sensor at a later date.

3.09 PRESSURE/TEMPERATURE PLUGS

A. Install in piping systems as specified on the drawings and details.

3.10 STRAINERS

A. Install strainers where indicated on the project details, allowing space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

B. For Y-type strainers, install a drain valve in the tapped screen retainer cover for blowdown purposes. Valve shall be the same size as the cover tapping. For basket strainers, install a drain valve in the tapped drain connection in the bottom of the strainer. Valve shall be the same size as the drain tapping.

3.11 AIR VENTS

A. MANUAL
1. Install at high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting water that might escape.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for supports of HVAC equipment and materials as well as piping system hangers and anchors.

1.02 RELATED WORK

A. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment

B. Section 23 07 00 – HVAC Insulation

1.03 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

A.	U.L.	Underwriters Laboratory
B.	ASME B31.1	ASME Code For Pressure Piping
C.	MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
D.	MSS SP-69	Pipe Hangers and Supports - Selection and Application
E.	MSS SP-89	Pipe Hangers and Supports – Fabrication & Installation Practices
F.	MSS SP-90	Guidelines on Terminology for Pipe Hangers and Supports

G. Federal Specification WW-H-171E

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 DESCRIPTION

A. Provide supporting devices for the installation of mechanical equipment and materials. Supports and installation procedures are to conform to the latest requirements of the ANSI/ASME Code for pressure piping.

B. Do not hang mechanical items directly from a metal deck or run piping so it rests on the bottom chord of trusses or joists.

C. 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.

D. Protect insulation at hanger points; see Related Work above.

1.07 DESIGN CRITERIA

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

B. Piping supported by laying on the bottom chord of joists or trusses is not acceptable.

C. Use galvanized hangers in lieu of black hangers in wet areas. Wet areas are those spaces that normally can have water in them (shower rooms, for example) or that could have water during normal maintenance and repair. The latter area includes equipment rooms containing expansion tanks, boilers, chillers, water coils; it does not include the space above suspended ceilings.

PART 2 - PRODUCTS

2.01 STRUCTURAL SUPPORTS

A. Provide supporting steel for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels and beams to suspend or floor support tanks, piping, and other HVAC equipment.

2.02 PIPE HANGER AND SUPPORT MANUFACTURERS

A. Grinnell figure numbers are listed below. Equivalent products by B-Line, Fee and Mason, Kindorf, Michigan Hanger or Unistrut are acceptable.

2.03 PIPE HANGERS AND SUPPORTS

A. Black hangers are specified below. Substitute equivalent galvanized hangers for use in wet areas or areas that are frequently washed down.

B. STEEL PIPING SYSTEMS OPERATING AT 250°F OR LESS
   1. Hangers for Pipe sizes ½" through 2½": Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 or 260
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.
   2. Hangers for Pipe sizes 3" and over: Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 260
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.
      a. Grinnell Figure 46.
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.
   4. Wall Support: Welded steel bracket with hanger. Support shall be selected for the application.
      a. Grinnell Figure 195/199 with hanger as specified above.

C. INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 with Grinnell Figure 167 insulation protection shield for each hanger.
   2. Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.
      a. Grinnell Figure 46 with Figure 167 insulation protection shield at each hanger location.

D. UN-INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel with copper finish and adjustable clevis.
      a. Grinnell Figure CT-65
   2. Vertical Riser Support: Carbon steel riser clamp with copper finish.
      a. Grinnell Figure CT-121

2.04 BEAM CLAMPS

A. MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of *3/8*, ½, and *5/8* inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Grinnell Figure 86.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place for rod sizes to 1½ inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Grinnell Figure 228.

2.05 CONCRETE INSERTS

A. MSS SP-69 Type 18 wedge type or universal concrete inserts.

B. Wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to *7/8* inch diameter. Wedge design to allow the insert to be held by concrete in compression. Grinnell Fig. 281.

C. Universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to *7/8* inch diameter. Grinnell Fig. 282.

D. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured. These inserts are not to depend on soft lead for holding power.

2.06 CONTINUOUS CONCRETE INSERT CHANNELS

A. Steel inserts with an industry standard pre-galvanized finish, nominally 1-*5/8* inch wide by 1-*3/8* inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices. Installed channels to provide a load rating of 2000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed to be used with the channel inserts may be used.

2.07 PIPE HANGER RODS

A. Steel Hanger Rods
1. Threaded both ends, threaded one end, or continuous threaded, black finish.
2. Size rods for individual hangers and trapeze support according to the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.)	Rod Diameter (Inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4

4. Provide rods with adjusting and lock nuts.
5. Maximum temperature shall not exceed 650°F.

PART 3 - EXECUTION

3.01 INSTALLATION

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

B. Coordinate hanger and support installation to properly group piping of other trades.

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

D. Piping over 1 ¼" shall be attached so that weight is carried on the top chord of steel bar joists or purlins.

3.02 HANGER AND SUPPORT SPACING

A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

C. Support riser piping independently of connected horizontal piping.

D. Adjust hangers to obtain the slope specified in the piping section of this specification.

E. SPACE HANGERS FOR PIPE AS FOLLOWS

Pipe Material	Pipe Size	Max. Horizontal Spacing	Max Vertical Spacing
Steel	½" through 1¼"	6' - 0"	15‘ – 0”
Steel	1½"	8' - 0"	15’ – 0”
Steel	2" through 4"	10' - 0"	15’ – 0”
Copper	½" through 1"	6' - 0"	10’ – 0”
Copper	1¼" and larger	10' - 0"	10’ - 0”

3.03 VERTICAL RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure at each floor and as specified above.

B. Piping 5" and above, of lengths exceeding 30 feet, shall be additionally supported on base elbows secured to the building structure, with flexible supporting hangers provided at top of riser to allow for pipe expansion.

3.04 CONCRETE INSERTS AND CONTINUOUS INSERT CHANNELS

A. Select size based on the manufacturer's stated load capacity and weight of material being supported. Locate continuous insert channels on 8' - 0" maximum centers and 2' - 0" from corners. Furnish inserts to the General Contractor for placement in concrete formwork. Use insets for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

B. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with the slab.

END OF SECTION

SECTION 23 05 48
VIBRATION AND SEISMIC FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for vibration isolation material for equipment, piping systems, and duct systems.

1.02 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

B. Section 23 33 00 – Air Duct Accessories

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.05 DESIGN CRITERIA

A. Isolate motor driven mechanical equipment from the building structure, and from the systems that they serve to prevent equipment vibrations from being transmitted to the structure. Consider equipment weight distribution to provide uniform isolator deflections.

B. For equipment with variable speed capability, select vibration isolation devices based on the lowest speed.

C. Provide flexible piping connections for piping connected to rotating or reciprocating equipment mounted on vibration isolators except do not use flexible piping connectors on gas piping or piping associated with in-line pumps.

D. Coordinate the selection of devices with the isolator and equipment manufacturers.

E. Piping connected to a coil, which is in an assembly mounted on vibration isolators, (whether internally or externally isolated) shall have flexible piping connections, and piping vibration hangers.

1.06 SUBMITTALS

A. Include isolator type, materials of construction, isolator free and operating heights, and isolation efficiency based on the lowest operating speed of the equipment supported.

PART 2 - PRODUCTS

2.01 GENERAL

A. Use materials that retain their isolation characteristics for the life of the equipment served. Use industrial grade neoprene for elastomeric materials.

B. Treat isolators to resist corrosion. For isolation devices exposed to the weather or used in high humidity areas, hot dip galvanize steel parts, apply a neoprene coating on steel parts, or use stainless steel parts; include limit stops to resist wind.

C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

D. Use isolators with a ratio of lateral to vertical stiffness not less than 1.0 or greater than 2.0.

2.02 ACCEPTABLE MANUFACTURERS

A. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
   1. Amber/Booth Co.
   2. Kinetics/ Peabody Noise Control
   3. Korfund
   4. Mason Industries
   5. Vibration Eliminator Co.
   6. Vibration Mounting & Controls

2.03 VIBRATION ISOLATION EQUIPMENT

A. TYPE 1: NEOPRENE PAD
   1. Neoprene waffle pad, 40 durometer with 16 gauge shims between layers.

B. TYPE 5: SPRING HANGER WITH NEOPRENE
   1. Vibration hanger with a steel spring and 0.3" deflection neoprene element in series. Use neoprene element molded with a rod isolation bushing that passes through the hanger box. Select spring diameters and size hanger box lower holes large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Select springs so they have a minimum additional travel to solid equal to 50% of the rated deflection.

C. TYPE AG: VERTICAL PIPE ANCHOR AND GUIDE
   1. All directional acoustical pipe anchor and guide consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum half inch thickness of heavy duty neoprene and duck or neoprene isolation material. Provide vertical restraints of similar material to prevent vertical travel in either direction. Design isolation materials for a maximum allowable load of 500 PSI, balanced for equal resistance in any direction.

2.04 FLEXIBLE PIPING CONNECTIONS

A. Rated for the pressure, temperature, and fluid involved; minimum pressure rating of 125 PSIG at the design temperature of the fluid served by the piping system. Use 12 inch minimum line length of flexible hose or length required to absorb ¾" lateral movement, whichever is greater.

B. MANUFACTURERS
   1. Flexonics, Mason, Mercer Rubber, Metraflex, or Proco.

C. WATER AND PUMPED CONDENSATE
   1. Multiple plies of nylon tire cord fabric reinforced with an EPDM cover and liner. Do not use steel wire or rings as pressure reinforcement. Use threaded or soldered connections for sizes 2" and smaller and floating steel or ductile iron flanges for sizes 2½" and larger; design the steel flange end so the steel flange is recessed to lock a steel wire bead ring in the raised face of the EPDM flange. Construct straight-through connections with twin spheres. Use control rods when recommended by the manufacturer.

D. STEAM AND STEAM CONDENSATE
   1. Seamless corrugated bronze or type 321 stainless steel flexible hose with type 321 stainless steel braided cover for 2" and smaller. Use threaded, soldered, or flanged connections, as applicable to the piping system. For sizes 2½" and larger, use seamless corrugated type 321 stainless steel flexible hose with type 321 stainless steed braided cover and flanged connections.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install vibration isolation devices for motor driven equipment in accordance with the manufacturer's installation instructions.

B. Do not allow installation practices to short circuit isolation devices.

C. Install flexible piping connections on the equipment side of shut-off valves.

3.02 PACKAGED AIR HANDLING UNITS

A. Units are internally isolated.

3.03 FLEXIBLE PIPING CONNECTIONS

A. Provide flexible piping connections for equipment specified to have vibration isolation devices installed and as shown on the drawings. Flexible piping connections shall be located between isolation valves and the equipment served. Pipe supports or hangers located between the flexible piping connection and the equipment shall also be provided with vibration isolation devices.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for air and water testing, adjusting and balancing (TAB) specifications for the entire project. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC submittals to be furnished for use by the testing and balancing agency for coordination of work.

B. Section 23 09 23 - Direct Digital Control System for HVAC

C. Section 23 09 25 – Integrated Automation System

D. Project drawings and specifications which define the scope of the systems to be balanced.

1.03 REFERENCE

A. Provisions of Division 1 govern work under this section.

1.04 REFERENCE STANDARDS

A. AABC National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Fifth Edition, 1989.

B. ASHRAE ASHRAE Handbook, 1987 HVAC Systems and Applications, Chapter 57, Testing Adjusting and Balancing.

C. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Latest Edition.

1.05 QUALITY ASSURANCE

A. An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of 3 years. A Firm not engaged in the commerce of furnishing or providing equipment or materials generally related to HVAC work other than that specifically related to installing Testing and Balancing components necessary for work in this section such as, but not limited to sheaves, pulleys and balancing dampers.

B. Testing, adjusting and balancing of new and existing air and water systems, including electrical measurement and verification of performance of equipment shall be completed in accordance with standards published by AABC or NEBB.

C. Air balancing work shall be completed by an AABC or NEBB certified air balance contractor. Certification number and seal of registration shall be included with each balancing report.

D. Submit qualifications of Firm to Dane County Public Works project manager upon request.

1.06 DESCRIPTION

A. Provide mechanical systems testing, adjusting and balancing. Requirements include the balancing of air systems, including adjustment of new and existing systems to provide design quantities as specified on the drawings, electrical measurement and verification of performance of equipment.

B. Test, adjust and balance air and hydronic systems so that each room, piece of equipment or terminal device is using the quantities indicated on the drawings and in the specifications.

C. Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project. Coordinate with other sections of work as specified to provide timely and accurate completion of the TAB work.

D. The test and balance agency is encouraged to make periodic site visits to make sure that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

1.07 COORDINATION

A. The testing, adjusting and balancing Contractor shall coordinate his work with the mechanical system and temperature control system installing Contractors to accomplish coordination and verification of system operation and readiness for testing, adjusting and balancing.

1.08 SUBMITTALS

A. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The reports to be certified prove that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

B. Submission
   1. Submit 5 sets of reports for distribution. Final distribution of submittals shall be as follows:
      a. Owner 3 copies for record purposes after approval (to be included in the operation and maintenance manuals).
      b. Project Engineer 1 copy for record purposes after approval.
      c. Contractor 1 copy for record purposes after approval.
   2. Include a copy of the approved final balancing report for this project.

C. Format
   1. Bind report forms in three-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions, separated by divider tabs:
      a. General Information
      b. Summary
      c. Air Systems
      d. Special Systems

D. Contents
1. Provide the following minimum information, forms and data:
a. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
b. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.
c. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely including the percent deviation from design values. Where information cannot be obtained or is not applicable indicate same.

PART 2 - PRODUCTS

2.01 INSTRUMENTATION

A. Provide required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements are to be in accordance with the requirements of NEBB or AABC Standards and instrument manufacturer's specifications.

B. All instruments used for measurements shall be accurate, and calibration histories for each instrument shall be available for examination upon request. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES

A. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation.

B. Do not proceed until systems are fully operational with components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.02 EXISTING EQUIPMENT AND SYSTEMS

A. Take airflow readings at each existing air handling unit and provide a report of findings to engineer for review prior to start of demolition work.

B. Take airflow readings in existing supply air ductwork to obtain total existing supply airflow in the spaces being renovated. Provide a report of findings to engineer for review prior to start of demolition work.

3.03 PERFORMING TESTING, ADJUSTING AND BALANCING

A. Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.

B. Unless specifically instructed in writing, work specified in this section is to be performed during the normal workday.

C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tiles for tiles that are damaged by this procedure. If the ceiling construction requires the installation of access panels for completion of work under this section, provide panels for access as necessary.

D. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

E. In air systems employing filters, blank off filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

F. Adjust equipment to yield specified total flow at terminals. Proceed taking measurements in mains and branches for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

G. Determine air handling system total supply and return airflow and return and exhaust fan total airflow at each piece of equipment utilizing a pitot tube duct traverse. Summation of air terminal inlet/outlet CFM's is not acceptable, unless a pitot tube traverse is impractical. If summation of the air inlets/outlets is used in lieu of the traverse method, a valid explanation shall be submitted along with the balancing reports. Insufficient back-up information to support use of the summation method is cause for rejection of the balancing reports without review.

H. Measure and record airflow and static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units. Submit a static pressure profile for each air handling unit system. Unit static pressure profile shall be done at both minimum outside air CFM and at maximum outside air CFM (full economizer cycle) and also with the face and bypass dampers (when provided on air handling systems) in full bypass position as well as full face position. Reports submitted without air handling system static pressure profiles is cause for rejection of the balancing reports without review.

I. Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and record both sets of data. Balance variable air volume systems at maximum air flow rate, full cooling, and minimum flow rate, full heating; record all data.

J. Provide fan and motor drive sheave adjustments to obtain design performance. If fan and motor drive sheaves require replacement to obtain design air volumes, provide sheave replacements at no additional cost to the project. Design air volume shall be obtained at all air handling unit operating conditions – minimum outside air and 100% outside air (economizer position).

K. Final air system measurements to be within the following range of specified CFM:
1. Fans -5% to +5%

L. Final water system measurements to be within the following range of specified GPM:
1. Coils -5% to +5%
2. Pumps -5% to +10%

M. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

N. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

O. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.04 DEFICIENCIES

A. Contractor shall correct installation deficiencies found during the test and balance stage. Test and balance agency shall notify the Construction Representative of these items.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.01 SCOPE

A. This section includes insulation specifications for heating, ventilating, and air conditioning piping, ductwork, and equipment.

1.02 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

B. Section 23 31 00 – HVAC Ducts and Casings

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A.	ASTM/ANSI C195	Mineral Fiber Thermal Insulation Cement
B.	ASTM/ANSI C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
C.	ASTM/ANSI C533	Calcium Silicate Block and Pipe Thermal Insulation
D.	ASTM/ANSI C547	Mineral Fiber Preformed Pipe Insulation
E.	ASTM/ANSI C552	Cellular Glass Block and Pipe Thermal Insulation
F.	ASTM/ANSI C553	Mineral Fiber Blanket and Felt Insulation
G.	ASTM/ANSI C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
H.	ASTM/ANSI C612	Mineral Fiber Block and Board Thermal Insulation
I.	ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
J.	ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation
K.	ASTM E84	Surface Burning Characteristics of Building Materials
L.	NFPA 225	Surface Burning Characteristics of Building Materials
M.	NFPA 96	Ventilation Control and Fire Protection of Commercial Cooking Operations
N.	MICA Manual	National Commercial & Industrial Insulation Standards, 1988, Third Edition, published by the Midwest Insulation Contractors Association
O.	UL 723	Surface Burning Characteristics of Building Materials

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

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

1.06 SUBMITTALS

A. Include manufacturer's data for the following:
   1. Pipe insulation
   2. Duct Insulation

B. Insulation submittal shall include data on thermal conductivity, materials of composition, jacket information and temperature limitations. Include in the submittals a schedule of insulation types and thickness for each type (and size) of surface to be insulated. Include in the schedule a listing of specialty type jackets for the applications required for the project.

1.07 DESCRIPTION

A. Furnish and install insulating materials and accessories as specified. The following types of insulation are specified in this section:
   1. Pipe insulation
   2. Duct Insulation

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

1.08 DEFINITIONS

A. “Concealed”
   1. Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

B. “Unconditioned spaces”
   1. Unheated or non-cooled attics, utility tunnels and crawl spaces were ambient temperatures may rise above 90°F, or drop below 50°. Ducts in these instances are considered to be located outside of the building thermal envelope.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less except that outdoor mechanical insulation may have a flame spread rating of 75 and a smoke developed rating of 150.

2.02 INSULATION AND JACKETS

A. MANUFACTURERS:
1. Armstrong, Halstead, Owens-Corning, Johns-Manville, Knauf, Certainteed or equivalent to types as specified herein.
2. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be capable of receiving jackets, adhesives and coatings for the required application.
3. Jackets shall have puncture resistance based on ASTM D-781 test methods. Vapor barriers, where required, shall have perm ratings based on ASTM E-96 procedure A.

B. FLEXIBLE FIBERGLASS INSULATION
1. Owens-Corning "All-Service Duct Wrap" or Johns-Manville "R" Series Microlite with a minimum density of 0.75 lb. per cu. ft., thermal conductivity of not more than 0.35 at 75°F mean temperature, and be suitable for an operating temperature up to 250°F. Vapor retarder facing shall be a foil-scrim-kraft laminate jacket, factory applied to the insulation. Permeance shall not exceed 0.02 perms when tested in accordance with ASTM E 96. Beach puncture resistance shall be 50 units minimum.

C. RIGID FIBERGLASS INSULATION - DUCTWORK
1. Owens-Corning 700 Series, having a thermal conductivity of not more than 0.23 at 75°F mean temperature and a maximum operating temperature of 450° F.
2. Inside applications: Minimum nominal density of 3 lbs. per cu. ft.,
3. Exterior applications: 6 lbs. per cu. ft. nominal density.
4. Jacket: FRK foil reinforced vapor barrier jacket, factory applied to insulation, maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 25 units.

D. RIGID FIBERGLASS INSULATION - PIPING
1. Owens-Corning SSL-II having a thermal conductivity of not more than 0.23 at 75°F mean temperature and a maximum operating temperatures of 450° F.
2. Jacket: White kraft reinforced vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 50 units.

E. PROTECTIVE METAL JACKETS
1. Constructed of .020 inch thick aluminum or .010 inch thick stainless steel with longitudinal Pittsburgh Z-Lock seam. End to end joints must be lapped a minimum of 2 inches and be sealed with vapor barrier mastic. Jacket shall be secured using metal bands for end to end joints, and rivets or sheetmetal screws for longitudinal joints. Rivets, screws, and bands shall be constructed of the same material as the jacket. Provide 2 piece preformed metal jackets at fitting locations.

2.03 ACCESSORIES

A. Products shall be compatible with surfaces and materials on which they are applied, and be compatible for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. Insulation bands to be ¾ inch wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015 inch for aluminum and 0.010 inch for stainless steel.

D. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

E. Finishing cement to be ASTM C449.

F. Fibrous glass cloth shall have a minimum untreated weight of 6 oz./sq. yd.

G. Bedding compounds to be non-shrinking and permanently flexible.

H. Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.

I. Wire mesh reinforcing shall be corrosion resistant metal with a hexagonal pattern.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Do not insulate systems or equipment that is specified to be pressure tested or inspected, until testing and inspection have been successfully completed.

B. Piping, ductwork, and equipment shall be installed with clearances from walls, piping, ductwork, equipment and other obstacles to permit the application of the full thickness of insulation as specified.

C. Insulation, jackets, or accessories shall only be installed under ambient temperatures or conditions recommended by the manufacturer of the material.

D. Insulation and jackets shall be provided as specified in the listings contained within this specification section, or as otherwise noted on the plans. Requirements apply to both exposed and concealed applications unless noted otherwise.

E. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled terminations at nameplates, uninsulated fittings, and at other locations where insulation terminates.

F. Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation will not be accepted.

G. Provide removable insulation sections to permit easy access where inspection, service, or repair is required.

H. Install jackets with longitudinal joints facing wall or ceiling.

I. Insulation shall be continuous through sleeves and openings except where partitions or assemblies are fire rated. Penetrations through rated assemblies shall be sealed with fireproofing insulation.

J. Provide a continuous vapor barrier for insulation on the following systems:
   1. Chilled water
   2. Insulated duct

K. Glass fabric reinforcing shall be installed in accordance with manufacturer's recommendations, and fitted without unnecessary wrinkles or seams. Seams shall overlap a minimum of 2 inches.

3.02 PIPING, VALVE AND FITTING INSULATION

A. Fittings and valves may be insulated with factory molded "Zeston" type covers, or built up insulation. Built up insulation must have the same thickness as adjoining insulation.

B. One piece, insulated PVC covers may be used for fittings and valves if insulation thickness and thermal performance is the same as adjoining insulation. Seams, joints between PVC cover and adjoining pipe insulation, and any staples or tacks used to secure seams in PVC covers, must be covered with 2 inch wide, 10 mil PVC tape and one coat of vapor barrier mastic.

C. Provide inserts of high density block insulation at hanger or support locations. Block insulation to be preformed for the pipe size and cover the bottom 180 degrees of the pipe. Insert must be installed under the finish jacket on piping 2 inches and larger to prevent insulation from sagging or compressing at support points. Inserts shall be heavy density insulating material acceptable for the operating temperature range of the system being insulated. Wood blocks and block insulation cut into strips will not be accepted. Insulation inserts shall not be less than the following lengths:

Pipe Size	**Length**
Through 2½"	10"
3" to 6"	12"

D. Insulation shall be applied to piping with butt joints and longitudinal seams closed tightly.

E. Minimum acceptable lap on factory applied jackets shall be 2 inches, firmly cemented with lap adhesive.

F. Joints shall be covered with factory furnished tape (2" minimum width) to match the jacket, firmly cemented with lap adhesive.

G. Insulation, except that with vinyl jackets, shall be additionally secured to piping with the use of staples. Where staples are used on systems that require a vapor barrier, the lap and staples must be covered with a finish coat of vapor barrier mastic.

H. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Provide neatly beveled terminations. Poorly fitted terminations or use of filler in voids will not be accepted.

I. Where metal jackets are used for exterior applications, locate seams on bottom side of horizontal piping.

J. Where anchors or supports are secured directly to the pipe, extend insulation up the anchor or support for a distance of 4 times the insulation thickness. Maintain vapor barrier where insulation is terminated.

K. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints. Insulation for valves, unions, strainers, flexible connections and expansion joints shall be removable for inspection and repair.

L. Provide insulation as specified in the following schedule for all [new] [new and existing] piping:

Service	Insulation	Insulation Thickness by Pipe Size				
		Type1" and smaller	1¼" to 2"	2½" to 4"	5" to 6"	8" and larger
Hot Water Piping	rigid fiberglass	1½"	1½"	2"	2"	2"
Chilled Water Piping	rigid fiberglass	1"	1"	1"	1½"	1½"
Cooling Coil Condensate	rigid fiberglass	1"	1"	1"	1"	1"
Low Pressure Steam	rigid fiberglass	1½"	1½"	2"	2"	3½"
Low Pressure Cond.	rigid fiberglass	1½"	1½"	2"	2"	3½"
Cond. Pump Disch.	rigid fiberglass	1½"	1½"	2"	2"	3½"

M. Provide a protective metal jacket for insulated piping exposed to the weather, or where potential physical damage could occur.

N. The following piping and fittings are not to be insulated:
1. Steam Traps
2. Piping unions for systems not requiring a vapor barrier

3.03 DUCT INSULATION

A. Where ductwork is specified to be pressure tested, do not insulate duct until pressure test has been successfully completed.

B. Duct insulation shall be applied evenly over the duct surface, secured with bonding adhesive in accordance with manufacturer's recommendations.

C. Rigid and flexible insulation on sides and bottom of ductwork over 24" wide shall also be secured with stick clip or weld pin fasteners spaced 18" on center. Where weld pin fasteners are used, they shall be installed without damage to the interior galvanized surface of the duct. Pins to be neatly clipped back to each fastener.

D. Where vapor barrier jackets are specified, pins shall be covered with jacket material matching that of the duct insulation, sealed vapor tight, and covered with vapor barrier mastic.

E. Insulation without factory jacket shall be cut and mitered to suit the surface on which it is being applied. Voids, seams, and joints shall be built up with insulating cement, finished to a smooth surface, and covered with glass fabric.

F. For ductwork surfaces insulated with rigid ductboard insulation, apply 2 coats of vapor barrier mastic after application of the insulating cement. Vapor barrier and weatherproof mastics to be applied with glass fiber reinforcing fabric.

G. Surface of duct must be cleaned before application of adhesives.

H. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.

I. Joints and seams of jackets for rigid fiberglass insulation shall be firmly butted together and covered with 6" wide glass cloth set in mastic. After first coat of mastic is dry, apply a second coat.

J. Where reinforced kraft jackets are used, joints and seams shall be firmly butted together and covered with 3" wide tape furnished by jacket manufacturer, and specifically recommended for the type of jacket being used.

K. For water coils in air systems, maintain the continuity of duct insulation over and around coils. This includes coils attached to VAV terminal units as well as duct mounted coils. Vapor barriers on cold coils shall be maintained continuous.

L. Provide duct insulation as specified in the following table for all new ductwork:

Service	**Insulation Type**	**Insulation Thickness**
Outside air intake ducts	Rigid fiberglass	2"
Mixed air* ducts	Rigid fiberglass	2”
Relief air ducts	Rigid fiberglass	2"
Concealed supply ducts	Flexible fiberglass	1½"
Exposed supply ducts in equipment rooms and other non-finished areas	Rigid fiberglass	1½"

* - **Mixed air ducts include bypass ducts for coil face and bypass applications.**

3.04 EQUIPMENT INSULATION

A. Where equipment is specified to be leak tested prior to operation, do not install insulation until testing and necessary repairs have been successfully completed.

B. Insulation shall be applied to equipment shells with bonding adhesive, and wired in place. Fill joints and seams with insulating cement, covering surfaces with a wire reinforcing mesh. An additional coat of insulating cement with glass cloth shall then be applied, and finished to a smooth, hard surface.

C. Where a vapor barrier is required, apply 2 coats of vapor barrier mastic after application of the insulating cement.

D. Where a vapor barrier is not required, apply 2 coats of weatherproof mastic after application of the insulating cement.

E. Provide insulated boxes with metal protective jacket where access is required for cleaning, repair, or inspection. Boxes must be easily removable without causing damage to insulation or equipment.

F. Air handling unit casings, chambers, or plenums (filters, mixing chambers and sound attenuators) and inline fans shall be insulated in accordance with requirements of adjacent duct insulation.

G. Do not insulate equipment that is factory insulated.

H. Do not insulate over equipment nameplates or ASME stamps. Bevel and seal insulation at these locations.

END OF SECTION

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.01 SCOPE

A. Work in this section includes Direct Digital Control (DDC) panels, field equipment panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete, fully functional Direct Digital Control (DDC) building automation system, utilizing Direct Digital Control signals to meet, in every respect, all operational and quality standards specified herein.

1.02 REFERENCE

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

1.03 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 15 – HVAC Valves and Piping Specialties

C. Section 23 09 93 – Sequence of Operation for HVAC Controls

D. Division 26 – Electrical

1.04 WORK OF OTHER SECTIONS

A. Power wiring for starters.

B. Furnishing of disconnect switches required by Code at motor locations.

C. Installing and wiring motor starters.

1.05 DEFINITIONS

A. The following definitions are applicable to work of this section:

1.	DDC	Direct Digital Control
2.	BAS	Building Automation System
3.	TCS	Temperature Control System
4.	TCC	Temperature Control Contractor
5.	I/O	Input/output Device
6.	FMS	Facility Management System
7.	LAN	Local Area Network
8.	DCU	Distributed Control Units
9.	ASC	Application Specific Controller

1.06 DESCRIPTION OF WORK

A. The extent of the work shall be as shown on the drawings, as shown in schedules and as detailed by the performance requirements specified hereinafter.

B. All necessary software, hardware, firmware, operating equipment, devices and system components required for the system shall be provided by the Subcontractor whether or not specifically itemized, in order to provide a complete system within the intent of this specification.

C. All system point types shall be universal I/O. All hardware inputs shall be digital inputs or analog inputs (field selectable). All hardware outputs shall be digital outputs or analog outputs (field selectable). Float control will not be allowed unless true analog feedback is used on a per point basis.

D. It is the intent of this specification to describe a system utilizing the latest technology with an emphasis towards “connectivity”. The BAS system shall in no way hinder the ability of the Owner to purchase mechanical equipment of multiple equipment manufacturers at this time or in the future.

E. ALL exceptions to bid specifications shall be clearly listed with the BAS bid for Owner/Engineer review. ANY exceptions not listed shall bind the contractor to the full extent of the specifications. All questions and comments shall be directed in writing to the engineer.

1.07 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. INSTALLER
1. All work shall be installed by mechanics and technicians directly employed by the automatic control system manufacturer who shall be responsible for the proper installation and operation of the automatic control system.
2. The Automatic Temperature Control Subcontractor shall maintain a local service office within a 75-mile radius of the job site, staffed with factory-trained engineers fully capable of providing instruction, routine maintenance, and emergency maintenance service on all system components.
3. The Subcontractor shall have a five-year experience record in the design and installation of systems of similar design, manufacture and performance to the automatic temperature control systems specified herein.

C. ELECTRICAL STANDARDS
1. Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

D. DDC Standards
1. DDC manufacturer shall provide written proof with shop drawings that the equipment being provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (1979 Amendment to Part 15, Subpart J).

1.08 SYSTEM INTEGRATION CONTRACTOR QUALIFICATIONS

A. The system integrator shall have a successful history in the design and installation of open control systems with browser based wide area network connectivity and shall provide evidence of this history as a condition of acceptance of bid.

B. The system integrator shall have an office that is staffed with trained engineers and technicians fully capable of providing instruction and routine emergency maintenance service on all system components within 24 hours of notification.

C. Contractor Service:
• System integrator shall have a local service facility within a 90-mile radius of the job site, staffed with qualified service personnel, fully capable of providing instructions and routine or emergency maintenance service.
• Qualified Bidder: Environmental Service Inc., Waukesha WI, 262-544-8860

1.09 SUBMITTALS

A. Submittals shall be required in two phases.

B. First phase (approval) submittals
1. First phase (approval) submittals, to be done on AutoCAD, shall include job-tailored shop drawings as detailed herein, individual catalog cut sheets detailing manufacturer's data for each major control system component listed under Section 4, "Materials and Equipment", general catalog for all other minor control components and descriptive sequences detailing all automatic control system work. Generalized, standard catalog shop drawings shall not be used for first phase (approval) submittals. This Subcontractor shall develop a complete set of new shop drawings showing the entire automatic control system including the new digital automatic control system and the FMS system interface.
2. Each shop drawing shall be provided with a title block identifying the name of the project, the address of the project, the address of the Subcontractor, the shop drawing sheet number, the Subcontractor's in-house project identification number and the mechanical system reproof the latest revision made to the individual shop drawing.
3. Each mechanical system shall be represented by a line diagram showing each mechanical component (supply fans, heating coils, cooling coils, etc.) as well as any other mechanical system components present but not necessarily affected by the automatic control system (filters, etc.).
4. A line diagram representation of the respective mechanical system shall show all dampers in their relative locations (outside air ductwork, return air ductwork, etc.) and shall show all valves as they are intended to be connected to their respective mechanical component for proper operation.
5. A line diagram representation of the respective mechanical system shall also show all field-mounted automatic control system sensing and control components (sensors, transmitters, receiver-controllers, etc.) and all controlled devices (pressure-electric switches, electric-pressure solenoids, damper actuators, valve actuators, etc.).
6. All panel-mounted control components shall be shown within a separate section of the shop drawing designated for representation of the individual control panel and its face layout. Interconnecting pneumatic piping between panel-mounted components shall be shown. Interconnecting electrical wiring shall not be shown within the designated panel section of the shop drawing but shall be detailed in a one-line diagram (complete with terminal designations) on the same drawing.
7. All electrical wiring for starters of mechanical system components affected by the automatic control system (supply fans, exhaust fans, pumps, etc.) shall be represented as one-line diagrams showing all interlocks between the automatic control system, the respective starter and any other interlocks not necessarily provided as part of the automatic control system (fire alarm, smoke alarm, etc.).
8. Each shop drawing shall be accompanied by a typewritten listing identifying each control system component shown on that drawing. Each component shall be identified by the name used to designate the component on the shop drawings, the component's actual catalog description and designation (to be used when purchasing repair parts), the component's operating range, the component's fail-safe position, the component's setpoint (where applicable) and any other pertinent information.

9. Each shop drawing shall be accompanied by a typewritten sequence of operation identifying the designated function of each control component shown on that drawing. Each control component shall be identified in the sequence of operation by the name used to designate the component on the shop drawings.
10. Each sequence of operation detailing a control sequence involving more than one controlled device (damper operator, valve operator, etc.) shall be accompanied by a sequence graph identifying the relative position of the respective controlled device in the overall sequence (above and below the setpoint of the control loop controlling the respective device.)
11. First phase (approval) submittals shall be provided to and approved by the Owner's authorized representative before any job site installation work is performed.

C. Second phase (operation and maintenance) submittals
1. Second phase (operation and maintenance) submittals shall be provided after all installation, calibration and start-up work has been completed and shall include the first phase submittal shop drawings of the automatic control system, revised to reflect the system in its as-built condition, along with all information previously included in the first phase submittals.
2. Each second phase (operation and maintenance) submittal shall include a typewritten set of operating instructions identifying the procedures to be employed to perform such automatic control system operations as overriding the system, entering new setpoints, displaying current values of system parameters, displaying trend logs, etc.
3. Second phase (operation and maintenance) submittals shall also include information detailing preventive maintenance to be performed by the Owner on a regular basis and the Subcontractor's system guarantee and system component warranties.
4. All as-builts shall be on AutoCAD and both a hard copy and 3.5" disk shall be included with O&M manuals.

1.10 OPERATOR INSTRUCTION

A. During the commissioning phase of the BAS/TCS installation and at such time as acceptable performance of the overall system's hardware and software has been established, the BAS/TCS Subcontractor shall provide 2 hours of on-site operator instruction to the Owner's operating personnel.

B. On-site operator instruction shall be provided during normal working hours and shall be performed by competent representatives of the BAS/TCS Subcontractor familiar with the overall BAS/TCS software, hardware and accessories.

C. At a time mutually agreed upon during the BAS/TCS commissioning phase as stated above, the BAS/TCS Subcontractor shall provide instruction to the Owner's designated personnel on the operation of all equipment within the BAS/TCS, describing its intended use with respect to the programmed functions specified.

D. On-site operator instruction relevant to the BAS/TCS shall include, but not be limited to the overall operational program, equipment functions (both individually and as part of the total integrated system), commands, system generation, advisories, and appropriate operator intervention required in responding to the BAS/TCS operation, a description of the chronological information flow from field sensors, contacts and devices to the BAS/TCS and an overview of the BAS/TCS communication network explaining the interplay between initiating devices, field data-gathering panels, system communications and their importance within the operating system.

E. Additional instruction time as deemed necessary by the Owner shall be obtained from the BAS/TCS Subcontractor on a negotiated basis with the Owner.

F. Provide at the time of instruction, three copies of the Owner's operation and maintenance manual, custom prepared for this project by the BAS/TCS Subcontractor, which shall be used in conjunction with the instruction. Each copy of the Owner's manual shall be bound in a three-ring binder, labeled with the name and address of the project.

1.11 MATERIAL DELIVERY AND STORAGE

A. Provide factory-shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. ACCEPTABLE MANUFACTURERS
1. TAC/Invensys, Alerton, Tridium

B. APPROVED VENDORS
1. Environmental Systems Inc., W223N603 Saratoga Ave, Waukesha, WI 262-544-8860
2. Modahl & Associates, 721 Christensen Ave., Madison, WI 608-843-2954

2.02 INTEROPERABLE DIGITAL CONTROLLERS (IDC)

A. IDC controllers shall be microprocessor based Interoperable BACnet ccontrollers.

B. Provide IDC's and ancillary devices as herein specified, as indicated on the drawings, and as necessary to perform the sequences of operation. The following equipment shall be controlled:
1. Air Handling Units (fans, valve and damper actuators, sensors, etc.)
2. Pump (P-1)

C. Publicly available specifications for the Applications Programming Interface (API) must be provided to the Section 23 09 25 System Integrator for each controller defining the programming or setup of each device. The DDCS Contractor shall provide all programming and documentation necessary to set up and configure the supplied devices per the specified sequences of operation.

D. The DDCS Contractor shall route the BACnet MSTP network trunk to the Network Area Controller (NAC) as indicated on the riser diagram in the bid documents. Coordinate locations of the NAC with the Section 23 09 25 System Integrator to ensure that maximum network wiring distances, as specified by the BACnet wiring guidelines, are not exceeded. A maximum of 70 devices may occupy any one BACnet MSTP trunk. Trunks must be installed using the appropriate trunk termination device.

E. The Network Area Controller (NAC), supplied by the Section 1 23 09 25 System Integrator, will provide all scheduling, alarming, trending, and network management for the BACnet-based devices.

F. The IDCs shall communicate with the NAC at a baud rate of not less than 32K baud. The IDC shall provide LED indication of communication and controller performance to the technician, without cover removal.

G. All IDCs shall be fully application programmable and shall at all times maintain their certification, if so certified. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

H. The DDCS Contractor supplying the IDC's shall provide, at a minimum, the following documentation for each device:
• Network Variable Inputs (nvi's); name and type
• Network Variable Outputs (nvo's); name and type
• Network configuration parameters (nci, nco); name and type
• BACnet Object Type, Object Instance and description

I. It is the responsibility of the DDCS Contractor to ensure that the proper Network Variable Inputs and Outputs (nvi and nvo) and/or BACnet objects are provided in each IDC and are exposed for connection to them by the Section 23 09 25 System Integrator, as required by the point charts. Refer to the software point charts for the required functionality (read-only, write-only, read-write) for each data point.

J. All IDC's shall be capable of being managed (upload, download, discovery, reload, bindings, etc.), by any Lon network management tool. IDC's that can be managed only with LNS-based tools or plug-ins built exclusively for LNS, shall not be permitted.

K. The DDCS Contractor shall provide two copies of the IDC programming tool and configuration tool, with documentation, to the owner.
• This tool shall allow the owner to fully program, configure, diagnose and otherwise manage the controller, without limitations.
• The tool shall be of the latest revision currently in production release by the manufacturer.
• The tool shall be licensed to the owner and shall not require annual license renewal fees.
• The tool shall not be dependent on the LNS network management system in order to properly function and shall be capable of running as a stand-alone application on a Windows XP operating system. Use of LNS-based plug-ins for programming and configuration are not acceptable.

2.03 CONTROL SYSTEM HARDWARE

A. INTEROPERABLE DIGITAL CONTROLLERS

B. APPLICATION SPECIFIC CONTROLLER (ASC)

C. Each terminal unit shall have a BACnet-based DDC Application Specific Controller (ASC) designed to provide the specified sequences. The controller shall store all specific control sequences and program settings in non-volatile memory.

D. All ASC processors shall be Echelon based 3150 Neurons operating at 5 MHz or higher with 8K of RAM and 64K of Flash memory with a minimum 10 year memory retention between program downloads.

E. Each ASC shall perform all intended temperature control functions in a 'standalone' mode should the unit incur a loss of communications.

F. The complete ASC including accessory devices such as relay, transducers, power supplies, etc., shall be factory-mounted, wired and housed in a NEMA 1, UL rated enclosure or as required by the location and local code requirements.

G. Each ASC shall allow Peer-to-Peer communications utilizing free-topology transceivers over a single pair 22 AWG twisted, stranded cable, Category 5 or Level IV.

H. All ASC's shall be provided as self sufficient units to maximize reliability and shall include internal 'soft' clock, operating systems, communication timing and interrupt controls, and shall be suitable for the specified applications.

I. In the event of a power outage or controller reset, each ASC shall enter a preprogrammed state on power re-application. Upon application of power to the ASC, all control conditions will start from an 'off' / 'closed' position or the default state. This state will be maintained for an automatically adjusted amount of time. Once this time delay has passed, the ASC control sequence shall resume according to current values

J. All ASC's shall be provided with a communications port to allow connection of any industry standard laptop PC and custom configuration tools. Program access via this communications port allows direct field modification of the configuration parameters.

K. Digital Inputs:

• All digital inputs shall be over voltage protected.

• Digital input types supported by the CU:
- Normally open contacts (24V and 120V).
- Normally closed contacts (24V and 120V).
- Current/no current.
- Voltage/no voltage.
- Pulse/Totalizer contacts

L. Digital Outputs:
• All digital outputs shall be 24 volt AC, current sinking, 0.5 amp opto-isolated triacs.
• Digital outputs shall be capable of handling maintained as well as pulsed outputs for momentaryor magnetic latching circuits. It shall be possible to configure outputs for 3-mode control (fast-slow-off) and 2-mode control.

M. Analog Inputs:
• All analog inputs shall be over voltage protected.
• The analog to digital resolutions shall be a minimum of 10 bit.
• Analog inputs shall accept the following temperature types: 10K Ohm thermistor, 20K Ohm thermistor, or 1K Ohm RTD.
• Inputs shall be configurable to accept a wide range of inputs including: 4-20mA, 1-5Vdc, 2-10Vdc, etc.

N. Analog Outputs:
• The ASC shall accommodate true analog outputs. Voltage (0-10V) and current (4-20 mA) outputs shall be accommodated.
• All analog outputs shall be proportional current or voltage type.
• The digital to analog resolution shall be a minimum of 10 bit.
• Outputs shall be configurable so that 0-100% output commands can represent any portion of the output voltage/current range.
• Outputs shall be reversible so that an increasing output command yields a decreasing electrical signal.

O. In addition to local physical or internal I/O, each ASC shall support distributed, or 'bound' I/O. This bound I/O can be used to allow the ASC to provide I/O data to another controller or to allow another controller to provide data to the controlling ASC.

P. PROGRAMMABLE CONTROL UNITS (PCU'S)

A DDC Programmable Control Unit (PCU) shall be provided where required to perform the sequence of operation. The PCU shall be fully configurable by configuration tool. The controller shall be store all specific control sequences and program settings in non-volatile memory.

Q. All PCU processors shall be Echelon based 3150 Neurons operating at 5 MHz or higher with 8K of RAM and 64K of Flash memory with a minimum 10 year memory retention between program downloads.

R. Each PCU shall perform all intended temperature control functions in a 'standalone' mode should the unit incur a loss of communications.

S. The complete PCU including accessory devices such as relay, transducers, power supplies, etc., shall be factory-mounted, wired and housed in a NEMA 1, UL rated enclosure or as required by the location and local code requirements.

T. Each PCU shall allow Peer-to-Peer communications utilizing free-topology transceivers over a single pair 22 AWG twisted, stranded cable.

U. All PCU's shall be provided as self sufficient units to maximize reliability and shall include internal 'soft' clock, operating systems, communication timing and interrupt controls, and shall be suitable for the specified applications.

V. In the event of a power outage or controller reset, each PCU shall enter a preprogrammed state on power re-application. Upon application of power to the PCU, all control conditions will start from an 'off' /'closed' position or the default state. This state will be maintained for an automatically adjusted amount of time. Once this time delay has passed, the PCU control sequence shall resume according to current values

W. All PCU's shall be provided with a communications port to allow connection of any industry standard laptop PC and custom configuration tools. Program access via this communications port allows direct field modification of the configuration parameters.

X. Digital Inputs:
• All digital inputs shall be over voltage protected.
• Digital input types supported by the CU:
- Normally open contacts (24V and 120V).
- Normally closed contacts (24V and 120V).
- Current/no current.
- Voltage/no voltage.
- Pulse/Totalizer contacts.

Y. Digital Outputs:
• All digital outputs shall be 24 volt AC, current sinking, 0.5 amp opto-isolated triacs.
• Digital outputs shall be capable of handling maintained as well as pulsed outputs for momentary or magnetic latching circuits. It shall be possible to configure outputs for 3-mode control (fast-slow-off) and 2-mode control.

Z. Analog Inputs:
• All analog inputs shall be over voltage protected.
• The analog to digital resolutions shall be a minimum of 10 bit.
• Analog inputs shall accept the following temperature types: 10K Ohm thermistor, 20K Ohm thermistor, or 1K Ohm RTD.
• Inputs shall be configurable to accept a wide range of inputs including: 4-20mA, 1-5Vdc, 2-10Vdc, etc.

AA. Analog Outputs:
• The ASC shall accommodate true analog outputs. Voltage (0-10V) and current (4-20 mA) outputs shall be accommodated.
• All analog outputs shall be proportional current or voltage type.
• The digital to analog resolution shall be a minimum of 10 bit.
• Outputs shall be configurable so that 0-100% output commands can represent any portion of the output voltage/current range.
• Outputs shall be reversible so that an increasing output command yields a decreasing electrical signal.

BB. In addition to local physical or internal I/O, each ASC shall support distributed, or 'bound' I/O. This bound I/O can be used to allow the ASC to provide I/O data to another controller on the LON or to allow another controller to provide data to the controlling ASC.

CC. The following modes of control shall be incorporated into each PCU:

DD. Occupied shall be a mode designed for normal occupied control of an area during regular business hours.

EE. This mode shall have unique heating and cooling setpoints associated with it.

FF. Unoccupied shall be a mode designed for after hours control of an area. This mode shall have unique heating and cooling setpoints associated with it.

GG. Override shall be a mode designed to invoke normal occupied control during after hours of an area. This mode shall use the occupied heating and cooling setpoints.

2.04 TEMPERATURE SENSORS

A. Provide thermistor or thin film silicon sensors for all temperature applications, except differential chilled water for BTU calculation, where precision matched Platinum RTDs shall be used. Solid-state sensors shall be linear, drift free, and require only a one-time calibration. Thermistors, or similar non-linear temperature devices shall be linearized by a look-up table in the connected controller. Resolution shall be better than 0.5 degrees F for zone or terminal equipment applications, and better than 0.2 degrees F for DDC control unit applications.

2.05 ROOM SENSORS (THERMOSTATS)

A. Room thermostats shall be active DDC type space sensors/thermostats. Each thermostat shall have user setpoint adjustment and shall also have the capability to digitally display room temperature and room temperature setpoint. The thermostat/sensor display shall present the midpoint of the heating and cooling set points for normal operation to avoid user confusion. The thermostat shall communicate with the DDC system for both room temperature and room temperature setpoint. The room temperature setpoint shall be remotely adjustable via the DDC system. User adjustment shall have the capability of being locked out if so desired via the DDC system.

B. Room sensors shall have and adjustable deadband between heating and cooling points. Deadband range shall allow the sensor to be set with up to a 5°F deadband range.

C. For special applications, provide remote mounted, or duct mounted sensors as indicated on the plans.

D. Provide insulated subbase for all thermostats/sensors installed on outside walls or walls exposed to outside air temperatures.

E. Thermistor type room thermostats are not acceptable.

2.06 CONTROL DAMPERS

A. Furnish control dampers shown on the plans and as required to perform the specified functions.

B. Acceptable Manufacturers of air dampers are Ruskin model CD-36 or equivalent Johnson Controls, Air Balance, Advanced Air, Cesco, American Warming and Ventilating, Vent Products Company Inc., Greenheck or Arrow damper products.

C. Use only factory fabricated, low leakage type dampers with replaceable resilient blade seals, stainless steel jamb seals and with entire assembly suitable for the maximum temperature and air velocities encountered in the system.

D. All dampers for shut-off or isolation service to be UL 555S Class 2 leakage rated at 250°F.

E. Dampers used for mixing of airstreams to be parallel blade type, sized for air velocity of 1800 to 2000 fpm. Dampers used for throttling or modulating applications other than air stream mixing to be opposed blade type. Two position dampers may be parallel or opposed blade type.

F. Dampers to have frames of not less than 16 gauge galvanized steel or 12 gauge extruded aluminum. Blades to be not less than 16 gauge galvanized steel for single thickness, 22 gauge galvanized steel for double thickness, or 14-gauge aluminum, with steel rod, bronze or nylon bearings. Maximum allowable blade width is 8 inches. Use zinc plated steel linkage hardware.

G. Maximum damper width is 48 inches; where required width exceeds 48 inches, use multiple dampers. Minimum size for duct-mounted dampers is 90% of duct size.

H. Damper operators shall be Belimo electric type compatible with the DDC control system. Use direct mount, synchronized operating, bi-directional, fail-safe operators. Provide operators with linkages and brackets for mounting on device served as required.

I. Size operators for smooth and positive operation of devices served, and with sufficient capacity to provide tight shutoff against system temperatures and pressure encountered. Equip operators with spring return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation.

J. Provide operators with linkages and brackets for mounting on device served.

2.07 CONTROL VALVES

A. Provide all control valves as shown on the plans/details and as required to perform functions specified.

B. Control valves shall be Belimo, or approved equal.

C. Valve operators shall be electric type compatible with the DDC control system. Use direct mount, synchronized operating, bi-directional, fail-safe operators. Provide operators with brackets for mounting on the valve served.

D. Size operators to allow smooth and positive operation of devices served and to provide sufficient capacity for tight shutoff against system temperatures and pressure encountered.

E. Use operators that are full-proportioning or two-position, as required for specified sequence of operation. Provide spring-return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation.

F. Provide operators with linkages and brackets for mounting on the valve served.

G. WATER SYSTEMS
1. Use equal percentage valves for two-way control valves; size for a pressure drop not less than 2 PSIG nor more than 4 PSIG.
2. Use three-way valves sized for a maximum pressure drop of 4 PSIG and that have linear characteristics so that the valve pressure drop remains constant regardless of the valve position.
3. Globe Valves 2" and Smaller: Bronze body, brass plug and seat, stainless steel stem, composition disc, spring loaded teflon packing, screwed ends, suitable for use on water systems at 150 PSIG and 240 F.
4. Globe Valves 2½" and Larger: Iron body, brass plug and seat, stainless steel stem, spring loaded teflon packing, flanged ends, suitable for use on water systems at 150 PSIG and 240^{o}F.
5. Butterfly Valves 3" and Larger: Iron body, stainless steel shaft, bronze bearings, resilient seat. Disc to be aluminum-bronze, nickel-plated ductile iron, cast iron with welded nickel edge, or stainless steel. Valve assembly to be bubble tight, suitable for use on water systems at 150 PSIG and 240^{o}F.

H. STEAM SYSTEMS (15 PSIG AND LESS)
1. Size for a pressure drop equal to 40% of the inlet steam gauge pressure.
2. 2" and Smaller: Bronze body, cage trim, brass or stainless steel plug and seat, stainless steel stem, composition disc, screwed ends, suitable for 35 PSIG saturated steam (281°F).
3. 2½" and Larger: Iron body, brass or stainless steel plug and seat, stainless steel stem, composition disc, flanged ends, suitable for suitable for 35 PSIG saturated steam (281°F).

2.08 SPECIALTY THERMOSTATS

A. Provide insulated base for all thermostats installed on outside walls or walls exposed to outside air temperatures.

B. LOW VOLTAGE ROOM THERMOSTATS
1. These types are to be used for control of terminal units such as convectors, cabinet heaters, etc.
2. Use direct or reverse acting as required. Temperature setpoint range shall be between 40 and 80 degrees F for heating thermostats, and 60 to 100 degrees F for thermostats controlling ventilation systems.

C. LOW LIMIT THERMOSTATS (FREEZESTATS)
1. Provide low temperature protection thermostats of the manual-reset type with sensing elements 20' in length.
2. Provide thermostat designed to operate in response to the coldest 1' - 0" length of the sensing element, regardless of the temperature at other parts of the element.
3. Support the element properly to cover the entire duct width.
4. Provide separate thermostats for each 25 square feet of coil face area or fraction thereof.
5. Unless otherwise indicated, set low limit controls at 36 degrees F.

D. AQUASTATS
1. Line voltage type with single pole, single throw switch of adequate rating for the applied load.

E. DUCT THERMOSTATS
1. DDC Type: Sensing element to be averaging type, temperature compensated, armored, with minimum length of 8 feet.

F. IMMERSION TYPE TEMPERATURE SENSORS
1. Rod and Tube Type With Linear Output. Provide separable wells with heat conductive fluid for installation in pipeline. Units shall be factory calibrated.

2.09 AIR FLOW MEASURING STATIONS

A. AIRFLOW PROBE
1. Ebtron (or equivalent) multi-probe duct thermal anemometer station consisting of a duct mounted lattice work of heated flow sensing thermistors and temperature sensors mounted inside an aluminum casing. Each thermistor shall be mounted within a strut, protected from upstream flow with an aluminum air straitening tube protecting the sensor. Unit shall be capable of linear flow measurement down to 0 FPM velocity in the ductwork.
2. Airflow resistance shall be less than or equal to 0.1 inches of water at 2000 feet per minute air velocity. Station shall be suitable for a velocity range from 0-5000 FPM, with an accuracy of +/- 2% over the entire range. Sensor shall be suitable for use from 40°F to 160°F and 0%-99% R.H. (non-condensing).

B. TRANSDUCER
1. Micro-proccessor based electronics mounted in a NEMA 1 enclosure, suitable for indoor installation.
2. Each electronics panel shall be powered by an isolated (secondary not grounded) 24 VAC transformer or a regulated 24VAC power supply.
3. The transducer shall be capable of providing either a 4-20 mA or 0-10 VDC output for both airflow and temperature.

2.10 MISCELLANEOUS SENSORS

A. TEMPERATURE SENSORS
1. Use nickel wire thermistor type temperature sensing elements constructed so that the accuracy and life expectancy is not affected by moisture or other conditions that exist in each application. Normal range to be 35°F to 100°F with accuracy of ± 0.5°F and a base resistance of 1000 ohms at 77°F.
2. Provide limited range or extended range sensors if required to sense the range expected for a respective point.
3. Use averaging elements on duct sensors.
4. Use elements on sensors in piping systems compatible with installation in separable wells.

B. Room sensors
1. Wall mounted with adjustable 2% RH range. Provide sensors in occupied spaces with covers to match those specified for thermostats.

C. Duct Sensors
1. Minimum length of sampling tube to be 12 inches.

D. High Limit Duct Sensor
1. Insertion type, with setpoint adjustable in 2.

E. CURRENT SENSORS
1. Provide for each fan or pump specified, or shown on point list as requiring this device a current sensor with adjustable threshold and digital output with LED display, equal to a Veris model H-708.

F. PRESSURE TRANSMITTERS
1. One pipe, direct acting, indicating type, with range suitable for system, and proportional DDC output as required.

PART 3 - EXECUTION

3.01 DEMOLITION OF EXISTING EQUIPMENT

A. Existing equipment, wiring, tubing, panels, etc. currently in use but no longer required for the new control system shall be removed and the mounting location shall be patched to match the existing conditions. No equipment, wiring, tubing, etc. taken out of service as a result of this project shall be abandoned in place.

B. All existing controls equipment (including control panels) shall be turned over to the owner for spare part removal. Contractor shall dispose of any unwanted demolished equipment as directed by the owner.

3.02 INSTALLATION

A. This Contractor shall provide all labor, materials, engineering, software permits, tools, check-out and certificates required to install a complete DDC automation system as herein specified. This system shall fully communicate through all I/O devices, central processing unit (CPU), and digital communication trunks. This digital communications trunk shall be true bi-directional analog and digital communications.

B. Any and all points on this project shall be grouped for display purposes into the system such that all points associated with the DDC system can appear together on the CRT display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. Each system shall be identified by an English descriptor and an alpha/numeric identifier.

C. This central campus automation system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and check-out necessary for a fully operational system.

D. All electronic work required as an integral part of the automation system work is the responsibility of this section unless specifically indicated otherwise in this section or in Division 26.

E. BAS vendor shall demonstrate the ability to upgrade 5 year of BAS hardware to operate with the latest release software revisions. This shall be done with “Firmware Chip” additions only. No integrators shall be allowed. A system expansion with lessor capabilities will not be accepted. This contractor shall provide evidence of having done five (5) similar installations and shall insure that the system installation will not alter the UL listing of the new system.

F. Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.

3.03 ELECTRICAL

A. All work and materials are to conform in every detail to the rules and requirements of the Wisconsin Electrical Code and present manufacturing standards. All material shall be UL approved.

B. This Contractor shall be responsible for all line voltage and low voltage electrical wiring incidental to the system installation.

C. All sensor and output wiring shall be shielded cable as required by the equipment manufacturer.

D. The field wiring connections of all field-mounted sensors shall be adequately protected by a junction box mounted at the point of measurement.

E. Separate conduit systems shall be provided for sensor wiring and high voltage (120 VAC) wiring.

F. All low voltage exposed wiring provided by this Contractor shall be enclosed in conduit (EMT). All line voltage provided by this Contractor shall be enclosed in conduit (EMT).

G. All conduit shall be secured at regular intervals and run parallel with the lines of the building.

H. Power to local temperature control panels shall be provided by the BAS Contractor.

I. DDC panels serving equipment fed by emergency power shall also be served by emergency power.

J. All line voltage wiring required to power the DDC Controllers shall be provided by BAS contractor.

K. BAS Identification Standards:
1. Node Identification. All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.
2. Cable shall be labeled at a minimum of every 18” with the FMS System manufacturer’s name and the type of signal carried within the cable, i.e. Analog Input, Analog Output, Binary Input, Binary Output, 24 VAC.

3. Each of the cable types specified in Item A shall be of a different color coding for easy identification and troubleshooting. Recommended color coding:

a.	Analog Input Cable	Yellow
b.	Analog Output Cable	Tan
c.	Binary Input Cable	Orange
d.	Binary Output Cable	Violet
e.	24 VAC Cable	Gray
f.	General Purpose Cable	Natural
g.	Tier 1 Comm Cable	Purple
h.	Other Tier Comm Cable	Blue

L. Raceway Identification. All the covers to junction and pull boxes of the FMS raceways shall be painted with the appropriate color.

M. Wire Identification - all low and line voltage FMS wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

3.04 CONTROL DAMPERS

A. All control dampers furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.

B. Coordinate installation with the sheetmetal installer to obtain smooth duct transitions where dampers size is different than duct size. Blank off plates will not be accepted.

C. Each operator shall serve a maximum damper area of 30 square feet. Where larger dampers are used, provide multiple operators.

3.05 CONTROL VALVES

A. All temperature control valves furnished by the control manufacturer are to be installed by the Mechanical Contractor under the coordinating control and supervision of the Control Contractor in locations shown on plans or where required to provide specified sequence of control.

3.06 ROOM THERMOSTATS AND TEMPERATURE SENSORS

A. Check and verify location of thermostats plans and room details before installation. Locate room thermostats 48 inches above floor. Align with light switches.

B. Any room thermostats mounted on an exterior wall shall be mounted on a thermally insulated sub-base.

C. Provide 2 zone temperature sensors on each floor for AHU-1 & AHU-2. (total of 8 sensors). Sensors to be used for night set back/morning warm up temperature sensing. Coordinate exact location with facility maintenance staff.

3.07 LOW LIMIT THERMOSTATS (FREEZE STATS)

A. Install low limit controls where indicated on the drawings or as specified. Unless otherwise indicated, install sensing element on the downstream side of heating coils.

B. Mount units using flanges and element holders. Provide duct collars or bushings where sensing capillary passes through sheetmetal housings or ductwork; seal this penetration to eliminate air leakage.

C. Distribute (serpentine) sensing element horizontally across the coil to cover every square foot of coil; on larger coils this may require more than one instrument. Install controls at accessible location with mounting brackets and element duct collars where required.

3.08 AIR FLOW MEASURING STATIONS

A. Install airflow stations in accordance with manufacturer's recommendations. Where units are installed within 10 feet of an elbow or transition, install straightening vanes upstream of unit.

3.09 COMMISSIONING

A. Fully commission all aspects of the Facility Management System work.

B. Acceptance Check Sheet:
1. Prepare a check sheet that includes all points for all functions of the FMS
2. Submit the check sheet to the Engineer for approval one month prior to testing.
3. Complete the check sheet for all items and functions of the FMS and initial each entry with time/date as record of having fully calibrated and tested the FMS. Submit to Engineer.
4. The Engineer will use the check sheet as the basis for acceptance testing with the FMS Contractor.

END OF SECTION

SECTION 23 09 93
SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes control sequences describing the manner in which the automatic control systems shall operate. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 09 23 – Direct Digital Control System for HVAC

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 SUBMITTALS

A. The following data/information shall be submitted for approval. This data shall be included with the balance of the Section 23 09 23 submittals:
1. Complete sequence of operation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Refer to Section 23 09 23.

PART 3 - EXECUTION

3.01 CONTROL SEQUENCES - DESCRIPTION OF WORK

A. Control sequence is hereby defined to mean the manner in which, and methods by which, the automatic temperature control system shall function. The requirements for each type of operation are detailed in this section.

B. All necessary operating equipment, devices and system components required for the automatic temperature control system shall be provided by the Automatic Temperature Control Subcontractor whether or not specifically itemized, in order to install a complete automatic temperature control system within the intent of this specification.

C. The extent of the automatic temperature control system work shall be as shown on the drawings and by the control performance requirements as specified in this section.

D. Variable Volume air handling unit control (AHU-1 and AHU-2):

1. General:
The Air Handling unit is variable air volume, indoor air unit.

The Air Handling unit is controlled by direct digital controller (DDC).

The Air Handling unit is equipped with the following:

a. Supply fan with VFD.
b. Supply and Return air airflow measuring stations furnished by Temperature Control Contractor (TCC)
c. Existing Return fan with new VFD.
d. Outside air damper and AFMS furnished by TCC
e. Return air damper furnished by TCC
f. Existing Relief air damper
g. Chilled water coil TCV for cooling.
h. Steam coil for heating.
i. 30% and 65% filter bank.
j. Actuators furnished by TCC

2. Fan Control:
Start/Stop: The DDC system shall start the supply and return fans in occupied mode via the VFD. Provide a manual service switch located in this control panel.

Current Status Switch: Provide as described under GENERAL, VFD Motor Run Status, in this Section for the supply return and exhaust fans.

Supply Fan Speed Control: The purpose of the supply fan control is to maintain a minimum static pressure in the supply ductwork to insure proper terminal air box operation. The DDC system shall modulate the supply fan VFD to maintain the static pressure setpoint as sensed by the existing static pressure sensor. Static pressure setpoint shall be 1.0” (adj).

Provide morning warm-up sequence for AHU that will index spaces to occupied temperature and delay OA ventilation. Start warm-up based on temperature and history trending for the length of time required.

Existing return fan speed control: The return shall maintain a differential airflow between the supply and return CFM as measured by the duct mounted airflow stations.

3. Ventilation Air Control:
Minimum, OA provided by OA airflow measuring station. The minimum outside airflow rate shall maintain a constant CFM regardless of VAV damper positions or supply fan speed.

When the unit goes into economizer mode the minimum outside air damper shall remain 100% open.

FILTERS:
Install a differential static pressure sensor across each filter bank. Ensure that the static probes do not impede filter removal.

For pre-filter banks, provide an alarm to the operator interface when the differential static pressure exceeds 0.6 " W.C. (adj.).

For final filter bank, provide an alarm to the operator interface when the differential static pressure exceeds 1.0 " W.C. (adj.).

4. Discharge Temperature Control:
System shall be indexed from occupied to unoccupied through the BAS. In the occupied mode the unit fan shall run continuously. In the unoccupied mode, the unit fan shall be off and shall be cycled on to maintain the night setpoint temperature as sensed by the new zone thermostats.

After the unoccupied cycle and before entering the occupied cycle, the zone thermostats in the area served by this system shall be indexed to their occupied setpoint and the system shall enter a return air warm-up cycle, during which the system shall start and operate continuously with the supply and return fan on, the outside and relief air dampers fully closed, the return air damper fully opened, cooling inoperative, VAV boxes shall be indexed to maximum CFM, and the discharge air setpoint shall be set to 90°F (adjustable) until the return air temperature rises above the morning warm-up setpoint.

Upon system start-up after morning warm-up, the supply and return fan shall operate continuously, the VFDs of the supply and return fan shall be controlled as specified herein, the heating coil control valve shall become operable, the chilled water cooling coil control valve shall be enabled and the outside air, relief air, and return air dampers shall open to their respective minimum and maximum positions.

The discharge air temperature setpoint shall be maintained at 55°F (adjustable) by modulating the heating and/or cooling coil control valves, the outside air, return air and relief air automatic dampers.

An dry bulb economizer shall provide “Free cooling” when conditions permit. Above a 65°F (ADJ) outside air temperature, the minimum outside air damper shall be open and the economizer damper shall be closed with the return air damper at its maximum position. Between 40°F and 65°F outside air temperature, the outside air/return air dampers shall modulate to maintaining a 55°F (adjustable) mixed air temperature when the room thermostats calls for cooling. The dampers shall operate proportionately in this mode. Below 40°F and above 70°F the minimum outside air damper shall open and the economizer damper shall close and the return air damper shall go to its maximum position. All damper minimums and maximums shall be coordinated with the test and balance contractor.

5. Economizer Control:
When the economizer sequence is enabled the outside air economizer damper, return damper, and relief damper will modulate in sequence to provide outside air to be used for free cooling. The dampers will modulate in sequence with the heating and cooling elements as described in the discharge air temperature control sequence above.

6. Safeties:
General: All safeties shall be hard wired to the supply and return fan starters or VFD safety circuits. Starters shall not function in the “Hand” or “Auto” and VFD’s shall be disabled if they are indexed to the “Auto” or “Hand” position in either the VFD or bypass modes.

Freezestat: Install an freezestat to shut down the unit (see Unit Shutdown for additional information) if the temperature downstream of the heating coil drops below 35º F (adj.). The freezestat shall act independently of the DDC system via hardwire interlock and shall override the DDC system control signal to open the heating coil control valve(s). A freezestat trip shall notify the DDC system that shall send an alarm to the operator interface.

Supply Fan High Pressure Limit: Install a static pressure probe located in the air handling unit main discharge duct at least six feet or as far as physically possible downstream of the fan and upstream of any dampers and pipe to a duct mounted differential pressure switch. Wire in series with the safety circuit of the supply return and exhaust fans. Differential pressure switch shall be a manual reset type and the DDC system shall monitor the status of the differential pressure switch. Initial setpoint shall be +4.0" W.C. (adj.)

Supply Fan Low Pressure Limit: Install a static pressure probe located in the air handling unit immediately downstream of the prefilter and pipe to a unit mounted differential pressure switch. Wire in series with the safety circuit of the supply, return and exhaust fans. Differential pressure switch shall be a manual reset type and the DDC system shall monitor the status of the differential pressure switch. Initial setpoint shall be -2.0" W.C. (adj.).

Fire Alarm Shutdown: Upon a Fire Alarm System alarm, the fire alarm control module provided by the electrical contractor at the temperature control panel shall change state of its contacts. This shall cause the unit to be shut down (see Unit Shutdown for additional information) and all fire/smoke and smoke dampers within this system shall close. An auxiliary contact shall be provided to notify the DDC system of a fire alarm shutdown.

7. Unit Shutdown:
Whenever the air handling unit is indexed off, the supply and return fans shall stop. Fire/Smoke dampers shall close. If the return fan fails off, the supply fan shall be indexed off. On a failure of either the supply or return fan, an alarm will be sent through the DDC system. Whenever both supply and return fans are off for any reason the following shall occur:

The outside air dampers and relief air dampers shall close and the return dampers shall open.

The chilled water control valve(s) shall close.
The heating coil control valve(s) shall remain under control from the mixed air sensor to maintain 55 ºF (adj.). Freezestat shall override heating control valve(s) open.

8. Unoccupied Control:
Provide unoccupied sequence.

Unit Cycling to Maintain Setback/Setup Temperatures: Cycle the air handling unit on to maintain the setback and setup temperature zone set points to maintain 58 ºF and 86 ºF (adj) respectively.

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for hydronic pipe and pipe fittings for this project.

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

C. Section 23 05 48 – Vibration and Seismic Controls for HVAC Equipment

D. Section 23 07 00 – HVAC Insulation

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A.	ANSI B16.3	Malleable Iron Threaded Fittings
B.	ANSI B16.4	Cast Iron Threaded Fittings
C.	ANSI B16.5	Pipe Flanges and Flanged Fittings
D.	ANSI B16.9	Carbon Steel Weld Fittings
E.	ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
F.	ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
G.	ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
H.	ASTM A74	Cast Iron Soil Pipe and Fittings
I.	ASTM A105	Forgings, Carbon Steel, for Piping Components
J.	ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
K.	ASTM A181	Forgings, Carbon Steel for General Purpose Piping
L.	ASTM A197	Cupola Malleable Iron
M.	ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
N.	ASTM B75	Seamless Copper Tube
O.	ASTM B88	Seamless Copper Water Tube

P. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

Q. MIL-SPEC P28584A

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

C. Order copper water tube with each length marked with the name or trademark of the manufacturer and type of tube; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier in accordance with ASTM B88.

D. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project.

E. Steel piping and fittings shall be manufactured in the United States.

1.06 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

1.07 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig and 250 degrees unless specifically indicated otherwise.

C. Non-metallic piping is acceptable only for the services indicated. It is not be acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings except for venting of sealed combustion, condensing gas fired appliances. When used in ceiling plenums, PVC piping and the piping installation shall conform with applicable codes and standards for installation of PVC piping within a ceiling plenum.

D. ProPress piping is not acceptable and shall not be used on this project.

E. Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

F. Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at Contractor's option.

1.08 WELDER QUALIFICATIONS

A. Welding procedures, welders, and welding operators for building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau.

B. The Architect or Engineer reserves the right to request testing and inspection of the work of welders employed on the project, at the Contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

PART 2 - PRODUCTS

2.01 HOT WATER

A. 2" and Smaller
   1. ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.

2.02 CHILLED WATER

A. 2" and Smaller
   1. ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.

B. 2½" and Larger
   1. ASTM A53, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.
   2. Contractor may use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for piping 2” and smaller. Piping materials may only be changed once in the loop to minimize electrolysis.

2.03 VENTS AND RELIEF VALVES

A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

2.04 COOLING COIL CONDENSATE

A. ASTM B88, type L hard temper copper tubing with ASTM B145/ANSI B16.23 cast red bronze or ASTM B75/ANSI B16.29 wrought solder-type drainage fittings.

2.05 UNIONS AND FLANGES

A. 2" and Smaller
   1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 PSI.

B. 2½" and Larger
   1. ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2½" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment. Gasket material to be non-asbestos and rated for the working pressure and temperature of the piping system.

PART 3 - EXECUTION

3.01 GENERAL

A. Remove foreign material from interior and exterior of pipe and fittings.

B. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. Consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

C. Provide anchors, expansion joints, swing joints and expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

D. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

E. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (½) the diameter of the main.

F. Install drains throughout the systems to permit complete drainage.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment room.

H. Install manual valves, control valves, and piping specialties, including items furnished under other sections of work. as specified and as detailed. Provide connections to equipment installed under other section of work where that equipment requires the piping services indicated in this section.

I. Run water mains level or pitch horizontal mains up 1 inch in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.

J. All low points shall have a drain valve and capped hose thread outlet.

K. Main branches and runouts to terminal equipment may be made at the top, side, or bottom of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.

L. Connections at a main may be made from the bottom with a tee and a 45 degree elbow.

M. Use a minimum of three elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service or removal of the terminal device.

N. Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

O. When other specification sections or piping details do not require a strainer upstream of each control valve, install bottom connections to a main with a capped dirt leg.

P. Provide connections to chilled water coils, hot water coils, and terminal heating devices as shown on the drawings for a fully functional system.

3.02 WELDED PIPE JOINTS

A. Construct welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.

B. Electrodes shall be Lincoln, or equal, with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

3.03 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking is not allowed.

3.04 COPPER PIPE JOINTS

A. Remove slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

3.05 VENTS AND RELIEF VALVES

A. Install vent and relief valve discharge lines as specified on the drawings, as detailed, and as specified for each specific valve or piping specialty item.

3.06 COOLING COIL CONDENSATE

A. Trap each cooling coil drain pan connection with a trap seal. Depth of trap seal depth shall prevent conditioned air from moving through the piping. Extend drain piping to nearest code approved drain location. Construct trap with plugged tee for cleanout purposes. Do not provide loop seals for air handling systems with internal traps.

3.07 UNIONS AND FLANGES

A. Install a union or flange 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. Piping shall be arranged to permit coils and equipment to be removed without disassembling piping beyond the unions. Concealed unions or flanges are not acceptable.

3.08 PIPING SYSTEM LEAK TESTS

A. Verify that the piping system being tested is fully connected to all components and that 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 additional weight loads that may be imposed by the test.

B. Conduct pressure test with test medium water. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Architect or Engineer. Notify the above parties 72 hours prior to pipe system testing. If leaks are found, repair the area with new materials and repeat the test; caulking is not acceptable.

C. Do not insulate pipe until it has been successfully tested.

D. Use clean water and remove air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

E. Pressure test piping systems in accordance with the following specifications:

System	Pressure	Medium	Duration
Hot water	100 psig	Water	8 hr
Chilled water	100 psig	Water	8 hr

3.09 INITIAL SYSTEM FILL AND VENT

A. For the hot water heating system, fill the system completely and operate the main system circulation pump and allow to circulate for 24 hours while the boilers maintain the hot water building supply loop at design temperature. After the 24 hour period, check the system water level in the expansion tank. Vent all system highpoints and terminal units.

B. For the chilled water cooling system, fill the system completely and operate the main system circulation pump and allow to circulate for 24 hours. After the 24 hour period, check the system water level in the expansion tank. Vent all system highpoints and terminal units.

C. Evacuate air that may be trapped in the system. Check the system operating pressure and verify that the pressure at the fill location corresponds with the specified fill pressure.

END OF SECTION

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for water and oil pumps used for HVAC applications.

1.02 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 15 – HVAC Vales and Piping Specialties

C. Section 23 05 48 – Vibration and Seismic Controls for HVAC Equipment

D. Section 23 21 13 – Hydronic Piping

1.03 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.04 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.05 SUBMITTALS

A. Submit submittal drawings for all pumps specified herein.

B. Include data concerning dimensions, capacities, materials of construction, ratings, motor efficiencies, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.06 DESIGN CRITERIA

A. Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

B. Pumps shall meet or exceed operating efficiencies scheduled.

C. Provide pumps with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on pumps unless specified otherwise. Service or repair of base mounted pumps shall not require breaking piping connections or removal of motor.

D. Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless otherwise indicated on the pump schedule.

E. Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

F. The manufacturer shall certify pump ratings.

G. Pumps shall operate without excessive noise or vibration.

H. After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

I. Furnish one spare seal and casing gasket for each pump.

PART 2 - PRODUCTS

2.01 IN-LINE CENTRIFUGAL PUMPS

A. ACCEPTABLE MANUFACTURERS
1. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
a. Bell and Gossett and Taco

B. DESCRIPTION
1. Type: Single stage, direct connected, resiliently mounted motor for in-line mounting, oil lubricated, 175 PSIG maximum working pressure at operating temperature of 225° F continuous, 250° F intermittent.
2. Casing: Cast iron or stainless steel; flanged suction and discharge connection; with plugged taps for vent, drain, suction and discharge gauges.
3. Impeller: Brass or bronze, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.
4. Bearings: Two, oil lubricated bronze sleeves or ball bearings capable of being greased.
5. Shaft: Stainless steel or carbon steel with stainless steel or bronze sleeve, integral thrust collar.
6. Seal: Mechanical type, carbon rotating against a stationary ceramic seat, 225° F maximum continuous operating temperature.
7. Drive: Flexible coupling.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install pumps in strict accordance with manufacturer's instructions. Access/service space around pumps shall not be less than minimum space recommended by pump manufacturer.

B. Provide pressure gauges across pumps. Reference section 23 05 15 for pressure gauge specifications. Pressure gauges shall be installed utilizing pump gauge tapings.

C. Provide air vent and drain valve on horizontal pump casings.

D. Lubricate pumps before startup.

END OF SECTION

SECTION 23 22 13
STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for steam and condensate pipe and pipe fittings for this project. This section also applies to pumped condensate.

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

C. Section 23 07 00 – HVAC Insulation

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A.	ANSI B16.3	Malleable Iron Threaded Fittings
B.	ANSI B16.4	Cast Iron Threaded Fittings
C.	ANSI B16.5	Pipe Flanges and Flanged Fittings
D.	ANSI B16.9	Carbon Steel Weld Fittings
E.	ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
F.	ASTM A105	Forgings, Carbon Steel, for Piping Components
G.	ASTM A181	Forgings, Carbon Steel for General Purpose Piping
H.	ASTM A197	Cupola Malleable Iron
I.	ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

C. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project..

D. Steel piping and fittings shall be manufactured in the United States.

1.06 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements does not relieve the contractor from using proper storage techniques.

1.07 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct piping for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

C. Where weld fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

D. Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at Contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

1.08 WELDER QUALIFICATIONS

A. Welding procedures, welders, and welding operators for building service piping and steam piping less than or equal to 15 psig to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau.

B. The Architect, Engineer or designated project representative reserves the right to request test and inspection of the work of any welder employed on the project, at the Contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

C. Before metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record required by Section IX of the ASME Boiler and Pressure Vessel Code and the National Certified Pipe Welding Bureau.

PART 2 - PRODUCTS

2.01 LOW PRESSURE STEAM (15 PSIG AND LOWER)

A. 2" and Smaller
   1. ASTM A53, type F, standard weight, schedule 40, black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.

B. 2½" to 10”
   1. ASTM A53, type E or S, grade A, standard weight, schedule 40, black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

2.02 LOW PRESSURE STEAM CONDENSATE (STEAM PRESSURE 15 PSIG AND LOWER)

A. 2" and Smaller
   1. ASTM A53, type F, extra strong, schedule 80, black steel pipe with ASTM A126/ANSI B16.4, Class 125 cast iron threaded fittings.

B. 2½" to 4”
   1. ASTM A53, type F extra strong, schedule 80, black steel pipe with ASTM A234 grade WPB/ANSI B16.9, extra strong, seamless, carbon steel weld fittings.
   2. fittings.

2.03 STEAM CONDENSATE PUMP DISCHARGE

A. 2" and Smaller
   1. ASTM A53, type F, extra strong (schedule 80) black steel pipe with ASTM A126/ANSI B16.4, Class 125, cast iron threaded fittings.

2.04 VENTS AND RELIEF VALVES

A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

2.05 UNIONS AND FLANGES

A. 2" and Smaller
   1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 PSI.

B. 2½" and Larger
   1. ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2½" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment. Gasket material to be non-asbestos and rated for pressures and temperatures of the piping system.

PART 3 - EXECUTION

3.01 PREPARATION

A. Remove all foreign material from interior and exterior of pipe and fittings.

3.02 ERECTION

A. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. Consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Provide anchors, expansion joints, swing joints and expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

C. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

D. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (½) the diameter of the main.

E. Use long radius elbow fittings unless specifically noted otherwise.

F. Install drains throughout the systems to permit complete drainage.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

H. Install valves, control valves, and piping specialties, including items furnished other sections of work, as specified and detailed. Make connections to equipment installed by other sections of work where that equipment requires the piping services indicated in this section.

I. Bending is permissible, but shall be done with the use of precision formers only. Minimum radii shall be six times the diameter of the pipe.

3.03 WELDED PIPE JOINTS

A. Make welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and applicable codes.

B. Electrodes shall be Lincoln, or similar with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

3.04 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking is allowed.

B. Threaded pipe may be welded at contractor’s option.

3.05 STEAM AND STEAM CONDENSATE

A. 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.

B. Install drip traps at each rise and at the horizontal termination of each steam main.

C. Construct full size dirt pockets at inlet to drips on mains up through 2" size. Dirt pockets on mains 2½" and larger shall be 2" size.

D. 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.

E. 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.

F. 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.

3.06 STEAM CONDENSATE PUMP DISCHARGE

A. 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.

3.07 VENTS AND RELIEF VALVES

A. Install vent and relief valve discharge lines as specified on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line or within 15 feet of a door or window.

3.08 UNIONS AND FLANGES

A. Install a union or flange, as specified, at each automatic control valve and at each piping specialty or piece of equipment. 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. Unions shall be installed in a location so the piece of equipment may be removed after the unions are removed without further disassembly of the piping system.

3.09 PIPING SYSTEM LEAK TESTS

A. Verify that the piping system being tested is fully connected to components and that 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.

B. Conduct pressure test with test medium of water. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Architect, Engineer or the project representative when so required. Notify the above parties 72 hours prior to pipe system testing. If leaks are found, repair the area with new materials and repeat the test; caulking is not acceptable.

C. Do not insulate pipe until it has been successfully tested.

D. Use clean water and remove air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

E. Pressure test piping systems in accordance with the following specifications:

System	Pressure	Medium	Duration
Low pressure steam and condensate	100 psig	Water	8 hr
Steam condensate pump discharge	100 psig	Water	8 hr

END OF SECTION

SECTION 23 22 16
STEAM AND CONDENSATE HEATING SPECIALTIES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes steam and steam condensate valves and specialty specifications for HVAC systems except where indicated under Related Work. This section also applies to pumped condensate.

1.02 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

B. Section 23 07 00 – HVAC Insulation

C. Section 23 09 23 – Direct Digital Control Systems for HVAC

D. Section 23 22 13 – Steam and Condensate Heating Piping

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A. ASTM B650 Electro-deposited Engineering Chromium Coatings on Ferrous Substrates

B. ASTM E814 Fire Tests of Through-Penetration Fire Stops

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Required for all items in this section.

B. Submittal shall include a schedule of valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves used on the project. Temperature and pressure ratings specified are for continuous operation.

C. Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data (where appropriate), and indicate identification as referenced in this section and as specified on the drawings.

1.07 DESIGN CRITERIA

A. Valves shall be of the same manufacturer for all individual mechanical services unless prior written approval is obtained.

B. Valves and piping specialties shall be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. STANDARD VALVES
1. Standard valves are based on models and styles as manufactured be Nibco. Equivalent valves as manufactured by the following are acceptable: Crane, DeZurik, Hammond, Bray, Jamesbury, Keystone, Milwaukee, Powell, Stockham, Jenkins, or Illinois.

B. SPECIALTY VALVES
1. Specialty valves are based on the manufacturers and models as specified under each section of valves, or as specified in the following list.

2.02 LOW PRESSURE STEAM/CONDENSATE (15 PSIG OR LESS)

A. GENERAL
1. Butterfly valves are not acceptable for use on low-pressure steam and condensate piping.
2. Globe valves are not acceptable for use on low-pressure steam and condensate piping, except for temperature control applications.
3. Where specified on the plans, globe valves used for bypass of steam pressure reducing stations, valves shall be constructed in accordance with requirements for high-pressure steam systems.

B. GATE VALVES (SHUT-OFF ONLY)
1. 2" and Smaller: Nibco T134; Bronze body, bronze trim, threaded ends, solid wedge, rising stem, union bonnet, malleable iron hand wheel, rated for 125 psig steam at 360°F.
2. 2½" and Larger: Nibco F617-O; Iron body, bronze trim, bolted bonnet, O.S. & Y., solid wedge, flanged, rated for 125 psig steam at 360°F.

C. SWING CHECK VALVES
1. 2" and Smaller: Nibco T413Y; bronze body, threaded ends, regrindable seat, renewable disc, teflon seat, rated for 125 psig steam at 360°F and for installation in a horizontal or vertical condensate line with flow upward.
2. 2½" and Larger: Nibco F918-B; cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, rated for 125 psig steam at 360°F and for installation in a horizontal or vertical condensate line with flow upward.

D. SPRING LOADED CHECK VALVES
1. 2" and Smaller: Nibco T480Y; bronze, threaded or wafer type, bronze trim, stainless steel spring, teflon seat unless only bronze available, rated for 125 psig WOG on condensate pump discharge lines.

E. DRAIN VALVES
1. Use 3/4 inch gate valve as specified above with threaded hose adapter. Strainer blowdown valves to be the same size at the blowdown connection.

2.03 SPECIALTY VALVES AND VALVE ACCESSORIES

A. GAUGE VALVES
1. Use ¼" ball valves of brass, bronze or steel construction, 500 psig at not less than 300°F.

2.04 STEAM SPECIALTIES

A. THERMOMETERS
1. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
2. Ashcroft, Marsh, Taylor, H.O. Trerice, U.S. Gauge, Weiss, Weksler.
3. Equivalent to Trerice Industrial Thermometer, stem type, with black finish cast aluminum case, 9 inch scale, clear acrylic window, adjustable angle brass stem with stem length so the end of the stem is near the middle of a pipe without reducing the thickness of the insulation, red indicating fluid and black lettering against a white background having a minimum increment of 2°F. Scale ranges shall be as follows:

Service	Scale Range, °F
Steam Condensate	30 to 300

B. THERMOMETER SOCKETS
1. Brass with threaded connections compatible for use with for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

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

D. PRESSURE GAUGES
1. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
2. Ametek/U.S. Gauge Division, Ashcroft, Marsh, Taylor, H.O. Trerice, Weiss, Weksler.
3. Trerice No. 500X series gauges, with flangless cast aluminum case, 6 inches in diameter, glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, accuracy shall be 1% of full scale over the middle half of range, and 2% of full scale over the remainder of the range. Pressure gauge ranges shall be as follows:

Service	Scale Range (PSIG)	Minor Division (PSIG)
Low Pressure Steam	0 - 30	0.2
Cond. Pump Discharge	0 - 60	0.5

4. Coil Syphons: Bronze or steel construction, rated for system working pressure, ¼" size.
5. Gauge Valves: Use gate valves as specified above.

E. STRAINERS
1. The following Manufacturers and Models are considered acceptable subject to compliance with the specified requirements listed below:
2. Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.
3. Steam Systems - Low Pressure: Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded in sizes through 2 inch and rated at not less than 250 psi at 400°F; flanged in sizes over 2 inch and rated at not less than 125 psi at 350°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.050 inch perforations for line sizes over 2 inch.

F. STEAM TRAPS
1. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
2. Armstrong, Dunham-Bush, Hoffman, Illinois, Spirax Sarco, Yarway
3. Minimum trap size is ¾ inch for all types of traps.
4. Traps with brass/bronze internal parts is not acceptable.
5. Float and Thermostatic Traps: Cast iron or semi-steel body and bolted cover, non-asbestos cover gasket, stainless steel bellows type air vent, stainless steel float, stainless steel lever and valve assembly, and rated at not less than 125 psig saturated steam. Traps used on low pressure steam, 15 psig or less, are to be SHEMA rated.
6. Inverted Bucket Traps – (Armstrong Model 800) Cast Iron (For Low Pressure Steam Systems): Cast iron or semi-steel body and bolted cover, non-asbestos cover gasket, stainless steel bucket, stainless steel or heat treated chrome steel seat and plunger, integral inlet strainer with stainless steel screen and tapped and plugged blowdown connection, rated at not less than 150 psig saturated steam. Sealed stainless steel traps may be substituted for cast iron traps if the pressure/temperature and other construction limitations are met.

G. STEAM TRAP REPAIR KIT
1. The following Manufacturer and model is basis of design:
a. Barnes & Jones Model 4341

H. VACUUM BREAKERS
1. The following Manufacturers and Models are considered acceptable subject to compliance with the specified requirements listed below:
a. Bell and Gossett No. 26
b. Johnson Corporation VB8 series
c. Spirax Sarco Model VB21.
2. Ball check valve constructed of bronze or stainless steel body; brass or stainless steel trim; stainless steel or glass filled poly-tetra-fluoro-ethylene ball; plain or threaded outlet by not less than ½ inch NPT inlet; having a working pressure not less than 125 psig steam. Swing type check valves are not acceptable.

PART 3 - EXECUTION

3.01 GENERAL

A. Properly align piping before installation of valves in an upright position; operators installed below the valves is not acceptable.

B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

C. Install temperature control valves.

D. Provide a Barnes and Jones model 4341 steam trap repair kit for each section of perimeter heat located within the 2nd floor office remodel area.

E. Install valves with the stem in the upright position. Valves installed with the stems down is not acceptable. Where valves 2½" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator.

F. Prior to flushing of piping systems, place valves in the full-open position.

3.02 SHUT-OFF VALVES

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

B. Install all shut-off valves in the recommended flow direction.

3.03 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified or detailed including reheat coils, coils, equipment, other locations required for drainage of systems.

3.04 SPRING LOADED CHECK VALVES

A. Install a spring loaded check valve in each condensate pump discharge line.

3.05 SWING CHECK VALVES

A. Provide swing check valves where specified, detailed, and at steam condensate lines where they rise at outlet of traps. In these applications, provide isolation valves to allow repair or replacement of check valve.

B. Where vacuum breakers are specified or detailed, installation of swing check valves is not acceptable.

3.06 THERMOMETERS

A. Install in piping systems as specified on the drawings and details using a separable socket in each location.

3.07 THERMOMETER SOCKETS

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

3.08 TEST WELLS

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

3.09 PRESSURE GAUGES

A. Install in locations where indicated on the drawings and details, including gauge piping, with scale range appropriate to the system operating pressures.

B. Coil Syphons: Install in gauge piping for gauges used on steam services.

C. Gauge Valves: Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

3.10 STRAINERS

A. Install strainers where indicated on the project details, allowing space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

B. STEAM SYSTEMS - LOW PRESSURE AND HIGH PRESSURE
1. Install a ball valve or a drain valve in the tapped screen retainer; valve to be the same size as the tapping.

3.11 STEAM TRAPS

A. Where scheduled trap capacity exceeds the capacity of a single trap, contractor may, at his option, use multiple traps or a single "ultra-capacity" trap.

B. Install on the discharge side of steam terminals, at the end of mains, at the end of long branches, at points where mains must rise to a new elevation, and elsewhere as specified on the drawings and in the manner indicated on the details. Do not lift condensate from the discharge of traps without the written permission of the Architect/Engineer.

C. Install a valved test tee on the discharge of traps as detailed. Install a strainer upstream of drip traps and upstream of all terminal equipment where a strainer is not present upstream of the control valve at the terminal. Install a shutoff valve upstream of each drip trap; shutoff valves are not required when the trap is at a piece of equipment which has a shutoff valve in the steam line serving it.

D. Install a line size dirt leg at each trap. Trap elevation to be not less than one foot below the equipment outlet connection. Provide a separate trap for each equipment outlet connection.

E. Provide independent support for traps 2” and larger.

3.12 STEAM TRAPS REPAIR KIT

A. Provide a repair kit for each section of perimeter baseboard radiation.

B. Coordinate the repair of the steam traps with the owner to minimize disruption to the building occupants.

3.13 VACUUM BREAKERS

A. Install on condensate lines from steam heating coils, and elsewhere as specified on the drawings and details.

END OF SECTION

SECTION 23 22 23
STEAM CONDENSATE PUMPS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for condensate pumps used on this project. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 15 – HVAC Valves and Piping Specialties

C. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment

D. Section 23 22 13 – Steam and Condensate Heating Piping

E. Division 26 – Electrical

1.03 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

A. UL Underwriters Laboratory

B. ASTM American Society for Testing of Materials

C. NEMA National Electric Motor Association

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Provide submittals for condensate pumps.

B. Include data concerning dimensions, capacities, materials of construction, ratings, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.07 DESIGN CRITERIA

A. Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

B. Provide pumps complete with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on pumps unless specified otherwise.

C. Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

D. Test pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.

E. Pumps to operate without excessive noise or vibration.

F. Furnish one spare seal and casing gasket for each pump.

G. Electrical components shall be UL listed and shall bear a UL label. Control circuits shall be a 120 volt. Provide control circuit transformer if required.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following Manufacturers are considered acceptable subject to compliance with the specified requirements listed below:
1. Hoffman
2. Shipco

B. GENERAL
1. Units shall be simplex or duplex, base or basin mounted as scheduled. Where duplex pumps are indicated, capacity scheduled is with one pump operating. Pump capacities and discharge pressures are specified on the plan schedule.
2. Refer to the plan schedule for pump motor electrical requirements.

2.02 PUMPS

A. Pumps for receiver mounted units shall be centrifugal type, bronze fitted with cast iron casing, stainless or carbon steel shaft, mechanical seals, and close-coupled pump motor.

2.03 MOTORS

A. 3500 RPM motors having a minimum service factor of 1.15. Refer to plan schedule information for motor horsepower rating.

2.04 RECEIVERS

A. Receiver for floor mounted units shall be cast iron or 3/16" galvanized steel (minimum), with taps or openings for pump suction, condensate inlet, vent, drain, float assembly, thermometer, and gauge glass. Receiver shall have a 20-year warranty against receiver failure due to corrosion.

2.05 CONTROLS AND CONTROL PANELS

A. Provide units with UL listed NEMA 1 control cabinet, combination magnetic starters with circuit breaker disconnect switches, overload protection and pump control switch.

B. Control panel shall include “Hand-Off-Auto” pump selector switch for pump and pump running pilot lights to indicate pump operation.

C. Controls shall be factory mounted and wired. Controls and pumps shall only require a single point power connection. Provide power transformers for control voltage components.

D. Provide duplex units with float operated mechanical alternator. Float operated mechanical alternator and level control shall start second pump if first pump cannot handle the load.

E. All motors shall be protected with three-phase overload protection.

F. Mount control cabinet to a support on top of the receiver and factory wire to the pump motors and combination float switch and alternator. Both pumps shall be automatically operated if one pump cannot handle the load.

2.06 ACCESSORIES

A. Provide condensate pumps with the following pump accessories:
1. Water level gauge glass with shut-off valve
2. Dial Thermometer
3. Inlet basket strainer
4. Pump discharge pressure gauges

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install condensate pumps in strict accordance with manufacturer's instructions. Access/service space around pumps shall not be less than minimum space recommended by pump manufacturer.

B. Pumps shall be mounted on concrete pads.

C. Decrease from line size at pump connections with suction diffusers where specified, long radius reducing elbows or concentric reducers/increasers in the vertical piping, and eccentric reducers/increasers for horizontal piping. Install eccentric reducers/increasers with the top of the pipe level. Valves and piping specialties shall be full line size. Support piping adjacent to pump so no weight is carried on pump casings. Provide air vent and drain valve on condensate pump receivers.

D. Lubricate pumps before startup.

E. Provide field required control interlock wiring for proper operation of the condensate pump.

END OF SECTION

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for duct systems used on this project. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

C. Section 23 33 00 – Air Duct Accessories

D. Section 23 05 93 – Sequence of Operation for HVAC Controls

1.03 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.04 REFERENCE STANDARDS

A.	ANSI/ASTM B209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
B.	ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
C.	ASTM A167	Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
D.	ASTM A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
E.	ASTM C 1071	Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
F.	NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
G.	UL 181	

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Include manufacturer's data and Contractor data for the following:
   1. Duct liner including data on thermal conductivity, air friction correction factor, and limitation on temperature and velocity.

1.07 DESIGN CRITERIA

A. Construct ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

B. Use material, weight, thickness, gauge, construction and installation methods as outlined in the latest editions of the following SMACNA publications, unless noted otherwise:
1. HVAC Duct Construction Standards, Metal and Flexible
2. HVAC Air Duct Leakage Test Manual,
3. HVAC Systems - Duct Design
4. Rectangular Industrial Duct Construction Standard
5. Round Industrial Duct Construction Standards

C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

PART 2 - PRODUCTS

2.01 GENERAL

A. Aluminum sheet metal used for construction of duct shall be 22 gauge or heavier.

B. Spiral round ductwork 12” diameter and less shall be 26 gauge or heavier.

C. Other sheet metal used for construction of duct shall be 24 gauge or heavier.

D. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

E. Duct system pressure classes shall be according to the following schedule

GENERAL

RECTANGULAR DUCTS

Duct type/location	**Pressure class**	**Duct Construction**	**Inner Wall**	**Lining**
Supply duct mains	3 inch positive	Single wall	None	No
Return ducts	2 inch negative	Single wall	None	No
ROUND DUCTS				
Supply duct branches				
Upstream of VAV term	2 inch positive	Single wall	None	No

2.02 MATERIALS

A. GALVANIZED STEEL SHEET
1. Use ASTM A924 (Formerly ASTM A525) or ASTM A653 (Formerly ASTM A527) galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90.

2.03 FLEXIBLE DUCT

A. Manufacturers
1. Clevaflex, Thermaflex, Wiremold or Flexmaster.
2. Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under in accordance with NFPA 90A.
3. Rated for pressures and temperatures involved but not less than a 180°F service temperature and ±6 inch pressure class.
4. Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.
5. Where duct is specified to be insulated, provide a minimum 1-inch fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

2.04 DUCT LINING

A. Manufacturers
1. Manville, CertainTeed. Owens-Corning or Knauf.
2. Glass fiber material, mat faced with an anti-microbial coating, 1” nominal thickness having a density of 3 lbs/FT^3 with maximum thermal conductivity of 0.25 Btu-inch per hour-square foot - degree F at 75°F mean temperature and an acoustical performance rating of NRC.060.
3. Liner shall be rated in accordance with the following standards:
   a. ASTM C 1071
   b. NFPA 90A and 90B
   c. UL181
   d. ASTM C 1104
   e. ASTM C 665
   f. ASTM G 22
   g. ASTM C 1338
   h. ASTM G 21
4. Air friction correction factor shall not exceed 1.15 at 2000 fpm air velocity.
5. Lining and adhesive shall be rated for air velocities to 6000 fpm and temperatures to 250°F.

2.05 LOW PRESSURE DUCTWORK (MAXIMUM 3 INCH PRESSURE CLASS)

A. GENERAL
1. Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.
2. Construct so that interior surfaces are smooth. Use riveted or bolted construction when fabricating ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than ½ inch into the duct.
3. Use elbows and tees with a center line radius to width or diameter ratio of 1.0 wherever space permits. When a short radius (less than 1.0 ratio) elbow must be used due to limited space, install single wall sheet metal turning vanes in accordance with Section 23 33 00. Where space does not allow, and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows is not acceptable.
4. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.

5. Provide expanded take-offs for branch duct connections or 45-degree entry fittings. Square edge 90-degree take-off fittings or straight taps is not acceptable.
6. Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer.
7. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

B. SINGLE WALL ROUND
1. Manufacturers
a. Ajax, Semco, Lindab or United Sheet Metal.
b. Machine formed round spiral lock seam duct constructed of G-90 galvanized steel.
c. Contractor fabricated spiral round ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.

2.06 DUCT SEALANT

A. Manufacturer
1. 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Lockformer cold sealant, Mon-Eco Industries, or United Sheet Metal.
2. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

2.07 GASKETS

A. 3 INCH PRESSURE CLASS AND LOWER
1. Soft neoprene gaskets in combination with duct sealant for flanged joints.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference.

B. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts to fit the installation, in accordance with SMACNA HVAC Duct Construction Standards, Figure 2-10, Fig. C, except do not reduce duct to less than six inches in either dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as specified in SMACNA HVAC Duct Construction Standards, Figure 2-10, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or fume exhaust ductwork.

C. Cut or drill temporary test holes in ducts for all testing required. Cap with neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Test openings for test and balance work will be provided under Section 23 05 93.

D. Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make connections to equipment including equipment furnished by other sections of work. Secure frames with gaskets and screws or nut, bolts and washers.

E. Install duct to pitch toward outside air intakes to outside of building. Solder or seal seams to form watertight joints in outside air intake ducts.

F. Where two different metal ducts meet, the joint shall be installed in a manner that metal ducts do not contact each other by using proper seal or compound.

G. Install motor operated dampers and connect to, or install equipment furnished by other sections of work.

H. Blank off unused portions of louvers with 1½ inch board insulation with galvanized sheet metal backing on both sides.

I. Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.

J. Locate ducts with space around equipment to allow normal operating and maintenance activities.

K. Connect terminal units to mains with flexible duct no longer than the lessor of three duct diameters or five feet. Do not use flexible duct to change direction.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Protect ductwork against entry of foreign matter during construction.

M. Use double nuts and lock washers on threaded rod supports for ducts.

N. Remove dirt and foreign matter from the entire duct system and clean diffusers, registers and grilles before operating fans.

O. Provide temporary capping of ductwork to prevent entry of foreign matter during construction.

P. When appropriate, metallic foil backed duct tape may be used to seal duct seams and joints. Under no circumstances shall “typical” cloth duct tape be used for sealing ductwork, or for any other purpose.

Q. Install turning vanes in rectangular, mitered elbows in accordance with SMACNA standards. Follow turning vane manufacturer's recommendations for installation.

R. Support ductwork from the building construction in accordance with SMACNA standards and guidelines. Refer to Section 23 05 29 for anchors and supports required to suspend ductwork from concrete structures and steel structural members.

S. For ductwork running through joists or trusses, do not support ductwork by laying on the bottom chord. Hang ductwork from the top chord of the truss or joist.

T. Wire hangers shall only be used for rounds ducts 12 inches or less in diameter. Rectangular ducts and larger diameter round ducts shall be supported with strap hangers or steel shapes or uni-strut supports in accordance with SMACNA standards.

3.02 FLEXIBLE DUCT

A. Flexible duct may be used for final connection of air outlets, diffusers and grilles. Where flexible duct branch run-out is perpendicular to the air outlet connection, provide a sheetmetal elbow at the connection to the air outlet to facilitate connection of the flexible duct. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than 5feet in length.

B. Secure flexible ducts to the rigid branch duct with stainless steel draw bands. The use of sheetmetal screws or duct tape to attached flexible ducts to hard ducts is not acceptable.

C. Flexible duct used to compensate for misalignment of main duct or branch duct is not acceptable.

D. Flexible ductwork is not acceptable in mechanical chases or in exposed locations.

E. Individual sections of flexible ductwork shall be of one-piece construction. Splicing of short sections is not acceptable.

F. Penetration of partitions, walls, or floors with flexible duct is not acceptable.

G. The use of flexible ductwork for connecting branch ducts to exhaust and return grilles is not acceptable.

3.03 DUCT LINING

A. When lining ductwork as specified in the schedule listed under part 2 of this section, follow the following requirements:
   1. Line only supply ductwork five feet downstream of VAV terminals (when lining is specified under the schedule in part 2).

B. DO NOT APPLY LINING TO ANY OF THE FOLLOWING DUCTWORK:
   1. Outside air ductwork
   2. Supply air ductwork except as noted in 3.03 A.

3.04 LOW PRESSURE DUCTWORK (MAXIMUM 3 INCH PRESSURE CLASS)

A. Seal ductwork in accordance with SMACNA seal class "B". All seams, joints, and penetrations shall be sealed.

B. Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers is not acceptable as use as a balancing dampers.

C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at Contractor's option.

3.05 LEAKAGE TEST

A. Test ductwork in accordance with test methods described in Section 5 of SMACNA HVAC Air Duct Leakage Test Manual. Do not insulate ductwork until it has been successfully tested. Test pressure shall be equal to the duct pressure class.

B. If excessive air leakage is found locate leaks, repair the duct in the area of the leak, seal the duct, and retest.

C. The leakage rate shall not exceed more than 5% of the system air quantity for low pressure ductwork, determined in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual.

D. Submit a signed report to the Architect/Engineer indicating test apparatus used, results of the leakage test, and remedial work required to bring duct systems into compliance with specified leakage rates.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

A. This section includes accessories used in the installation of duct systems. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

B. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment

1.03 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.04 REFERENCE STANDARDS

A.	NFPA 90A	Standard for Installation of Air Conditioning and Ventilating Systems
B.	SMACNA	HVAC Duct Construction Standards - Metal and Flexible, First Edition, 1985
C.	UL 214	
D.	UL 555	Standard for Fire Dampers and Ceiling Dampers
E.	UL 555S	Leakage Rated Dampers for Use in Smoke Control Systems

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Submit for ductwork accessories specified under this section. Include dimensions, capacities, ratings, installation instructions, and appropriate identification.

B. Include certified test data on dynamic insertion loss, self-noise power levels, pressure losses, and aerodynamic performance of each sound attenuator at its specified conditions.

C. Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

PART 2 - PRODUCTS

2.01 MANUAL VOLUME DAMPERS

A. Manufacturers
   1. Air Balance, Kees, Nailor, Ruskin, or Vent Products.
   2. Dampers must be constructed in accordance with SMACNA Fig. 2-12 and Fig. 2-13, and notes relating to these figures, except as modified below.
   3. Reinforce blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" W.C. pressure class or above.

2.02 TURNING VANES

A. Manufacturers
   1. Aero Dyne, Anemostat, Barber-Colman or Hart & Cooley.
   2. Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Fig. 2-2 and Fig. 2-5.

2.03 CONTROL DAMPERS

A. Control dampers are specified under section 23 09 23 .Refer to the temperature control sections as applicable for damper specifications on this project. Refer to fan and air handling unit sections of the specifications for additional dampers specified under those sections.

2.04 ACCESS DOORS

A. Manufacturers
   1. SMACNA Standard access doors as manufactured by Greenheck, Ruskin, Air Balance, Advanced Air, American Warming and Ventilating, Vent Products Company Inc., or Arrow.
   2. Access doors shall be constructed in accordance with SMACNA Fig. 2-10 and Fig. 2-11, and notes relating to these figures, except as modified below.
   3. Construction to be rated for the pressure class of the duct in which the door is to be installed. Materials of construction to be identical to adjacent ductwork. Doors in exposed areas shall be hinged type with sash lock. Doors in concealed spaces may be secured in place with cam latches. Gasket all access doors. Use insulated doors when installed in insulated ductwork. Access doors constructed with sheet metal screw fasteners will not be accepted.
   4. Use insulated, 1½ hour UL 555 listed and labeled access doors in kitchen exhaust ducts.

2.05 DUCT FLEXIBLE CONNECTIONS

A. Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA 90A.

B. Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and air tight. Connections to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected equipment, and other movement.

C. Use coated glass fiber fabric for all applications. Material for inside applications other than corrosive environments, fume exhaust, or kitchen exhaust to be double coated with neoprene, air and water tight, rated for temperatures between -10°F and 200°F, and have a nominal weight of 30 ounces per square yard. Material used for outdoor applications other than corrosive environments, fume exhaust, or kitchen exhaust to be double coated with Hypalon, air and water tight, rated for temperatures between -10°F and 250°F, and have a nominal weight of 26 ounces per square yard.

2.06 AIR FLOW STATIONS

A. Install air flow stations at locations indicated on plans and in accordance with manufacturer's instructions. Install straightening vanes upstream of unit where required per manufacturer. Provide access door for inspection.

2.07 DUCT THERMOMETERS

A. MANUFACTURERS
1. Ashcroft, Marsh, Taylor, H.O. Trerice, U.S. Gauge, Weiss, Weksler.

B. DESCRIPTION
1. Equivalent to Trerice Industrial Thermometer, insertion stem type, with black finish cast aluminum case, 9 inch scale, clear acrylic window, reversible aluminum mounting flange, perforated aluminum sensor guard, adjustable angle brass stem with stem length adequate so the end of the stem is near the middle of the duct, red indicating fluid and black lettering against a white background having a minimum increment of 2° F. Scale ranges shall be as follows:

Service	**Scale Range, °F**
Return air ducts	30 - 130
Supply air ducts	30 - 180

PART 3 - EXECUTION

3.01 MANUAL VOLUME DAMPERS

A. Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

B. Splitter dampers shall not be used in place of volume dampers. Splitter dampers are not allowed on any duct system.

3.02 TURNING VANES

A. Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and manufacturer's recommendations.

B. Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4½ inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.

C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and Figure 2-6.

3.03 CONTROL DAMPERS

A. Install dampers at locations indicated on plans. Locate dampers as close to louver as possible. Provide a duct access door for service.

3.04 CONTROL DAMPERS

A. Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's instructions. Install blank-off plates or transitions where required for proper mixing of air streams in mixing plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent to each control damper for inspection and maintenance access to the damper and damper operator.

3.05 ACCESS DOORS

A. Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, air flow measuring stations, and control devices needing periodic maintenance.

B. Provide duct access doors to be to perform the intended service. Minimum access door size shall be 8” x 8” inch size for hand access, 18” x 18” inch size for shoulder access, or other size as specified. Provide access doors on inlet side of reheat coils as well as on both sides of other duct mounted coils.

C. Install at all duct connections to rotating or vibrating equipment, including air handling units, fans, or other motorized equipment. Physical connection to equipment shall be made in accordance with SMACNA Figure for flexible duct connections. Install thrust restraints to prevent excess strain on duct flexible connections at fan inlets and outlets; see Related Work.

3.06 AIR FLOW STATIONS

A. Install where specified on the plan documents, and as specified within the project manual.

B. Install in accordance with manufacturer's recommendations.

3.07 DUCT THERMOMETERS

A. Install in air ducts where indicated on the drawings or as specified.

B. Install in strict accordance with manufacturer's recommendations. When installing thermometers directly on insulated ductwork, provide a ½" thick piece of elastomeric insulation between the thermometer and the ductwork.

C. Securely mount to the ductwork. Install so that the thermometer measures a uniform sample of air. Adjust readout so it is readily visible from a standing position on the floor.

END OF SECTION

SECTION 23 41 00
PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for air system filters. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 07 00 – HVAC Insulation

B. Section 23 73 13 – Modular Indoor Central-Station Air Handling Units

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A. ASHRAE Standard 52

B. UL 181

C. UL 586

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Include data concerning efficiencies, airflow capacities, air pressure drop, dimensions, materials of construction, installation instructions and appropriate identification.

1.07 DESIGN CRITERIA

A. Use UL Class 1 or Class 2 filters unless noted otherwise.

B. Efficiencies indicated in this section are based on ASHRAE Standard 52.

C. Fan motors have been selected to operate against the resistance of midlife filters as specified in this section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. All model numbers listed in the section are based on Farr filtration products. Equivalent products as manufactured by American Air Filter, Flanders/CSC, Flanders/PrecisionaAire, Eco-air, Purafil, are also acceptable.

2.02 25-30% EFFICIENT FILTER MEDIA

A. Use 2" thick, pleated, lofted, non-woven, reinforced fabric, supported and bonded to a welded wire grid, and enclosed in cardboard frame. Farr 30/30 type filter.

B. Media nominal rating to be 500 FPM face velocity, 0.30 inch WG initial resistance, 0.5 inches WG recommended final resistance, and a minimum of 4.6 sq. ft. of media per sq. ft. of filter face area. Efficiency to be 25-30% dust spot, 90-92% weight resistance.

C. Furnish a side access filter housing or holding frame as scheduled or utilize air handling unit filter housing section.

2.03 CARTRIDGE FILTER MEDIA

A. Use cartridge type, 12” deep extended surface high efficiency filter media in a factory fabricated filter frame. Farr Riga-Flow type filter.

B. Rating: ASHRAE 52; 65 percent dust spot efficiency; 500 FPM face velocity (max.), initial resistance, 0.25 inch WG. Recommended final resistance 1.0 inch WG

C. Furnish a side access filter housing or holding frame as scheduled or utilize air handling unit filter housing section.

2.04 HOUSINGS FOR 25-30% EFFICIENT FILTER MEDIA

A. Housing or holding frame to be of the same manufacturer as filter media or provided by the air handling unit manufacturer. Contractor fabricated housings or filter racks is not acceptable. Casing and tracks shall be constructed of galvanized or enameled steel or aluminum. Provide access to the media tracks from outside the casing so media and be readily changed.

2.05 FILTER GAUGES

A. Manufacturers
1. Dwyer.

B. Direct reading, 3½ inch dial type, diaphragm actuated, in a metal case. Lettering shall be black figures on white background. Provide front recalibration adjustment.

C. Provide one gauge for each filter bank, compatible for flush or surface mounting. Include an air filter gauge accessory package consisting of mounting bracket, aluminum tubing, two static pressure tips, and vent valves for each gauge

D. PROVIDE GAUGES WITH THE FOLLOWING RANGES:

Filter Type	Scale Range (inches W.G.)
25-30% efficient filters	0.0 to 1.0
60-85% efficient filters	0.0 to 2.0

PART 3 - EXECUTION

3.01 INSTALLATION

A. Where air-handling equipment is to be used for temporary heating or ventilation of a facility, do not operate the equipment until specified filter media has been installed. Contractor shall be responsible for maintaining the cleanliness of air handling apparatus and air distribution systems during construction through regular inspection and changing of filter media throughout the construction period.

B. Where air-handling apparatus is used during the construction period, install new filter media prior to start of air balancing. Additionally, deliver one new set of media to the project site prior to substantial completion.

C. Install units as shown on drawings and details according to manufacturer's instructions and recommendations.

D. Reinforce filter-holding frames per manufacturer's instructions.

E. Maintain necessary clearance for changing filters.

3.02 FILTER GAUGES

A. Install filter gauge static pressure tips upstream and downstream of filters. Mount gauge on outside of filter housing or filter plenum in accessible position, or within rooftop equipment when used in outdoor applications. Install tubing and gauge valves between gauge and sensor tips. Adjust and level each gauge.

END OF SECTION

SECTION 23 73 12
AIR HANDLING UNIT COILS

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for coils used in packaged air handling units, custom air handling units and field-erected, field installed air handling units, whether located indoors or outdoors. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 15 – HVAC Valves and Piping Specialties

C. Section 23 09 14 – Variable Frequency Drives

D. Section 23 09 23 – Direct Digital Control System for HVAC

E. Section 23 09 93 – Sequence of Operations for HVAC Controls

F. Section 23 21 13 – Hydronic Piping

G. Section 23 22 13 – Steam and Condensate Heating Piping

H. Section 23 73 13 – Modular Indoor Central-Station Air Handling Units

1.03 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.04 REFERENCE STANDARDS

A. ARI 410 Forced Circulation Air-Cooling and Air-Heating Coils

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Provide submittals for heating and cooling coils. Include data concerning dimensions, capacities, flow rate, pressure drop, materials of construction, ratings, weights, and appropriate identification at the same time that the air handling equipment in which the coils are located are submitted.

1.07 DESIGN CRITERIA

A. Select coil sizes, capacities, configuration, and operating characteristics as shown on the plans and as scheduled. Coil capacity ratings shall be ARI 410 certified.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. PACKAGED AIR HANDLING UNITS
   1. Trane, McQuay or York.

2.02 STEAM COILS (HORIZONTAL TUBE STEAM DISTRIBUTING)

A. Galvanized steel casing, end supports, top channel, and bottom channel to produce a rigid frame with allowance for expansion and contraction of the finned tube section.

B. 0.035 inch tube wall seamless copper tubes of 1 inch maximum outside diameter outer tube, 0.035 inch tube wall steam distributing seamless copper inner tube, rated for working pressures to 125 PSIG and temperatures to 250°F. Coil fins may be the continuous serpentine or plate fin type.

C. Coil headers shall be constructed of cast iron, steel, or seamless copper. Where cast iron headers are used, expand tubes into the headers. Where steel or copper headers are used braze tubes to header.

2.03 CHILLED WATER COILS

A. Galvanized steel casing, end supports, top channel, and bottom channel to produce a rigid frame with allowance for expansion and contraction of the finned tube section.

B. Minimum 0.024 inch tube wall seamless copper tubes for 5/8 inch outside diameter tubes and 0.020 inch tube wall seamless copper tubes for ½" outside diameter tubes, rated for working pressures to 200 PSIG. Coil fins may be the continuous serpentine or plate fin type.

C. Coil headers shall be constructed of cast iron, steel, or seamless copper. Where cast iron headers are used, expand tubes into the headers. Where steel or copper headers are used braze tubes to header.

D. Coils shall be drainable type with drain and vent plugs for each header.

E. When required, provide coils with bronze spring turbulators to provide the capacities as specified. Coils with spring turbulators are not acceptable.

PART 3 - EXECUTION

3.01 STEAM COILS (HORIZONTAL TUBE STEAM DISTRIBUTING)

A. Provide factory installed in central station packaged air handling units.

B. Comb bent or crushed fins after installation. Clean dust and debris from each coil to ensure its cleanliness.

C. Provide offsets in piping to facilitate coil removal. Trap each coil individually.

D. Provide a vacuum breaker on each steam coil.

E. Provide float and thermostatic traps for each coil. See plan detail for size and arrangement of traps. If plan detail does not specify trap size, select trap(s) for a minimum of 1.5 times the rated coil capacity, at rated coil inlet steam pressure and at a 0.5 PSIG pressure differential across the trap.

F. Install traps to provide a minimum 12” elevation drop from coil outlet to trap inlet.

3.02 CHILLED WATER COILS

A. Provide factory installed in central station packaged air handling units.

B. Comb bent or crushed fins after installation. Clean dust and debris from each coil.

C. Install a separate air vent and drain valve for each coil header in a manner that the vent and drain valves are located outside of air handling unit casing. Provide offsets in piping to facilitate coil removal. Unless otherwise specified, pipe coils for counter flow arrangement.

D. Where coils are installed in ductwork or field erected air handling units, provide a 1½" deep 18 gauge welded stainless steel drain pan as an integral part of the duct or at coil support.

E. Install piping with proper depth trap from each cooling coil condensate drain to the nearest drain location.

END OF SECTION

SECTION 23 73 13
MODULAR INDOOR CENTRAL-STATION AIR HANDLING UNITS

PART 1 - GENERAL

1.01 SCOPE

A. This section includes specifications for packaged central station air handling units to be provided with factory installed fans, coils, dampers, filters and other accessories as specified herein. Included are the following requirements:

1.02 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

C. Section 23 05 14 – Variable Frequency Drives

D. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment

E. Section 23 09 23 – Direct Digital Control System for HVAC

F. Section 23 09 93 – Sequence of Operations for HVAC Controls

G. Section 23 41 00 – Particulate Air Filtration

H. Section 23 73 12 – Air Handling Unit Coils

I. Division 26 – Electrical

1.03 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

A. NFPA 90A

B. UL

C. ARI Standard 430

D. AMCA Standard 300

E. ANSI S1.31 and S1.32

F. ASHRAE 62

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.06 SUBMITTALS

A. Include dimensions, fan capacities, fan curves, coil capacities, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification, arrangements, accessories, and vibration isolation for all internal rotating equipment. Sound power levels to be based on tests performed in accordance with AMCA Standard 300.

B. 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. Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's recommended drive loss factor for the specific application. Tabular fan performance data is not acceptable. Final unit submittals may also be submitted at time of bid if so desired. Submittals shall clearly indicate whether preliminary or final for equipment release.

1.07 DESIGN CRITERIA

A. Test and certify fans in accordance with the applicable AMCA test code.

B. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.

C. Consider drive efficiency in motor selection according to manufacturer's published recommendation or according to AMCA Publication 203, Appendix L.

D. Internal insulation and other components exposed to the air stream are to meet the flame spread and smoke ratings contained in NFPA 90A.

E. Units shall be designed in accordance with ASHRAE Standard 62 for indoor air quality.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Trane, York, or McQuay

2.02 GENERAL

A. Use fan size, class, type, arrangement and capacity as scheduled.

B. Furnish the air handling unit complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, heating and cooling coils, filters and other accessories indicated and required for specified performance and proper operation.

C. Air handling unit fan shall have internal vibration isolation unless otherwise specified herein.

D. Units shall be designed and constructed to meet ASHRAE guidelines for indoor air quality, including, but not limited to the following; sloped stainless steel drain pans; double wall construction and stainless steel drain tubes in cooling coil sections.

2.03 CASINGS

A. Double wall, sectionalized steel with rust resistant paint or galvanized finish; 1" thick, 3 LB/FT3 density glass fiber internal casing insulation. Connecting channels shall be insulated to prevent sweating. The casing shall be able to withstand up to 6" W.C. positive pressure and 4" W.C. negative pressure.

B. Provide access doors as shown on the drawings and at component locations requiring service access. Access doors shall be hinged, gasketed, insulated and airtight.

2.04 FANS

A. Forward curved, airfoil, backward inclined, or plug type centrifugal fans as specified in the unit schedule. Fans shall be selected so that at design operating conditions, the operating point shall not be in an unstable portion of the fan curve(s). Fan selections that indicate the possibility of unstable operation will be rejected.

B. Fans shall be internally spring isolated and include ball bearing supports with bearing grease extensions where required to allow for service access.

C. Statically and dynamically balance fans so they operate without objectionable noise or vibration.

D. Provide plug type fans with a metal fan inlet guard.

E. Backward inclined fans are acceptable in lieu of airfoil fans when the manufacturer does not offer airfoil fans for that size unit, provided that the following conditions are met:
   1. Airflow must meet or exceed specifications at scheduled conditions.
   2. The brake horsepower of the BI fan must be equal to or less than the airfoil fan at the scheduled conditions.
   3. The fan discharge sound power levels must be equal to or less than the values specified in all octaves.

2.05 MOTORS

A. Resiliently mounted, high efficiency, NEMA approved, open drip-proof type with adjustable mounting base.

B. Motor efficiency shall be high enough to qualify for current local utility rebates or state energy code minimums for high efficiency motors. In lieu of published efficiency standards, motor efficiency shall be the minimum as specified under section 23 05 13.

C. Motors as specified shall be compatible for use with variable frequency drives.

D. Aegis SGR grounding rings shall be installed on motors shafts of any motor with a VFD.

2.06 FAN DRIVES

A. V-belt type sized for a minimum horsepower rating of at least 150% of the fan motor horsepower with an adjustable pitch motor sheave.

2.07 COILS

A. Provide unit mounted heating and cooling coils as specified on the plan schedules. See Section 23 73 12 for coil specifications. Provide coils to meet minimum capacities specified and the requirements of these specifications.

B. Cooling coil sections shall include integral, stainless steel watertight condensate drain pan, insulated, and sloped in two directions to a single, integral, side mounted unit drain connection. Drain pan connections shall be located on both sides of the unit.

2.08 FILTERS

A. See plan schedules and unit drawings for filter types, arrangements and configurations. Refer to Section 23 41 00 for filter specifications.

B. When specified, the unit mixing box section shall act as the prefilter holding section.

C. Filter casing sections shall be manufactured by the air handling unit manufacturer. Filter sections and shall be compatible for use with standard size filters.

D. Provide air-handling unit with one set of filters for final unit operation and one set of filters as spare to the project.

2.09 ACCESS DOORS

A. Access doors shall be of double wall construction. Hinge pins shall be non-removable. Handles shall be provided on access door with provide positive airtight closure. Doors shall be gasketed and shall open outward for negative pressure sections and inward for positive pressure sections. Doors shall be provided on both sides of access, fan, diffuser, coil and filter sections unless noted otherwise. Fan and access sections must have handles on both inside and outside of door in compliance with OSHA requirements for confined space access. Access doors shall be a minimum of 16” inches in width.

2.10 ACCESSORIES

A. In addition to the above referenced components, the units shall be provided with the following accessories. All sections and accessories shall have the same casing construction as specified above.
   1. Access sections: Access sections shall include access doors as previously specified. Access doors shall include integral windows when specified on the plan drawings. Size of access sections shall be as shown and specified on the plans. Provide stainless steel drain pans, sloped in two directions to a single integral side mounted unit drain connection, in access sections downstream of humidifiers.
   2. Blank sections: Blank sections do not require access doors or windows. Size of blank sections shall be as shown and specified on the plans. Provide stainless steel drain pans, sloped in two directions to a single integral side mounted unit drain connection, in access sections downstream of humidifiers.
   3. Air Blender sections: Air blender section for airflow mixing within the unit.
   4. Base Rails: Provide unit with full length, 10 gauge galvanized steel minimum 8" high base rails. Mounting legs or mounting feet are not acceptable.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Unit shall be installed and placed into operation in strict accordance with the Manufacturer's instructions and recommendations.

B. For units with external vibration isolation, provide vibration isolators as specified in Section 23 05 48. Isolators shall be selected, installed and adjusted at the proper unit support points.

C. Extend cooling coil condensate drain line from air handling unit to the nearest clear water waste drain location. Provide loop seal at condensate drain outlet.

D. Provide flexible duct connections at each duct connection to the unit, regardless whether or not the unit has internal flexible connections on the fans.

E. Fan drive sheaves shall be adjusted or replaced by the Contractor at the job site to provide the system design air volume.

F. Unit shall be mounted above minimum elevation above floor to provide adequate clearance for drain pan drain line loop seal and to account for drain line pitch to floor drain.

G. Unit shall be mounted above minimum elevation above floor to provide adequate clearance for steam trap and associated piping.

H. Units shall be mounted on a concretes pad as specified on the plans.

END OF SECTION

SECTION 26 05 00
GENERAL ELECTRICAL PROVISION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern Work under this Section.

1.02 WORK INCLUDED IN THE ELECTRICAL CONTRACT

A. The mention of an Article, operation or method requires that the Contractor shall provide same and perform each operation in accordance with the conditions stated. The Contractor shall provide material, labor, equipment and transportation to complete the project in compliance with the Contract Documents.

B. Work shall be installed in accordance with State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.

C. Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become informed as to the extent and character of the work required and its relation to other work in the building.

D. The Contractor, in conjunction with the Architect's representative, shall establish exact locations of materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

E. Materials shall be suitably stored and protected prior to installation and work shall be protected after installation, during construction and prior to acceptance.

F. The Contractor shall furnish scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of equipment and apparatus required to be installed by the Contractor. This equipment shall be removed by the Contractor upon completion of the project.

G. Refer to General Requirement for temporary electrical service.

1.03 DEFINITIONS

A. The Owner. The individual who the Owner selects as the project representative.

B. The Architect.

C. The Engineer. Arnold & O'Sheridan, Inc., Consulting Engineers, Inc.,Madison, Wisconsin.

D. Provide. Furnish, install and wire ready for service.

E. Exposed. Exposed to view in room, corridor or stairway.

F. Code. National, State and Local Electrical codes including OSHA requirements.

G. Substitution. Manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

H. Signal voltage. NEC class 1, 2, or 3 remote control, signaling, or power limited circuits.

I. Low voltage. 50 to 600 volts.

J. Medium voltage. 601 to 35,000 volts.

K. High voltage. 35,001 volts and greater.

L. Electrical ductbank. Assembly consisting of electrical conduits encased in concrete.

1.04 ABBREVIATIONS

A. A/E: Architect or Engineer

B. ENGR: Engineer

C. NEC: National Electrical Code

D. NEMA: National Electrical Manufacturer's Association

E. NFPA: National Fire Protection Association

F. OSHA: Occupational Safety and Health Administration

G. UL: Underwriter's Laboratories

H. NECA: National Electrical Contractors Standards of Installation.

I. ANSI: American Society for testing Materials.

J. IEEE: Institute of Electrical and Electronic Engineers.

K. ASTM: American Society for testing Materials.

L. IPCEA: Insulated Power Cable Engineers Association.

M. FM: Factory Mutual.

N. ETL: Electrical Testing Laboratories.

O. FIA: Factory Insurance Association.

1.05 PERMITS AND LICENSES

A. The Contractor shall prepare and submit applications and working drawings to authorities having jurisdiction over the project. Licenses and permits required shall be secured and paid for by the Contractor. This includes required submittals for the fire alarm system.

1.06 STANDARDS AND CODES

A. Work shall be installed in accordance with National, State, and Local codes, ordinances, laws, and regulations. Comply with applicable OSHA regulations.

B. Materials shall have a UL or ETL label where a UL or ETL Standard or test exists.

1.07 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of equipment and devices shall be established in the field in accordance with instructions from the Architect as established by manufacturer's installation drawings and details.

B. The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.

C. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.

1.08 DRAWINGS

A. The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Upon completion of the project, the contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:
1. Locations of buried conduit or similar items. Include buried depth.
2. Field changes of dimension or detail.
3. Changes made by field order or change order.
4. Details not on original contract drawings.
5. Changes to circuit numbers.
6. Junction box locations and conduit runs, with trade sizes indicated, for power, and electrical systems installed.

B. As Built Drawings - See General Requirements - Division 1.

C. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless conflict is resolved by an addendum.

1.09 UTILITY CHARGES

A. Not required.

1.10 MATERIALS AND EQUIPMENT

A. Materials and equipment required shall be new.

B. Equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions are allowed except as permitted in this specification.

C. Items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

1.11 SUBSTITUTIONS

A. Substitutions shall not be allowed. Where the Contractor wishes to use equipment or methods other than those listed by name, that equipment must be approved by the Engineer. To gain approval for equipment not listed, the Contractor shall submit the following to the Engineer for his review:
   1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state exceptions taken to the specification and the reasons for exceptions. Documentation relative to the request shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.
   2. Manufacturer's Cut Sheets: Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review. (Furnish 3 copies.)

B. The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.

C. The Contractor shall furnish other information or materials as requested by the Architect/ Engineer to establish equality.

D. The Contractor shall acknowledge that they have reviewed the submission criteria for the request by stamping the submission with a review stamp or acknowledgement by an accompanying letter.

E. Equipment and materials submitted for review without proper documentation shall be rejected without review.

F. Submittal, including samples, shall be received in the Engineer's office 10 business days prior to bidding.

G. Materials, equipment, or methods of installation other than those named, shall be in accordance with the general requirements and similar in composition, dimension, construction, capacity, finish and performance.

H. Contractors submitting equipment for approval shall include in their bids incidental costs that may result from the use of equipment. Costs shall include, but not be limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of the product. The Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.

1.12 SUBMITTALS AND EQUIPMENT BROCHURES

A. Submit to Engineer for review, the manufacturer's shop drawings and equipment brochures in quantities determined by the Architect for the following:

   1. 26 05 19 - Low Voltage Wires, Cables, and Connectors
   2. 26 05 26 – Grounding
   3. 26 05 29.3 - Wiring System
   4. 26 24 16 - Electrical Panelboards
   5. 26 24 19 - Motor Control Centers (MCCs)
   6. 26 27 26 - Wiring Devices
   7. 26 27 28 - Motor and Circuit Disconnects
   8. 26 28 00 - Low Voltage Overcurrent Protective Devices

B. Submittals shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.

C. Data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:
   1. The name and location of the project.
   2. The name of the Contractor.
   3. The date of submittal.
   4. The date of the drawings and the date of each correction and revision.
   5. If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.

D. Submittals for different systems and equipment bound separately by specification section and not bound by manufacturer. Submittals which contain different specification section systems bound together shall be returned unreviewed for resubmittal.

E. The Contractor shall examine submittals and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted properly fit into the construction. The Contractor shall also review previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.

F. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for deviations has been granted.

1.13 MAINTENANCE MANUALS

A. The Electrical Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, three sets of a Manual of Operation and Maintenance for each of the electrical and communications systems.

B. Each manual shall consist of a loose leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover phases of operation of the equipment and shall be illustrated with photographs, drawings, and wiring diagrams. Manuals shall accurately describe the operation, construction and adjustable features of the system and its component parts. The manual shall include an equipment parts listing to facilitate the ordering of spare and replacement parts.

C. If it is desired to provide maintenance manuals in PDF format, the contractor shall provide a written request prior to submitting the manuals indicating which equipment manuals they propose to provide in this format.

D. Each manual shall contain two sets of shop drawings depicting equipment as installed.

1.14 CLEANING AND PAINTING

A. Rubbish resulting from this work shall be removed and disposed of on a daily basis in manner as to be acceptable to the Architect.

B. The Contractor shall clean exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove rubbish and debris resulting from the work.

C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall repair and paint to match original finish.

D. Clean other equipment indicated in other sections of the specification for specific equipment.

1.15 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical systems does not constitute an acceptance of the work. The acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

B. Upon completion of the installation, the Contractor shall furnish certificates of approval from authorities having jurisdiction. The Contractor shall demonstrate that work is in perfect operating condition, with raceway and conduit system properly grounded, wiring free from grounds, shorts, and that the entire installation is free from physical defects.

C. Perform other test as specifically stated in other sections of the specification for specific equipment.

1.16 WARRANTY

A. See General Conditions.

1.17 IDENTIFICATION

A. Junction and pullboxes smaller than 12” X 12” shall be identified by using a permanent marker on the coverplate indicating originating panelboard, voltage and circuit(s) or system served.

B. Junction and pull boxes with dimensions 12” X 12” and larger shall be stenciled or provided with permanent labels as follows:
   1. Power Feeders and Branch Circuits - 120, 208, 277, 480. Add
   2. Fire Alarm - FA

C. Branch wiring shall be color coded per industry standards. Where wires of different systems junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

D. On 3-phase systems, each phase shall be identified at terminals using code markers.

E. Cover plates for control stations controlling remote equipment shall be engraved to identify the device being controlled.

F. Motor starters, remote control stations, shall be identified with engraved metal or engraved plastic nameplates fastened to the equipment with escutcheon pins. Nameplates shall be 1/8" 5 ply engraved metal or engraved plastic with ¼" white letters on a black background. Adhesive cloth labels, similar to those manufactured by Brady Label Co., may be used on motor switches and controls only, indicating the number, designation, size and usage of the motor.

G. Refer to individual specification sections for more specific or additional identification requirements.

1.18 ACCESS PANELS

A. Access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

1.19 SPARE PARTS

A. Requirements for spare parts are outlines in individual specification sections. Spare parts shall be turned over, unopened, to the Owner as part of the maintenance manual submittal.

1.20 PREBID SURVEY

A. Before submitting his bid the Contractor shall tour the job site to review the following:
   1. The exact configuration of areas requiring demolition, temporary power, relocating, etc.
   2. Site conditions for material storage, staging areas, parking, etc.
   3. Problems with work sequence.

B. Conditions found that are not shown on the documents but that may affect the scope of the work shall be reported to the Engineer.

PART 2 - PRODUCTS

2.01 FIRESTOPPING

A. Fire stopping materials shall include, but not be limited to, mortars, sealants and caulks, putties, collars, intumescent wrap strips mastics, and firestop pillows. Materials and methods used shall be recognized by an independent testing agency and shall have flame and temperature ratings assigned by that agency.

B. Materials using solvents or those requiring hazardous waste disposal shall not be used.

C. The firestop assemblies shall meet fire test and hose stream test requirements of an independent testing agency.

D. Acceptable manufacturers.
   1. 3M Corporation or equivalent.

2.02 SLEEVES

A. Schedule 40 galvanized steel pipe.

2.03 ACCESS PANELS

A. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12” X 12” for hand access or 24” X 24” for body access.

B. Panels shall be as manufactured by Milcor or equivalent.

C. Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.

D. Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

E. Panel construction shall be as follows:
   1. Non-Security Areas: Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.
   2. Secure Locations: Minimum 16 gauge frame with not less than 14 gauge hinged door panel. Door locks shall be locking type. Furnish and install locking devices in accordance with types specified in Division 11. See plans for secure locations.

PART 3 - EXECUTION

3.01 FIRESTOPPING

A. Openings in fire rated construction and annular spaces around conduits, cable trays, and other penetrating items shall be protected in accordance with NEC article 300-21 and in accordance with the Wisconsin Administrative Code, Department of Commerce Chapter 51.049. The fire rating of the protective seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the construction is maintained.

B. Wall or floor penetrations openings shall be as small as possible.

C. Openings and annular spaces required by code to be protected shall be protected whether specifically indicated on the plans or not.

D. Installation of materials and assemblies shall be in strict accordance with the manufacturer’s instructions.

3.02 SLEEVES

A. Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It shall be the Electrical Contractor's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

B. Floor sleeves shall extend a minimum of 2 inches above the finished floor.

END OF SECTION

SECTION 26 05 02
ELECTRICAL DEMOLITION AND ALTERATION

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 JOB CONDITIONS

A. The existing building shall remain in service during construction. Power outages and interruptions in building systems shall be held to a minimum and shall only be done at a time convenient to the Owner. The time of outages shall be scheduled with the Owner and other trades affected by the outage at least ten working days in advance. Demolition work shall be scheduled at periods and times acceptable to the Owner.

B. Refer to other sections of specifications for areas and equipment being remodeled.

C. Prior to demolition or alteration of structures, the following shall be accomplished:
1. Owner release of structure.
2. Disconnection of electrical power to equipment and circuits removed or affected by demolition work.
3. Electrical services rerouted or shut off outside area of demolition.
4. Coordinate sequencing with Owner and other Contractors.
5. Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.
6. Contractor shall dispose of obsolete material.
7. Contractor shall notify Engineer of existing code violations observed during the course of performing his work. If corrective action needs to be taken that changes the scope of the work, corrective action to proceed only after approved change order.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 REMOVAL

A. Remove or relocate conduit, wire, boxes, fixtures, and electrical equipment that are in the way of construction.

B. Reconnect circuits and equipment to be continued in service.

C. Provide temporary wiring to equipment that is to remain in operation during demolition and whose power will be interrupted as a result of demolition.

D. Remove electrical equipment released from service as a result of construction.

E. Do not reuse removed electrical equipment except as specifically shown on the drawings.

F. Where the plans require existing equipment to be removed or relocated, removal shall include equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors. In instances where a device is removed but active conductors remain in the backbox and the box is mounted in a wall which is remaining, the backbox may remain and a blank coverplate provided. If removal of the box is specifically indicated on the plans the active conductors shall be intercepted at convenient, accessible locations and rerouted to allow existing box to be removed. When boxes are removed from existing walls which remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand flush with adjacent surfaces.

3.02 DISPOSAL

A. Dispose of equipment that is removed unless specifically indicated on the drawings shall be included in this work.

B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

C. The Contractor shall tour demolition areas with the Owner to determine the status of other equipment to be removed during demolition. Equipment that is to be salvaged for reuse shall be removed by the Contractor and transported to a designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

D. Contractor, at his option, may install new conductors in existing raceways provided that the raceways are in place and are properly sized and supported. Existing conduits that are removed from their existing location shall not be reinstalled.

3.03 ASBESTOS REMOVAL

A. Work involved with asbestos removal, disposal or abatement shall not be considered as part of this project. Work in this regard shall be the responsibility of the Owner. If this Contractor shall discover the presence of asbestos material he shall cease work immediately and notify Owner architect and Engineer of condition.

3.04 ALTERATIONS

A. The Contractor shall be responsible for work of other trades to facilitate installation of electrical work in the existing building.

B. Work required by Electrical Contractor which is normally performed by other trades shall be done under direction and at the expense of Electrical Contractor.

END OF SECTION

SECTION 26 05 04
INSPECTION AND TESTING OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. The work under this section includes the required cleaning, repair, adjustment, calibration, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project.

1.02 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

A. Not Used.

PART 3 - EXECUTION

3.01 GENERAL INSPECTION AND CLEANING OF ELECTRICAL EQUIPMENT

A. Review for physical damage and abnormal mechanical and electrical conditions.

B. items found to be out of tolerance, or defective as a result of the required testing, shall be reported to owner and engineer. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

C. Compare equipment nameplate information with the latest single line diagram and report discrepancies.

D. Verify proper auxiliary device operation and indicators.

E. Check tightness of accessible bolted electrical joints. Use torque wrench method.

F. Make a close examination of equipment and remove shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

G. Make a close examination of equipment and remove dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

H. Clean Equipment:
1. Vacuum inside of panelboards, switchboards, switchgear, transformer core and coils, horizontal and vertical busducts, MCC's, fire alarm panels, comm/data, security panel, etc.
2. Loosen attached particles and vacuum them away.
3. Wipe insulators with a clean, dry, lint free rag.
4. Clean insulator grooves.
5. Review equipment anchorage.
6. Review equipment and bus alignment.
7. Check heater elements for operation and control.
8. Lubricate nonelectrical equipment per manufacturer's recommendations.

3.02 GROUNDING SYSTEMS

A. Review the ground system for adequate termination at devices.

3.03 CABLES

A. Visual and Mechanical Inspections:
1. Review exposed sections for physical damage.
2. Verify cable is supplied and connected in accordance with single line diagram.
3. Review for shield grounding, cable support and termination.
4. If cables are terminated through window type C.T.'s make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
5. Review for visual jacket and insulation condition.
6. Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radii -- 12 times the diameter for tape shielded cables.
7. Review for proper fireproofing in common cable areas.
8. There shall be NO tests performed on existing cable without specific direction from the Consulting Engineer.

B. Electrical Tests -- Below 600 Volts:
1. Secondary cables from the substation transformers to the secondary switchboards shall be subjected to insulation tests using a 500 vdc megger.
2. Visually review cables, lugs, connectors and other components for physical damage and proper connections
3. Check cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.
4. Check for proper grounding resistance at services and at transformers. Resistance shall be 2 ohms maximum.
5. -- Above 600 volts:
6. Above 600 volt testing to be performed under a separate contract.

3.04 PANELBOARDS

A. Torque the connections per the manufacturers spec. Verify phase wires, color coding, separate neutral and mechanical bonding. Verify circuit breaker operation. Verify the directory revise as required by new work.

3.05 MOTOR STARTERS AND MOTOR CONTROL CENTERS

A. Verify the control circuits. Confirm the fusing and the grounding of the control transformers. Check torque of the connections. Confirm the fuses for proper sizing. Verify grounding. Operate and test each motor starter for proper operation.

END OF SECTION

SECTION 26 05 19
LOW VOLTAGE WIRES, CABLES AND CONNECTORS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Application requirements of Division 0 and Division 1 shall govern work under this Section.

1.02 SCOPE

A. Provide wires, cables and connectors as specified herein.

B. Provide branch wiring and feeder systems to serve lighting, receptacles, motors, and other equipment loads.

C. The terms “feeders” and “branch circuits” as used in this section are as defined in NEC Article 100.

1.03 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 27 26 - Wiring Devices

C. Section 26 05 26 - Grounding

1.04 QUALITY ASSURANCE

A. Reference Standards of the following associations:
   1. National Electrical Contractor's Association (NECA) - Standard of Installation
   2. Insulated Cable Engineers Association (ICEA)

PART 2 - PRODUCTS

2.01 CONDUCTORS

A. Copper conductor only.

B. Conductor insulation shall be rated 600 volts minimum. Insulation color for low voltage (secondary feeders and branch circuits) conductors shall vary to depict the type of conductor. Colors shall be as indicated elsewhere in this section and as required by code.

C. Single conductor #10 AWG size and smaller for general use wiring may be stranded or solid conductors at the contractor’s option, provided with type THWN insulation. Stranded conductors accessible with the use of compression (crimp) connectors. Minimum size shall be #12 AWG on 208 volt systems and #12 AWG for 480 volt systems. Conductors with dual rated insulations are approved provided one of the ratings is THWN.

D. Single conductor #8 AWG and larger for general use wiring shall be stranded configuration with type THWN insulation. Conductors with triple rated insulations are approved provided the ratings include one of the ratings that are listed.

E. Conductors installed in wet locations and areas with high humidity shall be type XHHW-2 or USE. Wet locations shall include, but not be limited to, conduits installed in contact with the earth and underground electrical ductbanks.

F. Conductors shall not be installed at temperatures below the manufacturer's minimum installation temperature.

G. Unless specifically indicated otherwise, conductor sizes indicated on the plans are based on the ampacities listed for conductors rated at 75 degrees C.

H. All conductors, whether stranded or solid, shall be terminated using approved methods.

I. Install 90˚c conductor in high ambient pent. Mechanical room, utility rooms and exterior installation.

2.02 JOINTS, TAPS AND SPLICES

A. CONDUCTORS NO. 10 AWG AND SMALLER
1. 3M Scotch-lok compression type solderless connectors with plastic cover.

B. JOINTS, TAPS, AND SPLICES IN CONDUCTORS NO 8 AWG AND LARGER
1. Solderless compression type connectors, tool and die applied, of a type that will not loosen (Non Reversing) under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.

2.03 TAGS AND LABELS

A. BRANCH CONDUCTOR LABELS
1. Sleeve type wrap around adhesive markers with factory printed circuit numbers.

B. FEEDER CONDUCTOR LABELS
1. Metal tags or flame-resistant adhesive label tags at the Contractor's option. Label shall include conductor source, voltage, and load/equipment served.

2.04 RUBBER INSULATING ELECTRICAL TAPE

A. Scotch 3M model 23, 30 mil tape.

B. Plymouth #2117, 30 mil tape.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

B. Run wire and cable in conduit, unless otherwise indicated on drawings.

C. Do not draw conductors into conduits until building is enclosed and watertight and until work that may cause conductor damage has been completed.

D. Voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of NEC Article 215.

E. Examine areas and conditions under which conductors are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

F. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 JOINTS, TAPS AND SPLICES

A. Each tap, joint, or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and a finish wrap of color coding tape, where required by code.

B. Cable splices shall be made only in distribution and junction boxes.

3.03 WIRE AND CABLE IDENTIFICATION

A. TAGS AND LABELS
1. Install tags and or/labels on conductors and cables in junction boxes, pullboxes, wireways, wiring gutters of panels, and other accessible locations. Labels and tags shall contain information under “products” for branch circuit conductors and feeder conductors.
2. Conductor phase identification. Different conductor insulation colors and electrical tape colors shall be used to identify the different phases of conductors in a given circuit and to identify the neutral and ground conductors. Painted identification is not acceptable. Provide color identification on conductors at accessible locations. Requirements of the Code regarding conductor identification shall always be followed where applicable. In general, colors shall be as follows:
   a. 120/208 Volt Systems Neutral Conductor - Solid White: Provide additional markings for neutral conductors in the same raceway.
   b. 120/208 Volt Systems A-Phase, B-Phase, and C-Phase Unswitched Legs: Solid black, solid red and solid blue respectively. Different colors shall be used to identify switched legs.
   c. 480/277 Volt Systems Neutral Conductor - Solid Gray: Provide additional markings for neutral conductors in the same raceway.
   d. 480/277 Volt Systems A-Phase, B-Phase, and C-Phase Unswitched Legs: Solid brown, solid orange and solid yellow respectively. Different colors shall be used to identify switched legs.
   e. Ground Conductors - Solid Green: Provide additional markings for ground conductors in the same raceway.
3. For additions to existing buildings, existing conductor color-coding schemes shall be followed unless in conflict with the codes. If no logical color-coding scheme exists, color-coding indicated above shall be followed.

3.04 BRANCH CIRCUIT CONDUCTORS

A. Install branch circuits and switched circuits to comply with the circuiting, switching, and functions shown on the drawings.

B. Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.

C. Conductor shall increase the size of branch wiring one size (i.e., from #12 AWG to #10 AWG) where the distance from the panel to the center of the load is more than 100 Feet long for 120V. circuits and 200 feet ;long for 277V. circuits.

D. Provide individual neutral conductors for branch circuits serving isolated ground receptacles and computer equipment. (No common neutrals for these circuits.)

E. Route branch circuits and switch legs as dictated by construction, these specifications, or instruction from Engineer.

F. Size conduit, outlet boxes, and other raceway system components in accordance with NEC requirements as minimum.

G. Circuit numbers as shown on drawings are for Contractor to plan his wiring and for estimating purposes and are not necessarily the exact circuit numbers to be used in that panel for that particular load. Exact circuit numbers for each load are to be selected by the Contractor at his option. Balanced load on panelboard bus is to be determining factor in arrangement of circuits. Panelboards average load shall not differ from phase to phase by ± 7½%.

3.05 MOTOR AND EQUIPMENT BRANCH WIRING

A. Furnish and install motor circuits in accordance with schedules on drawings and code requirements, from source of supply to associated motor starter, and from starter to motor terminal box, including necessary and required intermediate connections.

B. Conductor and conduit size for motor branch circuits if shown on drawings are sized for motor requirement only. Control wiring is not included in conduit sizes shown on the drawings.

C. Motors shall have proper conductor sizes in accordance with NEC requirements and nameplate ratings. Contractor is responsible for verification of ratings of motors and installing proper branch circuits.

D. Obtain manufacturer's wiring diagrams and shop drawings for equipment requiring electrical connections.

E. Check drawings and specifications of other divisions of work for equipment and work which shall be included.

F. Motor connections shall be made by compression type connectors using proper tools and fittings.

END OF SECTION

SECTION 26 05 19.4
MOTOR WIRING

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable provisions of Division 0 and Division 1 shall govern work in this Section.

1.02 SCOPE

A. Provide connections and wiring to motors as shown on the drawings and in other divisions of the specifications and as specified herein.

1.03 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 24 19 - Motor Control Centers

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 GENERAL

A. Motor starters shall be furnished by the HVAC Contractor supplying the motor requiring a starter.

B. This Contractor shall check the drawings and specifications of the other trades to determine the requirements for motor disconnect switches. In each case, the Contractor shall install required disconnect switches. The Electrical Contractor shall provide code required disconnect switches not specifically supplied by others and as indicated on drawings.

C. Unless otherwise indicated on the drawings or elsewhere in these specifications, motors shall be furnished by others.

D. Motors shall be set in place and the associated motor starters and controllers shall be turned over to the Electrical Contractor for installation.

E. Contractor supplying starters and controllers shall index same and provide the Electrical Contractor with written instructions as to proper location in time to permit the installation of a concealed raceway system.

F. Control wiring, regardless of voltage, shall be the responsibility of the Contractor providing the motor. The Electrical Contractor shall extend the 120 volt circuit to the control transformers and make 120 volt transformer connections. Control transformers shall be supplied by HVAC Contractor. Location of control transformers shall be in close proximity of the heating equipment.

G. Review the HVAC and plumbing specifications and provide line voltage wiring and connections to controls and auxiliary equipment specified as to be provided by the Electrical Contractor or Division 26.

END OF SECTION

SECTION 26 05 26
GROUNDING

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 SCOPE

A. Provide material, labor and incidentals necessary for the installation of a code compliant grounding system.

1.03 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

1.04 APPLICABLE CODES

A. National Fire Protection Association (NFPA), NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.

B. Local Codes and Ordinances.

1.05 REFERENCE STANDARDS

A. Conform to the standards of the National Electrical Contractors Association (NECA), Standard of Installation.

1.06 SUBMITTALS

A. Not required.

PART 2 - PRODUCTS

2.01 GROUND CLAMPS

A. Ground clamp fittings shall be interlocking clamp type fabricated from high strength corrosion-resistant metal with high strength silicon bronze U-bolt, nuts, and lock washers.

2.02 GROUND WIRES

A. Copper only.

B. Size as shown on drawings, or required by NEC.

C. No. 6 AWG minimum.

PART 3 - EXECUTION

3.01 GENERAL

A. Ground electrical systems and equipment required by code, utility, local ordinances, and to requirements herein.

B. Install separate code rated grounding conductors to special equipment and activity areas required by code.

C. Bond metallic piping systems and service equipment required by NEC.

D. Cable connections and joints shall be non-reversible compression connected or thermo-welded.

3.02 EQUIPMENT GROUND

A. Bond metallic conduits, supports, cabinets, and other equipment to provide an electrically continuous equipment ground from service to outlet boxes.

B. Ground wire shall be bonded at equipment and at first junction box of conduit system on line side of conduit to the system.

C. Install separate ground conductors in pvc raceway.

D. Install grounding conductors to permit shortest path from equipment to ground. When grounding conductor runs through metallic conduit, bond to conduit at entrance and exit with a bolted clamp.

E. Install a separate equipment grounding conductor in each conduit containing feeder conductors.

F. Install a green equipment grounding conductor in conduits serving receptacles and special purpose outlets.

G. Connections shall be accessible for inspection and checking. No insulation shall be installed over ground connections.

H. Ground connection surfaces shall be cleaned and connections shall be made so that it is impossible to move them.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 SCOPE

A. Provide equipment for the support of electrical equipment as detailed or indicated on the drawings and as specified herein.

1.03 APPLICABLE STANDARDS AND CODES

A. National Electrical Contractors Association (NECA), Standard of Installation.

B. National Electrical Manufacturers Association (NEMA).

C. American National Standards Institute (ANSI).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Kindorf.

B. Midland-Ross Corp.

C. Steel City/Midland-Ross Corp.

D. Unistrut.

E. B-Line.

F. Power-Srut.

2.02 GENERAL

A. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

2.03 SUPPORT STRUCTURES

A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.

B. Weld sections, do not use bolts.

PART 3 - EXECUTION

3.01 PREPARATION

A. Install hangers, supports, and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 SUPPORT OF CONDUIT

A. Fasten conduit to structural parts of building in a manner acceptable to Engineer.

B. Do not use perforated hanger iron.

C. See section 36 05 33.

D. Install concrete insert channel, with spacings as recommended by manufacturer. Install with anchor and caps, insert joiner clips and closer seals.

E. Support conduit as follows:
   1. Single Conduit Runs:
      a. Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for exposed conduit and conduit on exterior walls.
      b. Horizontal Surfaces: Galvanized, heavy duty, 2 hole steel pipe straps.
   2. Multiple Conduit Runs:
      a. Vertical Surfaces: Horizontal or vertical rack channel with conduit straps.
      b. Horizontal Surfaces: Single or double rack channel trapeze, with conduit straps and supported with threaded hanger rods.
   3. Conduits Passing Between Floors and Through Roof:
      a. 1¼" and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.
      b. Conduit extending through roof shall pass through a ceiling box at roof lines.
      c. Provide 14-gauge minimum copper box with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
      d. Conduit and pitch pocket shall be installed in advance of roofing work.

END OF SECTION

SECTION 26 05 33
CONDUITS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Drawings and General Provisions of Contract, General and Supplementary Conditions, and Division 1 Specifications, apply to this Section

1.02 SCOPE

A. Provide conduit systems for power wiring and communications systems as specified. Flexible, modular-wiring systems shall not be used.

1.03 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 05 26 - Grounding

1.04 QUALITY ASSURANCE

A. National Electrical Contractor's Association (NECA) Standard of Installation.

B. National Electrical Code (NEC) including local supplements.

PART 2 - PRODUCTS

2.01 CONDUIT FITTINGS - GENERAL

A. Fittings for metal raceways shall be steel, and shall be zinc galvanized or cadmium plated.

B. Fittings for PVC raceways shall be of the type recommended by the raceway manufacturer.

C. Do not use aluminum or die cast fittings.

D. Do not use malleable iron.

E. Do not use running threads.

F. Do not use indentor type fittings.

G. Box connector bushings shall have insulated throats. Integral grounding lugs shall be provided where required by code or detailed on the drawings and elsewhere in the specifications.

H. Termination bushings for conduits that terminate in free air, as at cable trays, communications backboards, in electrical vaults, and in electrical manholes.

I. For conduits carrying conductors rated 50 volts and below and where no ground connection is required. Termination bushings may be push-on, non-metallic, insulating type as manufactured by Arlington Industries, Inc. Equivalent products by other manufacturers are acceptable.

J. For conduits carrying conductors rated 50 volts and below where a ground connection is required provide termination bushings with insulated throats and integral grounding lugs.

K. For conduits carrying conductors rated 51 volts and above. Termination bushings shall have insulated throats. Integral grounding lug shall be provided where required by code or required on the drawings and elsewhere in the specifications.

2.02 GALVANIZED RIGID CONDUIT (GRC) AND INTERMEDIATE METAL CONDUIT (IMC)

A. Manufactured lengths, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings.
1. Threaded.
2. Liquid tight.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Standard lengths and size.

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings. Compression type. With steel bodies and steel nuts. (Cast fittings NOT acceptable).

2.04 POLYVINYL CHLORIDE CONDUIT (PVC)

A. Standard lengths and sizes.

B. Minimum size ½ inch with the exception that the minimum size conduit for underground site lighting circuits shall be 1 inch.

C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC-2 standards, UL listed, and as required by NEC. Sunlight resistant.

D. Rated for 90 degrees C. cable.
1. Connectors and couplings.
2. Schedule 40 or 80, to match conduit.
3. Expansion Fittings: PVC material, Carlon series E945 or equivalent.
4. Expansion Straps: PVC material, Carlon series E978 or equivalent.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Heavy wall, sunlight resistant, PVC jacket.

D. Minimum size ½ inch.

E. Connectors and couplings.
1. Liquid tight.
2. Grounding type.
3. Suitable for wet locations.
4. Tapered threaded hub.
5. Non-metallic materials.

2.06 FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Minimum size ½ inch with the exception that 3/8 inch diameter may be used to serve individual lighting fixtures installed in a suspended accessible ceiling system.

D. Connectors and couplings.
1. Threaded.
2. Grounding type.
3. Insulated throat.
4. Two screw clamp type with locknuts.
5. Externally Secured.

2.07 EXPANSION FITTINGS

A. Copper bonding jumper, Crouse-Hinds Type XJ.

2.08 EXPANSION/DEFLECTION FITTINGS

A. Copper bonding jumper, Crouse-Hinds Type XD.

2.09 CONDUIT BODIES

A. Galvanized or cadmium plated.

B. Threaded hubs.

C. Removable cover, with gasket.

D. Corrosion-resistant screws.

2.10 SEALS

A. Link Seal type as manufactured by Thunderline Corporation.

PART 3 - EXECUTION

3.01 GENERAL

A. Requirements.
1. Seal conduits that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.

2. Install conduit expansion fittings with bonding jumper in following locations:
   a. Conduit runs which cross a structural expansion joint.
   b. Conduit runs where movement perpendicular to axis of conduit may be encountered.
3. Locate junction boxes, conduit bodies, and other access covers so as to be accessible to electrical wiring.
4. Cut joints shall be square, reamed smooth, and drawn up tight.
5. Keep conduit plugged, clean, and dry during construction. Before wire pulling begins, pull cleaning plug through conduits to clear of dirt, oil, moisture, and other debris.
6. Install #12 AWG pull wire in empty conduit.
7. Cap spare conduits.
8. Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal.
9. Route conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members except conduit runs routed concealed in poured-in-place concrete floor slabs may be run in a direct line from source to load.
10. Make bends and offsets without kinking or destroying smooth bore of conduit. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.
11. Conduit runs that extend through areas of different temperature or atmospheric conditions shall be sealed, drained, and installed in a manner that prevents drainage of condensed or entrapped moisture into cabinets, and equipment enclosures.
12. Conduits shall be routed at least 12” from parallel to steam lines, hot water pipes, flues, or high temperature piping or ducts shall not be closer than 12 inches and not be closer than 12 inches clear when crossing same.
13. Conduit shall not be routed over boiler, incinerator, or other high temperature equipment.
14. Where conduits must cross or follow the same path as water, steam or other fluid piping, electrical conduits shall be installed above, not below, piping.
15. Install bushings with ground lugs and integral plastic linings at equipment with open-bottom conduit entrances.
16. Feeder conduits shall contain only those conductors constituting a single feeder circuit.
17. Feeder conduits shall follow most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation.
18. Feeder conduits shall not be routed in conduit floor slabs.
19. Confine feeder conduit to insulated portions of building, unless otherwise specified.
20. Trapped feeder conduit runs without facilities for continuous drainage are not acceptable.

3.02 CONDUIT LOCATION REQUIREMENTS

A. Interior conduits for wiring systems rated 50 to 600 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
   1. Conduits in poured concrete construction shall be IMC or GRC regardless of size.
   2. Flexible conduit where required by other paragraphs in this section.
   3. Unless otherwise restricted by codes.
   4. Conduits installed in hazardous locations shall be GRC.
   5. Conduits in corrosive locations shall be PVC coated GRC.
   6. Conduits in security locations shall be IMC or GRC.
   7. Conduits in wet locations shall be IMC or GRC.

8. Interior conduits for wiring systems rated 0 to 50 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
9. Conduits in poured concrete construction shall be IMC or GRC regardless of size.
10. Flexible conduit where required by other paragraphs of this section.
11. Unless otherwise restricted by codes.
12. Conduits installed in hazardous locations shall be GRC.
13. Conduits in corrosive locations shall be PVC coated GRC.
14. Conduits in security locations shall be IMC or GRC.
15. Conduits in wet locations shall be IMC or GRC.

B.

C. Conduits containing only electrical service bare copper grounding conductors shall be schedule 40 HW PVC.

D. Conduit connections at motors, transformers, and other equipment that vibrates:
1. Flexible metal conduit between 18 inches and 3 feet long for conduit connections at equipment that vibrates.
2. Liquid-tight flexible metal conduit where flexible connections are required and where conduit is exposed to moisture, dirt, fumes, oil, corrosive atmosphere. Locate so it is least subject to physical abuse. Corrosive areas are identified on the floor plans.
3. Use double locknuts and insulated bushings with threads fully engaged.

E. Conduit connections at ceiling recessed light fixtures. Provide flexible steel conduit whips between an independent junction box mounted above ceiling and the recessed ceiling mounted lighting fixtures. Allow for positioning of equipment to tile increments. Maximum length of whip shall be six feet.

F. Install conduct expansion fittings for all conduits crossing expansion joists.

3.03 FLEXIBLE CONDUITS

A. Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit and prevent entrance of moisture.

3.04 CONCEALMENT

A. Unless specifically noted otherwise, conduits shall be routed concealed in finished spaces and shall not be visible at any point within the finished space or from the building's exterior. This requirement also applies to new conduits installed in existing construction.

B. Exposed raceway may be used on remodeling projects only where physically impossible to route concealed in existing construction. In cases where exposed conduit is allowed it shall be equivalent to Wiremold 500 or 700 series as dictated by the wiring quantities. In each case the specific raceway type and routing shall be submitted to the Architect for approval. Where allowed, the general installation requirements are as follows:
1. Raceways shall be routed horizontally along the corners of walls and ceilings, above edges of base molding at floors, or along the tops of window and door frames.
2. Raceways shall be routed vertically along corners of adjacent walls and along the edges of window and door frames.
3. Raceways shall not be routed down or across open wall surfaces except in portions of runs not exceeding 12 inches in length.

4. Raceways shall be painted to match wall finishes. EC is responsible for painting of raceways.
5. Fittings and boxes used with raceways shall be specifically designed and approved for use with the raceways.

C. At the contractor's option, conduits may be installed concealed below basement floor slabs or below slabs on grade.

D. Conduits may be routed exposed in mechanical equipment rooms and utility rooms.

3.05 SUPPORTS

A. Raceways installed concealed in the stud space of hollow, stud and drywall partitions shall be fastened to steel studs with spring steel clips. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions. Conduit supports utilizing tie wires shall not be used.

B. Interior surface mounted conduits attached to walls:
1. Raceways 1 ¼" diameter and smaller. One hole support straps.
2. Raceways 1 ½" diameter and larger. Two hole straps.
3. Light gauge steel framing fastened to wall surface with conduits fastened to steel framing using two piece conduit clamps.

C. Interior surface mounted conduits attached to underside of structural ceilings and roofs:
1. Two hole support straps.
2. Light gauge steel framing fastened to ceiling surface with conduits fastened to steel framing using two piece conduit clamps.
3. Where underside of roof structure consists of steel trusses, joists, beams, etc., spring steel clips for supporting raceways will be allowed. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions.

D. Interior conduit runs suspended from the underside of structural ceilings and roofs:
1. Single Conduit Runs: Threaded rod fastened to structure with conduit attached to rod utilizing steel, yoke type support.
2. Multiple Conduit Runs: Horizontal light gauge steel framing suspended from structure with threaded rods, minimum two per frame, in a trapeze configuration. Conduits fastened to steel framing using two piece conduit clamps.

E. Exterior, wall mounted, surface raceways. Cast zinc, one hole strap with back plate to stand raceway off wall surface 3/8" minimum.

F. Provide riser clamps around conduits 1-1/4 inch or larger that are routed between floors.

G. Conduits shall not be supported by, or attached to the suspension systems for dropped ceiling systems unless specifically detailed on the drawings.

H. Secure conduits in place with malleable corrosion-proof alloy straps or hangers.

I. The use of perforated strapping as a conduit hanging method is not acceptable.

J. The use of tie wires to support conduits is not acceptable.

3.06 FIRESTOPPING

A. Provide firestopping at conduit penetrations through fire rated construction in accordance with Section 26 05 00.

3.07 CUTTING AND PATCHING

A. Provisions for openings, holes, and clearances through walls, floors, ceilings, and partitions shall be made in advance of construction.

B. Provide cutting, patching and painting necessary for the installation of electrical systems.

C. Where conduits need to penetrate concrete or masonry construction install 22 gauge galvanized steel pipe sleeves, 1 inch larger in diameter than the conduit being installed. Sleeves shall extend 2 inches above the floor slab or wall penetrated. Install sleeves before walls or slabs are poured or constructed.

D. Provide drawings indicating size and location of anticipated floor sleeves for the installation of electrical conduits.

3.08 ADJUSTMENT AND CLEANING

A. Restore damaged areas on PVC jacketed, rigid conduit with spray type touch-up coating compound or as recommended by manufacturer.

3.09 CONDUIT SYSTEMS

A. Where raceway systems are required, separate raceway systems shall be provided for each wiring system as follows:
   1. 208 volt normal power wiring systems.
   2. 480 volt normal power wiring systems.
   3. Fire alarm systems.

END OF SECTION

SECTION 26 05 33.1
ELECTRICAL BOXES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 SCOPE

A. Provide electrical boxes in accordance with this specification.

1.03 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

C. Section 26 27 26 - Wiring Devices

D. Section 26 05 29 - Supporting Devices

E. Section 26 05 26 - Grounding

1.04 QUALITY ASSURANCE

A. Reference Standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PART 2 - PRODUCTS

2.01 INTERIOR WALL OUTLET BOXES - FLUSH MOUNTED

A. Stamped steel, four inch square, 2-1/8" deep minimum, with square corners. Provide with raised device rings, height to match wall finish thickness. Mounting accessories. Larger width boxes shall be provided for ganging requirements indicated on plans.

2.02 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DRY LOCATION

A. Stamped steel, four-inch square, 2-1/8" deep, with round corners. Provide rounded corner raised box covers with openings for devices being installed. Refer to section 16111 for restrictions on exposed conduit systems.

2.03 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DAMP OR WET LOCATION

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to Section 26 05 33 for restrictions on exposed conduit systems.

2.04 ELECTRICAL BOXES IN CORROSIVE LOCATIONS

A. PVC coated cast steel boxes compatible with conduit system installed. Coating shall cover both interior and exterior surfaces. See floor plans for identification of corrosive areas.

2.05 SPECIAL BOXES

A. Provide special boxes and other devices where standard outlets are not applicable.

2.06 GENERAL PURPOSE JUNCTION AND PULL BOXES

A. Fabricate from code gauge galvanized steel, with covers held in place by corrosion resistant machine screws.

B. Size shall conform to code requirements for number of conduits and conductors entering and leaving box.

C. Provide with welded seams, where applicable, and equip with corrosion-resistant nuts, bolts, screws, and washers.

D. Provide safety chain between cover and enclosure for boxes 24” or larger.

E. Boxes to be sized per NEC 314.

2.07 WEATHERPROOF JUNCTION AND PULL BOXES

A. Stainless steel or cadmium plated malleable iron cast type with threaded hubs, cast cover, and neoprene gasket.

2.08 BETWEEN STUD BOX SUPPORT BRACKETS

A. Stamped and fabricated steel bracket designed to support 4" or 4-11/16" electrical boxes between wall studs.

B. Manufactured by Erico, RBS series or equivalent.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install electrical boxes, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices.

B. Seal conduit at entrance to weatherproof boxes for interior and exterior locations exposed to weather or moisture.

C. Install knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes to provide access to electrical wiring. Relocate boxes rendered inaccessible by the installation of work by other trades.

E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers.

G. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum 12 inches.

H. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

I. Do not burn conduit holes, use knock-out punches, or hole saws.

J. Use "no-bolt" studs where required.

K. Use handy boxes only where specifically detailed on the drawings.

L. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings within the box. Do not use box extensions to create additional volume to meet NEC requirements for the number of conductors contained in a box.

3.02 EXPOSED OUTLET AND JUNCTION BOXES

A. Install weatherproof outlet and junction boxes outdoors and in areas where drawings show weatherproof (WP) wiring devices.

3.03 INTERIOR OUTLET BOX ACCESSORIES

A. Provide outlet box accessories for each installation, including but not limited to: mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes being used and meeting requirements of individual wiring situations.

3.04 OUTLET BOX LOCATIONS

A. Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to a minimum.

B. Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified and shall be determined by:
1. Construction or code requirements.
2. Conflict with equipment of other trades.
3. Equipment manufacturer's drawings.

C. Where receptacles and communications outlets are shown grouped next to each other on the drawings, the boxes for these outlets shall be mounted next to each other and shall not be located according to stud spacings. The Contractor shall utilize between stud box supports to assist in mounting boxes proximal to one another on a consistent spacing between wall studs.

D. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in.

E. Mounting heights for devices and equipment to be measured from finished floor to centerline of device.

END OF SECTION

SECTION 26 24 16
ELECTRICAL PANELBOARDS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 SCOPE

A. Provide panelboards as shown on the drawings and as specified herein.

1.03 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

C. Plans

1.04 SUBMITTALS

A. Shop drawings.
   1. Electrical ratings, and breaker type listing.
   2. Product data sheets with installation instructions.

B. Operating and Maintenance manuals.
   1. Field quality control test results.
   2. Operating and maintenance data.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Existing equipment is manufactured by Square D. New equipment must match existing.

2.02 PANELBOARD UL LISTED SHORT CIRCUIT INTEGRAL EQUIPMENT RATINGS

A. Match existing

PART 3 - EXECUTION

3.01 INSPECTION

A. Revise existing panelboards as required to accommodate the work of this project. Provide new breakers as required that match existing.

B. Monitor construction of other trades so that no material is installed over the top or in front of the switchboard in violation of code required working clearances.

C. Start work only after unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Install in each panelboard a revised typewritten directory accurately indicating rooms and equipment being served.

3.03 FIELD QUALITY CONTROL

A. Balance load among feeder conductors.

B. Unbalance shall not exceed ± 7½% of computed average load per phase.

C. Energize each circuit and check for correct function.

3.04 ADJUSTMENT AND CLEANING

A. Adjust doors and operating mechanisms for free mechanical movement.

B. Tighten lugs and bus connections.

C. Thoroughly clean enclosure inside and outside of dust and debris before final acceptance.

END OF SECTION

SECTION 26 24 19
MOTOR CONTROL CENTERS (MCC)

1.01 GENERAL

1.02 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.03 SCOPE

A. Revise existing motor control center as indicated on the drawings and as specified herein.

1.04 RELATED WORK

A. Section 26 27 26 - Motor and Circuit Disconnects

B. Section 26 05 26 - Grounding

C. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

1.05 QUALITY ASSURANCE

A. REQUIREMENTS OF REGULATORY AGENCIES
   1. National Fire Protection Association (NFPA). NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.
   2. Underwriters' Laboratories, Inc. (UL). UL-845.
   3. Local Codes and Ordinances.

B. REFERENCE STANDARDS
   1. National Electrical Manufacturers Association (NEMA), NEMA ICS-2-322.

1.06 SHOP DRAWING SUBMITTALS

A. Not required

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Existing equipment is Square D company.

2.02 MATERIAL AND EQUIPMENT

A. Match existing equipment on site.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which motor control centers are to be revised and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 IDENTIFICATION

A. Provide revised nameplates on feeder termination compartment indicating MCC designation and voltage.

B. Provide nameplates on motor starter compartments indicating load served. Nameplates shall identify loads by HVAC or plumbing designations. Do not use motor numbers indicated on the electrical plans. Revise existing nameplates as required.

3.03 INSTALLATION

A. Install and wire where shown in accordance with NEC, manufacturer's written instructions, and with recognized industry practices.

3.04 ADJUSTMENT AND CLEANING

A. Clean MCC equipment and enclosures of dirt and debris.

3.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle equipment carefully to prevent internal components damage, breakage and denting and scoring the enclosure finish. Do not install damaged equipment.

B. Store equipment in a clean, dry space and protect from dirt, fumes, water, construction debris and physical damage.

C. After installation, protect from damage by work of other trades.

END OF SECTION

SECTION 26 27 02
EQUIPMENT CONNECTIONS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 01 shall govern work in this section.

1.02 DESCRIPTION

A. Provide power and selected control wiring for equipment including (but not limited to):
   1. HVAC motors and panels.

B. Coordinate equipment requirements with the HVAC Contractors and Owner. Review the drawings and specifications to determine extent of wiring, starters, devices, and other equipment required.

1.03 RELATED WORK AND REQUIREMENTS

A. Section 26 05 33 - Conduits

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

C. Section 26 27 28 - Motor and Circuit Disconnects

PART 2 - PRODUCTS

A. Not Used.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, match conductors of the electrical connection for proper interface between the electrical supply and the installed equipment.

B. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

C. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

D. Cover splices with electrical insulation equivalent to, or of a higher rating than, insulation on the conductors being spliced.

E. Prepare wire by cutting and stripping covering insulation properly to ensure a uniform and neat appearance where wires are terminated.

F. Trim wires to be as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.

G. Provide flexible conduit for electrical equipment connections where subject to movement and vibration.

H. Provide liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration and one or more of the following conditions:
   1. Exterior location:
      a. Moist or humid atmosphere where condensate can be expected to accumulate.
      b. Subject to water spray.
      c. Subject to dripping oil, grease or water.

I. Install cord set where connection with attachment plug is indicated, specified, or required.

J. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

K. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

L. Install disconnect switches, controllers, control stations and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

3.02 HVAC AND PLUMBING CONNECTIONS

A. Provide power wiring including circuitry carrying electrical energy from panelboard or other source through starters and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide wiring between packaged control panels and motors. Include starters disconnects and overload protection if not included in packaged control panels.

B. Provide connection to variable frequency drives, (VFD furnished by others) to include wiring from the drive to the motors and interconnecting of included isolation transformers. VFD and transformer setting by Division 23.

C. Provide 120 volts to each temperature control panel.

D. Unless otherwise specified, electrical motors and control devices including (but not limited to) aquastats, float and pressure fan powered VAV boxes, switches, electropneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished, installed and wired by Contractor supplying the devices.

E. Each motor terminal box shall be connected with a maximum 18" piece of liquid-tight flexible nonmetal conduit to a fixed junction box. A green wire run through the flexible conduit shall interconnect the motor frame and the rigid conduit system. Use Liquidtight flexible non-metal conduit for connections.

F. Check for proper rotation of each motor.

END OF SECTION

SECTION 26 27 28
MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.02 SCOPE

A. Provide disconnect switches for the disconnection of motorized equipment and other equipment required by the national and state electrical codes and as specified herein. Code required disconnects shall be provided for all equipment unless included with equipment provided by others. Verify requirements with other trades.

1.03 RELATED WORK

A. Section 26 05 26 - Grounding

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

C. Section 26 05 19.4 - Motor Wiring

D. Section 26 24 19 - Motor Control Centers

1.04 SHOP DRAWING SUBMITTALS

A. Enclosure dimensions, nameplate nomenclature, electrical ratings, and fuse and breaker type listing.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not store exposed to weather.

B. Protect against damage from work of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Square D

2.02 DISCONNECT RATINGS

A. UL listed short circuit rating. 200,000 RMS amps with Class R fuses.

2.03 SAFETY SWITCH CONSTRUCTION

A. Twenty amp, one pole, non-fusible.
   1. Toggle type operator.
   2. Toggle guard capable of locking switch in the on or off position.
   3. Rated 1HP at 120 volts AC.

B. Switches for 250 volt or 600 volt equipment
1. NEMA heavy duty Type HD.
2. Horsepower rated or as indicated on drawings
3. Dual cover interlock.
4. Visible blades.
5. Provisions for control circuit interlock.
6. Pin type hinges.
7. Tin plated copper current carrying parts.
8. Quick make and break operator mechanism.
9. Handle attached to box, not cover.
10. Handle position indication, ON in up position and OFF in down position.
11. Padlock provisions for up to three padlocks in OFF position.
12. UL listed lugs for type and size of wire specified.
13. Spring reinforced fuse clips for Type R fuses where fusible disconnect is indicated or required.
14. Provisions for insulated neutral.
15. Disconnect feeder grounding kit.
16. Service listed.

2.04 ENCLOSURES

A. Indoor. NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.

B. Outdoor. NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.

C. Corrosive Areas. NEMA 4X Type 304 stainless steel with brushed finish.

2.05 NAMEPLATES

A. Engraved laminated plastic type. Identify specific name of equipment served.

B. Letters 3/16” high.

C. White letters on black background.

D. Identify per equipment controlled.

2.06 SPARE FUSES

A. Furnish owner with one complete set (3) of spare fuses for each size.

PART 3 - EXECUTION

3.01 GENERAL

A. Provide disconnect switches for loads required by code. Review HVAC and Plumbing specifications to determine what equipment is furnished with disconnect switches. Install disconnect switches whether furnished under this contract or not. It is the Electrical Contractor’s responsibility to determine the need for a disconnect switch requirements for each specific load. The contractors shall include in their bid code required disconnect switches whether indicated on the drawings or not.

B. Provide label on inside of disconnect cover identifying the types of fuses to be used.

3.02 GROUNDING

A. If disconnect concentric knockouts are used, the contractor shall provide a grounding bushing or other means to insure ground continuity. Concentric knockouts are not listed for grounding continuity.

B. If disconnect is utilized as service disconnect. Provide service grounding kit, label as service disconnect and provide UL Listing for service disconnect.

3.03 INSPECTION

A. Examine area to receive disconnect for adequate clearance for installation.

B. Start work only after unsatisfactory conditions are corrected.

3.04 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Locate disconnect switches as shown on drawings or required by NEC.

C. Install on equipment support where feasible, or anchor firmly to wall or structural surface.

D. Provide control circuit interlock required by NEC.

3.05 ADJUSTMENT

A. Adjust covers and operating mechanism for free mechanical movement.

B. Verify overcurrent protection to provide proper operation and compliance with NEC.

C. Tighten wire and cable connections.

D. Thoroughly clean enclosure inside and outside of dust and debris before final acceptance.

E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 28 00
LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.02 SCOPE

A. Provide overcurrent devices of the sizes and interrupting ratings as shown on the drawings and as specified herein.

1.03 RELATED WORK AND REQUIREMENTS

A. Section 26 24 16 - Electrical Panelboards

B. Section 26 24 19 - Motor Control Centers (MCC's)

1.04 SUBMITTALS

A. SHOP DRAWINGS
   1. Device dimensions, nameplate nomenclature and electrical ratings.
   2. Product data sheets with installation instructions.
   3. Time current characteristics curves for each size and type of device.

B. OPERATING AND MAINTENANCE DATA
   1. As specified in Section 26 05 00.
   2. Manufacturer's instructions for replacing parts, performing cleaning, and operating and maintaining circuit breakers.
   3. Repair parts lists.

C. TEST REPORTS
   1. Report of field tests.
   2. Record of circuit breaker settings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. FUSES
   1. Bussmann, Gould Shawmut, and Little Fuse

B. MOLDED CASE CIRCUIT BREAKERS
   1. Square D

2.02 250 VOLT FUSE TYPES

A. Class RK-1, one end rejection or to fit mountings specified. 0-600 ampere, 200,000 ampere interrupting rating. Equivalent to Bussmann Low-Peak. LPN-R, dual element, time delay with short circuit protection for motor, transformer, welder, feeder and main service protection.

2.03 600 VOLT FUSE TYPES

A. Class RK-1, one-end rejection or to fit mountings specified, 0-600 ampere, 200,000 ampere interrupting rating. Equivalent to Bussmann Low-Peak. LPS-R, dual element, time delay with short circuit protection for motor, transformer, welder, feeder and main service protection.

B. Class L, bolt-in, 601-6,000 amperes, 200,000 ampere interrupting rating. Equivalent to Bussmann HI-CAP. KRP-C, time delay for overload and short circuit protection for motor, transformer, feeder and main service protection.

C. Class CC, fast acting, single element, 0-30 amperes, 200,000 ampere interrupting rating. Equivalent to Bussmann Limitron KTK-R standard non-rejection, UL listed for motor control circuits, lighting ballasts, control transformers and street lighting fixtures.

2.04 LIGHTING PANEL CIRCUIT BREAKERS

A. Match existing equipment on site.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Overcurrent protection devices by same manufacturer.

C. Verify all breakers are tightened to manufactures recommended torque values.

D. Fuses shall not be installed until equipment is ready to be energized.

3.02 ADJUSTMENT

A. Adjustable settings on circuit breakers shall be set to provide selective coordination, proper operation and compliance with NEC. Follow manufacturer’s recommendations and set all breakers as required

3.03 FIELD QUALITY CONTROL

A. Test and permanently record the following:
   1. Fuses.
   2. Equipment nameplate requirement.
   3. Actual fuse rating.

B. Circuit Breakers:
   1. Nameplate data.
   2. Actual trip setting.

END OF SECTION