RFB NO. 309010

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. 309010
CHILLER PROJECT
PUBLIC SAFETY BUILDING
115 W. DOTY ST.
MADISON, WISCONSIN

Opening Date / Time: **THURSDAY, MAY 7, 2009 / 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. 309010

PROCUREMENT AND CONTRACTING REQUIREMENTS

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DRAWINGS

To be printed to correct scale or size, plot sheets on 36” x 48” paper.

T100 – Title Sheet
ME000 – Abbreviations, Symbols & Overall Plans
ME100 – Partial Penthouse Plans - HVAC
ME200 – Details & Schedules

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders / proposers wishing to submit a bid / proposal must be a registered vendor with Dane County & pay an annual registration fee. Complete a Vendor Registration Form at www.danepurchasing.com, or obtain one by calling 608/266-4131.

DANE COUNTY BEST VALUE CONTRACTORS REGISTRATION PROGRAM

All bidders wishing to submit a bid must be registered with Dane County Public Works Engineering Division. Complete the Registration Form in this RFB, or obtain one at www.co.dane.wi.us/pwht/pwengineer.aspx.

EQUAL BENEFITS REQUIREMENT

The Contractor hereby acknowledges that a condition of this Contract is to provide equal benefits as required by Dane County Code of Ordinances Chapter 25.016. Contractor hereby certifies that it will 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

LEGAL NOTICE

INVITATION TO BID

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

2:00 P.M., THURSDAY, MAY 7, 2009

REQUEST FOR BID NO. 309010

CHILLER PROJECT – PUBLIC SAFETY BUILDING
115 WEST DOTY STREET
MADISON, WI 53703

A pre-bid tour is scheduled for **Thursday, April 30, 2009 at 10:00 A.M.** Meet in Room 315 of the City-County Building, 210 Martin Luther King, Jr. Blvd., Madison, WI. Attendance is strongly advised.

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.

All Bidders wishing to submit Bids should be a registered vendor with Dane County & pay an annual registration fee. Complete Vendor Registration Form at www.danepurchasing.com or obtain one by calling 608-266-4131.

PUBLISH: APRIL 23 & 30, 2009 - WISCONSIN STATE JOURNAL

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 is scheduled on April 30, 2009 at 10:00 AM at the City-County Building, 210 Martin Luther King Jr. Blvd., Madison in Room 315. Attendance by all bidders is optional, however bidders and subcontractors are strongly encouraged to attend.

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 Opening. Bidders shall bring inadequacies, omissions or conflicts to Owner or Architect / Engineer's attention at least ten (10) days before Bid Opening. 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 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.

      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 Opening.

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 Opening. 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 Opening, 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 Opening 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 Opening.

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 Opening 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 Opening. 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 Opening 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 Opening.

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

10. METHOD OF AWARD - RESERVATIONS

A. Following will be basis of award of Contract, providing cost does not exceed amount of funds then estimated by County as available to finance Contract(s):
   1. Lowest dollar amount submitted by qualified responsible bidder on Base Bid for all work comprising project, combined with such additive Owner accepted alternates.

   2. Owner reserves right to reject all bids or any bid, to waive any informality in any bid, and to accept any bid that will best serve interests of County.

   3. Unit Prices and Informational Bids will not be considered in establishing low bidder.

11. SECURITY FOR PERFORMANCE AND PAYMENTS

A. Simultaneous with delivery of signed Contract, Bidder shall be required to furnish Performance and Payment Bonds as specified in Article 29 of General Conditions of Contract, "Contract Security". Surety Company shall be licensed to do business in Wisconsin. Performance and Payment Bonds must be dated same date or subsequent to date of Contract. Performance and Payment Bonds must emulate information in Sample Performance and Payment Bonds in Construction Documents.

B. Provide certified copy of power of attorney from Surety Company showing that agent who signs Bond has power of attorney to sign for Surety Company. Secretary or Assistant Secretary of company must sign this certification, not attorney-in-fact. Certification must bear same or later date as Bond. Power of Attorney must emulate model power of attorney information detailed in Sample Performance and Payment Bonds.

C. If Bidder is partnership or joint venture, State certified list, providing names of individuals constituting partnership or joint venture must be furnished. Contract itself may be signed by one partner of partnership, or one partner of each firm comprising joint venture, but Performance and Payment Bonds must be signed by all partners.

D. If Bidder is 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.

12. 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.

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. All bidders are encouraged to submit their bids in special printed bid envelope available at Dane County Public Works, Highway & Transportation Department - Public Works Engineering Division. Bids submitted in any other type of envelope run risk of not being identified as bid and County shall not be liable therefore in any respect. Bids shall be signed, sealed and delivered at place and before time of closing designated in Invitation to Bid, and identified with project name, bid number, location, category of work being bid upon, Bid Opening date, name and address of bidder.

G. Bidder shall be responsible for sealed Bid being delivered to place designated for Bid Opening 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. Descriptions of requested Alternate Bids are as set forth in Construction Documents.

16. 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".

17. WORK BY OWNER

A. This work will be accomplished by Owner or will be let under separate contracts and will not be included under this Contract:
   1. The County will be performing all electrical work for the project. Coordinate electrical requirements with Facilities Maintenance. All electrical work shall comply with local, state and national codes. All electrical work shall be done in a timely fashion to facilitate project completion.

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 Opening.

PROJECT NAME: _____

_____

BID NO.: _____ BID OPENING DATE: _____

BIDDER INFORMATION

COMPANY NAME: _____

ADDRESS: _____

_____

TELEPHONE NO.: _____

CONTACT PERSON: _____

FORM B

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - INVOLVEMENT

Page ___ of ___
(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

BID FORM

BID NO. 309010
PROJECT: CHILLER PROJECT
PUBLIC SAFETY 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 of water cooled chillers and associated work as specified. 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

ALTERNATE BID 1 - LUMP SUM:
Add price for material and labor complete to provide a new network controller.

_____ and _____ /100 Dollars
Written Price

$_____
Numeric Price (circle: Add or 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 August 1, 2009. Assuming this Work can be started by May 25, 2009, what dates can you commence and complete this job?

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

Name of Bidder: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Contact Person: _____

SIGNATURE: _____
(Bid is invalid without signature)

BID CHECK LIST:
These items **must** be included with Bid or completed **before** bidding
☐ Bid Form ☐ Bid Bond ☐ Fair Labor Practices Certification
☐ Best Value Qualified Contractor ☐ Vendor Registration

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
Kathleen M. Falk

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 prequalification 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 15 days of any changes to its business or operations that are relevant to the prequalification application. Failure to do so could result in suspension, revocation of the contractor's prequalification, debarment from County contracts for up to three 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 or subcontractors of any tier attain prequalification status with Dane County if the contractor has current Executive Order 108 precertification status with the State of Wisconsin.
- Contractors who employ less than five (5) apprenticeable trade workers are not required to prequalify.
- 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, prequalified 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 and listed at: dwd.wisconsin.gov/apprenticeship/executive_order108.htm?	Yes: ☐ No: ☐
16	Is your firm exempt from being prequalified 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 prequalified with the County or become so ten days prior to commencing work?	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:

JOHN SCHRAUFNAGEL
EMAIL: SCHRAUFNAGEL@CO.DANE.WI.US
OFFICE: (608)266-4798, CELL: (608)575-3374, 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

EQUAL BENEFITS REQUIREMENT

The Contractor hereby acknowledges that a condition of this Contract is to provide equal benefits as required by Dane County Code of Ordinances Chapter 25.016. Contractor hereby certifies that it will 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

COUNTY OF DANE

PUBLIC WORKS CONTRACT

Contract No. _____ Bid No. 309010

Authority: Res. _____, 2009-10

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 furnish and install the Chiller Project in the Public Safety Building ("the Project"); and

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

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

1. CONTRACTOR agrees to construct, for the price of $_____ the Project and at the CONTRACTOR'S own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence labor, insurance, and other accessories and services necessary to complete the Project in accordance with the conditions and prices stated in the Bid Form, General Conditions of Contract, the drawings which include all maps, plats, plans, and other drawings and printed or written explanatory matter thereof, and the specifications therefore as prepared by JDR Engineering (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 General Conditions of Contract,

and to make payments on account thereof as provided in Article entitled, "Payments to Contractor" of the General Conditions of Contract.

3. During the term of this Contract, CONTRACTOR agrees to take affirmative action to ensure equal employment opportunities. The CONTRACTOR agrees in accordance with Wisconsin Statute 111.321 and Chapter 19 of the Dane County Code of Ordinances not to discriminate on the basis of age, race, ethnicity, religion, color, gender, disability, marital status, sexual orientation, national origin, cultural differences, ancestry, physical appearance, arrest record or conviction record, military participation or membership in the national guard, state defense force or any other reserve component of the military forces of the United States, or political beliefs. Such equal opportunity shall include, but not be limited to, the following: employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, training, rates of pay, and any other form of compensation. CONTRACTOR agrees to post in conspicuous places, available to all employees and applicants for employment, notices setting forth the provisions of this paragraph.

4. CONTRACTOR shall file an Affirmative Action Plan with the Dane County Contract Compliance 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.

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:	

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.

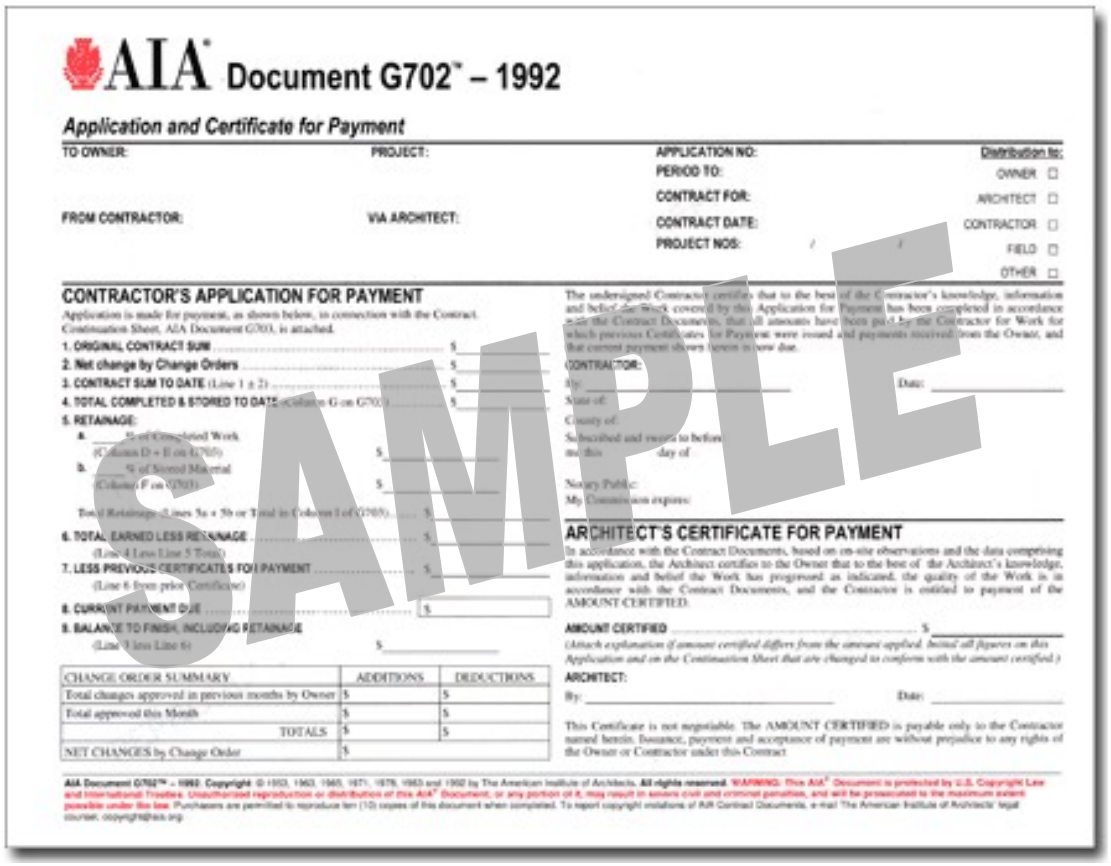
51. WISCONSIN LAW CONTROLLING

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 Manager 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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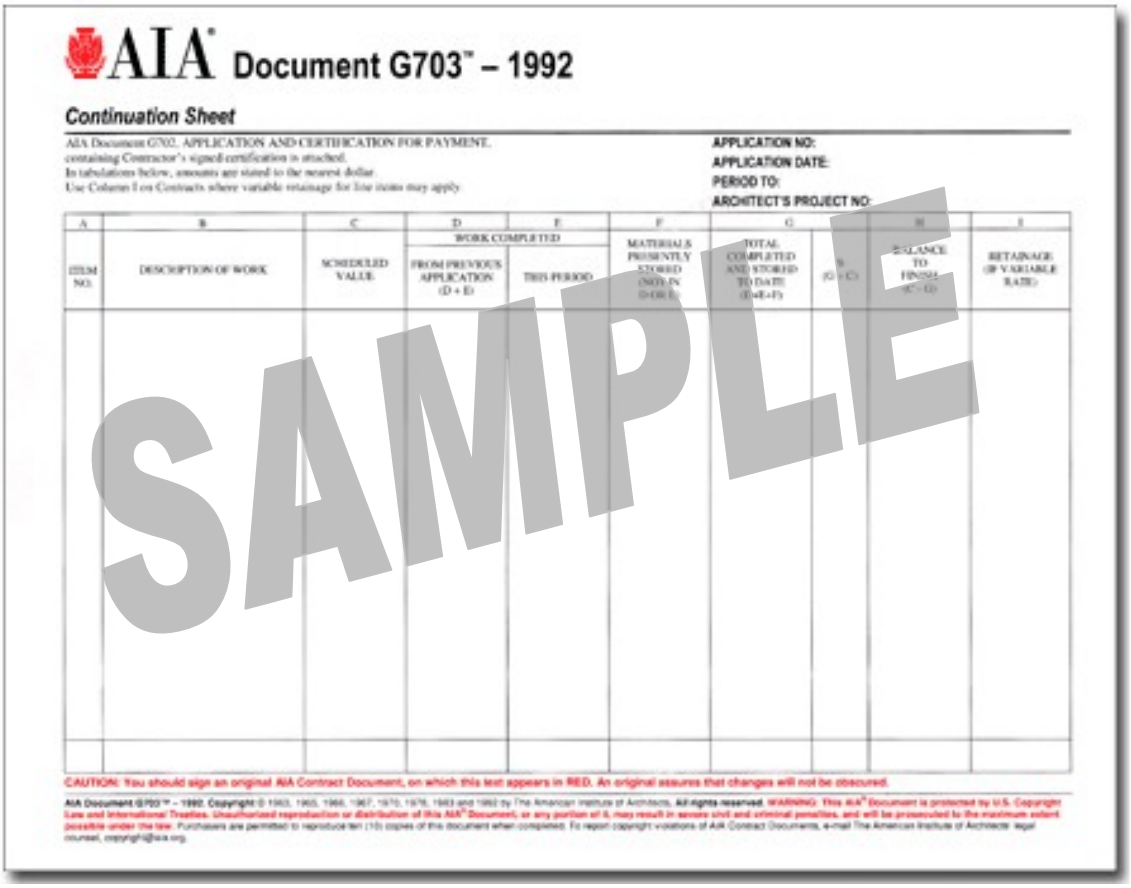

AIA Document G703™ – 1992

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	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED: FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED: THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)	BALANCE TO FINISH (C – G)	RETAINAGE (IF VARIABLE RATE)

SAMPLE

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

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2. PREVAILING WAGE RATE DETERMINATION

A. 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. 200900795 is added to General Conditions of Contract.

B. These State of Wisconsin forms, hereinafter set forth in this section, shall be filled out and submitted to Department of Public Works, Highway & Transportation:
   1. Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination (ERD-5724)
   2. Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination (ERD-10584)
   3. Disclosure of Ownership (ERD-7777)
   4. Request To Employ Subjourneyperson (ERD-10880)

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

Prime Contractor Affidavit of Compliance With Prevailing Wage Rate Determination

NOTICE REQUIRED UNDER Section 15.04(1)(m), Wisconsin Statutes. Authorization for this form is provided under Sections, 66.0903(9)(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. Personally identifiable information may be used for secondary purposes.

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

State Of))SS County Of)	Project Name	
	Project Number	Determination Number
	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) 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 of 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 or Business				
Street Address or P O Box	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
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 ( ) -		
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) 266-0028

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

Agent or Subcontractor Affidavit of Compliance With Prevailing Wage Rate Determination

NOTICE REQUIRED UNDER Section 15.04(1)(m), Wisconsin Statutes. Authorization for this form is provided under Sections, 66.0903(9)(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. Personally identifiable information may be used for secondary purposes.

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

State Of))SS County Of)	Project Name	
	Project Number	Determination Number
	Date Determination Issued	Date of Subcontract
	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) 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 all of 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 contractor.

Name of Corporation, Partnership, Sole Proprietorship or Business				
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) 266-0028

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

Disclosure of Ownership

Notice required under Section 15.04(1)(m), Wisconsin Statutes. The statutory authority for the use of this form is prescribed in Sections 66.0903(12)(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.

(1) On the date a contractor submits a bid to or completes negotiations with a state agency or local governmental unit, on a project subject to Section 66.0903 or 103.49, Wisconsin Statutes, the contractor shall disclose to such state agency or local governmental unit 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), 103.49(2) and 103.50(2), Wisconsin Statutes.

(3) This form must ONLY be filed, with the state agency or local governmental unit 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 hours worked in excess of the prevailing hours of labor, to any employee at any time within the preceding three (3) years.

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) 266-0028

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

Request To Employ Subjourneyperson

Personal information you provide may be used for secondary purposes. [See Section 15.04(1)(m), Wisconsin Statutes for details.] The use of this form is mandatory. The authority for the use of this form is prescribed in Section DWD 290.025, Wisconsin Administrative Code. The penalty for failing to complete this form is prescribed in Section 103.005(12), 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 utilize a subjourneyperson(s) on the following public works project, in accordance with the provisions of Section DWD 290.025, Wisconsin Administrative Code.

1. Name of Public Works Project	
County	**City, Village or Township**
Determination Number	**Project Number**

2. Name of Employee (Last, First and Initial)	**P.O. Box or Street Address**	**City**	**State**	**Zip Code**	**Date of Birth**	**Journey Classification**

3. Name of Employer (Print)	**Name of Person Making Request (Print)**		
P O Box or Street Address	**City**	**State**	**Zip Code**
Telephone Number **( ) -**	**Title of Requestor**		

READ CAREFULLY: I fully understand that this request is ONLY applicable to the project and employee(s) listed above and that such employee(s) will ONLY work under the direction of and directly assist a skilled trades employee by frequently using the tools of a skilled trades employee and will NOT regularly perform the duties of a general laborer, heavy equipment operator or truck driver. If the employee(s) indicated above regularly perform(s) the work of a different trade or occupation, he/she will be compensated for such work at the applicable journeypersons prevailing wage rate. I agree not to employ any employee as a subjourneyperson on this project until I receive written confirmation from the DWD. After such confirmation is received, I will compensate the employee(s) indicated above in strict accordance with the directions received from the DWD.

Signature of Requestor _____ Date Signed _____

MAIL COMPLETED REQUEST TO Equal Rights Division, Labor Standards Bureau, P. O. Box 8928 Madison WI 53708.
You may call (608) 266-6860 if you need assistance in completing your request

Jim Doyle
Governor

Roberta Gassman
Secretary

Jennifer A. Ortiz
Division Administrator

EQUAL RIGHTS DIVISION
201 East Washington Avenue, Room A300
P.O. Box 8928
Madison, WI 53708
Telephone: (608) 266-6860
Fax: (608) 267-4592
TTY: (608) 264-8752
http://www.dwd.state.wi.us/

State of Wisconsin
Department of Workforce Development

DEPARTMENTAL ORDER

ROBERT J. NEBEL, ASSOC PUBLIC WORKS DIR
DANE CO PUBLIC WORKS
1919 ALLIANT ENERGY CTR WAY
MADISON, WI 53713

RE: CHILLER PROJECT
CITY OF MADISON, DANE CO. WI
Determination No. 200900795 Project No. 309010

The application which you filed or was filed on your behalf, by the person copied below, for a prevailing wage rate determination applicable to the above-referenced project has been received.

A survey was conducted to determine the prevailing wage rate for the trade(s) or occupation(s) needed to complete the project. The findings of the survey are set forth in the enclosed 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 in which the project is located, you have the right to request the department to conduct an administrative review regarding such wage rate.

Your request must be made, in writing, within 30 days from the date indicated below and at least 10 days before the date a construction contract(s) is to be awarded or negotiated. Your request must also include wage rate information on at least three (3) similar projects located in the city, village or town where the proposed project is located on which some work was performed by the contested trade(s) or occupation(s) during the current survey period and which was previously considered by the department in issuing the enclosed determination. See s. DWD 290.10 of the Wisconsin Administrative Code and either s. 66.0903 (3)(br) or s. 103.49 (3)(c), Stats. for a complete explanation of the administrative review process.

Now, therefore, it is hereby ORDERED that the prevailing wage rates set forth in the enclosed determination shall only be applicable to the above referenced project. This ORDER shall be deemed a FINAL ORDER of this department unless a timely request for an administrative review is filed with the department or a construction contract(s) is not awarded or negotiated before the determination's expiration date.

DATED

4/21/2009

Enclosures

FOR THE DEPARTMENT

Dave Newman, Investigator
Labor Standards Bureau
Construction Wage Standards Section
(608) 266-2832

PREVAILING WAGE RATE DETERMINATION

Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Stats.
Issued On: 4/21/2009

DETERMINATION NUMBER: 200900795

EXPIRATION DATE: Prime Contracts MUST Be Awarded Or Negotiated On Or Before 12/31/2009. If NOT, You MUST Reapply.

DESCRIPTION OF PROJECT: CHILLER PROJECT
PROJECT NO: 309010

LOCATION OF PROJECT: CITY OF MADISON, DANE CO. WI

CONTRACTING AGENCY: DANE CO PUBLIC WORKS

CLASSIFICATION: Contractors are required to call the Department of Workforce Development if there are any questions regarding the proper trade or classification to be used for any worker on a public works project.

OVERTIME: Time and one-half must be paid for all hours worked over 10 hours per day and 40 hours per calendar week and for all hours worked on Saturday, Sunday and the following six (6) 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.

FUTURE INCREASE: If indicated for a specific trade or occupation, the full amount of such increase MUST be added to the "TOTAL" indicated for such trade or occupation on the date(s) such increase(s) becomes effective.

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, whenever such pay is applicable.

SUBJOURNEY: Wage rates may be available for some of the classifications indicated below with the exception of laborers, truck drivers and heavy equipment operators. Any employer that desires to use any subjourney classification on this project MUST request the applicable wage rate from this department PRIOR to the date such classification is used on this project. Form ERD-10880 is available for this purpose.

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.

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Acoustic Ceiling Tile Installer	27.51	13.48	40.99
Future Increase(s): Add $2.25/hr on 6/1/2009; Add $2.25/hr on 5/31/2010.			
Boilermaker	30.69	16.87	47.56
Bricklayer, Blocklayer or Stonemason	30.61	14.10	44.71
Future Increase(s): Add $1.90 06/01/2009; Add $1.95 05/31/2010			
Cabinet Installer	24.10	0.00	24.10
Carpenter	27.51	13.48	40.99
Future Increase(s): Add $2.25/hr on 6/1/2009; Add $2.25/hr on 5/31/2010.			
Carpet Layer or Soft Floor Coverer	27.51	13.48	40.99
Future Increase(s): Add $2.25/hr on 6/1/2009; Add $2.25/hr on 5/31/2010.			

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Cement Finisher	28.43	12.94	41.37
Drywall Taper or Finisher Future Increase(s): Add $1.60/hr on 6/1/09	25.30	12.15	37.45
Electrician Future Increase(s): Add $1.70/hr on 6/1/2009; Add $1.70/hr on 6/1/2010.	31.00	16.80	47.80
Elevator Constructor	42.73	16.47	59.20
Fence Erector	17.35	2.32	19.67
Fire Sprinkler Fitter	35.69	14.27	49.96
Glazier	34.48	7.17	41.65
Heat or Frost Insulator	30.63	16.66	47.29
Insulator (Batt or Blown)	22.07	11.30	33.37
Ironworker Future Increase(s): Add $2/hr on 6/1/2009; Add $2/hr on 6/1/2010.	30.30	15.77	46.07
Lather	26.11	12.86	38.97
Line Constructor (Electrical)	33.08	14.68	47.76
Marble Finisher	25.28	14.10	39.38
Marble Mason	31.60	14.10	45.70
Metal Building Erector	29.30	14.71	44.01
Millwright Future Increase(s): Add $2.25/hr on 6/1/2009; Add $2.25/hr on 5/31/2010.	29.11	13.48	42.59
Overhead Door Installer	25.04	13.01	38.05
Painter Future Increase(s): Add $1.60 on 6/1/09 Premium Pay: Add $.25/hr. sandblasting; Add $.40/hr. paperhanging; Add $1.00/hr. spray/structural steel.	25.00	12.15	37.15
Pavement Marking Operator	23.40	6.15	29.55
Piledriver Future Increase(s): Add $2.25/hr on 6/1/2009; Add $2.25/hr on 5/31/2010.	28.01	13.48	41.49
Pipeline Fuser or Welder (Gas or Utility)	29.58	14.64	44.22
Plasterer	25.28	12.91	38.19
Plumber	34.78	12.76	47.54
Refrigeration Mechanic Future Increase(s): Add $2.85/hr on 6/01/2009.	36.55	13.41	49.96
Roofer or Waterproofer	27.85	7.51	35.36
Sheet Metal Worker	32.01	17.79	49.80
Steamfitter Future Increase(s): Add $2.85/hr on 6/01/2009.	36.55	13.41	49.96
Teledata Technician or Installer Future Increase(s): Add $.90 on 6/1/09.	21.08	10.68	31.76
Temperature Control Installer	35.25	11.64	46.89
Terrazzo Finisher	27.98	13.20	41.18
Terrazzo Mechanic	29.46	13.41	42.87
Tile Finisher Future Increase(s): Add $1.65/hr on 6/01/2009; Add $1.65/hr on 5/31/2010.	22.93	13.45	36.38
Tile Setter Future Increase(s): Add $1.65 06/01/2009; Add $1.65 05/31/2010	28.66	13.45	42.11

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Tuckpointer, Caulker or Cleaner Future Increase(s): Add $1.90 6/01/2009; Add $1.95 05/31/2010	30.61	14.10	44.71
Underwater Diver (Except on Great Lakes)	33.50	11.84	45.34
Well Driller or Pump Installer	22.52	13.68	36.20
Siding Installer	24.75	9.18	33.93
Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	25.22	12.05	37.27
Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	29.12	16.00	45.12
Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	16.00	8.00	24.00
Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	21.50	11.00	32.50
Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	18.19	10.04	28.23
TRUCK DRIVERS			
Single Axle or Two Axle	17.00	0.66	17.66
Three or More Axle	17.50	11.83	29.33
Articulated, Euclid, Dumptor, Off Road Material Hauler Future Increase(s): Add $1.75/hr on 6/1/2009; Add $1.80/hr on 6/1/2010.	29.89	16.41	46.30
Pavement Marking Vehicle	20.06	11.55	31.61
Truck Mechanic	19.00	11.14	30.14
LABORERS			
General Laborer Future Increase(s): Add $1.60/hr on 6/1/2009; Add $1.65/hr on 5/31/2010 Premium Pay: Add $1.00/hr for certified welder; Add $.25/hr for mason tender	22.59	11.75	34.34
Asbestos Abatement Worker	22.06	12.40	34.46
Landscaper	23.25	5.38	28.63
Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	24.67	11.87	36.54
Fiber Optic Laborer (Outside, Other Than Concrete Encased)	17.06	12.65	29.71
Railroad Track Laborer	20.96	11.95	32.91
HEAVY EQUIPMENT OPERATORS SITE PREPARATION, UTILITY AND LANDSCAPING WORK ONLY			
Crane; Backhoe (Track Type); Tractor or Truck Mounted Hydraulic Backhoe; Gradall (Cruz-Aire Type); Mechanic or Welder; Bulldozer or Endloader; Grader or Motor Patrol; Scraper (Self Propelled or Tractor Drawn) 5cu yards or more capacity; Power Subgrader; Asphalt Milling Machine; Boring Machine (Horizontal, Vertical or Directional); Air Track, Rotary or Percussion Drilling Machine; Trencher; Post Hole Digger or Driver; Tug or Launch (not performing work on the Great Lakes)	28.59	16.45	45.04
Farm or Industrial Type Tractor; Greaser; Compactor (Self-Propelled); Broom or Sweeper; Environmental Burner Future Increase(s): Add $1.75/hr on 6/1/2009; Add $1.80/hr on 6/1/2010.	29.89	16.41	46.30
Crusher, Screening or Wash Plant; Air Compressor (400 CFM or Over); Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Skid Steer Loader (With or Without Attachments); Skid Rig; Stump Chipper;	26.52	17.08	43.60

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Mulcher; Vibratory Hammer or Extractor			
HEAVY EQUIPMENT OPERATORS EXCLUDING SITE PREPARATION, UTILITY, PAVING AND LANDSCAPING WORK			
Crane, Tower Crane or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons; Crane, Tower Crane or Derrick, With Boom, Leads and/or Jib Lengths Measuring 176 Feet or Over Future Increase(s): Add $2.00/hr on 6/1/2009; Add $2.05 on 6/1/2010. Premium Pay: Add $.50/hr for cranes with lifting capacity over 200 ton: Add $1.00/hr. at 300 ton; Add $1.50/hr at 400 ton; Add $2.00/hr at 500 ton.	32.12	16.41	48.53
Crane, Tower Crane or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under; Crane, Tower Crane or Derrick, With Boom, Leads and/or Jib Lengths Measuring 175 Feet or Under; Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of 130,000 Lbs. or Over; Traveling Crane (Bridge Type); Caisson Rig; Pile Driver; Dredge (Not Performing Work on the Great Lakes) Future Increase(s): Add $2.00/hr on 6/1/2009; Add $2.05/hr on 6/1/2010. Premium Pay: Add $.25/hr for cranes with lifting capacity of 45 ton or over.	31.12	16.41	47.53
Crane (Go-Devil Type) or Truck Mounted Hydraulic Crane (10 Tons or Under); Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs.; Tractor or Truck Mounted Hydraulic Backhoe; Gradall (Cruz-Aire Type); Mechanic or Welder; Bulldozer or Endloader; Grader or Motor Patrol; Scraper (Self Propelled or Tractor Drawn) 5 cu yards or more capacity; Concrete Pump, Grout Pump or Concrete Conveyor (Rotec or Bidwell Type); Concrete Breaker (Manual or Remote); Concrete Batch Plant; Power Subgrader; Concrete Spreader; Concrete Paver; Concrete Grinder or Planing Machine; Concrete Conveyor System; Concrete Slipform Placer; Curb and Gutter Machine; Roller (Over 5 Ton); Shouldering Machine; Boring Machine (Horizontal, Vertical or Directional); Air Track, Rotary or Percussion Drilling Machine; Straddle Carrier or Travel Lift; Forklift (Machinery Moving or Steel Erection); Manhoist or Elevator; Material or Stack Hoist; Trencher; Sideboom; Hydro-Blaster (10,000 PSI or Over); Post Hole Digger or Driver; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment Future Increase(s): Add $1.75/hr on 6/1/2009; Add $1.80/hr on 6/1/2010.	30.42	16.41	46.83
Farm or Industrial Type Tractor; Greaser; Compactor (Self-Propelled); Concrete Saw (Vermeer Type); Concrete Bump Cutter or Grooving Machine; Tining or Curing Machine; Roller (5 Tons or Under); Broom or Sweeper; Hoist (Tugger); Environmental Burner	23.40	6.15	29.55
Crusher, Screening or Wash Plant; Air, Electric or Hydraulic Jacking System; Air Compressor (400 CFM or Over); Generator (150 KW or Over); Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Skid Steer Loader (With or Without Attachments); Robotic Tool Carrier (With or Without Attachments); Skid Rig; Stump Chipper; Mulcher; Vibratory Hammer or Extractor	30.60	7.73	38.33
Oiler; Forklift Future Increase(s): Add $1.75/hr on 6/1/2009; Add $1.80/hr on 6/1/2010.	27.19	16.41	43.60
Gas or Utility Pipeline, Except Sewer and Water (Primary Equipment)	34.01	17.23	51.24
Gas or Utility Pipeline, Except Sewer and Water (Secondary Equipment) Future Increase(s): Add $1.60/hr on 6/1/2009; Add $1.60/hr on 6/1/2010; Add $1.60/hr on 6/1/2011.	27.12	15.80	42.92

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Fiber Optic Cable Equipment	21.84	14.55	36.39

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 most 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) 266-2832.

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

Each contractor, subcontractor or agent thereof performing work on a project that is subject to this section shall keep full and accurate records clearly indicating the name and trade or occupation of every person described in sub. (4) and an accurate record of the number of hours worked by each of those persons and the actual wages paid therefor.

Any contractor, subcontractor or agent thereof, 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 determinded under sub.(3), shall be liable to any affected employe in the amount of his or her unpaid wages or his or her unpaid overtime compensation and in an additional equal amount as liquidated damages. An action to recover the liability may be maintained in any court of competent jurisdiction by any employe for and in behalf of that employe and other employes similarly situated. No employe may be a party plaintiff to any such action unless the employe consents in writing to become such 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.

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

January 1, 2009

This list has been prepared in accordance with the provisions of s. 66.0903(12) 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. No state agency or local governmental unit 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
Bechitsao, Joel	See Tri-State Traffic Services, Inc.					
Custom Heating & Air LLC	283 Tony Lane, Green Bay, WI 54304	12/1/06	11/30/09	1, 2 and 4	2003 to 2004	None
D. C. Nevels Trucking, Inc. or D. C. Nevels Trucking	3246 North Sherman Blvd., Milwaukee, WI 53216	6/1/05	5/31/08	1, 2 and 4	2000-2002	None
Gibralter Construction LLC	N60 W15080 Bobolink Ave., Menomonee Falls, WI 53051	12/1/06	4/30/07	1	2005	None
HGI Painting	P. O. Box 3481, Janesville, WI 53545	11/1/04	10/31/07	1, 2 and 4	2001, 2002 and 2003	None
Hedding, Matt	C/O HGI Painting, P. O. Box 3481, Janesville, WI 53545	11/1/04	10/31/07	1, 2 and 4	2001, 2002 and 2003	None
Joseph Stoller Company	N8426 Hwy 42	2/1/2007	1/31/2010	1, 2	2004 and 2005	None

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Keiver, David	See Custom Heating & Air LLC	12/1/06	11/30/09	1, 2 and 4	2003 and 2004	None
Maria, Steve	See Gibralter Construction LLC					
Nevels, Betty	See D. C. Nevels Truckng, Inc.					
Nevels, Donald	See D. C. Nevels Trucking, Inc.					
Rick's Painting & Drywall	P. O. Box 2316, Eagle River, WI 54521	3/1/03	2/28/06	1	5/8/00 to 4/30/01	None
Stoller Enterprises LLC	N8426 Hwy 42, Algoma, WI 54201-9552	2/1/2007	1/31/2010	1 and 2	2005 to 2006	None
Stoller, Joseph	See Joseph Stoller Company					
Stoller, Patrick J.	See Stoller Enterprises LLC					
Strobel Construction, Inc..	P. O. Box 2316, Eagle River, WI 54521	3/1/03	2/28/06	1	5/8/00 to 4/30/01	None
Strobel, Diane	See Strobel Construction, Inc.					
Strobel, Rick	See Strobel Construction, Inc.					
Tri-State Traffic Services, Inc.	12555 West Burleigh Road #3, Brookfield, WI 53005	12/1/06	11/30/07	1, 2 and 4	2003-2004	None

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

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

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

B. Work by Owner: The County will be performing all electrical work for the project. Coordinate electrical requirements with Facilities Maintenance. All electrical work shall comply with local, state and national codes. All electrical work shall be done in a timely fashion to facilitate project completion.

C. 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.

B. Contractors will be escorted by Dane County Sheriff Deputy.

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 ALTERNATES

A. Alternates quoted on Bid Form shall be reviewed and accepted or rejected at the Owner's option.

B. Coordinate related work and modify surrounding work as required.

C. Schedule of Alternates:
1. Alternate Bid 1 - Network Controller.

Temperature Control Contractor shall provide a cost for material and labor complete to provide a new network controller to allow for the integration of all current Public Safety Building Direct Digital Control Point to the City/County Building central Building Automation System. This panel will be equal to a FX-60 integration panel. Extend Owner Ethernet to new panel and tie-in to Owner specified IP address for access from existing City/County Building BAS.

1.6 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.

1.7 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.

1.8 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.

1.9 PROGRESS MEETINGS

A. Owner shall schedule and administer meetings throughout progress of the Work at minimum of one (2) per month

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

1.10 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.

1.11 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.

1.12 SHOP DRAWINGS

A. Submit number of copies that Contractor requires, plus two (2) copies that shall be retained by Public Works Project Engineer.

1.13 PRODUCT DATA

A. Submit number of copies that Contractor requires, plus two (2) 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 PROTECTION OF INSTALLED WORK

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

1.21 PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. Limited parking shall be available at the Work site.

1.22 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 and will be apportioned among the various Contractors as their needs dictate with due regard for storage requirements of each Contractor. Each Contractor shall be responsible for safety of equipment and materials that are stored on site.

1.23 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 (8:00 am to 4:30 pm), but confer with Owner, schedule work and store materials so as to interfere as little as possible with normal use of premises. 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. Work shall be done and temporary facilities furnished so as not to interfere with access to any occupied area and so as to cause least possible interference with normal operation of facility or any essential service thereof.

C. Contractor shall, at all times, provide approved, safe walkways and facility entrances for use by Owner, employees and public.

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

E. 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.

F. 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.

1.24 PROTECTION

A. Contractor shall protect from injury all trees, shrubs, hedges, walks and driveways and pay for any damage to same resulting from insufficient or improper protection.

B. Guard Light: Contractor shall provide and maintain guard lights at all barricades, railings, obstructions in streets, roads or sidewalks and at all trenches adjacent to public walks or roads.

1.25 PROGRESS CLEANING

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

1.26 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.

1.27 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.28 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.

1.29 SUBSTITUTIONS

A. Public Works Project Engineer shall consider requests for Substitutions only up to seven (7) days prior to date of Bid Opening.

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.

1.30 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.

1.31 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.

1.32 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.

1.33 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.

1.34 ADJUSTING

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

1.35 OPERATION AND MAINTENANCE DATA

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

1.36 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.

1.37 AS-BUILT 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 as-built drawings in AutoCAD 2007 (or lower), manually drafted format and entire specification in Word 2000 (or lower) format on CD.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 74 19

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 01 00 00 - Basic Requirements

1.2 WASTE MANAGEMENT GOALS

A. Dane County requires that as many waste materials as possible produced as result of this project be salvaged, reused or recycled in order to minimize impact of construction waste on landfills and to minimize expenditure of energy and cost in fabricating new materials. Additional information may be found in 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 has recycling symbol (link) near top of page that 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 in above referenced web site. Statewide listings of recycling / reuse markets at available from Wisconsin Department of Natural Resources, www.dnr.state.wi.us/org/aw/wm/markets.

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

SCOPE

This section includes information common to 2 or more technical Specification Sections or items of a general nature, not conveniently fitting into other technical Sections. Included are the following requirements:

PART 1- GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Qualifications of Bidders
- Abbreviations
- Definitions
- Drawings
- Electronic Drawings
- Codes and Standards
- Continuity of Existing Services
- Protection of Finished Surfaces
- Owner Furnished Equipment and Work
- Provisions for Future
- Alternate Bid
- Submittals
- Specified Materials and Equipment
- Off Site Storage
- Certificates and Inspections
- Operating and Maintenance Instructions
- Training of Owner Personnel
- Record Drawings
- Project Closeout

PART 2- PRODUCTS
- Pipe Penetrations
- Identification

PART 3 - EXECUTION
- Demolition
- Concrete Work
- Cutting and Patching
- Painting
- Building Access
- Equipment Access
- Coordination of Work
- Pipe Penetrations
- Cleaning
- Identification
- Lubrication
- Project Closeout

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

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

Section 23 05 13 – Common Motor Requirements for HVAC Equipment
Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
Section 23 09 23 – Direct Digital Control Systems for HVAC
Section 23 33 00 – Air Duct Accessories

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in other Sections are as follows:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AGA	American Gas Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
EPA	Environmental Protection Agency
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract.

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

QUALIFICATIONS OF BIDDERS

Bidders must meet or exceed the following minimum requirements:

- Have been in business for a minimum of 3 years.

- Have satisfactorily completed a project having the following features:

  Water Cooled Chillers

- Has access to necessary equipment and has organizational capacity and technical competence necessary to do work properly and expeditiously,

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

ABBREVIATIONS

A/E	Architect/Engineer
GC	General Contractor
FPC	Fire Protection Contractor
PC	Plumbing Contractor
HC	Heating Contractor
EC	Electrical Contractor
TCC	Temperature Contractor
DDC	Direct Digital Controls
BAS	Building Automation System
TCS	Temperature Control System

DEFINITIONS

Furnish:

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

Install:

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

Provide:

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

DRAWINGS

Drawings show 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 Drawings. General and structural drawings shall take precedence. Because of the scale of Drawings, it is not possible to indicate all offsets, fittings and accessories required. Investigate structural and finish conditions affecting work and arrange work accordingly, providing offsets, fittings and accessories required to meet constructed conditions.

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.

ELECTRONIC DRAWINGS

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

CODES AND STANDARDS

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.

Non-Compliance:
If Contractor installs materials or performs Work that does not comply with above requirements, he shall correct Work and shall bear costs arising from correcting deficiencies.

CONTINUITY OF EXISTING SERVICES
Refer to Division 01 of the Project Manual.

Do not interrupt or change existing services (water, chilled water, condenser water, electrical) without prior approval from Facility Maintenance, County Public Works, Owner, Architect or Engineer. When interruption to existing services is required, interruption time shall be minimized and coordinated with Facility Maintenance, County Public Works and Owner to reduce disruption to building activities and occupants. Scope of Work is indicated on Contract Documents or described herein. Unless specifically stated, any work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES
Refer to Division 01 of the Project Manual.

Furnish 1 can of touch-up paint for each different color factory finish to be finished surface of product. Deliver touch-up paint with other "loose and detachable parts" as covered in General Requirements.

OWNER FURNISHED EQUIPMENT AND WORK
Drawings indicate equipment and work to be furnished or installed by Owner.

The owner (County) will provide all electrical work associated with the project. This contractor shall provide all electrical connection information, in submittal format (at same time as submission to A/E) for Chillers and Pumps to Facility Maintenance personnel and County Public Works.

PROVISIONS FOR FUTURE
Equipment and systems shall be sized for future expansion or extension when indicated on Contract Documents or described herein.

ALTERNATE BID
As part of Alternate Bid #1, Temperature Controls Contractor (TCC) shall provide a cost for material and labor complete to provide a new network controller to allow for the integration of all current Public Safety Building Direct Digital Control Point to the City/County Building central Building Automation System. This panel will be equal to a FX-60 integration panel. Extend Owner Ethernet to new panel and tie-in to Owner specified IP address for access from existing City/County Building BAS.

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

Shop Drawings are to be reviewed by HVAC contractor before submission to Engineer. Submittals shall be stamped by contractor and clearly indicate corrections made by contractor during review process. Submittals not reviewed and stamped by contractor will be automatically rejected.

Submit for equipment and systems specified in respective specification sections, marking each submittal with 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 Contract Documents. Include plan designation mark (i.e. "AHU-1") on submittals. Include dimensions, capacities, ratings, and installation instructions.

Before submitting electrically powered equipment, verify electrical power and control requirements for equipment are in agreement with motor schedule on HVAC/Electrical drawings. Include statement on Shop Drawing transmittal to Engineer if equipment submitted and motor schedules are not in agreement, indicating discrepancies.

Include wiring diagrams of electrically powered equipment.

SPECIFIED MATERIALS AND EQUIPMENT

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

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

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

EQUIPMENT INSTALLATION

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

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

Drawings show route of equipment access to Mechanical Penthouse.

OFF SITE STORAGE

Refer to Division 01 of the Project Manual.

CERTIFICATES AND INSPECTIONS

Refer to the General Conditions of the Contract.

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

OPERATING AND MAINTENANCE INSTRUCTIONS

Refer to Division 01 of the Project Manual.

Provide HVAC systems and equipment operation and maintenance manuals in accordance with requirements of Project Specifications.

Assemble material in 3-ring or post binders, using an index at front of each volume and tabs for each system or type of equipment. In addition to data indicated in General Requirements, include the following information:

- Copies of all approved shop drawings.
- Manufacturer's instructions for installation, operation, and maintenance.
- Manufacturer's wiring diagrams for electrically powered equipment.
- Records of tests performed to indicate compliance with system requirements (system start-up reports).
- Temperature control Record Drawings and control sequences.
- Parts lists for manufactured equipment.
- Valve schedules.
- Lubrication instructions, including list/frequency of lubrication done during construction.
- Warranties.
- Testing, adjusting and balancing data.
- Additional information as required in technical specification sections.

TRAINING OF OWNER PERSONNEL

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

Provide a total of 8 hours of training (minimum) over a total of 2 training sessions. Coordinate with Owner at least 2 weeks prior to scheduling training systems.

RECORD DRAWINGS

Refer to Division 01 of the Project Manual.

Maintain Record Drawings on daily basis to be turned over at completion of Project.

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

PROJECT CLOSEOUT

Refer to Division 01 of Project Manual.

Contractor shall complete and provide items and materials, training and start-up associated with project closeout as specified under Division 01 of Project Manual. In addition, Contractor shall provide the following items prior to acceptance of installation:

Final 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).

Submission of Operating and Maintenance instructions in accordance with the requirements of Division 1, of this Section, and code. Operation and Maintenance Manuals shall include a copy of completed testing, adjusting and balancing report for Owner's records.

Submission of start-up report for temperature control system, signed by technician in responsible charge of control system, indicating system has been adjusted, calibrated and put into operation in accordance with requirements of Temperature Controls Sections and code.

Submission of start-up report for chillers, signed by technician in responsible charge of installation and start-up, indicating system has been adjusted, calibrated and put into operation in accordance with requirements of Section 23 64 15.

PART 2 - PRODUCTS

PIPE PENETRATIONS

Fire, Smoke And Fire/Smoke Rated Surfaces:

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

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

UL listed or tested by independent testing laboratory, approved by State and Local Code jurisdictions. Use product that has a rating not less than rating of wall or floor being penetrated.

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

Non-Rated Surfaces:

Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.

In exterior wall openings below grade, use modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and cored opening or a water-stop type wall sleeve.

At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effect seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

IDENTIFICATION

Stencils:

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

Engraved Name Plates:

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

Valve Tags:
Round brass tags with ½ inch numbers, ¼ inch system identification abbreviation, 1¼ inch minimum diameter, with brass jack chains or brass "S" hooks around valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady.

Pipe Markers:
At least ¾ inch high legend for piping under 3 inch diameter and at least 2 inch high legend for piping 3 inch diameter and larger. Include flow arrows. Manufacturers: W.H. Brady Co., EMED Co. or Seton Name Plate Company.

PART 3 - EXECUTION

DEMOLITION
Perform demolition as specified on Drawings to accomplish new work.

Carefully examine present building and site, together with 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 necessary to accomplish arrangement indicated Drawings. To assist Contractor in meeting above requirements, Drawings note certain items, but absence of notes shall not limit responsibility of each Contractor to perform Work described in this Paragraph.

Where demolition work is to be performed adjacent to existing work that remains in an occupied area, provide measures to limit amount of contamination of 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 existing building occupants.

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

CONCRETE WORK
Provide all cast-in-place concrete pad extensions for this project. 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.

CUTTING AND PATCHING
Refer to Division 01 requirements.

Contractor shall be responsible for cutting and patching of existing general construction to accommodate installation of new HVAC system(s) and piping.

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

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

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

PAINTING

All new exposed piping (uninsulated piping located inside the building) shall be painted after installation with 1 coat of compatible metal primer coat and 2 coats of finish coat of paint for application.

Paint piping in accordance with the following color schemes:

Service	**Color**
Condenser water	Green

Piping systems shall be clearly identified after painting with pipe markings specified under the Paragraph titled Identification under this Section.

BUILDING ACCESS

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

Equipment access route to Mechanical Penthouse is shown on plans.

EQUIPMENT ACCESS

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

COORDINATION OF WORK

Coordinate work with other Facility Maintenance, Building Operators and County Public Works prior to installation. Installed work not coordinated and that interferes with other contractor's work shall be removed or relocated at installing contractor's expense.

Verify system completion prior to start of 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 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 starting, interlocking and control features of each system so test and balance agency can perform work. Provide appropriate sections of work with required wall, roof and floor opening locations and dimensions. If Contractor neglects to coordinate information, openings shall be the responsibility of Contractor.

PIPE PENETRATIONS

General:

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

CLEANING

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

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

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

Contractor shall leave his portion of Work in safe and clean condition ready for operation.

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

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with 1 coat of black enamel against light background or white enamel against dark background. Use primer where necessary for proper paint adhesion. Do not label equipment in occupied spaces (for example cabinet heaters and ceiling fans).

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

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

Identify all new 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 partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use 1 coat of black enamel against light background or white enamel against dark background.

Identify all new valves with brass tags bearing system identification and valve sequence number. Valve numbers shall be coordinated with existing building valve numbers. Consult Facility Maintenance for existing valve numbers. Provide typewritten valve schedule indicating existing and new valve numbers and equipment or areas supplied by each valve; turn schedules over to Facility Maintenance and locate copy in mechanical room and in each Operating and Maintenance manual. Updated schedules in mechanical rooms shall be framed under clear plastic.

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

LUBRICATION

Lubricate bearings with lubricant as recommended by manufacturer before equipment is operated for any reason. Once equipment has been run, maintain lubrication in accordance with manufacturer's instructions until Owner accepts Work. Maintain log of lubricants used and frequency of lubrication. Include information in Operating and Maintenance Manuals at completion of Project.

PROJECT CLOSEOUT

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

1

PROJECT CLOSEOUT SUBMITTAL DATA REQUIREMENTS			
Project Name:	**Public Safety Building Chiller**		
SPECIFICATION SECTION	**CLOSEOUT SUBMITTAL REQUIREMENT**		
23 05 00	• Record drawing submission		
	• Operation and maintenance manuals		
	• Owner training and instructional walk thru		
	• Valve identification charts		
	• Inspectors test reports (HVAC inspection reports and certifications		
23 21 13	Pressure test reports for:		
	• Above grade chilled water piping		
	• Above grade condenser water piping		
	•		
23 64 15	• Chiller Start Up Report		

2

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

SCOPE

Section includes requirements for single and 3 phase motors and motor starters used with equipment specified in other sections. Included are general requirements for electrical wiring and electrical connections. Included are the following requirements:

PART 1-GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Shop Drawings
- Operating and Maintenance Instructions
- Electrical Coordination and General Requirements
- Product Criteria

PART 2 - PRODUCTS
- Motors
- Motor Starters

PART 3 - EXECUTION
- Motor Installation
- Motor Starter Installation

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

Section 23 21 23 – Hydronic Pumps
Section 23 64 15 – Water Cooled Chillers

Division 26 - Electrical for power wiring, starter installation and other electrical devices

Electrical and temperature control wiring installation shall conform to requirements of applicable electrical sections of Specifications.

REFERENCE STANDARDS

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

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract.

SUBMITTALS

Submit Shop Drawings for motor connections. Include information with motor starter submittals on identification of motor starters.

Motor starter submittals shall show starter features and options, auxiliary contactors and installation instructions.

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

Submit wiring diagrams for motors, motor starters and HVAC equipment requiring wiring by the County for Project. Wiring diagrams shall be prepared by Contractor specifically for this Work.

OPERATING AND MAINTENANCE INSTRUCTIONS

Include manufacturer's instructions in manuals with specific equipment to which they apply. 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.

ELECTRICAL COORDINATION AND GENERAL REQUIREMENTS

Starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, push-buttons, pilot lights, and other devices required for control of motors or electrical equipment shall be furnished by HVAC Contractor and turned over for installation by the County, except as specifically noted elsewhere in this Division of Specifications.

Motor starters located in motor control centers, will be furnished by the HVAC Contractor and installed by the County.

Drawings and Specifications show number and horsepower rating of motors furnished by Contractor, with actuating devices if devices are furnished by HVAC Contractor. Should discrepancy in size, horsepower rating, electrical characteristics, or means of control be found for motors or other electrical equipment after contracts are awarded, Contractor is to immediately notify Engineer of discrepancy.

Costs involved in changes required due to equipment substitutions initiated by Contractor will be responsibility of the contractor. Refer to related comments in Section 23 05 00 – Common Work Results for HVAC, under Shop Drawings.

The County will provide line voltage power wiring.

HVAC contractor shall be responsible for providing control wiring (line and low voltage) for Project, including installation of low voltage interlock wiring.

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

Provide on front enclosure face of starting equipment, selector switches and push-buttons stations, securely mounted, laminated plastic engraved name plate identifying motorized equipment served by respective starter. Name tags shall be constructed of black and white plastic (black face and white lettering) with 1/4 inch high lettering. Lettering shall identify unit served by plan identification mark (example: "Exhaust Fan EF-1").

PRODUCT CRITERIA

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

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

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

All motors over 1 HP shall meet minimum efficiency requirements as specified under Wisconsin Code, COMM 63.1032 requirements (Table 63.1032). Coordinate with respective supplier(s) of motors for Project to meet minimum efficiency requirements. Note special minimum motor efficiencies as specified on Drawings or within Project Specifications.

Magnetic starters shall be equipped with adequate interlocks and relays for equipment control interlocking.

Flush mounting manual starters, selector switches and push-button stations shall be provided at locations in finished areas. Flush mounting units shall be equivalent to surface mounted type units specified herein. Flush mounting equipment shall include switch box and flush plate.

All 3 phase magnetic starters shall have an integral 60 hertz control power transformer with 2 primary and 1 secondary fuses. Operating coils shall be rated 115-120 volts 60 hertz. Size transformer to meet control circuit power requirements.

PART 2 - PRODUCTS

MOTORS

Single Phase, Single Speed Motors:

Use NEMA rated 120 volt, single phase, 60 hertz motors for motors 1/3 HP and smaller.

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 to be provided with internal overload protection.

Three Phase, Single Speed Motors:

Use NEMA rate 460 volt, 3 phase, 60 hertz motors for motors 1/2 HP and larger unless specifically indicated otherwise on Drawings or in specifications.

Use NEMA general purpose, continuous duty, Design B, normal starting torque, T-frame or U-frame motors with Class B or better insulation unless manufacturer of equipment on which 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 equipment sections or otherwise indicated on Drawings.

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 end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

Open drip-proof motors shall have a 1.15 service factor. Other motor types may have minimum 1.0 service factors.

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 values listed below when tested in accordance with NEMA MG1.

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
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4

	----Totally Enclosed Fan-Cooled----		
MOTOR	-------Nominal Motor Speed------		
HP	1200 rpm	1800 rpm	3600 rpm
10	91.7	91.7	91.7
15	92.4	92.4	91.7
20	92.4	93.0	92.4

MOTOR STARTERS

Manufacturers:

Models specified herein are based on Allen-Bradley starters and accessories. Equivalent units as manufactured by Square D, General Electric, or Cutler Hammer/Westinghouse are acceptable.

Manual Starters:

Manual starters shall be 2-pole type, compatible for use with single-phase motors and include overload protection, general purpose (NEMA 1) enclosure and toggle operation. Units shall have neon type pilot lights and "On-Off" or "Hand-Off-Auto" selector switched as specified on Drawing Schedule.

Manual starters: Bulletin 600-TAX5

Manual starters with pilot light: Bulletin 600-TAX109

Manual starters with "Hand-Off-Auto" selector switch: Bulletin 600-TAX9

Manual starters with "Hand-Off-Auto" selector switch and pilot light: Bulletin 600-TAX142

Magnetic Starters:

Magnetic starters shall be 3-pole type, compatible for use with 3-phase motors and include general purpose (NEMA 1) enclosure, reset button in front cover and overload and under-voltage protection. Include necessary control circuit transformers with fused protection and auxiliary contactors. Units shall be non-combination or combination type and have pilot light and "On-Off" or "Hand-Off-Auto" selector switches as specified on Drawing Schedule.

Magnetic starters (non-combination): Bulletin 509.

Magnetic combination type starters: Bulletin 513 with circuit breaker disconnect switch.

PART 3 - EXECUTION

MOTOR INSTALLATION

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

When motors are flexible coupled to driven device, mount coupling to shafts in accordance with coupling manufacturer's recommendations. Using dial indicator, check angular misalignment of 2 shafts; adjust motor position so angular misalignment of shafts does not exceed 0.002 inches per inch diameter of coupling hub. Again using dial indicator, check shaft for run-out for concentricity of shafts; adjust so run-out does not exceed 0.002 inch.

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

Lubricate motors requiring lubrication. Record lubrication material used and frequency of use. Include information in Maintenance Manuals.

MOTOR STARTER INSTALLATION (BY COUNTY)

Motor starting equipment shall be delivered to selected location on job site by this contractor and turned over to County for installation.

Motor starting equipment shall be clearly tagged and identified with respect to motor it serves.

Motor starters shall be installed in strict accordance with manufacturer's instructions and recommendations.

Verify proper rotation of each 3-phase motor as it is being wired or before motor is energized.

END OF SECTION

SECTION 23 05 23.10
HYDRONIC VALVES AND PIPING SPECIALTIES

PART 1 - GENERAL

SCOPE

This Section contains specifications for hydronic valves and piping specialties for HVAC hydronic piping systems on this Project. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- Valve Manufacturers
- Gate Valves
- Globe Valves
- Ball Valves
- Butterfly Valves
- Swing Check Valves
- Spring Loaded Check Valves
- Drain Valves
- Gauge Valves
- Triple Duty Valves
- Balancing Valves
- Flow Metering Devices
- Differential Pressure Meter
- Thermometers
- Thermometer Sockets
- Test Wells
- Pressure/Temperature Plugs
- Pressure Gauges
- Strainers
- Air Vents
- Suction Diffusers

PART 3 - EXECUTION
- General
- Shut-off Valves
- Swing Check Valves
- Spring Loaded Check Valves
- Drain Valves
- Triple Duty Valves
- Balancing Valves
- Flow Metering Devices
- Differential Pressure Meter
- Thermometers
- Thermometer Sockets
- Test Wells
- Pressure/Temperature Plugs
- Pressure Gauges

Strainers
Air Vents
Suction Diffusers

RELATED WORK

Provisions of Division 01 govern work under this Section.

Section 23 21 13 - Hydronic Piping
Section 23 07 00 – HVAC Insulation

REFERENCE STANDARDS

ASTM B650	Electro-deposited Engineering Chromium Coatings on Ferrous Substrates
ASTM E814	Fire Tests of Through-Penetration Fire Stops

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and General Conditions of the Contract.

SHOP DRAWINGS

Required for all items in this Section.

Submit schedule of valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for valves to be used on Project. Temperature and pressure ratings specified are for continuous operation.

Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this Section and on Drawings.

DESIGN CRITERIA

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

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

PART 2 - PRODUCTS

VALVE MANUFACTURERS

The following manufacturers and models are considered acceptable subject to compliance with specified requirements.

Standard Valves:

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

Specialty Valves:

Specialty valves are based on manufacturers and models specified under each section of valves, or as specified in the following list.

Triple Duty Valves: Armstrong, Bell & Gossett, Mueller, Taco, or Thrush-Amtrol.

Calibrated Balancing Valves: Armstrong, Bell & Gossett, Flowset, Mueller, Nibco, Taco, or Tour and Anderson.

GATE VALVES

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:

GLOBE VALVES

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

BALL VALVES

2" and Smaller:

Nibco T/S 585-70; 2- piece bronze body; threaded or soldered ends to match 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.

2½" and Over:

Ball valves will not be accepted in sizes over 2 inch.

BUTTERFLY VALVES

2" and Smaller:

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

2½" to 12":

Nibco LD Series, lug style with 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 valve for system shutoff. Valves shall be rated for dead-end service.

Provide 10-position lever actuators for valves 6" and smaller. Provide hand wheel, worm gear operators for valves 8" and larger.

SWING CHECK VALVES

2" And Smaller:

Nibco T413Y; bronze body, threaded ends, regrindable seat, renewable disc, teflon seat, 200 psig WOG, acceptable for installation in horizontal or vertical line with flow upward.

2½" And Larger:

Nibco F918B; cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, 200 psig WOG, acceptable for installation in horizontal or vertical line with flow upward.

SPRING LOADED CHECK VALVES

2" and Smaller:

Nibco T480; bronze, threaded, bronze trim, stainless steel spring, teflon seat unless only bronze available, 250 psig WOG.

2½" and Larger:
Nibco W910 Series; cast iron or semi-steel body, wafer style disk, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem, and 125 psig WOG. Valves with ductile iron in contact with working fluid will not be accepted.

DRAIN VALVES
Use 3/4 inch ball valve with threaded hose adapter, unless larger size valve is specified on Drawings. For drain valves used as blowdown valves on strainers, valve shall be same size as blowdown connection.

GAUGE VALVES
Use ¼" ball valves of brass, bronze or steel construction, 500 psig at not less than 300 degrees F.

TRIPLE DUTY VALVES

2 Inch and Larger:
Bell & Gossett Triple Duty Valve; Cast or ductile iron body, threaded or flanged or grooved end connections, stainless steel spring, bronze disc with EPDM seat, calibrated memory stop, backseating valve stem, inlet and outlet pressure tappings, capable of being repacked under full line pressure, rated for working pressure of 125 PSIG at 240 degrees F when used in hot water heating systems.

BALANCING VALVES

4" and Larger (Pipe Line):
Use butterfly valves as specified in this Section along with flow metering device PTFM-1.

FLOW METERING DEVICES

Pitot Tube Flow Meter (Ptfm-1):

Manufacturers:
Dieterich Standard/Annubar, Preso, or Taco.

Multi-port, averaging type, flow sensor designed to sense velocity of fluid flowing in pipe and produce pressure output proportional to fluid velocity. Sensor to consist of Type 316 stainless steel probe with diamond, elliptical, or round shape long enough to sense flow completely across pipe section and to accommodate insulation specified for pipeline; brass body gate, needle, or ball instrument connection valves with appropriate fitting for connection to meter; single forged steel weld type installation fitting for pipe sizes through 6 inch, double forged steel weld type installation fittings for use on opposite ends of sensor for larger pipe sizes if recommended by the manufacturer for the application; accurate within 1% of actual flow with turndown ratio of 10:1 or better; permanently stamped nameplate attached to sensor indicating the flow/differential pressure characteristics of sensor; rated use on systems to 150 PSIG at 250 degrees F.

DIFFERENTIAL PRESSURE METER

Manufacturers:
Barton Model 247A or Midwest Model 809.

Description:
Bellows type differential pressure meter kit that includes a 6 inch diameter gauge with a 270 degree arc having an accuracy of plus/minus 1% of full scale or better and rated for differential pressures of flow meters supplied for Project, over range protection on meter, color coded hoses not less than 10 feet in length with brass connectors rated for connection to low and high

pressure connections on balance valves, inline strainers, instrument valving so meter can be vented and drained, pressure and temperature rating at least equal to that of valves. Provide meter and accessories in durable case with carrying handle.

THERMOMETERS
Manufacturers:
Ashcroft, Marsh, Taylor, H.O. Trerice, U.S. Gauge, Weiss, Weksler.

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 end of stem is near middle of pipe without reducing thickness of insulation, red indicating fluid and black lettering against a white background having minimum increment of 2 degree F. Scale ranges shall be as follows:

Service	Scale Range, °F
Chilled Water	0 to 100
Condenser Water	30 to 130

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

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

PRESSURE/TEMPERATURE PLUGS
Provide Pete's Plugs, Fairfax or equal combination pressure/temperature sensing plugs. Plugs shall include ¼" NPT connection, Nordel valve core, cap and gasket. Plugs shall be rated for 250 degrees F and 200 PSIG. Provide 1 pocket test kit for 1 Project.

PRESSURE GAUGES

Manufacturers:
Ametek/U.S. Gauge Division, Ashcroft, Marsh, Taylor, H.O. Trerice, Weiss, Weksler.

Trerice No. 500X Series gauges, with flangless cast aluminum case, 4.5 inches in diameter, glass window, black lettering on white background, phosphor bronze bourdon tube with bronze bushings, recalibration from front of dial, accuracy shall be 1% of full scale over middle half of range, and 2% of full scale over remainder of range. Pressure gauge ranges shall be as follows:

Service	Scale Range (PSIG)	Minor Division (PSIG)
Chilled Water	0 - 100	1
Condenser Water	0 – 100	1

Pressure Snubbers:
Bronze construction, 300 PSI working pressure, ¼" size.

Gauge Valves:
Use valves as specified above.

STRAINERS
Manufacturers:
Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

Standard Water Systems:
Y Type; cast iron body; 304 stainless steel screens; bolted or threaded screen retainer tapped for 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 degrees F.

Screen perforations for strainers located at condenser water pumps shall be:

5" and larger	0.0331 inch perforations (20 mesh)

Screen perforations for strainers located at chilled water and condenser chiller inlets shall be:

5" and larger	0.0232 inch perforations (30 mesh)

AIR VENTS
Manual Type:
Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.

Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from system when vent is opened, rated at not less than 125 PSIG at 220 degrees F.

SUCTION DIFFUSERS
Manufacturers:
Amtrol, Armstrong Pumps, Bell and Gossett, Mueller or Taco.

Closed Systems:
Body constructed of cast iron, ductile iron or carbon steel; cast iron, steel or stainless steel straightening vanes; steel or stainless steel strainer; brass or bronze fine mesh startup strainer, strainer blowdown connection, inlet pressure gage connection, provisions for field supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 150 PSI working pressure at not less than 250 degrees F.

Open Systems:
Body constructed of cast iron, ductile iron or carbon steel; cast iron, stainless steel straightening vanes; stainless steel strainer; strainer blowdown connection, inlet pressure gauge connection, provisions for field supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 150 PSI working pressure at not less than 250 degrees F.

PART 3 - EXECUTION

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

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

Install temperature control valves.

Install valves with the stem in upright position. Valves installed with 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 horizontal position and provide chain wheel operator.

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

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

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

Install rotary shut-off valves in recommended flow direction.

SWING CHECK VALVES
Provide swing check valves where specified and detailed on Drawings.

SPRING LOADED CHECK VALVES
Install spring loaded check valve in each pump discharge line.

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

TRIPLE DUTY VALVES
Contractor may use triple duty combination shut-off, check, and balancing valves where separate shut-off valve, check valve, and balancing valve are specified or detailed in pump discharge piping.

Triple duty valves shall be sized according to manufacturer's recommendations.

BALANCING VALVES
Provide balancing valves for major equipment, individual terminal equipment, at the discharge of each pump and where indicated on Drawings and Details for balancing of hydronic systems.

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

FLOW METERING DEVICES

Pitot Tube Flow Meters:
Install where indicated on Drawings and Details for flow sensing in hydronic piping systems. Butterfly valves installed at location of flow sensing device shall include a memory stop.

DIFFERENTIAL PRESSURE METER
Handle as loose and detachable part as outlined in General Requirements.

Turn over portable meter at completion of balancing work.

THERMOMETERS
Stem Type:
Install in piping systems as specified on Drawings and Details using separable socket in each location. Thermometers shall be readable by person standing on floor.

Provide a thermometer for outside air, return air, mixed air, and supply air of each air handling unit.

Provide thermometer on inlet and outlet piping from hot water, chilled water, and condenser water piping entering or leaving chillers, boilers, and heat exchangers.

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

TEST WELLS
Install in piping system as specified on Drawings and Details wherever provisions are needed for inserting thermometer or DDC sensor at a later date.

PRESSURE/TEMPERATURE PLUGS
Install in piping systems as specified on Drawings and Details.

PRESSURE GAUGES
Install in locations where indicated on Drawings and Details, including gage piping, with scale range appropriate to the system operating pressures. Pressure gages shall be readable by person standing on floor.

Pressure Snubbers:
Install in gage piping for all gages.

Gauge Valves:
Install at each gage location as close to main as possible and each location where gage tapping is indicated.

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

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

AIR VENTS
Manual:
Install at high points where air may collect and not be carried by system fluid. Use soft Type L copper "pigtail" so vent can be positioned for venting and collecting water that might escape.

SUCTION DIFFUSERS
Install at each pump suction connection for end suction pumps where shown on Drawings. Provide space for removal of strainer. Install drain valve in the blowdown connection. Install support below the suction diffuser so the weight of suction piping does not rest on pump suction connection.

Install pressure gage across the suction diffuser, valved so single gage can be used to read pump discharge presssure, inlet pressure at the suction diffuser and the outlet pressure at the suction diffuser. Use gage valves as specified with gages.

Open drain valve and blowdown strainer after system cleaning. If unit is furnished with fine mesh startup strainer, remove strainer after the system has been flushed and cleaned just prior to testing and balancing.

On applications involving open systems, including, but not limited to cooling towers, remove fine mesh startup strainer prior to pump operation if suction diffuser includes a strainer.

END OF SECTION

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

PART 1 - GENERAL

SCOPE

This Section includes Specifications for supports of HVAC equipment and materials as well as duct and piping system hangers and anchors. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Description
- Submittals
- Design Criteria

PART 2 - PRODUCTS
- Structural Supports
- Pipe Hanger and Support Manufacturers
- Pipe Hangers and Supports
- Beam Clamps
- Pipe Hanger Rods

PART 3 - EXECUTION
- Installation
- Hanger and Support Spacing

RELATED WORK

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

Section 23 05 00 – Common Work Results for HVAC
Section 23 05 48.10 – Vibration Control
Section 23 07 00 – HVAC Insulation

REFERENCE STANDARDS

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

Federal Specification WW-H-171E

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract.

DESCRIPTION

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

Do not hang mechanical items directly from metal deck or run piping to rest on bottom chord of trusses or joists.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at hanger points; refer to Related Work above.

SUBMITTALS

Submit data in accordance with Section 23 05 00 and Division 1 of the Project Manual.

Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

DESIGN CRITERIA

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

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

Use galvanized hangers in lieu of black hangers in wet areas. Wet areas are spaces that normally can have water in them or that could have water during normal maintenance and repair. The latter area includes equipment rooms containing expansion tanks, boilers, chillers, water coils.

PART 2 - PRODUCTS

STRUCTURAL SUPPORTS

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

PIPE HANGER AND SUPPORT MANUFACTURERS

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

PIPE HANGERS AND SUPPORTS

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

Steel Piping Systems Operating At 250 degrees F or Less:

Hangers for Pipe sizes ½ inch through 2-1/2 inch: Carbon steel, adjustable clevis, black finish.

Grinnell Figure 65 or 260

Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.

Hangers for Pipe sizes 3 inches and over: Carbon steel, adjustable clevis, black finish.

Grinnell Figure 260

Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.

Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.

Grinnell Figure 46.

Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.

Wall Support: Welded steel bracket with hanger. Support shall be selected for the application.

Grinnell Figure 195/199 with hanger as specified above.

Floor Support for Pipe sizes up to 6 Inches": Cast iron adjustable pipe saddle, locknut nipple, and special cast iron reducer. Provide with steel support pipe and steel plate floor flange.

Grinnell Figure 264

Floor Support for Pipe sizes 8 Inches" and over: Adjustable cast iron pipe roll stand with cast iron base plate, stand, and roll and steel adjusting screws.

Grinnell Figure 274

Provide Grinnell carbon steel pipe covering protection saddle for each support location on insulated piping systems.

Floor Support for Pipe Elbow Risers: Steel pipe stanchion with steel support pipe and steel floor plate.

Grinnell Figure 63

Insulated Copper Pipe Support:

Hangers for Pipe sizes 4" and less: Carbon steel, adjustable clevis, black finish.

Grinnell Figure 65 with Grinnell Figure 167 insulation protection shield for each hanger.

Multiple or Trapeze Hangers: Steel channels with welded spacers, or unistrut with hanger rods.

Grinnell Figure 46 with Figure 167 insulation protection shield at each hanger location.

Vertical Riser Support: Carbon steel riser clamp with copper finish.

Grinnell Figure CT-121

Un-Insulated Copper Pipe Support:

Hangers for Pipe sizes 4 Inches and less: Carbon steel with copper finish and adjustable clevis.

Grinnell Figure CT-65

Vertical Riser Support: Carbon steel riser clamp with copper finish.

Grinnell Figure CT-121

BEAM CLAMPS

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, 1/2, and 5/8 inch diameter, for use with pipe sizes 4 inch and less. Furnish with hardened steel cup point set screw. Grinnell Figure 86.

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 1-1/2 inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Grinnell Figure 228.

PIPE HANGER RODS

Steel Hanger Rods:

Threaded both ends, threaded 1 end, or continuous threaded, black finish.

Size rods for individual hangers and trapeze support according to the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, not to exceed limits indicated.

Maximum Load (Lbs.)	Rod Diameter (Inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	11/4

Provide rods complete with adjusting and lock nuts.

Maximum temperature shall not exceed 650 degrees F.

PART 3 - EXECUTION

INSTALLATION

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

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

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

Piping over 1-1/4 inch shall be attached so weight is carried on top chord of steel bar joists or purlins.

HANGER AND SUPPORT SPACING

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

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

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain slope specified in piping section of Specification.

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”
Steel	5" and over	12' - 0"	15’ – 0”
Copper	½" through 1"	6' - 0"	10’ – 0”
Copper	1¼" and larger	10' - 0"	10’ - 0”

END OF SECTION

SECTION 23 05 48.10
VIBRATION CONTROL

PART 1 - GENERAL

SCOPE
This section includes Specifications for vibration isolation material for equipment, piping systems, and duct systems. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Quality Assurance
- Design Criteria
- Shop Drawings

PART 2 - PRODUCTS
- General
- Acceptable Manufacturers
- Vibration Isolation Equipment
- Flexible Piping Connections
- Performance

PART 3 - EXECUTION
- Installation
- Flexible Piping Connections

RELATED WORK
Provisions of Division 01 govern work under this Section.

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

QUALITY ASSURANCE
Substitution of Materials: Refer to Division 01 and 0 General Conditions of the Contract.

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

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.

Coordinate selection of devices with isolator and equipment manufacturers.

Creditwill not be given for inherent flexibility and vibration absorption characteristics of mechanical grooved pipe connections providing supporting calculations are submitted for approval.

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

PART 2 - PRODUCTS

GENERAL

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

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

ACCEPTABLE MANUFACTURERS

The following Manufacturers are considered acceptable subject to compliance with specified requirements listed below:

Amber/Booth Co.
Kinetics/ Peabody Noise Control
Korfund
Mason Industries
Vibration Eliminator Co.
Vibration Mounting & Controls

VIBRATION ISOLATION EQUIPMENT

Type 1: Neoprene Pad:
Neoprene waffle pad, 40 durometer with 16 gauge shims between layers.

Type 3: Unhoused Spring With Neoprene:
Combination freestanding, unhoused spring and neoprene with rib molded anti-friction base. Include leveling bolts for securing to equipment. Springs to be laterally stable under load and selected so they have an additional travel to solid equal to 50 percent of rated deflection. Use height saving brackets when appropriate to application. Spring diameters shall not be less than 0.8 inches of compressed height at rated load.

Type IB: Inertia Base:
Rectangular structural beam or channel form, designed to accommodate poured concrete fill for use as floating foundation. Include support for suction and discharge base ells for split case pump bases. Use perimeter steel members with minimum depth equal to 1/12 of longest dimension of base but not less than 6 inches; base depth need not exceed 12 inches unless specifically recommended by base manufacturer for mass or rigidity. Include concrete reinforcements consisting of steel angles or ½ inch bars welded in place on 6 inch centers running in 2 layers perpendicular to each other and 1-1/2 inch above bottom; provide additional steel if required by structural conditions. Furnish form with steel bolting templates and anchor bolt sleeves to receive equipment anchor bolts where anchor bolts fall in concrete locations. Use height saving brackets to maintain base clearance of at least 1 inch above floor or housekeeping pad.

FLEXIBLE PIPING CONNECTIONS

Rated for pressure, temperature, and fluid involved; minimum pressure rating of 125 PSIG at design temperature of fluid served by piping system. Use 12 inch minimum line length of flexible hose or length required to absorb 3/4 inch lateral movement, whichever is greater.

Manufacturers:
Flexonics, Mason, Mercer Rubber, Metraflex, or Proco.

Water:
Multiple plies of nylon tire cord fabric reinforced with EPDM cover and liner. Do not use steel wire or rings as pressure reinforcement. Use threaded or soldered connections for sizes 2 inches and

smaller and floating steel or ductile iron flanges for sizes 2-1/2 inches and larger; design steel flange end steel flange is recessed to lock steel wire bead ring in raised face of EPDM flange. Construct straight-through connections with twin spheres. Use control rods when recommended by manufacturer.

PERFORMANCE

Select vibration isolation devices as specified below or to provide not less than 95 percent isolation efficiency, whichever is greater.

	---------- Floor Span or Column Spacing----------							
	--On Grade--		---20 Feet---		---30 Feet---		---40 Feet---	
TYPE OF EQUIPMENT	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.	Iso. Type	Min. Static Defl. In.
Modular Chillers								
Rotary Screw	1	0.10	1	0.10	1	0.10	1	0.10
Pumps, Flexible Coupled	Grout to pad		3-IB	0.75	3-IB	1.50	3-IB	1.50

PART 3 - EXECUTION

INSTALLATION

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

Set steel and inertia bases for a 1 inch clearance between concrete floor or housekeeping pad and base.

Provide concrete fill for inertia bases in accordance with inertia base manufacturer’s recommendations.

Do not allow installation practices to short circuit isolation devices.

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

FLEXIBLE PIPING CONNECTIONS

Provide flexible piping connections for equipment specified to have vibration isolation devices installed and as shown on 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 FOR HVAC

PART 1 - GENERAL

SCOPE

This Section includes specifications for chilled water system testing, adjusting and balancing (TAB) specifications. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Description
- Coordination
- Submittals

PART 2 - PRODUCTS
- Instrumentation

PART 3 - EXECUTION
- Preliminary Procedures
- Performing Testing, Adjusting and Balancing
- Deficiencies

RELATED WORK

Provisions of Division 01 govern work under this Section.

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

Division 23 Drawings and Specifications which define scope of systems to be balanced.

REFERENCE STANDARDS

AABC	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Fifth Edition, 1989.
ASHRAE	ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.
NEBB	Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Latest Edition.

QUALITY ASSURANCE

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.

DESCRIPTION

Provide total mechanical systems testing, adjusting and balancing. Requirements include balancing of chilled water system, including adjustment of new and existing system pumps and chillers to provide design quantities specified on Drawings.

Test, adjust and balance chilled water system so each piece of equipment is using quantities indicated on Drawings and in Specifications.

Accomplish testing, adjusting and balancing work in a timely manner to facilitate proper system operation.

COORDINATION

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

SUBMITTALS

Refer to Related Work in this Section.

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

Submission:

Submit 5 sets of reports for distribution. Final distribution of submittals shall be as follows:

County Public Works	3 copies for record purposes after approval (to be included in Operation And Maintenance Manuals).
Facilities Maintenance	1 copy for record purposes after approval.
Project Engineer	1 copy for record purposes after approval.
Contractor	1 copy for record purposes after approval.

Include a copy of approved final balancing report for Project.

Format:

Bind report forms in 3-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide contents of report into below listed divisions, separated by divider tabs:

General Information
Summary
Chilled Water Systems

Contents:

Provide the following minimum information, forms and data:

General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Include certification sheet containing seal and signature of Test and Balance Supervisor.

Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within scope of Contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.

Remainder of report to contain appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely, including percent deviation from design values. Indicate where information cannot be obtained or is not applicable .

PART 2 - PRODUCTS

INSTRUMENTATION

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

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 requirements of NEBB or AABC Standards

PART 3 - EXECUTION

PRELIMINARY PROCEDURES

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

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.

PERFORMING TESTING, ADJUSTING AND BALANCING

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

Unless specifically instructed in writing, Work specified in this Section is to be performed during normal workday.

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

Adjust equipment to yield specified total flow at terminals. Take 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.

Final water system measurements to be within the following range of specified GPM:

Pumps (new and existing)	-5% to +10%
Chillers (new and existing)	-5% to +5%

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

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

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

DEFICIENCIES

Division 23 Contractor shall correct installation deficiencies found during test and balance stage. Test and balance agency shall notify Construction Representative of these items.

END OF SECTION

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

SCOPE

This Section includes insulation specifications for heating, ventilating, and air conditioning piping, ductwork, and equipment. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Submittals
- Description
- Definitions

PART 2 - PRODUCTS
- Materials
- Insulation & Jackets
- Accessories

PART 3 - EXECUTION
- Installation
- Piping, Valve and Fitting Insulation
- Equipment Insulation

RELATED WORK

Applicable provisions of Division 01 govern work under this Section.

Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
Section 23 21 13 – Hydronic Piping

REFERENCE STANDARDS

ASTM/ANSI C195	Mineral Fiber Thermal Insulation Cement
ASTM/ANSI C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM/ANSI C533	Calcium Silicate Block and Pipe Thermal Insulation
ASTM/ANSI C547	Mineral Fiber Preformed Pipe Insulation
ASTM/ANSI C552	Cellular Glass Block and Pipe Thermal Insulation
ASTM/ANSI C578	Preformed, Block Type Cellular Polystyrene Thermal Insulation
ASTM/ANSI C612	Mineral Fiber Block and Board Thermal Insulation
ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C240	Cellular Glass Insulation Block
ASTM C302	Density of Preformed Pipe Insulation
ASTM C303	Density of Preformed Block Insulation
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C591	Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C610	Expanded Perlite Block and Thermal Pipe Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM E84	Surface Burning Characteristics of Building Materials

NFPA 225	Surface Burning Characteristics of Building Materials
NFPA 96	Ventilation Control and Fire Protection of Commercial Cooking Operations
MICA Manual	National Commercial & Industrial Insulation Standards, 1988, Third Edition, published by the Midwest Insulation Contractors Association
UL 723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and General Conditions of the Contract.

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

SUBMITTALS

Include manufacturer's data for the following:

- Pipe insulation
- Equipment Insulation

Submittal shall include the following information:

Manufacturer’s technical data sheets for each product with the following information:

- Density
- Thermal characteristics
- Temperature limitations
- Jacket type
- Materials of composition
- Material safety data sheets

Schedule of all insulating materials to be used including:

- Application / intended use of each insulation type
- Insulation type and thickness
- Jacket type
- Fastening methods and adhesive type

DESCRIPTION

Furnish and install insulating materials and accessories specified. The following types of insulation are specified in this Section:

Pipe insulation
Equipment Insulation

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

DEFINITIONS

“Concealed”:

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

“Exposed to weather”:

Ducts located outdoors, either on grade, on a wall, or on a roof, in location where sun, wind, rain, snow and other elements will come in contact with ductwork.

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

PART 2 - PRODUCTS

MATERIALS
Materials or accessories containing asbestos will not be accepted.

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

INSULATION AND JACKETS
Manufacturers:
Armstrong, Halstead, Owens-Corning, Johns-Manville, Knauf, Certainteed or approved equal.

Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be capable of receiving jackets, adhesives and coatings for required application.

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.

Rigid Fiberglass Insulation – Piping:
Owens-Corning SSL-II having a thermal conductivity of not more than 0.23 at 75 degrees F mean temperature and maximum operating temperatures of 450 degrees F.

Jacket: White kraft reinforced vapor barrier all service jacket, factory applied to insulation with self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 50 units.

Block Insulation:
Owens-Corning Kaylo 10, Schuller Thermo-12 hydrous calcium silicate, ASTM C533, Type I, acceptable for use to a maximum operating temperature of 1,200 degrees F. Material to be visually coded or marked to indicate it is asbestos free. Thermal conductivity shall not be more than 0.44 at 300 degrees F, with dry density 12.5 lbs. per cu. ft. minimum.

Provide jacket of 6 oz. per sq. yd. fiberglass cloth embedded in 2 coats of weatherproof mastic. Field or factory applied stainless steel or aluminum jacket may be substituted for fiberglass cloth jacket at contractors option.

Elastomeric Insulation;
Armstrong AP Armaflex or Armaflex II or Halstead F/R Insul-Tube closed cell insulation, with minimum nominal density of 5.5 lbs. per cu. Ft., thermal conductivity of not more than 0.27 at 75 degrees F mean temperature, and maximum water vapor transmission of 0.17 perm inch. Material shall have acceptable application temperature range from 220 degrees F to -40 degrees F.

ACCESSORIES
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.

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

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.

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

Finishing cement to be ASTM C449.

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

Bedding compounds to be non-shrinking and permanently flexible.

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

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

PART 3 - EXECUTION

INSTALLATION

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

Piping 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.

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

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.

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.

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

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

Install jackets with longitudinal joints facing wall or ceiling.

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.

Provide a continuous vapor barrier for insulation on the following systems:

Chilled water
Equipment with a surface temperature below 65° F.

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.

PIPING, VALVE AND FITTING INSULATION

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.

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.

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"
8" to 10"	16"

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

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

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

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.

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.

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.

Couplings for mechanical grooved pipe must be insulated in the same manner as the adjoining pipe.

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.

Provide insulation as specified in the following schedule for all new piping (and at all points where new piping connects to existing piping):

Service	**Insulation**	**Insulation Thickness by Pipe Size Type**				
		1" and smaller	**1¼" to 2"**	**2½" to 4"**	**5" to 6"**	**8" and larger**
Chilled Water Piping	rigid fiberglass	1"	1"	1"	1½"	1½"

EQUIPMENT INSULATION

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

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.

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

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

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.

Do not insulate equipment that is factory insulated.

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

Insulation on chilled water pumps shall extend from the point of piping connection, down around the pump housing and onto the pump base.

Provide equipment insulation as follows:

Equipment Type	**Insulation Type**	**Insulation Thickness**
Pumps and strainers (chilled water)	Elastomeric	1"
Chiller evaporator shell, suction piping, heads, and water boxes	Elastomeric	1"

END OF SECTION

SECTION 23 09 23
DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

RELATED DOCUMENTS
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SCOPE
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.

This project will include the addition of a power module and expansion card to an existing JCI DX9100 to facilitate the installation of the new DDC points to support the operation of the new chiller and pumps.

PART 1 – GENERAL
- Reference
- Related Work
- Work of other Sections
- Definitions
- Description of Work
- Quality Assurance
- Submittals
- Operator Instruction
- Material Delivery and Storage

PART 2 – PRODUCTS
- Approved Manufacturers
- Facility Management System
- FMS Architecture
- Existing Operator Interface
- Functional Requirements
- Temperature Sensors
- Miscellaneous Sensors
- Control Valves

PART 3 - EXECUTION
- Installation
- Control Valves
- Electrical
- Graphics

POINT CHARTS
Section 23 09 15 – Direct Digital Control Input/Output Point Summary Tables

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

RELATED WORK
Section 23 05 00 – Common Work Results for HVAC
Section 23 09 93 – Sequence of Operation for HVAC Controls
Division 16 - Electrical

WORK OF OTHER SECTIONS
Power wiring for starters.

Furnishing of disconnect switches required by Code at motor locations.

Installing and wiring motor starters.

DEFINITIONS
The following definitions are applicable to work of this section:

DDC	Direct Digital Control
BAS	Building Automation System
TCS	Temperature Control System
TCC	Temperature Control Contractor
I/O	Input/output Device
FMS	Facility Management System
LAN	Local Area Network
DCU	Distributed Control Units
ASC	Application Specific Controller

DESCRIPTION OF WORK
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.

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.

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.

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.

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.

QUALITY ASSURANCE
Substitution of Materials: None will be allowed.

MANUFACTURER
Provide principal direct digital temperature control equipment and materials as manufactured by a single manufacturer.

INSTALLER
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.

The Automatic Temperature Control Subcontractor shall maintain a local service office within a 100-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.

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.

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

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

SUBMITTALS
Submittals shall be required in two phases.

FIRST PHASE (APPROVAL) SUBMITTALS
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.

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.

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.).
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.

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.).

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.

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.).

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.

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.

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.)

First phase (approval) submittals shall be provided to and approved by the Owner's authorized representative before any job site installation work is performed.

SECOND PHASE (OPERATION AND MAINTENANCE) SUBMITTALS
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.

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.

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.

All as-builts shall be on AutoCAD and both a hard copy and CD-ROM shall be included with O&M manuals.

OPERATOR INSTRUCTION
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 on-site operator instruction to the Owner's operating personnel.

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.

At a time mutually agreed upon during the BAS/TCS commissioning phase as stated above, the BAS/TCS Subcontractor shall provide 4 hours of 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.

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.

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

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.

MATERIAL DELIVERY AND STORAGE

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

PART 2 - PRODUCTS

APPROVED MANUFACTURERS

Environmental Systems, Inc (Waukesha, WI) and Johnson Controls (Madison Service Branch Only).

FACILITY MANAGEMENT SYSTEM

The FMS shall be a complete system designed for use on Intranets and the Internet. This functionality shall extend into the equipment rooms. Primary nodes located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure existing in the facility. Contractor shall be responsible for coordination with the owner’s IT staff to ensure that the FMS will perform in the owner’s environment without disruption to any of the other activities taking place on that LAN.

All points of user interface shall be on standard PCs that do not require the purchase of any special software from the FMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser such as Internet Explorer or Netscape.

Where necessary and as dictated elsewhere in these Specifications, Servers shall be used for the purpose of providing a location for archiving system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform: Microsoft Data Engine (MSDE) or Microsoft SQL Server as dictated elsewhere in this specification.

The work of the single FMS Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents as are listed in Part 1 of this Section.

The FMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, verification, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary

protection, cleaning, cutting and patching, warranties, services, and items as Specified in these Division documents which are required for the complete, fully functional and commissioned FMS.

Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software and configurations to be provided for this Project.

Manage and coordinate the FMS work in a timely manner in consideration of the Project schedules. Coordinate cooperatively with the associated work of other trades so as to assist the progress and not impede or delay the work of associated trades.

The FMS as provided shall incorporate, at minimum, the following integrated features, functions and services:

Operator information, alarm management and control functions at any Operator's console without the need to purchase special software from the FMS manufacturer for those consoles.

Enterprise-level information and control functions.

Information management including monitoring, transmission, archiving, retrieval, and reporting functions.

Diagnostic monitoring and reporting of FMS functions.

Offsite monitoring and management

Energy management

Indoor Air Quality monitoring and control

FMS ARCHITECTURE

OVERALL CONCEPTUAL DESCRIPTION

The FMS shall be designed entirely for use on intranets and internets. All networking technology used at the Tier 1 level shall be off the shelf, industry standard technology fully compatible with other owner provided networks in the facility.

All aspects of the user interface, whether to servers or to Tier 1 solid-state devices, shall be via browsers. Any PCs used as operator interface points shall not require the purchase of any special software from the manufacturer in order to provide the complete user interface as described herein.

The user interface will be complete as described herein, providing complete tool sets, operational features, multi- panel displays, and other display features. Systems which merely provide HTML based web pages as the operator interface will not be acceptable.

The primary components of the system will be the Primary Application Nodes and Servers located at the highest level of the network architecture. Both will use the same user interface and provide the same level of accessibility via the network. The only distinction between the user interface used on servers as compared to Primary Application Nodes will be select menu items used for accessing long term storage features on the servers or on their respective archive devices (CD/RW, etc.)

GENERAL

The FMS shall consist of a number of Nodes and associated equipment connected by industry standard

network practices. All communication between Nodes shall be by digital means only.

The FMS network shall at minimum comprise of the following:

- Operator PCs – fixed or portable.
- Network processing, data storage and communication equipment including file servers.
- Routers, bridges, switches, hubs, modems and like communications equipment.
- Active processing Nodes including field panels.
- Intelligent and addressable elements and end devices.
- Third-party equipment interfaces.
- Other components required for a complete and working FMS.

All FMS features shall be accessible via Enterprise Intranet and Internet browser with equivalent FMS access control for user access.

The FMS shall support auto-dial/auto-answer communications to allow FMS Nodes to communicate with other remote FMS Nodes via standard telephone lines. Refer to drawings for type of line to be used, DSL or voice grade. Where no preference is indicated, DSL is the preferred grade.

The PC Workstations, File servers and principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels. "Clones" are not acceptable.

Provide licenses for all software residing in the FMS system and transfer these licenses to the Owner prior to completion.

NETWORK

The FMS shall incorporate a primary Tier 1 network. At the Contractor's option, the FMS may also incorporate integrated secondary Tier 2 and tertiary Tier 3 networks.

The FMS Network shall utilize an open architecture capable of all of the following:

- Utilizing standard Ethernet communications and operate at a minimum speed of 10/100 Mb/sec
- Connecting via BACnet at the Tier 1 level in accordance with as per ANSI/ASHRAE Standard 135-2001.
- Connecting via the N2 Protocol at the Tier 2 level.
- Connecting via LonMark as per ANSI/EIA 709 (LonWorks) to LonMark FTT-10 transceivers at the Tier 2 level.

The FMS network shall support both copper and optical fiber communication media.

THIRD-PARTY INTERFACES

FMS Contractor shall integrate real-time data from systems supplied by other trades as required in Part 3.

The FMS system shall include necessary FMS hardware equipment and software to allow data communications between the FMS system and systems supplied by other trades.

The trade contractor supplying other systems will provide their necessary hardware and software and will cooperate fully with the FMS contractor in a timely manner at their cost to ensure complete data integration.

UNINTERRUPTIBLE POWER SUPPLY (UPS)

Where indicated for supporting operator PCs, servers, and other equipment as indicated, provide a UPS.

UPS shall be sized for 50% spare capacity. The UPS shall be complete with batteries, external bypass and line

conditioning.

POWER FAIL/AUTO RESTART
Provide for the automatic orderly and predefined shutdown of parts or all of the FMS following total loss of power to parts or all of the FMS.

Provide for the automatic orderly and predefined startup of parts or all of the FMS following total loss of power to those parts or all of the FMS. Archive and annunciate time and details of restoration.

Provide for the orderly and predefined scheduling of controlled return to normal, automatically time scheduled, operation of controlled equipment as a result of the auto restart processes.

Maintain the FMS real-time clock operation during periods of power outage for a minimum of 72 hours.

DOWNLOADING AND UPLOADING
Provide the capability to generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same at any Operator PC, and the means to download same to the associated Application Node.

Application software tool used for the generation of custom logic sequences shall be resident in both the application node and the server(s) where indicated on the drawings.
Provide the capability to upload FMS operating software information, database items, sequences and alarms to the designated server(s).

The functions of this Part shall be governed by the codes, approvals and regulations applying to each individual FMS application.

EXISTING OPERATOR INTERFACE

GENERAL
Map all new DDC points to color graphic and associated alarms to the appropriate locations within the existing system for USER access.

FUNCTIONAL REQUIREMENTS

APPLICATION SPECIFIC CONTROLLER INTERFACE
It shall not be necessary to calculate and enter Proportional, Integral, Derivative, or Interval values in order to engineer, startup or commission the ASCs. The ASCs shall be shipped with default parameters which can be adjusted if required. Standard default parameters will be different for each application.

APPLICATION SPECIFIC CONTROLLER - COMMON REQUIREMENTS
Inputs shall be software definable to accept Thermistor or Discrete Contact Closure. Outputs shall be TRIAC, and shall support Two Position, Frequency Modulated, Pulse Width Modulated and Floating.

Connectors for field wiring shall be easily removable without disconnecting the cabling.

LED indication shall be provided for communications status and controller self diagnostics status.

Setpoint bias, local override, and room temperature shall be available via the room sensor or a plain Thermistor based sensor, using the same terminals.

The room sensor shall support a hand held console

The ASC shall be UL Listed for UL 916 Energy Management Systems. Any plastics used (i.e., cover, etc.) shall be UL Listed for UL 94-V0 (self extinguishing materials).

The ASC shall be field configurable for standalone operation, without power to the unit, using DIP switches, or similar methods. The ASC shall operate with the new settings immediately and not require a power cycle to initiate them. Each ASC shall ship from the factory pre-programmed with common default values.

Editors, set points, addresses, etc. shall remain in NOVRAM or EEPROM, to ensure standalone operation. It shall be possible to read and write to this memory, locally and remotely to make changes to the default parameters. Parameters requiring ongoing changes will reside in RAM, and default to the NOVRAM or EEPROM values.

The ASC shall contain a seven day software clock which shall be accurate to five (5) minutes per day. This software clock is intended to be used for initial commissioning prior to connecting to the communication bus, as well as a "fallback" for when communication with the bus is lost. The hardware clock in the communication bus shall automatically update the software clocks in the ASC's once per day, to ensure best accuracy during occupancy hours.

Outside air sensor value will be available to all ASC's from a system point external to the ASC. Where the ASC uses the outside air temperature value (e.g.; economizer) and communication is lost with the source, the ASC will retain the last communicated value.

The ASCs shall support one-step calibration of temperature sensors and velocity transducers. Eliminate the need for a technician, test & balance contractor, or Owner to have to refer to look-up tables or to interpolate "counts" in calibration or recalibration of an input or output.

Staging will be automatic. If one stage is required, analog outputs will vary between 0 and 100% as the load calculation varies between 0 and 100%. If two stages are required, stage one analog output will vary between 0 and 100% as the load calculation varies between 0 and 50%, and stage two analog output will vary between 0 and 100% as the load calculation varies between 50 and 100%. Digital outputs will also be staged and modulated using time proportioned modulation over a fixed window (i.e., 5 or 10 minutes). If one stage is required the first stage will be on for ¼ the time window for a 25% load calculation, ½ the time window for a 50% load calculation, etc. If two stages are required, the first stage will be on 100% at 50% load calculation, and the second stage will be on for ½ its time window at 75% load calculation.

The currently active zone temperature set points (as biased by setpoint adjustment) shall be available for dynamic displays, and use in other system applications.

Fans, compressors, heat stages, and the like shall have minimum on and maximum off times. It shall be possible to lockout heating and cooling centrally. Fans shall be interlocked to operate when stages of heat or cooling are operational.

Resident I/O database shall support minimum trip and close. Default minimum fan cycle times = 30 seconds and minimum compressor cycle time = 4 minutes. These values shall be adjustable.

Provide for points to be predefined based on how they are wired to certain terminals. For applications which do not fully utilize all points in an application, the unused point may be any defined for other applications resident in the MCI or other controllers..

TEMPERATURE SENSORS

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.

MISCELLANEOUS SENSORS

TEMPERATURE SENSORS

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 degrees F to 100°F with accuracy of ± 0.5°F and a base resistance of 1000 ohms at 77°F.

Provide limited range or extended range sensors if required to sense the range expected for a respective point.

Use averaging elements on duct sensors.

Use elements on sensors in piping systems compatible with installation in separable wells.

CURRENT SENSORS

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.

PRESSURE TRANSMITTERS

One pipe, direct acting, indicating type, with range suitable for system, and proportional DDC output as required.

CONTROL VALVES

Provide all control valves as shown on the plans/details and as required to perform functions specified. Spring ranges must be selected to prevent overlap of operation and simultaneous heating and cooling.

Size operators to allow smooth and positive operation of devices served and to provide sufficient torque capacity for tight shutoff against system temperatures and pressure encountered. Use fully proportional actuators with 0-10VDC inputs and zero and span adjustments unless specified otherwise in the chart below. If TriState with feedback is specified, valve position shall be fed back to the controller and controller shall position valve based on this feedback. For two-position electric actuation use 24 VAC for DDC controlled actuators, 120 VAC actuators may be used for hardwire interlocking. All electric actuators shall be provided with a visible position indicator.

All power required for electric actuation shall be provided by this contractor if it is not able to be directly provided from the DDC controller.

Provide operators that are full proportioning or two-position, as required for specified sequence of operation. Provide spring-return for applications involving fire, freeze protection, moisture protection or specified normally open/closed operation. Valves shall move to their fail positions on loss of electrical power or air pressure to the actuator.

Two-position shut-off valves shall be sized for a maximum pressure drop of 2 PSI at design flow and shall be a minimum of line size.

Provide operators with linkages and brackets for mounting on device served.

All valves unless specifically noted on the plans or indicated below shall be globe style valves.

VALVE SERVING	TYPE Globe Butterfly (BF) Ball Press Independent Ball (PI Ball)	SIGNAL 0-10 VDC TriState (24VAC) 2-Position Elect Pneumatic (Pneu)	SPRING RETURN REQUIRED Yes No	FAIL POSITION Open (thru Coil) Closed (bypass Coil) Last Position
Chilled Water Isolation	Butterfly	2-Pos Elect	Yes	See Flow Diagram
Cond. Water Isolation	Butterfly	2-Pos Elect	Yes	See Flow Diagram

See plan details, notes, and schedules for where two-way and three-way valves should be used.
1. Equivalent Cv butterfly valves may be used where 3" and larger globe valves would be required.

WATER SYSTEMS:
Use equal percentage valves for two-way control valves; size for a pressure drop not less than 4 psi or more than 6 psi. Note: For low flows, the required minimum Cv size will result in lower pressure drop than 4 psi.

Use three-way valves sized for a maximum pressure drop of 5 psi and that have linear characteristics so that the valve pressure drop remains constant regardless of the valve position.

Butterfly valves: Iron body, stainless steel shaft, bronze bearings, and 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° F. For pneumatically actuated valves, provide pilot positioners on all operators for butterfly valves used in modulating applications. When butterfly valves are used in modulating applications, entering and leaving pipe sizes and required transition distances shall be detailed on the control valve submittals. The control contractor shall be responsible for coordinating the proper pipe sizes and transitions with the mechanical contractor to provide the correct Cv at 70° open position.

PART 3 - EXECUTION

INSTALLATION

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.

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.

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.

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 16.

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.

Install system and materials in accordance with manufacturer's instructions, rough-in drawings and details on drawings.

CONTROL VALVES

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.

All valves shall have end-position indication monitored by the building automation system.

ELECTRICAL

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.

This Contractor shall be responsible for all line voltage and low voltage electrical wiring incidental to the system installation.

All sensor and output wiring shall be shielded cable as required by the equipment manufacturer.

The field wiring connections of all field-mounted sensors shall be adequately protected by a junction box mounted at the point of measurement.

Separate conduit systems shall be provided for sensor wiring and high voltage (120 VAC) wiring.

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).

All conduit shall be secured at regular intervals and run parallel with the lines of the building.

Power to local temperature control panels shall be provided by the BAS Contractor.
DDC panels serving equipment fed by emergency power shall also be served by emergency power.

All line voltage wiring required to power the DDC Controllers shall be provided by BAS contractor.

BAS Identification Standards:
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.

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.

Each of the cable types specified in Item A shall be of a different color coding for easy identification and troubleshooting. Recommended color coding:

Analog Input Cable	Yellow
Analog Output Cable	Tan
Binary Input Cable	Orange
Binary Output Cable	Violet

24 VAC Cable	Gray
General Purpose Cable	Natural
Tier 1 Comm Cable	Purple
Other Tier Comm Cable	Blue

Raceway Identification. All the covers to junction and pull boxes of the FMS raceways shall be painted with the appropriate color.

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.

GRAPHICS

Provide a dynamic graphic representation for all major systems (i.e., AHU, Chilled Water System, Hot Water System, Boilers, etc.). Also provide floor plan layouts with linked temperature sensors for all digitally controlled terminal control (vav, reheat, FCU, etc.). Show building entry graphic with links to other buildings and then the system graphics.

END OF SECTION

DDC INPUT / OUTPUT SUMMARY TABLE

PROJECT: Public Safety Building - Chiller	HARDWARE																				SOFTWARE																														
LOCATION: Madison, WI	OUTPUT								INPUT												ALARMS																														
	DIGITAL				ANALOG				DIGITAL						ANALOG						DIGITAL			ANALOG				ENERGY MANAGEMENT SYSTEM FUNCTIONS																										
SYSTEM: Chiller Plant	Control Relay	Solenoid	Contactor	2-Pos Actuator	Elect/Pneu Transducr	Electric Actuator	4-20 mA	0-10 VDC	Current Sensing Switch	Control Relay Contact	Switch Closure	Auxiliary Contact	Diff Pressure Switch	Flow Switch	Temperature	Relative Humidity	Differential Pressure	Gauge Pressure	Static Pressure	Flow	Equipment Status	Maintenance	Pressure	High Limit	Low Limit			Day/Night Setback	Demand Limiting	Dial-up I/O	Lead/Lag Control	Optimum Start/Stop	Scheduled Start/Stop	Totalization	Trend		Lighting Integration	Fire Alarm Integration	Security/Access Integration	Elect PQM Integration	Chiller Integration	Manual Changeover	HW/OA Reset	CHW Reset	Smoke Control	Fire Alarm Override	Comments
POINT DESCRIPTION																																																
CHILLED WATER																																																
Exist. Chiller CH-1 Enable	X																																														
Exist. Chiller CH-1 Alarm												X									X																											
Exist. Chiller CH-1 Setpoint Reset							X					X																																				
Exist. Chiller CH-1 Demand Reset							X					X																																				
Exist. CH-1 CHW Sup Temp															X																				X													
Exist. CH-1 CHW Ret Temp															X																				X													
Chiller CH-2, 3, 4, 5 Enable	X																																															
Chiller CH-2, 3, 4, 5 Alarm												X									X																											
Chiller CH-2, 3, 4, 5 Setpoint Reset							X					X																																				
Chiller CH-2, 3, 4, 5 Demand Reset							X					X																																				
CH-2, 3, 4, 5 CHW Sup Temp															X																				X													
CH-2, 3, 4, 5 CHW Ret Temp															X																				X													
CHW SYSTEM Supply Temperature															X									X												X												
CHW SYSTEM Return Temperature															X																				X													
PRIMARY PUMPS																																																
Exist. Pump (P-3) S/S	X																																	X													New point
Exist. Pump (P-3) Status									X												X																									
Pump (P-5) S/S	X																																	X													
Pump (P-5) Status									X												X																									
CONDENSER PUMPS																																															
Exist. Pump (P-4) S/S	X																																	X													New point
Exist. Pump (P-4) Status									X												X																									
Pump (P-6) S/S	X																																	X													
Pump (P-6) Status									X												X																									
Cond Water Bypass Valve					X																																									
Clg Tower Fan 1 S/S	X																																													
Clg Tower Fan 1 Status									X												X																									
Cooling Tower Sump Temperature															X									X	X																					
CH-1 CHW ISO Valve (V-2)						X																																									End Position Feedback
CH-2 CHW ISO Valve (V-3)						X																																									End Position Feedback
CH-1 COND ISO Valve (V-4)						X																																									End Position Feedback
CH-2 COND ISO Valve (V-5)						X																																									End Position Feedback
Outside Air Temperature															X																																
Outside Air Humidity																X																																

SECTION 23 09 93
SEQUENCE OF OPERATION (CONTROLS)

PART 1 - GENERAL

RELATED DOCUMENTS
Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

SCOPE
This section includes control sequences describing the manner in which the automatic control systems shall operate. Included are the following topics:

PART 1 – GENERAL
- Related Documents
- Scope
- Description of Work
- Related Work
- Reference
- Submittals

PART 2 – PRODUCTS
- Manufacturers

PART 3 - EXECUTION
- Controls Sequences – Description of Work
- Chiller Plant Control

DESCRIPTION OF WORK
Control sequences are hereby defined as the manner and method by which automatic controls function. Requirements for each type of operation are specified in this section.

Operation equipment, devices and system components required for automatic control systems are specified in other Division 23 control sections of these specifications.

All temperature, humidity, and pressure sensing, and all other control signal transportation for the control sequences shall be furnished under Section 23 09 23. All pneumatic, electronic, and electric input/output signals shall be extended under Section 23 09 23.

Sequences for equipment controlled by Direct Digital Controls (DDC) as specified are accomplished by hardware and software provided under Section 23 09 23.

RELATED WORK
Section 23 05 13 – Common Motor Requirements for HVAC Equipment
Section 23 09 23 – Direct Digital Control System for HVAC

REFERENCE
Applicable provisions of Division 1 govern work under this section.

SUBMITTALS
The following data/information shall be submitted for approval. This data shall be included with the balance of the Section 23 09 23 submittals:

Complete sequence of operation.

PART 2 - PRODUCTS

MANUFACTURERS
Refer to Section 23 09 23.

PART 3 - EXECUTION

CONTROL SEQUENCES - DESCRIPTION OF WORK
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.

All necessary operating equipment, devices and system components required for the automatic temperature control system shall be furnished and/or 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.

The extent of the automatic temperature control system work shall be as shown on the drawings and by the control performance requirements specified hereinafter in this section.

The existing chiller and pumps are controlled through a JCI DX9100. This controller shall be used in conjunction with an additional power module and expansion card to facilitate installation and control of new DDC points for this project.

The Temperature Control Contractor (TCC) shall provide and field install all required sensors to provide the points as indicated on the points list, as well as any additional sensors and points as required to provide the specified sequence of operation.

LEAD/LAG SEQUENCING
For sequences that call for lead/lag of equipment connected to building automation systems, the lead device shall be able to be chosen through a selectable day of the week and time of day through the building automation system. Switchover shall occur at 10AM the first Tuesday of each month.

CHILLER PLANT CONTROL

GENERAL:
The Chiller Plant consists of the following:

1. Existing nominal 300 ton centrifugal chiller (CH-1)
2. New nominal 280 ton modular scroll compressor chiller (CH-2,3,4,5)
3. Existing primary chilled water pump (P-3)
4. New back-up primary chilled water pump (P-5)
5. Existing condenser water pump (P-4)
6. New back-up condenser water pump (P-6)
7. Existing Cooling Tower (CT-1)
8. Condenser water minimum bypass control valve (3-way TCV Existing: V-1)
9. 4 new 2-position control valves for directing chilled water and condenser water to selected chiller
    a. Chilled water supply V-2 (isolate existing chiller)
    b. Chilled water supply V-3 (isolate new chiller)
    c. Condenser water supply V-4 (isolate existing chiller)
    d. Condenser water supply V-5 (isolate new chiller)

BUILDING AUTOMATION SYSTEM CHILLER SELECTOR:
Chilled water system shall be locked out when outside air temperature is below 50 ºF (adj.).
Chilled water system shall be enabled when outside air temperature is above 50 ºF (adj.).

When the chilled water system is enabled, the BAS shall select the operating chiller based on the following

schedule:

Outside Air Temp.	Existing Chiller CH-1	New Chiller CH-2,3,4,5
Below 50 ºF (adj.)	OFF	OFF
50 ºF - 75 ºF (adj.)	BACK-UP	ENABLED
Over 75 ºF (adj.)	ENABLED	BACK-UP

The new chiller has built-in unloading that the existing chiller does not. This selector for chiller operation will prevent operation of the existing chiller during period with low chilled water load by using the new chiller. During periods of 70% chilled water load or more, the existing chiller will provide a more efficient source of generating chilled water and will be used as the lead chiller. In the case for either chiller being the lead chiller, the other will be the back-up.

CHILLER ENABLE:
Chiller will be enabled based on the BAS selector chart.

Chilled water control valves V-2/V-3 shall modulate to provide flow to the enabled chiller. Condenser water control valves V-4/V-5 shall modulate to provide flow to the enabled chiller.

BAS shall start the lead chilled water pump (P-3/P-5). Lead / Lag Control: Current status switches, shall prove lead and lag pump operation. If the lead pump is called to run and the current status switch indicates that the lead pump is not operating for 30 seconds (adj.), an alarm shall be sent to the operator interface and the DDC system shall start the lag pump. Upon sensing the lead pump is operating, the lag pump shall be stopped. The DDC system shall index the lag pump to become the lead pump through scheduling feature of the building automation system.

BAS shall start the lead condenser water pump (P-4/P-6). Lead / Lag Control: Current status switches, shall prove lead and lag pump operation. If the lead pump is called to run and the current status switch indicates that the lead pump is not operating for 30 seconds (adj.), an alarm shall be sent to the operator interface and the DDC system shall start the lag pump. Upon sensing the lead pump is operating, the lag pump shall be stopped. The DDC system shall index the lag pump to become the lead pump through scheduling feature of the building automation system.

Upon flow being proven through enabled chiller, the chiller unit mounted controls shall verify all safeties and start chiller. The chiller unit mounted controls shall monitor its evaporator and condenser flow and safety statuses and shall provide a chiller failure alarm in the event of a flow or safety failure. Minimum chiller runtime shall be 30 minutes (adj.).

The chiller unit mounted controls shall maintain a discharge chilled water setpoint of 44°F (adjustable) until such time that mechanical cooling is no longer required.

CONDENSOR WATER CONTROL:
Condenser Make-up Water Control: Existing to remain.

Condenser Water Bypass Valve Control (3-way TCV Existing: V-1): Existing to remain.

Cooling Tower Fan Control: Existing to remain

END OF SECTION

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

SCOPE

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

PART 1 - GENERAL
- Scope
- Related Work
- Reference Standards
- Quality Assurance
- Delivery, Storage, and Handling
- Design Criteria
- Welder Qualifications

PART 2 - PRODUCTS
- Chilled Water
- Condenser Water
- Vents and Relief Valves
- Dielectric Unions and Flanges
- Unions and Flanges
- Mechanical Grooved Pipe Connections

PART 3 - EXECUTION
- General
- Welded Pipe Joints
- Threaded Pipe Joints
- Mechanical Grooved Pipe Connections
- T-Drill Connections
- Copper Pipe Joints
- Vents and Relief Valves
- Dielectric Unions and Flanges
- Unions and Flanges
- Piping System Leak Tests
- Initial System Fill and Vent

RELATED WORK

Provisions of Division 01 govern work under this Section.

Section 23 05 00 – Common Work Results for HVAC
Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
Section 23 05 48.10 – Vibration Control
Section 23 07 00 – HVAC Insulation

REFERENCE STANDARDS

ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in Through 48 in, for Water and Other Liquids
ANSI A21.11	Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids
ANSI B16.3	Malleable Iron Threaded Fittings

ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.9	Carbon Steel Weld Fittings
ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A181	Forgings, Carbon Steel for General Purpose Piping
ASTM A197	Cupola Malleable Iron
ASTM B75	Seamless Copper Tube
ASTM B88	Seamless Copper Water Tube
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
AWWA C110	Ductile-Iron and Gray-Iron Fittings, 3 in Through 48 in, for Water and Other Liquids
AWWA C111	Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids
MIL-SPEC P28584A	

QUALITY ASSURANCE

Substitution of Materials: Refer to Division 01 and General Conditions of the Contract.

Order Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on size of pipe, and in accordance with appropriate ASTM specification.

Order copper water tube with each length marked with name or trademark of manufacturer and type of tube; with each shipping unit marked with purchase order number, metal or alloy designation, temper, size, and name of supplier in accordance with ASTM B88.

Installed material not meeting specification requirements must be replaced with material that meets Specifications without additional cost to Project.

Steel piping and fittings shall be manufactured in the United States.

DELIVERY, STORAGE AND HANDLING

Promptly inspect shipments to insure material is undamaged and complies with Specifications.

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 to avoid damage. Where end caps are provided or specified, take precautions so caps remain in place. If end caps are not present on tube bearing "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.

Offsite storage agreements will not relieve contractor from using proper storage techniques.

DESIGN CRITERIA

Use new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this Specification.

Construct piping for 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.

Non-metallic piping is not acceptable.

Where weld fittings or mechanical grooved fittings are used, use long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 Type F pipe is specified, ASTM A53 Grade A Type E or S, or ASTM A53 Grade B Type E or S may be substituted at Contractor's option. Where ASTM A53 Grade A pipe is specified, ASTM A53 Grade B pipe may be substituted at Contractor's option. Where grade or type is not specified, Contractor may choose from those commercially available.

Where ASTM B88, Type L hard temper copper tubing is specified, ASTM B88, Type K hard temper copper tubing may be substituted at Contractor's option.

WELDER QUALIFICATIONS

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.

Architect or Engineer reserves right to test and inspect work of welders employed on Project at Contractor's expense. If work of welder is found unsatisfactory, welder shall be prevented from doing further welding on Project.

PART 2 - PRODUCTS

CHILLED WATER

2” and Smaller:

ASTM A53, Type F, standard weight (Schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125, standard weight cast iron threaded fittings.

2-1/2” and Larger:

ASTM A53, standard weight (Schedule 40) black steel pipe with ASTM A234 Grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

Contractor may use ASTM B88 seamless, Type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for piping 2” and smaller. Piping materials may be changed only once in loop to minimize electrolysis.

CONDENSER WATER

2" and Smaller:

ASTM A53, Type F, standard weight (Schedule 40) black steel pipe with ASTM A126/ANSI B16.4, Class 125, standard weight cast iron threaded fittings.

2½" and Larger:

ASTM A53, standard weight (Schedule 40) black steel pipe with ASTM A234 Grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

VENTS AND RELIEF VALVES

Use pipe and pipe fittings specified for system to which relief valve or vent is connected.

DIELECTRIC UNIONS AND FLANGES

1-1/4" and Smaller:

Watts Regulator Company, Perfection Corporation, Central Plastics Company or EPCO Sales, Inc., dielectric unions with female pipe thread by solder end connections, non-asbestos gaskets, having a pressure rating of not less than 250 psig at not less than design operating temperature of fluid being conveyed.

1-1/2" and Larger:

Watts Regulator Company, Perfection Corporation, or EPCO Sales, Inc., dielectric flanges with steel weld neck by copper solder joint end connections, non-asbestos gaskets, having pressure rating of not less than 125 psig at not less than design operating temperature of fluid being conveyed.

UNIONS AND FLANGES

2" and Smaller:

ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use unions of pressure class equal to or higher than that specified for fittings of respective piping service but not less than 250 PSI.

2-1/2" and Larger:

ASTM A181 or A105, Grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern and of pressure class compatible with that specified for valves, piping specialties and fittings of respective piping service. Flanges smaller than 2-1/2" 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 working pressure and temperature of piping system.

MECHANICAL GROOVED PIPE CONNECTIONS

Mechanical grooved pipe couplings and fittings, as manufactured by Victaulic, ITT Grinnell, or Gustin-Bacon to be used with steel pipe on systems indicated below. Either cut-groove or equivalent roll-groove products are acceptable providing system temperature and pressure requirements are met.

Where malleable iron fittings are indicated, conform to ASTM A-47, Grade 32510 in all sizes. Where ductile iron fittings are indicated, conform to ASTM A-536, Grade 65-45-12. Where forged steel fittings are indicated, conform to ASTM A106, Grade B. Where fabricated steel fittings are indicated, conform to ASTM A-53, Type F in sizes ¾" through 1-1/2" and Type E or S, Grade B in sizes 2" through 20". Do not use fabricated fittings where malleable iron or forged steel fittings are available.

Gaskets shall be EPDM, with green color code, rated for operation in temperatures from -30 degrees° F to 230 degrees F. Contractor shall provide manufacturer's evidence of gasket suitability for intended service.

The following services may use mechanical grooved pipe connections within building Mechanical Penthouse:

Chilled Water
Condenser Water

Fittings and couplings shall be rated for temperature and pressure involved. In no case shall entire system have pressure rating of less than 125 PSIG at the design temperature of fluid.

Acceptable fittings and couplings listed below are based on Victaulic. When used on galvanized piping, fittings and couplings shall be galvanized. When used on black steel piping, fittings and couplings shall have an enamel coating.

Couplings:
Mechanical couplings shall be Style 07, rigid style couplings with angled bolt pads. Use Style 77 lightweight couplings or Style 75 couplings where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction shall be achieved by installing 3 Style 77 or Style 75 flexible couplings in series near vibration source. Contractor shall provide manufacturer's data supporting use of flexible couplings for noise and vibration reduction. Reducing couplings are not acceptable.

Flanges:
Malleable iron Style 741 or 743 except at lug type butterfly valves where standard welding flanges shall be used. When used to connect rubber faced valves or equipment, metal flange washers shall be installed in accordance with manufacturer's instructions and recommendations.

Fittings:
Use malleable iron elbows and tees of manufacturer's standard line, except bullhead tees will not be accepted. Fabricated steel fittings may be used where fitting wall thickness conforms to standard weight pipe. 90 degree and 45 degree elbows shall be full flow, not miter welded. Mechanical -T Style 920 fittings with malleable iron housings may be used for up to 2 inch outlet size. Use of bullhead tees will not be accepted.

Expansion Joints:
Credit for inherent flexibility of mechanical grooved pipe connections, when used for expansion joints, may be allowed upon specific application by Contractor. Request shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for intended service.

Use of mechanical grooved pipe connections does not relieve Contractor from providing vibration isolation specified in Section 23 05 48.10.

PART 3 - EXECUTION

GENERAL
Remove foreign material from interior and exterior of pipe and fittings.

Install piping parallel to building walls and ceilings and at heights that do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in 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.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

"Weldolets" and "Threadolets" may be used for branch takeoffs up to 1/2 the diameter of main.

Install drains throughout the systems to permit complete drainage.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including required service space for equipment, unless piping is serving equipment room.

Install manual valves, control valves, and piping specialties, including items furnished under other Sections of Work as specified and detailed. Provide connections to equipment installed under other Sections of Work where equipment requires the piping services indicated in this Section.

Run water mains level or pitch horizontal mains up 1 inch in 40 feet in direction of flow. Install manual air vents at high points where air may collect. If vent is not in an accessible location, extend air vent piping to nearest code acceptable drain location with vent valve located at drain.

Low points shall have drain valve and capped hose thread outlet.

Main branches and runouts to terminal equipment may be made at top, side, or bottom of main provided there are drain valves suitably located for complete system drainage and manual air vents located as described above.

Connections at main may be made from bottom with tee and 45 degree elbow.

Use minimum of 3 elbows in each pipe line to piece of terminal equipment to provide flexibility for expansion and contraction of piping systems. Offset pipe connections at equipment to allow for service or removal of terminal device.

Use eccentric fittings for changes in horizontal pipe sizes with fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

When other specification sections or piping details do not require strainer upstream of each control valve, install bottom connections to main with capped dirt leg.

Provide connections to pumps and equipment as shown on Drawings for fully functional system.

WELDED PIPE JOINTS

Construct welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State codes where applicable.

Electrodes shall be Lincoln, or equal, with coating and diameter recommended by manufacturer for type and thickness of work being done.

THREADED PIPE JOINTS

Use thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or cauking is allowed.

MECHANICAL GROOVED PIPE CONNECTIONS

Use pipe factory grooved in accordance with coupling manufacturer's specifications or field grooved pipe in accordance with same specifications using specially designed tools available for application.

Grooved piping system components shall be of 1 manufacturer.

Contractor shall provide evidence of job site training and post-installation review by coupling manufacturer.

Lubricate pipe and coupling gasket, align pipe, and secure joints in accordance with coupling manufacturer's specifications.

Support pipe as specified in Section 23 05 29 of Specifications except as modified below. Support each horizontal pipe section at least once between couplings and whenever change in direction of line flow takes place. Support vertical pipe at every other floor or every other pipe length, whichever is most frequent. Set base of riser or base fitting on pedestal or foundation.

Follow coupling manufacturer's installation recommendations if more stringent than above requirements.

T-DRILL CONNECTIONS

T-Drill connections will not be allowed.

COPPER PIPE JOINTS

Remove slivers and burrs remaining from cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for specific piping service.

VENTS AND RELIEF VALVES

Install vent and relief valve discharge lines as specified on Drawings, as detailed, and as specified for each specific valve or piping specialty item.

DIELECTRIC UNIONS AND FLANGES

Install insulating or dielectric unions or flanges at each point where copper-to-steel pipe connection is required in the following systems.

Chilled water system
Condenser water system

UNIONS AND FLANGES

Install union or flange at each automatic control valve and at each piping specialty or piece of equipment that may require removal for maintenance, repair, or replacement. Where valve is located at equipment, locate flange or union connection on equipment side of valve. Piping shall be arranged to permit coils and equipment to be removed without disassembling piping beyond unions. Concealed unions or flanges are not acceptable.

PIPING SYSTEM LEAK TESTS

Verify piping system being tested is fully connected to components and 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 during test. Verify hangers can withstand additional weight loads imposed by test.

Conduct pressure test with test medium water. Minimum test time is indicated in the table below; additional time may be necessary to conduct examination for leakage. Each test must be witnessed by Architect or Engineer. Notify above parties 72 hours prior to pipe system testing. If leaks are found, repair area with new materials and repeat test; cauking is not acceptable.

Do not insulate pipe until successfully tested.

Use clean water and remove air from piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at high point in system.

Pressure test piping systems in accordance with the following specifications:

System	Pressure	Medium	Duration
Chilled water	100 psig	Water	8 hr
Condenser water	100 psig	Water	8 hr

INITIAL SYSTEM FILL AND VENT

For chilled water cooling system, fill system completely and operate main system circulation pump and allow to circulate for 24 hours. After the 24 hour period, check system water level in expansion tank. Vent system highpoints and terminal units. Clean all system strainers.

Evacuate air trapped in system. Check system operating pressure and verify pressure at fill location corresponds the specified fill pressure.

END OF SECTION

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 - GENERAL

SCOPE

This Section includes specifications for water and oil pumps used for HVAC applications. Included are the following requirements:

PART 1 - GENERAL
- Scope
- Related Work
- Quality Assurance
- Shop Drawings
- Design Criteria

PART 2 - PRODUCTS
- Base Mounted Centrifugal Pumps

PART 3 - EXECUTION
- Installation

RELATED WORK

Provisions of Division 01 shall govern work under this Section.

Section 23 05 13 – Common Motor Requirements for HVAC Equipment
Section 23 05 48.10 - Vibration Control
Section 23 21 13 – Hydronic Piping
Section 23 05 23.10 – Hydronic Valves and Piping Specialties

QUALITY ASSURANCE

Substitution of Materials: Refer to division 01 and General Conditions of the Contract.

SHOP DRAWINGS

Submit Shop Drawings for pumps specified herein.

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.

DESIGN CRITERIA

Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

Pumps shall meet or exceed operating efficiencies scheduled.

Provide pumps with motors, impellers, drive assemblies, bearings, coupling guard, and accessories specified. Statically and dynamically balance 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.

Where pump is specified for parallel operation, scheduled conditions are for pump with both pumps operating, i.e., total system flow rate is twice that scheduled for single pump. When only 1 of the parallel pumps is operating, operating point of pump must fall within manufacturer's recommended operating range.

Provide pump with motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless otherwise indicated on Pump Schedule.

Furnish each pump and motor with nameplate giving 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.

Test, clean and paint pumps before shipment. Manufacturer shall certify pump ratings.

Pumps shall operate without excessive noise or vibration.

After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

Furnish 1 spare seal and casing gasket for each pump.

PART 2 - PRODUCTS

BASE MOUNTED CENTRIFUGAL PUMPS

Acceptable Manufacturers:
The following manufacturers are considered acceptable subject to compliance with specified requirements listed below:

Aurora, Bell and Gossett, Peerless, Taco

Description:
Type: Horizontal shaft, single stage, single or double suction, split casing, 175 PSIG working pressure at operating temperature of 225 degrees F continuous, 250 degrees F intermittent. Pump shall be back pull-out design to allow for servicing without disturbing piping, motor or requiring shaft realignment.

Casing: Cast iron with suction and discharge gage ports, renewable bronze wear rings, vent and drain plugs, flanged suction and discharge connections.

Impeller: Bronze, hydraulically and dynamically balanced, keyed and locked to pump shaft, and protected by replaceable bronze shaft sleeve.

Bearings: Oil or grease lubricated ball or roller bearings.

Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

Seal: Carbon rotating against stationary ceramic seat, 225 degrees F maximum continuous operating temperature.

Drive: Flexible spacer type coupling or coupling with extended hub to allow for pump service. Provide and OSHA approved guard for shaft/coupling assembly.

Baseplate: Cast iron or fabricated steel with provisions for grouting.

PART 3 - EXECUTION

INSTALLATION
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.

Set base mounted pumps on concrete pads and concrete inertia bases as specified in Section 23-05-48.10. Fill entire base with non-shrinking grout when required by manufacturer's installation instructions. Level and bolt down pump prior to grouting of pump base. Base mounted pumps not mounted on inertia bases shall be mounted on concrete pads. Fill entire base with non-shrinking grout when required by manufacturer's installation instructions. Level and bolt down pump prior to grouting of pump base.

Align flexible coupled base-mounted pumps in accordance with manufacturer's instructions.

Decrease from line size at pump connections with suction diffusers where specified, long radius reducing elbows or concentric reducers/increasers in vertical piping, and eccentric reducers/increasers for horizontal piping. Install eccentric reducers/increasers with top of pipe level. Valves and piping specialties shall be full line size as specified on Drawings.

Support piping adjacent to pump so no weight is carried on pump casings. For base mounted pumps, provide supports for elbows on pump suction and discharge piping 4 inch and over.

Provide pressure gauges across pumps, both base mounted and in-line type, for all applications. Reference Section 23 05 23.10 for pressure gauge specifications. Pressure gages shall be installed utilizing pump gage tapings.

Provide air vent and drain valve on horizontal pump casings.

Provide drains for bases and seals, piped to and discharging into floor drains.

Lubricate pumps before startup.

Install full line size non-slam check valve and balancing valve in pump discharge piping of each pump.

END OF SECTION

SECTION 23 64 15
WATER COOLED CHILLERS

P A R T 1 - G E N E R A L

SCOPE
This section includes specifications for modular scroll water chillers. Included are the following topics:

PART 1 - GENERAL
- Scope
- Related Work
- Reference
- Reference Standards
- Quality Assurance
- Design Criteria
- Operating Sound Pressure Level
- Submittals
- Operation and Maintenance Data
- Delivery, Storage and Handling
- Warranty

PART 2 - PRODUCTS
- Manufacturers
- Manufactured Units
- Compressors and Refrigeration
- Evaporator
- Condenser
- Insulation
- Controls
- Electrical and Motor Starter
- Vibration Isolation

PART 3 - EXECUTION
- Installation
- Startup
- Training

RELATED WORK
Section 23 05 00 - Common Work Results for HVAC
Section 23 05 13 – Common Motor Requirements for HVAC Equipment
Section 23 05 48.10 – Vibration Control
Section 23 21 13 – Hydronic Piping
Section 23 21 23 – Hydronic Pumps
Section 23 09 23 – Direct Digital Control System for HVAC
Section 23 09 93 - Sequence of Operations for HVAC Controls

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

REFERENCE STANDARDS

ARI 550/590-2003	Centrifugal or Rotary Screw Water-Chilling Packages
ARI 575	Method of Measuring Machinery Sound Within an Equipment Space
ASHRAE 15	Safety Code for Mechanical Refrigeration
ASHRAE 90.1	Energy Standard for Building except Low Rise Residential Buildings

ASME SEC 8	Boiler and Pressure Vessel Code
NEMA MG1	Motors and Generators
UL 1995	Central Cooling Air Conditioners
UL 984	Safety Standards for Hermetic Compressors
COMM 45	Wisconsin Department of Commerce Mechanical Refrigeration Code

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

Construct, test and rate chiller performance in accordance with ARI 550 with exceptions as noted in this specification.

Construct, install and operate chillers in accordance with ANSI/ASHRAE 15- Safety Code for Mechanical Refrigeration and COMM 45 Wisconsin Mechanical Refrigeration Code.

Construct and test chillers in accordance with ASME SEC 8.

Construct and label chillers in accordance with UL 1995.

DESIGN CRITERIA

Furnish serviceable modular scroll chillers as identified in Part 2 and on the plans.

Chillers shall utilize R-410A or R-134A as unit refrigerant.

Multiple modular chillers shall utilize a single point electrical connection for the entire modular chiller plant.

Units shall be factory run tested.

OPERATING SOUND PRESSURE LEVEL

The unit shall operate at full load and all part load conditions without exceeding 85-dBA sound pressure level in the equipment room. If units do not meet the 85-dBA requirements, as measured in accordance with latest version ARI Standard 575, furnish all attenuation devices necessary to meet this requirement. The sound pressure levels in all octave bands must be met as scheduled for full load and part load conditions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals

Submit chiller shop drawings including the following information: specific manufacturer and model numbers, dimensional and weight data, required clearances, materials of construction, capacities and ratings, minimum load achievable without hot gas bypass, pressure ratings, refrigerant charge, pumpout refrigerant storage capacity, component information, assembly information, size and location of piping connections, electrical connections, wiring diagrams, motor information (ref. 23 05 13), surfaces requiring insulation, SqFt of surface insulation, sound pressure levels in all octave bands at 25%/50%/75%/100% load, information for all specialties and accessories.

Include an ARI approved chiller selection method for the specified refrigerants. Verification of date and version of computer program selection or catalog is available through the Vice-President, Engineering, ARI (703) 524-8800.

Indicate ASME construction and stamping of pressure vessels or unit physical characteristics and ASME code section and paragraph references that allow non-compliance with this construction and stamping requirement.

Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts lists, controls and accessories.

At substantial completion, submit warranty certificate and copy of start-up report.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

Protect units from physical damage. Leave factory-shipping covers in place until installation.

Review drawings for routing of chiller to Mechanical Penthouse.

The maximum allowable dimensions of entire modular assembled chiller is 11'-0" long x 6'-0" high x 5'-0" wide.

It shall be the contractors responsibility to deliver and install chillers at location show on plans.

WARRANTY

Provide a one year all-inclusive warranty to begin upon acceptance of project by owner.

Provide an additional four (4) year material and labor warranty extension for compressor motor, compressor assembly and unit controls.

PART 2 - PRODUCTS

MANUFACTURERS

Multistack, ClimaCool or Tandem. Other manufacturers will be considered by prior approval only and issued by Addendum.

MANUFACTURED UNITS

Provide factory assembled and tested, packaged, water-cooled, liquid chiller consisting of scroll compressor(s), compressor motor, condenser, evaporator, refrigeration accessories, instrument and control panel, gages and indicating lights, auxiliary components and accessories, solid state motor starter.

Acceptable refrigerants are R-134a and R-410A.

Firmly attach metal nameplates to major components indicating the name of the manufacturer, unit model number, compressor/condenser/cooler type, refrigerant used, pounds of refrigerant needed for normal operation, operating pressures, and unit serial number.

COMPRESSORS AND REFRIGERATION

Compressor assemblies shall be run tested at the factory. Vibration shall not exceed 1.0 mil peak to peak. Over-speed test compressor impeller(s) to not less than 20% above operating conditions.

Chiller must be supplied with dual refrigeration circuits and each circuit complete with externally equalized thermal expansion valve, liquid line solenoid to prevent liquid migration during the off cycle, liquid line filter dryer, sight glass moisture indicator and two (2) hermetic scroll compressors.
Scroll compressors must each be supplied with crankcase heaters, internal thermal protection, rubber isolation pads between compressor and frame, have two steps of capacity control by cycling of compressors, 100%, 50% and off.

EVAPORATOR

Evaporator shall be dual circuit brazed plate heat exchanger designed and constructed to ASME and UL standards.

Evaporator shall be constructed of copper brazed 316 stainless steel plates.

Design, test, and stamp refrigerant side for 400 psig working pressure and water side for 285 psig working pressure, in accordance with ASME SEC 8.

Provide thermometer wells for temperature controller and low temperature cutout.

Each module shall have chilled water supply and return main piping with grooved connections to facilitate interconnection of multiple units.

Unit to include factory provided, integral, cleanable, water strainer with efficiency as required by manufacturer.

CONDENSER

Condenser shall be dual circuit brazed plate heat exchanger designed and constructed to ASME and UL standards.

Condenser shall be constructed of copper brazed 316 stainless steel plates.

Design and stamp refrigerant side for 400 psig working pressure. Design, test and stamp water side for 285 psig working pressure.

Provide relief valve on shell in accordance with ASHRAE 15.

Provide baffles to ensure even distribution of incoming gas and to concentrate non-condensable gases.

Each module shall have condenser water supply and return main piping with grooved connections to facilitate interconnection of multiple units.

Unit to include factory provided, integral, cleanable, water strainer with efficiency as required by manufacturer.

INSULATION

3/4" thick, flexible closed cell elastomeric foam insulation; minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75 ^{o}F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20 ^{o}F to 180 ^{o}F.

Factory insulate the following:

- Evaporator heat exchanger
- Motor housing (hermetic compressors)
- Motor cooling lines (hermetic compressors)
- All lines and surfaces 65^{o}F or colder

CONTROLS

Provide fully automatic microprocessor controller in a lockable steel control panel containing solid state chiller operating and safety controls for each chiller. Factory mount, wire and test controls on chiller. Operating setpoints and diagnostic procedures to be programmed through a color-coded, tactile-feel keypad. Provide an alphanumeric display showing all system parameters, safety and cycle shutdowns in the English language with numeric data in English units. Safety and cycle shutdown display to consist of date, time, cause of shutdown, and type of restart required.

Provide master chiller controller, of same manufacturer of chillers to facilitate operation of modular chillers, including: chiller safeties, sequencing, controlling and managing multiple modular chillers in a single plant.

Chiller controls shall, at a minimum provide the following safety controls:

- Low evaporator refrigerant temperature
- High condenser refrigerant pressure
- Low safety chilled water temperature
- Low chilled water flow
- Low condenser water flow
- Sensor malfunction
- Power fault
- Internal time clock
- Anti-recycle

Provide the following cycling shutdown controls with automatic reset:

- Low operating chilled water temperature
- Power fault
- Internal time clock
- Anti-recycle

Master system controller shall provide, at a minimum the following chiller controls:

- Leaving chilled water temperature control and reset
- Variable timers to prevent compressor short cycle
- Automatic rotation of compressors/refrigerant circuits to equalize compressor runtime.
- Automatic start which determines demand for chilled water from proof of chilled water flow and temperature differential between chilled water set point and supply temperature
- Percent current limit
- Pulldown demand limiting

The front of the chiller control panel shall display the following including the discrete external point connections, in clear language, without the use of codes, look-up tables, or gauges.

- Compressor starts and run time
- Chilled water setpoint and setpoint source
- Electrical current limit setpoint and setpoint source
- % RLA
- Chiller diagnostics including a time and date of occurrence (minimum 20 historic diagnostics stored in non-volatile chiller panel memory)
- Differential oil pressure
- Compressor motor voltage and amperes, by phase
- Compressor discharge temperature
- Chilled water entering and leaving temperatures
- Condenser water entering and leaving temperatures
- Evaporator and condenser refrigerant pressures
- Evaporator and condenser saturation temperatures

At a minimum, provide the following terminal connections for discrete input and output points as listed below:

- Enable/disable chiller
- Chiller Alarm
- Chilled Water Setpoint Reset
- Demand Reset
- Chilled Water Supply Temperature
- Chilled Water Return Temperature

The master chiller controller shall convert information into the BACnet MSTP BACnet/IP protocol that will be compatible with the building direct digital control system (DDC) as specified in Section 23 09 23. This output shall be through the appropriate interface port capable of two-way communication with the building DDC system. Coordinate with the DDC contractor so that the data port connection provided at the chiller shall not require any additional intermediate gateway or media conversion devices to provide throughput of data. No additional labor by the DDC contractor to integrate the chiller data points to the DDC system shall be required other than to make the communication trunk connection and program the points at the DDC workstation.

Provide evaporator freeze protection and low limit control to avoid low evaporator refrigerant temperature trip-outs. Control system shall take progressively more aggressive load limiting action in response to the severity of the rate of change and the actual value of the evaporator refrigerant temperature. If the condition exists for more than 20 minutes, a warning alarm relay shall energize to indicate that the condition has persisted.

Provide condenser high limit control to avoid condenser high-pressure tripouts. Control system shall take progressively more aggressive load limiting action in response to the severity of the rate of change and the actual value of the condenser pressure. If the condition exists for more than 20 minutes, a warning alarm relay shall energize to indicate that the condition has persisted.

For chillers that do not integral flow sensing, provide two (2) [McDonnell Miller Type FS7-4L] [IFM Efector model SI1006 Thermal Dispersion, Fluid Components Intl (FCI) model 12-64B Thermal Dispersion, or approved equal] flow switches to the Mechanical Contractor for installation in the condenser and chilled water piping. Provide all power supplies required for the flow sensors. The Mechanical Contractor shall provide and coordinate all field wiring from the flow switches to the chiller control panel.

ELECTRICAL AND MOTOR STARTER

Modular chillers shall utilize a single point electrical connection, with buss bar, for entire modular chilled water plant.

Motor starter shall be a 480 volt, solid-state type with closed-circuit transition.

Isolating switch and contactor assemblies, including current limiting fuses, shall be of the component-to-component design without any interconnecting cables or flexible shunts, removable from the front of the enclosure. Line and load cable terminations shall be completely accessible from the front.

The isolating switch shall be an externally operated manual three pole draw-out, such that in the open position it completely grounds and isolates the starter from the line connectors. Integral mechanical interlocks shall prevent entry while the starter is energized and shall prevent accidental opening or closing of the isolating switch when the door is open or contactor is closed. The isolating switch handle shall have provision for three (3) padlocks.

Current limiting power fuses shall be of the self-protecting type with visible fuse condition indicators, and with special time/current characteristics for motor service allowing proper coordination with the contactor and overload protection for each phase for maximum motor protection. The power fuses shall be vertically mounted permitting easy inspection and replacement without starter disassembly.

Isolate the low voltage starter control from the high power voltage area. Provide a control power transformer (CPT), fuses for each leg of the primary and secondary side of the CPT, “Start” and “Stop” pushbuttons, a red “Running” pilot light, and at least two normally open, and two normally closed contractors for control interlocking. CPT shall be of sufficient size to accommodate all control power needs of the starter/chiller combination.

Enclosure shall meet ANSI/NEMA ICS-6 enclosure standards, be NEMA 1 unless otherwise noted, be completely accessible from the front and allow freestanding, against a wall or back-to-back mounting.

Starter assembly shall be UL listed, and bear the UL label of approval where a UL standard or code exists.

Starter shall include motor protection system incorporating electronic three-phase overloads and current transformers. This electronic motor protection system shall monitor and protect against the following conditions:

Three-phase overload protection
Overload protection during start-up
Phase imbalance
Phase loss
Phase reversal
Overvoltage — each phase
Undervoltage — each phase
Distribution fault protection with manual restart at the starter consisting of three-phase, current sensing devices that monitor the status of the current. Distribution faults of 1-1/2 electrical cycle duration shall be detected and the compressor motor shall be disconnected within six (6) electrical cycles.
Alternately, the advanced motor protection system can be furnished in the chiller control panel
The starter shall be able to operate in temperatures up to 120 degrees F.
All field supplied wires, bus bars and fittings shall be copper only.

VIBRATION ISOLATION

The chiller supplier shall furnish refrigeration machine vibration isolation in accordance with 23 05 48 for the installation by the mechanical contractor.

PART 3 - EXECUTION

INSTALLATION

Install chillers in accordance with manufacturer's installation instructions.

Chillers shall be factory assembled, tested, and shipped to the job site. The chiller manufacturer is responsible for unloading at the job site and the Mechanical Contractor is responsible for final setting and installation.

Provide water strainers with efficiency/mesh size as required by chiller manufacturer at chiller inlet of chilled water and condenser water.

STARTUP

Include the service of a factory-trained technician/mechanic employed by the chiller manufacturer for the initial startup. Accomplish initial startup before County acceptance of the installation. .

Furnish a startup log to the Owner's operating personnel with a copy to the facility maintenance representative for this project. Document each subsequent startup or shutdown procedure and send report to Owner's operating personnel. Demonstrate the following items have been accomplished:

1. Inspect/clean cooler and condenser. Clean chilled water and condenser water inlet screens.

2. Perform leak test on fabricated compressor, vessel and piping joints after the system has been serviced and closed.

    a. Initial startup: Follow manufacturer's instructions with respect to evacuation, charging, positive pressure and/or vacuum testing. Pressure/vacuum testing to be in accordance with manufacturer's instructions. Perform any repairs necessary to obtain a successful pressure test. Do not operate chiller until it is successfully pressure tested. Use nitrogen

and suitable refrigerant for pressure test unless manufacturer's instructions require otherwise.

3. Lubrication system

   a. Initial startup: Charge unit with oil in accordance with manufacturer's instructions. Energize oil sump heater and verify thermostat setting per manufacturer's specification.

4. Electrical

   Tighten all starter electrical power connections and all control terminations at each inspection.

   Check all contactors at each inspection for proper mechanical linkage, freedom of operation and contact surfaces for pitting, corrosion and spring tension. Clean all contact surfaces as required; notify owner if replacement is recommended.

   Megger test and record all compressor and oil pump motor insulation readings at initial startup and each succeeding inspection. Compare findings to previous readings and make recommendations on any preventative maintenance required.

   Visually inspect and clean all components including resistor banks, disconnects, fuse holders, arc chutes, ammeters, voltmeters, watt-hour meters, dash-pots, etc.

5. At initial startup record date and pounds of refrigerant in machine.

6. Clean and touchup paint unit as required for protection.

7. Repair or replace damaged insulation caused by service/repair/maintenance work.

8. Give any used compressor oil to owner; owner will make arrangements for proper disposal.

9. At the initial startup, check unit operation, check all safety and operating controls, log all pertinent parameters of the unit, including but not limited to the following:

   a. Refrigerant pressure in cooler and condenser
   b. Saturated refrigerant temperature in cooler and condenser
   c. Water inlet and outlet temperatures in cooler and condenser
   d. Water side pressure drop in cooler and condenser
   e. Flow rate in gallons per minute in cooler and condenser
   f. Motor voltage and amperage in each phase

TRAINING

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 23 05 00.

Contractor to provide factory authorized representative and/or field personnel knowledgeable with the operations, maintenance and troubleshooting of the system and/or components defined within this section for a minimum period of 4 hours.

END OF SECTION