RFB NO. 108104

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. 108104
CITY-COUNTY BUILDING 4TH FLOOR AIR HANDLING UNIT REPLACEMENT
210 MARTIN LUTHER KING JR. BLVD.
MADISON, WISCONSIN

Opening Date: **THURSDAY, SEPTEMBER 4, 2008** Time: **2:00 P.M.**

Performance / Payment Bond: **100% OF CONTRACT AMOUNT** Bid Deposit: **5% OF BID AMOUNT**

Location: **PUBLIC WORKS OFFICE**

FOR INFORMATION ON THIS REQUEST FOR BIDS, PLEASE CONTACT:

ROB NEBEL, PROJECT ENGINEER
DANE COUNTY DEPARTMENT OF PUBLIC WORKS,
HIGHWAY & TRANSPORTATION
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713
TELEPHONE NO.: 608/267-0119
FAX NO.: 608/267-1533
E-MAIL: NEBEL@CO.DANE.WI.US

DOCUMENT INDEX FOR RFB NO. 108104

PROCUREMENT AND CONTRACTING REQUIREMENTS

Project Manual Cover Page
Documents Index and Dane County Vendor Registration Program
Invitation to Bid (Legal Notice)
Instructions to Bidders
Bid Form
Fair Labor Practices Certification
Best Value Contracting Application
Sample Public Works Contract
Sample Bid Bond
Sample Performance Bond
Sample Payment Bond
General Conditions of Contract
Supplementary Conditions

DIVISION 1 - GENERAL REQUIREMENTS

01000 – Basic Requirements
01058 – Recycling

DIVISION 2 - SITE CONSTRUCTION

02070 – Selective Demolition

DIVISION 3 - CONCRETE

(Not Used)

DIVISION 4 - MASONRY

04415 – Stone Masonry

DIVISION 5 - METALS

05500 – Metal Fabrications

DIVISION 6 - WOOD AND PLASTICS

(Not Used)

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07420 – Aluminum Composite Panel System
07900 – Joint Sealers

DIVISION 8 - DOORS AND WINDOWS

(Not Used)

DIVISION 9 - FINISHES

09900 – Painting

DIVISION 10 - SPECIALTIES

(Not Used)

DIVISION 11 - EQUIPMENT

(Not Used)

DIVISION 12 - FURNISHINGS

(Not Used)

DIVISION 13 - SPECIAL CONSTRUCTION

(Not Used)

DIVISION 14 - CONVEYING SYSTEMS

(Not Used)

DIVISION 15 - MECHANICAL

B15010 – Basic HVAC General Requirements
B15050 – Basic HVAC Materials and Methods
B15250 – HVAC Systems Insulation
B15500 – HVAC Basic Piping Requirements
B15750 – Mechanical Heat Transfer Equipment
B15850 – Air Handling
B15880 – Air Distribution
B15900 – Facility Management and Control System (FMCS)
B15950 – Automatic Temperature Control Work
B15990 – Testing, Adjusting, and Balancing
C15010 – Basic Fire Protection General Requirements
C15050 – Basic Fire Protection Materials and Methods
C15400 – Fire Protection Systems

DIVISION 16 - ELECTRICAL

16001 – General Electrical Requirements
16100 – Basic Materials and Methods
16515 – Lighting
16722 – Fire Alarm System

DRAWINGS – NOTE: All drawings are to scale if printed on 24" x 36" paper.

G1.0 – Cover Sheet and Index of Drawings
A1.0 – Exterior Elevations
A2.0 – Fourth Floor Mechanical Room Plan and Demolition Plan
A7.0 – Wall Sections
H1.1 – Fourth Floor Mechanical Room and HVAC Schedules
H2.0 – HVAC Demolition Plan, New Work Schedules and Details
E1.1 – Electrical Floor Plan, Details and Abbreviations
E1.2 – Electrical Riser Diagram and Schedules

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders / proposers wishing to submit a bid / proposal should be registered with Dane County Purchasing before bid / proposal opening & must be registered before award of contract. Complete a Vendor Registration Form at www.danepurchasing.com, or obtain one by calling 608/266-4131.

LEGAL NOTICE

INVITATION TO BID

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

2:00 P.M., THURSDAY, SEPTEMBER 4, 2008

REQUEST FOR BIDS NO. 108104

FOURTH FLOOR AIR HANDLING UNIT REPLACEMENT
CITY-COUNTY BUILDING
210 MARTIN LUTHER KING, JR. BLVD.
MADISON, WISCONSIN

Dane County is inviting Bids from Mechanical Contractors for removal and replacement of existing air handling unit and associated ductwork.

A pre-bid tour is scheduled for Tuesday, August 26, 2008 at 9:00 a.m. Meet at the 4th floor elevator lobby. 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 Engineer, at 608-267-0119, for any questions or additional information.

All Bidders wishing to submit Bids should be registered vendor with Dane County Purchasing & prequalified as Best Value Contractor before bid opening & must be registered & prequalified before award of contract. Complete Vendor Registration Form at www.danepurchasing.com or obtain one by calling 608-266-4131. Complete Prequalification Application for Contractors at www.co.dane.wi.us/pwht/pwengineer.aspx or obtain one by calling 608-266-4018.

PUBLISH: AUGUST 14 AND 21, 2008 - WISCONSIN STATE JOURNAL

AUGUST 18 AND 25, 2008 – WESTERN BUILDER

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 Tuesday, August 26, 2008 at 9:00 AM. Meet on 4th Floor of the City-County Building at the Martin Luther King Jr. Blvd. elevator lobby. 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 County 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. County and Architect / Engineer will not be responsible for verbal instructions.

4. QUALIFICATIONS OF BIDDER (CONTRACTOR AND SUBCONTRACTOR)

A. Before award of Contract can be approved, County shall be satisfied that Bidder involved meets following requirements:

1. Has completed at least one (1) project of at least fifty percent (50%) of size or value of Division of work being bid and type of work completed is similar to that being bid. If greater magnitude of experience is deemed necessary, other than size or value of work, such requirements will be described in appropriate section of Specifications.

2. Maintains permanent place of business.

3. Can be bonded for terms of proposed Contract.

4. Complies with Chapter 40 of the Dane County Ordinances with respect to Best Value Contracting qualification. Qualification with State of Wisconsin's Executive Order 108 or City of Madison's Best Value Contracting Ordinance meets qualification requirements of County.

5. Is not presently on ineligible list maintained by County's Department of Administration for noncompliance with equal employment opportunities and affirmative action requirements.

6. Is 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 County 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. County reserves right to reject Bid if evidence submitted by, or investigation of, bidder fails to satisfy County 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 County 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 ten (10) days 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 ten (10) days 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 any Owner accepted alternates. Alternates do not need to be chosen in order of their appearance on the Bid Form.

   2. County 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 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 Statue 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.

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. INFORMATIONAL BIDS

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

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

17. UNIT PRICES

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

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

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

18. COMMENCEMENT AND COMPLETION

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

B. Should it be found impossible to complete the Work on or before time specified for completion, written request may be submitted for extension of time setting forth reasons believed to justify granting of such request.

19. WORK BY COUNTY

A. This work will be accomplished by County or will be let under separate contracts and will not be included under this Contract:
   1. Alternate Bid 1.

20. SPECIAL HAZARDS COVERAGE

A. Not Applicable.

FORM A

DANE COUNTY
EMERGING SMALL BUSINESS REPORT - CERTIFICATION

In accordance with General Conditions of Contract, submit this Emerging Small Business Report within ten (10) days after Bid 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. 108104
PROJECT: TENANT IMPROVEMENTS
FOURTH FLOOR AHU, CITY-COUNTY BUILDING

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

BASE BID - LUMP SUM:
Work includes construction services for the replacement of the 4th Floor air handling unit including demolition, exterior façade modifications, HVAC, electrical and fire protection. The undersigned, having examined the site where the Work is to be executed and having become familiar with local conditions affecting the cost of the Work and having carefully examined the Drawings and Specifications, all other Construction Documents and Addenda thereto prepared by Dane County Department of Public Works, Highway & Transportation hereby agrees to provide all labor, materials, equipment and services necessary for the complete and satisfactory execution of the entire Work, as specified in the Construction Documents, for the Base Bid stipulated sum of:

_____ and _____ /100 Dollars
Written Price

$_____
Numeric Price

The undersigned further agrees to add the alternate(s) portion of the Work as described, for the following addition(s) to or subtraction(s) from the Base Bid stipulated below. They further agree to honor the alternate(s) bid for 60 days from date of Award of Contract.

ALTERNATE BID 1 - LUMP SUM:
Demolition of mechanical (excluding fire protection), electrical and architectural within the Mechanical Room, prep of existing floors, and removal of existing louvers by County.

Deduct: _____ and _____ /100 Dollars
Written Price

$_____
Numeric Price

ALTERNATE BID 2 - LUMP SUM:
Control system integration as indicated in specification Section 15900-14, 2.14.

_____ and _____ /100 Dollars
Written Price

$_____
Numeric Price

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

Addendum No(s). _____ through_____

Dated _____

Dane County Department of Public Works, Highway & transportation must have this project completed by April 1, 2009. Assuming a Notice to Proceed is issued by October 9, 2008, 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 bidders to be prequalified with the County prior to bid opening. In addition, the County reviews potential contractors and sub-contractors who wish to work on County contracts. This document shall be completed, properly executed, along with the necessary attachments regarding information relating to financial ability, equipment, experience in the work prescribed in the public contract, and other matters that the County requires for the protection and welfare of the public in the performance of a County contract.

The Contractor shall notify the County within 15 days of any information regarding any material 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 or other sanctions available under the law.

Contractors or subcontractors of any tier who attain prequalification status will retain that status for a period of two years from the date of qualification. Subcontractors must become prequalified ten days prior to commencing work under any Dane County Public Works Contract. Potential subcontractors are urged to become prequalified as early as possible.

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 www.wisconsinapprenticeship.org.

EXEMPTIONS

- Contractors or subcontractors of any tier automatically attain prequalification status with Dane County if the contractor has current Executive Order 108 precertification status with the State of Wisconsin or prequalification status with the City of Madison.
- Contractors who employ less than five (5) craft 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; or
    - 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 the project or obtain the same through the use of responsible, prequalified subcontractors?	Yes: ☐ No: ☐
2	Does 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	Does your firm meet all bonding requirements as required by applicable law or contract specifications?	Yes: ☐ No: ☐
4	Does 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	Does 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	Does 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 prequalified with the City of Madison?	Yes: ☐ No: ☐
16	Is your firm an active Wisconsin Trade Trainer as determined by the Wisconsin Bureau of Apprenticeship Standards?	Yes: ☐ No: ☐
17	Is your firm exempt from being prequalified with Dane County?	Yes: ☐ No: ☐ If Yes, attach reason for exemption.
18	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

ATTN: JOHN SCHRAUFNAGEL
DANE COUNTY DEPARTMENT OF PUBLIC WORKS
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
Environmental Systems Technician/HVAC Service Technician/HVAC Install/Service
Glazier
Heavy Equipment Operator/Operating Engineer
Insulation Worker (Heat & Frost)
Iron Worker (Assembler, Metal Buildings)
Painter/Decorator
Plasterer
Plumber
Roofer/Waterproofer
Sheet Metal Worker
Sprinkler Fitter
Steamfitter (Service & Refrigeration)
Taper & Finisher
Telecommunications (Voice, Data & Video) Installer/Technician
Tile Setter

COUNTY OF DANE

PUBLIC WORKS CONTRACT

Contract No. _____ Bid No. 108104

Authority: Res. _____, 2008-09

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

W I T N E S S E T H :

WHEREAS, COUNTY, whose address is c/o Associate Public Works Director, 1919 Alliant Energy Center Way, Madison, WI 53713, desires to have CONTRACTOR provide City-County Building 4th Floor Air Handling Unit Replacment [including Alternate Bids 1 & 2] ("the Project"); and

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

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

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

7. 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.

8. 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.

9. 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 a 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 a 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, an 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 a 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 a 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 a 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 a 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 a 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 a 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 a standard; 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 a 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 an 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 a 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 in a diligent manner, without previous instructions from Architect / Engineer and / or Department, in an 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 an 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. An 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 a 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 a 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 a 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, an 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 THE 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 a Construction Schedule. Contractor and all subcontractors associated with the Work shall furnish following information from each Division of Specifications:
   1. A 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 a monthly basis. Revisions to Schedule shall be by Contractor and made in same detail as original Schedule and accompanied by an 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 a 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 a 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 a 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 a bonded warehouse with adequate coverage. If there is any error in a 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 a 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 a 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 a 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 representativesfrom 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 a 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 a 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 a Performance and Payment Bonds in an 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 a 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 a 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. 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".

37. 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.

38. 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 an 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 a waiver by County of any breach of covenants of Contract or a 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 a 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 a 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.

39. 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.

40. 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.

41. 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.

42. 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 a recipient of services (actual or potential), an employee, or an 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 a statement to effect Contractor is an "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. A 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 a percentage of total dollar amount of bid.

43. 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."

44. USE AND OCCUPANCY PRIOR TO ACCEPTANCE

A. Contractor agrees to use and occupancy of a 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.

45. MINIMUM WAGES

A. Contractor shall post, at appropriate conspicuous point on site of project, a 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 a 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.

46. 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.

47. ANTITRUST AGREEMENT

A. Contractor and County recognize that in actual economic practice, overcharges resulting from antitrust violations are in fact usually borne by County. Therefore, Contractor hereby assigns to County any and all claims for such overcharges as to goods and materials purchased in

connection with this Contract, except as to overcharges which result from antitrust violations commencing after price is established under this Contract and any change order thereto.

48. INSURANCE

A. Contractor Carried Insurance:
   1. Contractor shall not commence work under this Contract until Contractor has obtained all insurance required under this Article and has provided evidence of such insurance to Risk Manager, 425 City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703. Contractor shall not allow any subcontractor to commence work until insurance required of subcontractor has been so obtained and approved. Company providing insurance must be licensed to do business in Wisconsin.
   2. Worker's Compensation Insurance:
      a) Contractor shall procure and shall maintain during life of this Contract, Worker's Compensation Insurance as required by statute for all of Contractor's employees engaged in work at site of project under this Contract and, in case of any such work sublet, Contractor shall require subcontractor similarly to provide Worker's Compensation Insurance for all of latter's employees to be engaged in such work unless such employees are covered by protection afforded by Contractor's Worker's Compensation Insurance.
      b) If any claim of employees engaged in hazardous work on project under this Contract is not protected under Worker's Compensation Statute, Contractor shall provide and shall cause each subcontractor to provide adequate Employer's Liability Insurance for protection of such of Contractor's employees as are not otherwise protected.
   3. Contractor's Public Liability and Property Damage Insurance:
      a) Contractor shall procure and maintain during life of this Contract, Contractor's Public Liability Insurance and Contractor's Property Damage Insurance in an 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 an amount not less than $1,000,000 on account of one accident, and Contractor's Property Damage Insurance in an amount not less then $1,000,000 or a combined single limit of at least $1,000,000 with excess coverage over and above general liability in an amount not less than $5,000,000. Contractor shall add "Dane County" as an 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. Contractual Liability coverage shall be carried in (substantially) following form: "Insurance 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 insurance will save, defend, indemnify and hold harmless County and Architect / Engineer from all damages caused by or as a result of Contractor's operations" and each shall be listed as additional insured.
      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 an 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 an 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. County Provided Protection:
   1. County shall provide a Builder's Risk policy when applicable to project. County's Risk Manager, upon Contractor's request, will make available terms of this policy. 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 a part indemnified hereunder.
   2. In any and all claims against Dane County, its boards, commissions, agencies, officers, employees and representatives or by any employee of Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, indemnification obligation under this Contract shall not be limited in any way by any limitation on amount or type of damages, compensation or benefits payable by or for Contractor or any subcontractor under worker's compensation acts, disability benefits or other employee benefit acts.
   3. Obligations of Contractor under this Contract shall not extend to liability of Architect / Engineer, its agents or employees arising out of:
      a) Preparation or approval of maps, drawings, opinion, reports, surveys, change orders, designs or specifications; or
      b) Giving of or failure to give directions or instruction by Architect / Engineer, its agents or employees provided such giving or failure to give is primary cause of injury or damage.
   4. Dane County shall not be liable to Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

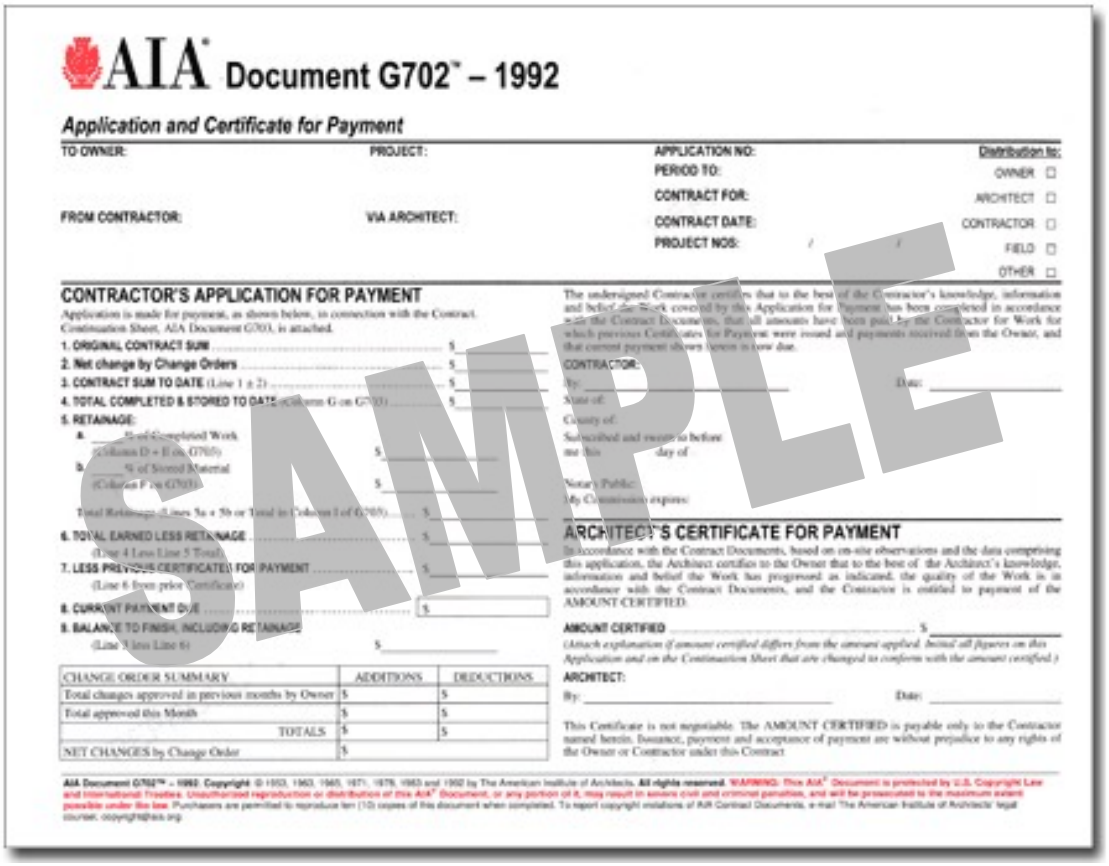
49. WISCONSIN LAW CONTROLLING

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

SUPPLEMENTARY CONDITIONS

1. APPLICATION & CERTIFICATE FOR PAYMENT

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

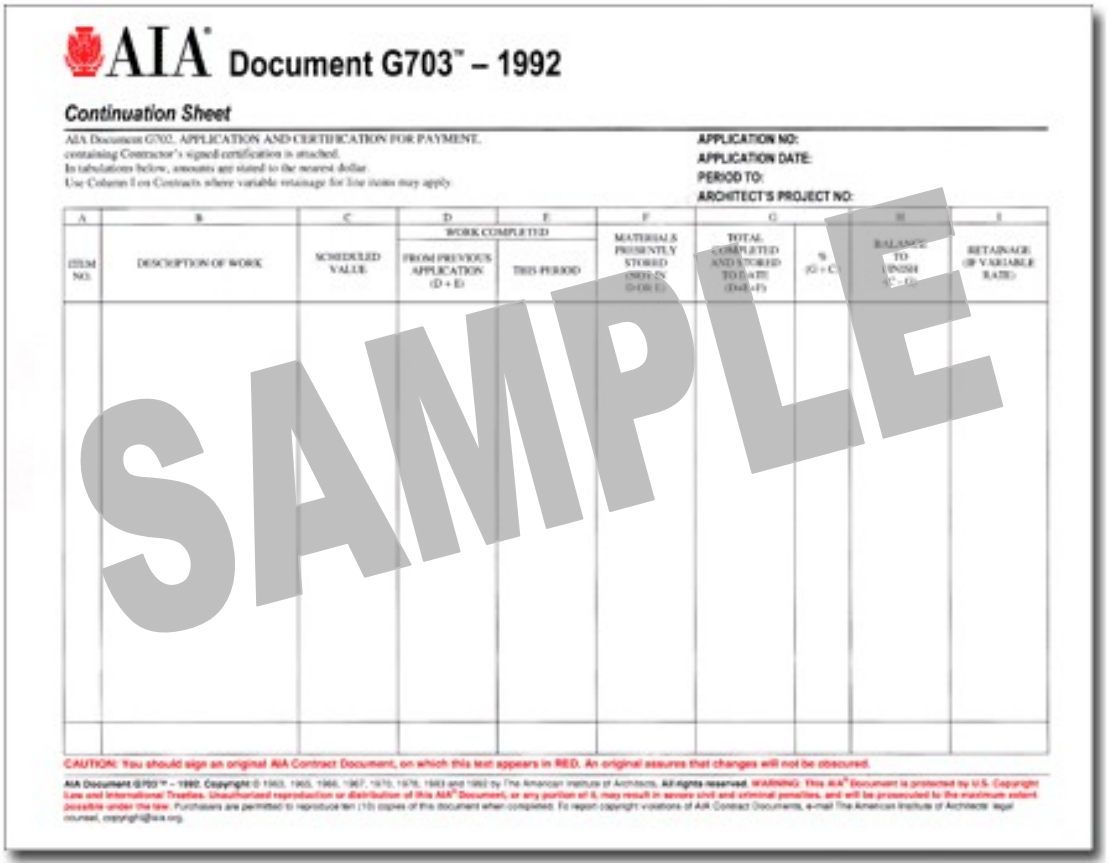
AMOUNT CERTIFIED ..... $
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

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.

AIA Document G702™ – 1992. Copyright © 1953, 1963, 1965, 1971, 1978, 1983 and 1992 by The American Institute of Architects. All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.

SAMPLE



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.

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. 200800417 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)

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, ASSOCIATE PUBLIC WORKS DIRECTOR
DANE COUNTY PUBLIC WORKS
1919 ALIANT ENERGY CENTER WAY
MADISON, WI 53713

RE: 4TH FLOOR AIR HANDLING UNIT REPLACEMENT
CITY OF MADISON, DANE COUNTY, WI
Determination No. 200801164 Project No. 108104

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

8/11/2008

Enclosures

FOR THE DEPARTMENT

Rita Ruona, Investigator
Labor Standards Bureau
Construction Wage Standards Section
(608) 266-1898

PREVAILING WAGE RATE DETERMINATION

Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Stats.
Issued On: 8/11/2008

DETERMINATION NUMBER: 200801164

EXPIRATION DATE: Prime Contracts MUST Be Awarded Or Negotiated On Or Before 2/06/2009. If NOT, You MUST Reapply.

DESCRIPTION OF PROJECT: 4TH FLOOR AIR HANDLING UNIT REPLACEMENT
PROJECT NO: 108104

LOCATION OF PROJECT: CITY OF MADISON, DANE COUNTY, WI

CONTRACTING AGENCY: DANE COUNTY 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	25.51	12.11	37.62
Boilermaker	29.44	16.37	45.81
Bricklayer, Blocklayer or Stonemason	29.46	13.41	42.87
Cabinet Installer	48.00	0.00	48.00
Carpenter	26.11	12.86	38.97
Carpet Layer or Soft Floor Coverer	25.51	12.11	37.62
Cement Finisher	28.43	12.94	41.37
Drywall Taper or Finisher Future Increase(s): Add $1.55/hr on 6/1/08; Add $1.60/hr on 6/1/09	24.30	11.60	35.90

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Electrician	30.00	16.05	46.05
Elevator Constructor	40.94	18.34	59.28
Fence Erector	21.50	3.00	24.50
Fire Sprinkler Fitter	35.69	13.35	49.04
Glazier	33.68	6.47	40.15
Heat or Frost Insulator	30.63	16.60	47.23
Future Increase(s): Add $2.60/hr on 6/1/08; Add $2.85/hr on 6/1/09; Add $3.05/hr on 6/1/2010.			
Insulator (Batt or Blown)	21.97	10.65	32.62
Ironworker	29.30	14.71	44.01
Lather	25.51	12.11	37.62
Line Constructor (Electrical)	31.99	13.94	45.93
Marble Finisher	24.60	13.00	37.60
Marble Mason	30.75	13.00	43.75
Metal Building Erector	19.23	1.61	20.84
Millwright	27.11	12.07	39.18
Overhead Door Installer	24.60	11.99	36.59
Painter	24.00	11.60	35.60
Future Increase(s): Add $1.55 on 6/1/08; Add $1.60 on 6/1/09 Premium Pay: Add $.25/hr. sandblasting; Add $.40/hr. paperhanging; Add $1.00/hr. spray/structural steel.			
Pavement Marking Operator	23.46	9.45	32.91
Piledriver	26.61	12.86	39.47
Pipeline Fuser or Welder (Gas or Utility)	27.11	12.19	39.30
Plasterer	25.28	12.95	38.23
Plumber	33.50	11.84	45.34
Future Increase(s): Add $2.20/hr on 6/1/08			
Refrigeration Mechanic	33.11	14.84	47.95
Future Increase(s): Add $2.60 6/2/2008; Add $2.85 6/1/2009			
Roofer or Waterproofer	26.70	3.62	30.32
Sheet Metal Worker	30.96	16.34	47.30
Future Increase(s): Add $2.50 6/1/2008			
Steamfitter	35.25	12.11	47.36
Future Increase(s): Add $2.60 6/02/2008; Add $2.85 6/01/2009			
Teledata Technician or Installer	20.69	10.23	30.92
Future Increase(s): Add $.85 on 6/1/08; Add $.90 on 6/1/09			
Temperature Control Installer	34.10	10.89	44.99
Terrazzo Finisher	26.62	10.63	37.25
Terrazzo Mechanic	26.62	10.63	37.25
Tile Finisher	14.00	1.35	15.35
Tile Setter	26.62	10.63	37.25
Tuckpointer, Caulker or Cleaner	20.98	6.02	27.00
Underwater Diver (Except on Great Lakes)	31.90	11.44	43.34
Well Driller or Pump Installer	22.52	7.14	29.66
Siding Installer	28.56	15.24	43.80
Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	24.06	15.52	39.58

Fringe Benefits Must Be Paid On All Hours Worked

TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.12	15.40	43.52
Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	16.00	8.00	24.00
Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	20.58	10.71	31.29
Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	17.41	9.80	27.21
TRUCK DRIVERS			
Single Axle or Two Axle	24.55	16.08	40.63
Three or More Axle	16.40	11.17	27.57
Articulated, Euclid, Dumptor, Off Road Material Hauler	27.87	15.40	43.27
Pavement Marking Vehicle	20.85	11.10	31.95
Truck Mechanic	12.50	0.00	12.50
LABORERS			
General Laborer Premium Pay: Add $1.00/hr for certified welder; Add $.25/hr for mason tender	21.69	11.15	32.84
Asbestos Abatement Worker	21.06	11.13	32.19
Landscaper	12.36	14.53	26.89
Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	18.25	3.33	21.58
Fiber Optic Laborer (Outside, Other Than Concrete Encased)	40.00	1.81	41.81
Railroad Track Laborer	12.00	0.00	12.00
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)	28.12	15.73	43.85
Farm or Industrial Type Tractor; Greaser; Compactor (Self-Propelled); Broom or Sweeper; Environmental Burner	28.59	16.00	44.59
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; Mulcher; Vibratory Hammer or Extractor	27.59	14.88	42.47
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 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.	30.62	16.00	46.62

Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
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): Premium Pay: Add $.25/hr for cranes with lifting capacity of 45 ton or over	29.62	16.00	45.62
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); Manholst 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):	29.12	16.00	45.12
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	22.98	6.02	29.00
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	28.87	14.90	43.77
Oiler; Forklift	25.89	16.00	41.89
Gas or Utility Pipeline, Except Sewer and Water (Primary Equipment)	31.57	17.23	48.80
Gas or Utility Pipeline, Except Sewer and Water (Secondary Equipment)	28.12	15.40	43.52
Fiber Optic Cable Equipment	25.33	12.35	37.68

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) 266-1898.

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

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 Mike Dixon, Equal Rights Division, P. O. Box 8928, Madison, WI 53708 or call (608) 266-0028. 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
Bay Asphalt, Inc.	1792 Scray Hill Road De Pere, WI 54115	1/1/03	12/31/05	1, 2 and 4	1997-1999	None
Bechitsao, Joel	See Tri-State Traffic Services, Inc.					
B.P. Phillips Construction, Inc.	1570 Fire Lane Drive Green Bay, WI 54311	9/19/01	9/18/04	1, 2 and 4	4/7/97 to 3/7/98	None
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
Haim, James	See Haim Painting, Inc.					

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Haim Painting, Inc.	N15 W22120 Jerico Drive, #8 Waukesha, WI 53186	4/1/01	3/31/04	1, 2 and 4	7/6/97 to 10/30/98	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
Jacobi, Sandi	See Wisconsin Detention Systems, Inc.					
Jacobi Sr., Michael A.	See Wisconsin Detention Systems, Inc.					
Joseph Stoller Company	N8426 Hwy 42	2/1/2007	1/31/2010	1, 2	2004 and 2005	None
J. R. Electric	2391 233rd St., P. O. Box 491, Cushing, WI 54006	1/1/03	12/31/05	1 and 2	1999	None
J. R. Electric, Inc.	2391 233rd St., P. O. Box 491, Cushing, WI 54006	1/1/03	12/31/05	1 and 2	1999	None
Keiver, David	See Custom Heating & Air LLC	12/1/06	11/30/09	1, 2 and 4	2003 and 2004	None
Kletschka, Richard	See J. R. Electric and J. R. Electric, Inc.					
Kletschka, Tristan	See J. R. Electric, Inc.					
Kruczek Construction, Inc.	3636 Kewaunee Road, Green Bay, Wi 54311	6/1/05	11/30/05	1 and 2	1998 and 1999	None
Kruczek, John	See Kruczek Construction, Inc.					
LaCosse, Todd	See Midwest Contractors, Inc.					

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Maria, Steve	See Gibralter Construction LLC					
Mellendez, Odilion	See Amigo Painting					
Midwest Contractors, Inc.	2100 Depot St., Holt, MI 48842	6/21/02	6/20/05	1	6/11/99 to 12/31/99	None
Nevels, Betty	See D. C. Nevels Truckng, Inc.					
Nevels, Donald	See D. C. Nevels Trucking, Inc.					
Phillips, Bruce P.	See B.P. Phillips Construction					
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
Scandia Heating and Air Conditioning, Inc.	P. O. Box 7 Scandia, MN. 55703	5/1/2003	4/30/2004	1 and 2	2001	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

Name of Contractor	Address	Effective Date	Termination Date	Cause Code	Date of Violation(s)	Limitations/Deviations
Wanta, Daniel	See Bay Asphalt, Inc.					
Wisconsin Detention Systems, Inc	.W204 N16635 Jackson Drive Jackson, Wisconsin 53037	1/1/03	12/31/05	1	9/2000 to 3/2001	None
West, James F.	See Scandia Heating and Air Conditioning, Inc.					
Zinke, Stacy	See Talex Contractors, Inc.					

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

SECTION 01000

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. Progress Cleaning
23. Products
24. Transportation, Handling, Storage and Protection
25. Product Options
26. Substitutions
27. Starting Systems
28. Demonstration and Instructions
29. Contract Closeout Procedures
30. Final Cleaning
31. Adjusting
32. Operation and Maintenance Data
33. Spare Parts and Maintenance Materials
34. 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 construction services for 4th Floor air handling unit replacement including demolition, exterior façade modifications, HVAC, electrical and fire protection.

B. Work by Owner: Alternate Bid 1.

C. Permits: Prior to commencement of the Work, Contractor to secure any and all necessary permits for completion of the Work and facility occupancy. Contractor to include in permit submittal a letter regarding building envelope modifications. Letter to be provided by Architect.

1.3 CONTRACTOR USE OF PREMISES

A. Limit use of premises to allow work by Contractors or Subcontractors, work by Owner, and access by Owner. Note that the spaces adjacent to and affected by this Work will be occupied during all Work.

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: Bi-weekly.

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 Demolition by County.
      a. Demolition of mechanical (excluding fire protection), electrical and architectural within the Mechanical Room, prep of existing floors, and removal of existing louvers by County.
   2. Alternate Bid 2 Control system integration.
      a. Control system integration as indicated in specification Section 15900-14, 2.14.

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. One (1) parking stall for the general contractor shall be available in the City-County Building underground parking garage.

B. An additional three (3) parking stalls shall be available in the Courthouse driveway. These stalls shall be available as follows:
   1. One (1) stall for the HVAC subcontractor.
   2. One (1) stall for the plumbing subcontractor.
   3. One (1) stall for the electrical subcontractor.

C. Arrange for any additional parking to accommodate construction personnel.

1.22 PROGRESS CLEANING

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

1.23 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.

1.24 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

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

1.25 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 Project Engineer for approval at least seven (7) days prior to Bid Opening. Public Works Project Engineer shall consider requests for Substitutions up to seven (7) days prior to date of 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 up to fifteen (15) days after Bid Opening may be considered, but Project Engineer is not required to consider them. Dane County reserves right to approve or reject substitutions based on Specification requirements and intended use.

1.26 REQUESTS FOR SUBSTITUTIONS

A. Document each request with complete data substantiating compliance of proposed Substitution with Construction Documents.

B. Submit three (3) copies of requests for Substitution for consideration. Limit each request to one (1) proposed Substitution.

C. Substitutions shall not change contract price established at Bid Opening.

1.27 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.

1.28 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.

1.29 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.

1.30 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.

1.31 ADJUSTING

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

1.32 OPERATION AND MAINTENANCE DATA

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

1.33 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.

1.34 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-builts drawings in AutoCAD 2007 (or lower) format on CD.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01058

RECYCLING

PART 1 GENERAL

1.1 SUMMARY

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

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. Concrete.
   7. Corrugated Cardboard.
   8. Metal.
   9. Carpet Padding.
   10. Gypsum Drywall.
   11. Barrels & Drums.
   12. 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:_____
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:_____
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 02070

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

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

1.03 RELATED WORK

A. Stone Masonry, Section 04415.

B. Metal Fabrications, Section 05500.

1.04 SUBMITTALS

A. For utilities or other services requiring removal or abandonment in-place, submit materials documenting completion of such work.

B. Submit copies of records documenting recycling of demolition materials from the site.

1.05 DEFINITIONS

A. “Remove”: Remove and legally dispose of items, except those indicated to be reinstalled.

B. “Remove and Reinstall”: Remove items indicated; clean, service and otherwise prepare them for reuse; store and protect against damage. Reinstall in the same location or in locations indicated.

C. “Existing to Remain”: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the A/E, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.06 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

1.07 RECORD DRAWINGS

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

1.08 SAFETY

A. Verify that all gas and electrical utilities have been abandoned or disconnected and associated hazards mitigated, prior to beginning any demolition.

B. Take all necessary precautions while dismantling piping containing gas, gasoline, oil or other explosive or toxic fluids or gases. Purge lines and contain materials in accordance with all applicable regulations. Store such piping outdoors until fumes are removed.

C. Maintain a clean and orderly site. Remove debris at end of each workday.

D. If hazardous materials are not anticipated, but encountered, terminate operations and contact the Owner immediately. Follow all applicable local, state and federal regulations pertaining to hazardous materials.

1.09 PERMITS

A. Unless otherwise noted, Contractor shall be responsible for obtaining and paying for all permits necessary to complete demolition work.

B. If necessary, file and maintain Notification of Demolition and/or Renovation and Application for Permit Exemption (WDNR Form 4500-113) in accordance with the Wisconsin Administrative Code Chapter NR447.

1.010 DISCONNECTION OF SERVICES

A. Prior to starting removal and/or demolition operations be responsible and coordinate disconnection of all existing utilities, communication systems, alarm systems and other services.

B. Disconnect all services in manner which insures continued operation in facilities not scheduled for demolition.

C. Disconnect all services in manner which allows for future connection to that service.

D. Disconnect services to equipment at unions, flanges, valves, or fittings wherever possible.

1.011 REMOVAL/SALVAGING OF ITEMS

A. Carefully remove all items that are scheduled to be salvaged.

B. Secure salvaged items to allow for future movement; provide pallets, skids and other devices as necessary. Secure all loose parts.

C. Provide crates, padding, tarps and other measures necessary to protect salvaged items during storage. Store items in secure location, safe from vandalism, weather, dust and other adverse elements.

D. Where salvaged items are indicated to be turned over to Owner, deliver to location on property where designated by Owner.

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

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

PART 2 - PRODUCTS

2.01 EQUIPMENT

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

PART 3 - EXECUTION

3.01 GENERAL

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

3.02 PROTECTION OF EXISTING WORK AND FACILITIES

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

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

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

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

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

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

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

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

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

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

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

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

M. If necessary, provide additional materials to protect existing building components that are to remain.

N. Where necessary to prevent collapse of any construction, install temporary shores, struts or bracing. Do not commence demolition work until all temporary construction is complete.

O. Take precautions to guard against movement, settlement or collapse of any surrounding construction designated to remain and be liable for any such movement, settlement or collapse.

3.03 DEMOLITION

A. Remove all equipment, fixtures and other materials scheduled for salvage prior to beginning demolition operations.

B. Abandon gas, electric and communication utilities in accordance with local utility company requirements, or applicable substantive requirements if considered private.

C. Remove all sealant, fasteners and damaged or rotten blocking from existing construction to remain where demolition occurs.

3.04 TRANSPORTATION AND DISPOSAL OF DEMOLITION WASTE

A. Transport and dispose all demolition waste in accordance with local, state, and federal guidelines.
1. Recycle fluorescent lamps and other lamps containing heavy metals with a company engaged in the proper handling and recycling of these materials.
2. Properly dispose of any lamp ballasts containing PCB's.

B. Whenever possible, or otherwise required by the Contract Documents, recycle demolition waste.

C. Demolition waste that cannot be recycled shall be disposed of at a landfill or dumpsite designed and approved to accept the given waste.

D. Maintain records documenting recycling of demolition waste. Record description of material, date removed, quantity removed and recycling destination.
1. Provide copies of records to A/E at completion of project.

3.05 SCHEDULE

A. Items to be removed shall be as indicated on the Drawings.
1. Items to be stored and reinstalled.
2. Items to be removed from site by Contractor.

B. Items to remain (if clarification required).

3.06 CLEANING

A. All adjacent areas shall be broom cleaned and ready to receive new construction.

B. Remove from the site all debris resulting from the Work of this Section.

END OF SECTION

SECTION 04415

STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

A. Modification to stone masonry anchored to concrete masonry back-up.

B. Anchorage and setting systems.

1.03 QUALITY ASSURANCE

A. Manufacturer shall have minimum of five years production experience in work of quality and scope required on this Project.

B. All units, setting methods and finish shall be in strict accordance with Industry Standards and Practices set forth by the Indiana Limestone Institute of America.

1.04 SUBMITTALS

A. Shop Drawings:
   1. Shop Drawings shall be complete and shall include a layout plan, fabrication details, connection and anchorage details, location of lifting devices, and member identification marks. The identification marks shall appear on the manufactured units to facilitate correct field placement. Manufacturer's standard hardware will be clearly described.

B. Mock-up:
   1. Provide mock-up for review. Approved mock-up may be review of modification of first panel.

C. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

1.05 DELIVERY, STORAGE AND HANDLING

A. Transport and handle with proper equipment to protect units from dirt and damage. Place nonstaining resilient spacers of even thickness between each unit. Units shall be palletized.

B. Store to protect units from contact with soil or ground. Store units on firm surfaces to avoid warping and cracking. Place stored units so that identification marks are discernible.

1.06 PROJECT CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed stone masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone masonry.
   1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt on completed stone masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions.
   1. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   2. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

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

1.07 COORDINATION

A. Advise installers of other work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

PART 2 - PRODUCTS

2.01 STONE

A. Stone: existing.

2.02 MORTAR SETTING BED

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Color: Match existing.

B. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.

E. Aggregate: ASTM C 144 and as follows:
   1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.

F. Mortar Color:
   1. Mortar Color to be selected by Architect from full line of manufacturer’s colors.

2.03 ANCHORS

A. Veneer Anchors
   1. Materials:
      a. Hot-Dip Galvanized-Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
      b. Hot-Dip Galvanized-Steel Sheet: ASTM A 1008/A 1008M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.
   2. Size: Sufficient to extend at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least 5/8-inch cover on outside face.
   3. Truss Reinforcement with Veneer Anchors: Units consisting of a wire tie section and a metal horizontal joint reinforcement section that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall.
   4. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2.04 DAMPPROOFING

A. As recommended by Indiana Limestone Institute of America. Dampproof all unexposed surfaces of units that are less than 1 foot above grade.

2.05 SEALANT

A. Sealant for Loactions Except as Specified in the Subsequent Paragraphs: PECORA Dynatrol I, Sonolastic NP-1, TREMCO Dymonic, or other acceptable one part polyurethane.
   1. Comparable means both quality and color options.

B. Primer: When required, as recommended by the Sealant Manufacturer.

C. Closed Cell Back-up (Backer Rod): "Green-Rod", Nomanco "HBR" or "Sonofoam".

2.06 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

   1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.

   2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.

B. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.

C. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 3/4 inch out from wall, with outer edge bent down 30 degrees and hemmed.

D. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

E. Elastomeric Sealant: ASTM C 920, chemically curing polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.07 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from polyurethane.

B. Water: Potable.

2.08 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride.
   2. Limit cementitious materials in mortar to portland cement and lime.

B. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball.
   1. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency.
   2. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

C. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

D. Mortar for Stone Masonry: Comply with ASTM C 270.
   1. Mortar for Setting Stone: Type S.

2.09 FABRICATION

A. Fabricate stone to comply with sizes, shapes, and tolerances recommended by applicable stone association or, if none, by stone source, for faces, edges, beds, and backs.

B. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
   1. Cut and select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated.
   2. Cut and drill sinkages and holes in stone for anchors and supports.
   3. Carefully inspect stone at quarry or fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units before shipment.
   4. Clean sawed backs of stone to remove rust stains and iron particles.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into stone masonry are correctly installed.

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

3.02 PREPARATION

A. Coordinate delivery, erection of units.

B. Protect the work and material of other trades during installation of units.

3.03 INSTALLATION

A. Transportation, Site Handling, Erection: Performed with acceptable equipment methods, by qualified personnel acceptable to Indiana Limestone Institute of America.

B. Set units in full bed of mortar. Leave 3/8 inch space for end joints. Install backer rod and sealant.

C. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches, through stone masonry and with at least 5/8-inch cover on outside face.

D. Space anchors not more than 18 inches o.c. vertically and 32 inches o.c. horizontally, with not less than 1 anchor per 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings, sealant joints, and perimeter at intervals not exceeding 12 inches.

E. Keep cavity free of mortar droppings and debris.

F. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
   1. At multi-wythe masonry walls, including cavity walls, extend flashing through stone masonry, turned up a minimum of 8 inches, and extend into or through inner wythe.
   2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches into masonry at each end.
   3. At sills, extend flashing not less than 4 inches at ends.
   4. At ends of head and sill flashing turn up not less than 2 inches to form end dams.
   5. Extend sheet metal flashing 3/4 inch beyond face of masonry at exterior and turn flashing down to form a drip.

G. Place and align the members in final position in the structure on the accepted bearing surfaces.

H. After all installation procedures, including joint treatment are completed, clean exposed faces of units.

END OF SECTION 04415

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

A. Miscellaneous steel framing.

B. Metal accessories.

1.03 RELATED WORK

A. Aluminum Composite Panel System, Section 07420.

1.04 SUBMITTALS

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

1.05 QUALITY ASSURANCE

A. Take field measurements prior to shop drawing preparation and fabrication.

B. Comply with the provisions of the following except as otherwise indicated:
   1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
   2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including the "Commentary" and Supplements thereto as issued.
   3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
   4. AWS D1.1 "Structural Welding Code".

C. Qualify welding process and welding operators in accordance with the AWS "Standard Qualification Procedure". Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous twelve months. If recertification of welders is required, retesting will be the Contractor's responsibility.

D. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Package, handle, deliver and store at the job site in a manner that will avoid damage or deformation. Damaged material will be rejected.

B. Items to be built into concrete, masonry, etc. shall be furnished by the respective contractor and the contractor shall build this into the work as the work progresses.

1.07 PROJECT CONDITIONS

A. Verify dimensions in field for pre-cut or prefabricated items.

B. Examine job conditions and adjoining construction which may affect the acceptability of the work.

PART 2 - PRODUCTS

2.01 METAL FOR FABRICATIONS

A. Cold-rolled carbon steel sheets: ASTM A336.

B. Structural Steel Sheet: Hot rolled ASTM A570, or cold-rolled ASTM A611, of grade required for design loading, minimum of Grade C.

C. Galvanized carbon steel sheets: ASTM A446, with G90 zinc coating.

D. Welding materials: AWS D1.1; type required for materials being welded.

E. Shop coat primer: FS-TT-P-32, for shop application and field touch-up.

F. Touch-up primer for galvanized surfaces.

G. Steel shapes and fasteners, in general, for exterior use and where built into exterior wall : zinc coated.

H. Structural Steel: ASTM A36.

I. Stainless Steel: AISI Type 302/304, #4 satin finish, vertical grain except as otherwise specified.

J. Aluminum: 1/8” thick.

2.02 ACCESSORIES

A. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A 47 or cast steel ASTM A 27. Provide bolts, washers and shims as require, hot-dipped galvanized, ASTM A 153.

B. Non-shrink Grout: Master Builders "Masterflow 928" or L&M Construction Chemicals "Crystex".

C. Concrete fill shall comply with requirements of Division-3 section "Concrete Work" for normal weight, ready-mix concrete with minimum 28-day compressive strength of 2500 psi, 440 lbs. cement per cu. yd. minimum and W/C ratio of 0.65 maximum, unless higher strengths indicated.

D. Provide zinc-coated fasteners for exterior use where built into exterior walls or where shown on drawings. Select fasteners for the type, grade and class required.
   1. Provide hot-dipped galvanized coating for fasteners less than 1/2” diameter that are in contact with pressure-treated wood.

E. Bolts and Nuts: Regular hexhead type, ASTM A 307, Grade A or Type 304 stainless steel, ASTM A 320. High Strength bolts and nuts, ASTM A 325.

F. Lag Bolts: Square head type, FS FF-B-561.

G. Machine Screws: Cadmium plated steel, FS FF-S-92, Security Screws.

H. Wood Screws: Flat head carbon steel, FS FF-S-111.

I. Plain Washers: Round, carbon steel, FS FF-W-92.

J. Concrete Anchorage Devices: Wedge-type expansion bolts, FS FF-S-325, Group II, Type 4, Class 1, zinc coated or stainless steel as shown on the drawings and installed in accordance with manufacturer's recommendations.
1. Kwik-bolt", Hilti Corporation
2. "Wej-it", Wej-it Corporation.

K. Masonry: Sleeve anchors zinc coated or stainless as shown on the drawings.
1. Rawl Lok/Bolt.
2. HILTI - Sleeve anchor.

L. Toggle Bolts: Spring-wing type, FS FF-B-558, Type I, Class I and Style 1 zinc coated or stainless steel as shown on the drawings.

M. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

N. Electrodes for Welding: E70XX, comply with AWS code.

O. Aluminum Anchors

2.03 FABRICATION

A. Weld permanent connections wherever possible; use continuous welds where exposed and grind smooth; straighten members after welding.

B. Do shop cutting, drilling, fitting wherever possible. Field measure before fabrication when necessary or required.

C. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, security (countersunk) screws or bolts.

2.04 FABRICATION

A. Weld permanent connections wherever possible; use continuous welds where exposed and grind smooth; straighten members after welding.

B. Do shop cutting, drilling, fitting wherever possible. Field measure before fabrication when necessary or required.

C. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.

2.05 SHOP PAINTING

A. Clean steel items free of mill scale, rust and foreign matter, grease, oil, dust, and dirt in accordance with SSPC SP-2, SP-3, or SP-7.

B. Apply one shop coat of metal primer using manufacturer's standard primer, except stainless steel, galvanized steel, and other non-ferrous items.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Anchor to masonry with expansion bolts or toggle bolts. Where built-in anchorage is not provided do not use wood plugs for anchorage.

B. Bolts, screws, and similar fastenings for field connections shall be of the same material and finish as the parts being fastened.

C. Immediately after erection, repaint field connections, weld burns, abraded surfaces. Scrape and wire brush loose and scaling paint to sound metal, follow with spot priming.

D. Install brand name specialty products in accordance with the manufacturer's instructions and approved shop drawings.

E. Do not proceed with installation until conditions are satisfactory.

F. Install in accordance with approved shop drawings.

G. Perform field welding in accordance with AWS D1.1.

END SECTION 05500

SECTION 07420

ALUMINUM COMPOSITE PANEL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE OF WORK

A. Furnish all labor and materials necessary to complete all aluminum composite building panels indicated on the project drawings and as specified herein.

B. The work of this section consists of items noted on drawings as Aluminum Wall Panels, Aluminum Brackets, Metal Panels, Composite Aluminum Panels, Two piece extruded aluminum moldings.

C. Sealant for a complete panel system shall be a part of this section. Sealant type to be as recommended by the panel system fabricator, supplied and installed by the panel installer. Color to be selected by architect from manufacturer's standard color selector card. All metal surfaces to be primed per recommendations and instructions of sealant manufacturer prior to sealant installation.

D. Metal stud framing and furring (18 gauge minimum) as may be required for the support of the panel wall is to be supplied and installed by this section.

1.03 RELATED WORK

A. Metal Fabrications, Section 05500

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. ASTM E84: Surface Burning Characteristics
2. ASTM D1781: Climbing Drum Peel for Adhesives

B. American Society for Testing and Materials (ASTM)
1. AAMA 2605-98: Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
2. AAMA 611-98: Voluntary Specification for Anodized Architectural Aluminum.

1.05 QUALITY ASSURANCE

A. Panel Manufacturer: Manufacturer shall have a minimum of ten (10) years experience in the manufacture of ACM/MCM and must have ISO 9001:2000 Certification.

B. Panel Installer: Installer shall be experienced in performing work of this section and be specialized in the installation of similar work required on this project.

C. Field Measurements: Measurements should be taken prior to the completion of shop manufacturing and assembly.

1.06 SUBMITTALS

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

B. Shop Drawings: Submit complete shop drawings of all work of this section including large scale details of construction and showing method of installation and attachment, detail and location of joints, including joints necessary to accommodate thermal movement.

C. Submit samples of typical aluminum composite panels, of type, thickness and finish specified, manufacturers product data and specification and procedures for sealing and installing the attachment system.

1.07 PERFORMANCE

This is a performance specification; panel systems that are not in compliance with the required performance standards listed herein are unacceptable. Note: The listing of a product name, system, or fabricator does not constitute approval unless all performance criteria are met.

A. Provide a composite building panel system which has been pretested by an independent testing laboratory to provide specified resistance to air and water infiltration and structural deflection, when installed. Systems that are not pretested and certified by an independent laboratory prior to bid are unacceptable. The use of a panel manufacturer's generic tests reports are unacceptable; the tests must be for the specific system submitted by the panel system engineer and fabricator.

B. Structural Deflection: Deflection of perimeter framing members shall not exceed L/175 of span length or ¾ inches, whichever is less; or there shall be no permanent set in excess of .100 inches.

C. Performance Test Standards:
1. Panels exposed finishes shall perform according to AAMA 2605-98; exposed anodized aluminum according to AAMA 611-98.
2. Panel composite assembly shall conform to ASTM E84, Flame Spread, Class A.
3. Panel bond integrity shall have a minimum peel strength of 34.5 lb-in/lb when testing according to ASTM D1781.
4. Design wall system to withstand a positive and negative windload pressure acting inward and outward normal to the plane of the wall to meet the requirement of the latest adopted Local Building Code.
5. Make adequate provisions in the wall system for thermal expansion and contraction of the component parts and fastening of the system to prevent harmful damage caused by buckling, opening of joints, expansion and contraction due to accumulation of dead loads and various live loads.
6. Design wall system to be sealed at all joints, intersections and cutouts to prevent moisture intrusion of any type.

1.08 PRODUCT DELIVERY, STORAGE & HANDLING

A. All materials under this section shall be packaged, boxed, wrapped, or otherwise protected to assure complete protection from damage at all times.

B. Store all materials in accordance with manufacturer's installation instructions. Stack materials on pallets or platforms, covered with suitable ventilated covering. Do not store panels where accumulation of water may occur or in contact with other materials that might cause staining, denting or other damage.

1.09 WARRANTY

A. Manufacturer's Warranty: Furnish panel manufacturer's standard limited warranty document executed by an authorized company official. Manufacturer's warranty is in addition to and not a limitation of other rights Owner may have under Contract Documents.

B. Panel Lamination Warranty: Five (5) years commencing on date of Substantial Completion.

C. Finish Warranty: Anodized 20 years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE COMPOSITE PANEL MANUFACTURERS

A. Envelope 2000 (Rout and Return system) – Prefinished Architectural Panels by Citadel Architectural Product, Inc., Indianapolis, Indiana.

B. Alucobond® by Alusuisse Composites, Inc., St. Louis, MO.

C. Reynobond® by Reynolds Metals Co., Richmond, VA.

D. Alpolic® by Mitsubishi Chemical America, Inc., Chesapeake, VA.

E. Or approved equal.

2.02 MATERIALS

A. Face Skin: .024" minimum prefinished smooth aluminum to match Architect's color selection.

B. Core: .075" thermoset phenolic resin

C. Back Skin: .024" primed smooth aluminum

D. Panel tolerances: Thickness +/- 1/32"; Length and Width: +0", 1 1/16"; Squareness: 1/64" per linear foot.

E. Panel finish/color to be Anodized - Class I, to match anodized aluminum.

F. Attachment System: Two piece extruded aluminum moldings.

2.03 PANEL SYSTEM PERFORMANCE REQUIREMENTS

A. Detail and fabricate panels to the sizes, configurations and layouts as shown on the approved shop drawings. Panel system fabricator's shop drawings will provide for flat panel surfaces within the tolerances and performance requirements of the panel manufacturer.

B. Fabricate all materials in accordance with the approved shop drawings.

C. Grain pattern of anodized and metallic finished aluminum facing sheets to run in same direction, unless otherwise specified.

D. Provide protective film on exposed panel faces and leave in place during fabrication.

2.04 ACCESSORIES

A. Fasteners, attachment extrusions, clip angles and channels integral for panel fastening and any moldings as required for panel system's design by panel system manufacturer. Fastener shall be coated or stainless steel.

B. Weather Seals shall be Tremco Spectrem 2 or approved equal applied per the sealant manufacturer's guidelines and in accordance with the panel manufacturer's installation requirements.

C. Adjustable Z studs: 16 gauge.

2.05 INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type 3, closed-cell product extruded with an integral skin.

1. Styrofoam Square Edge as manufactured by Dow Chemical Company.

2. U.C. Industries FoamulaR 250.

3. Certifoam by Minnesota Diversified.

4. Amofoam.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated

1. Styrofoam Brand.

2. Contech PL300.

PART 3 - EXECUTION

3.01 PREPARATION

A. Installer shall examine all surfaces and conditions which the work of this section is to be applied and notify the Architect, in writing, of any defects which would be detrimental to proper installation and alignment of the work. No work shall be erected until all discrepancies have been resolved. Application of materials constitutes acceptance of subsurfaces and conditions.

3.02 INSTALLATION

A. Install composite metal panel system in accordance with the panel system fabricator's approved shop drawings and as per manufacturer’s requirements.

B. Erect and securely anchor all panels plumb, level, square and true to line in accordance with approved shop drawings. Metal grain of panels to be installed in same direction on anodized and metallic finished material, unless otherwise noted on the approved shop drawings.

C. Tolerances: Maximum deviation from vertical and horizontal alignment of erected panels shall not exceed 1/4" inch per 20 feet.

D. Use fastening system of non-corrosive type fasteners as recommended by the panel systems manufacturer.

E. Provide for necessary structural movement as indicated on the approved shop drawings.

F. Installer to prime metal surfaces as recommended by sealant manufacturer. Install sealant in accordance with sealant manufacturer's recommendations. Finished sealant joints to have clean edges.

3.03 INSTALLATION

A. Sealant Joints
   1. Panel to panel joints width to be 1/2" (+/-1/16"), panel to adjacent material joints width to be 3/8 (+/-1/16").
   2. All metal surfaces to be primed per recommendations of sealant manufacturer.

B. Fasteners exposed to atmosphere to be stainless steel or equal.

C. Conform to panel manufacturer’s installation instruction for attachment systems.

3.04 CLEAN-UP

A. Remove temporary coverings and protection to adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to Owner’s acceptance.

B. Upon completion, remove and legally dispose of all trash and debris resulting from operations of this section.

END OF SECTION 07420

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 WORK INCLUDED

A. Miscellaneous Joints.

1.03 RELATED WORK

A. Air Distribution: Section B15880 (louvers).

1.04 SUBMITTALS

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

1.05 PROJECT CONDITIONS

A. Examine the joint surfaces and backing, and their anchorage to the structure, and the conditions under which the joint sealer work is to be performed. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected.

B. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

PART 2 - PRODUCTS

2.01 SEALANT

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

B. Horizontal Joint Sealant: PECORA NR-200 Urexpan, Sonolastic SL2, TREMCO THC-900, or other acceptable 2-part self-leveling polyurethane.
   1. Comparable means both quality and color options.

2.02 SEALANT ACCESSORIES

A. Primer: When required, as recommended by the Sealant Manufacturer.

B. Closed Cell Back-up (Backer Rod): Tremco "Closed Cell Backer Rod", Sonneborne "Sonofoam" or W.R. Meadows "Kool-Rod".

PART 3 - EXECUTION

3.01 JOINT PREPARATION

A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces as recommended by sealant manufacturer.

B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

3.02 SEALANT APPLICATION, GENERAL

A. Set joint filler units at proper depth or position in the joint to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.

B. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

C. Apply compound with a gun having proper size nozzle or with a knife, as required. Use sufficient pressure to fill all voids and joints solid. Remove excess sealant and leave surfaces smooth, neat and clean. Upon completion sealant shall have a smooth, even finish and all joints shall be weathertight. All work shall be in accordance with manufacturer's printed instructions.

D. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

3.03 PROTECTION

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

END OF SECTION 07900

SECTION 09900

PAINTING

PART 1:GENERAL

1.01RELATED DOCUMENTS

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

1.02WORK INCLUDED

A. Painting and finishing of interior exposed items and surfaces throughout Project.

B. Field painting of exposed bare and covered pipes and ducts and hangers, exposed steel and iron work, all metal fabricated Section 05500 items, and primed metal surfaces including but not limited to, hollow metal work, equipment installed under mechanical and electrical work.

C. HVAC items that require painting are:
   1. None.

D. "Paint" as used herein means all coating systems materials including primers, emulsions, enamels, stains, sealers and fillers, and other applied material whether used as prime, intermediate or finish coats.

E. Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas.

F. Following categories are not included as part of field-applied finish work.
   1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified.
   2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces in concealed areas and generally inaccessible areas.
   3. Finished Metal Surfaces.
   4. Operating Parts.

1.03RELATED WORK

A. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.

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

1.04SUBMITTALS

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

2. If manufacturer to be used is different from that of color chips furnished, prepare and submit two approximately 6 inch square, properly labeled samples of each color and sheen required on properly prepared paint-out cards or hardboard.

1.05QUALITY ASSURANCE

A. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
      a. For areas to be renovated, comply with requirements in "MPI Maintenance Repainting Manual".

1.05DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials to site until having received all written approvals of submitted information and samples.

B. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label.

C. Store materials not in actual use in tightly covered containers.

D. Take all precautions to ensure that workers and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

E. Remove rags and waste from storage areas daily.

1.06PROJECT CONDITIONS

A. Apply water-base paints only when temperatures of surfaces to be painted and surrounding air temperatures are between 50 and 95 degrees F.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F. and 95 degrees F.

C. Do not apply paint when relative humidity exceeds 85%; at temperatures less than 5 degrees F. above the dew point; or to damp or wet surfaces.

1.07SEQUENCING AND SCHEDULING

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

1.08EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2: PRODUCTS

2.01MANUFACTURERS

A. AFM Safecoat.

B. Benjamin Moore & Co.

C. ICI/Dulux.

D. PPG Architectural Finishes, Inc.

E. Sherwin Williams Company

F. Diamond Vogel Paints

2.02 COLORS

A. Colors: Paint-1.

.

2.03MATERIALS

A. Use the materials of the same manufacturer for each system.

B. Sherwin Williams systems are called out in the system schedules to establish quality and dry mil thickness of finished installation for all systems. A different manufacturer may be used for color selection. Any manufacturer noted above may be used as long as quality and color requirements are met.

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

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

D. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

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

1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
2. Non-flat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.

c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

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

2.04PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

2.05METAL PRIMERS

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

2.06LATEX PAINTS

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

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

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

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

2.07 EQUIPMENT

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

PART 3: EXECUTION

3.01 EXAMINATION

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

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

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

3.02 PREPARATION

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

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

a. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
b. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

2. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning.
3. Remove dirt, rust, scale, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

B. Ferrous Metal
1. Remove dirt and grease with mineral spirits or solvent recommended by paint manufacturer and clean cloths.
2. Where not galvanized, shop coat of primer will exist on surface. If prime coat is not smooth, sand to bare metal and re-prime.

C. Existing Surfaces: Prepare to provide good adhesion and appearance.
1. Remove loose paint and rust from metal surfaces.
2. Feather sand edges of existing paint and spot prime bare metal to provide a smooth surface.

3.03 APPLICATION

A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

B. Do no interior work until building is properly enclosed.

C. Do work under adequate illumination and dust-free conditions.

D. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

F. Materials
   1. Do not open containers until required for use.
   2. Stir materials thoroughly and keep at uniform consistency during application.

G. Coats
   1. Number specified is minimum.
   2. Touch up suction spots between coats.
   3. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
   4. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
   5. Refinish surfaces affected by refitting work.

3.04 CLEANING

A. During the progress of this work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.05 PROTECTION

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

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

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

3.06 SCHEDULE OF INTERIOR WORK

A. In addition to obvious surfaces, the following do not require painting or finishing.
   1. Do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) acoustic materials, finished mechanical and electrical equipment including light fixtures and distribution cabinets.
   2. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
   3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

4. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
5. Do not paint over any code-required labels, such as Underwriter's Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plate.
6. N/A indicates system not applicable to this Project.

B. Floors
1. Do not apply next coat until previous is thoroughly dry.
2. Provide final coat which is solid and even in color, free from runs, laps, sags, brush marks, air bubbles and excessive roller stipple and worked into crevices, joints and similar areas.

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

D. Other Unfinished and Primed Surfaces

1. Provide specified finish on exposed surfaces. This includes prime coated mechanical units, piping, pipe covering, conduit, and interior duct surfaces visible behind grilles.

	Material	Type	Number and Type of Coating
2.	IPS 1 - Concrete Floor	Acrylic based copolymer	Sonneborne-Kure-N-Seal W
3.	IPS 3 - Ferrous Metal Metal (Unprimed)	Latex Semi-gloss	One coat "Pro-Cryl Universal Primer", two coats "ProClassic Waterborne".
4.	IPS 4 - Ferrous Metal (Primed)	Latex Semi-gloss	One coat “Pro-Cryl Universal Primer” and two coats “ProClassic Waterborne ".
5.	IPS 14 – Concrete (floor)	Epoxy	Two coats “Armorseal Tread-Plex”

END OF SECTION 09900

SECTION B15010

BASIC HVAC GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

Applicable requirements of instruction to bidders, conditions of contract, and of Sections listed under related Sections of this Division apply to all work specified in this Division B15000.

1.02 RELATED SECTIONS OF THIS DIVISION

B15010 - Basic HVAC General Requirement
B15050 - Basic HVAC Materials and Methods
B15250 - HVAC Systems Insulation
B15500 - HVAC Basic Piping Requirements
B15750 - Mechanical Heat Transfer Equipment
B15850 - Air Handling
B15880 - Air Distribution
B15950 - Automatic Temperature Control Work
B15990 - Testing, Adjusting, and Balancing

1.03 RELATED WORK OF OTHER SECTIONS OR DIVISIONS

1010 - Summary of Work
1020 - Allowances
1045 - Cutting and Patching
1100 - Alternative Bids
1300 - Submittals
1500 - Temporary Facilities and Control
1522 - Temporary Enclosure
1700 - Contract Close-out
1710 - Cleaning
9900 - Painting
A15000 - Plumbing
B15990 - Testing, Adjusting, and Balancing
16000 - Electrical

1.04 WORK INCLUDED IN THIS SECTION

3.01 Codes and Permits
3.02 Interpretation of Specifications, Drawings, and Associated Work
3.03 Visiting the Premises
3.04 Shop Drawings
3.05 Dimensions and Locations
3.06 Coordination and Cooperation
3.07 Substitution of Equipment and Materials
3.08 Record Drawings
3.09 Asbestos and Hazardous Waste Handling
3.10 Manual and Instructions
3.11 Warranties

3.12 Alternative Bids

1.05 GENERAL SCOPE

Provide a complete heating and air conditioning system in the building in accordance with the Bid Documents. Provide competent superintendent, or foreman, at the job site.

1.06 DESIGN CONDITIONS

A. Outside Conditions:

1. Winter: -15°F

2. Summer: 89°F, D.B.; 75°F, W.B.

B. Inside Conditions:

1. Winter: Minimum temperatures are all in accordance with requirements of Chapter ILHR 64, Wisconsin Administrative Code.

2. Summer: 75°F to 78°F, 50% Relative Humidity

C. Water Temperatures:

1. Hot water supply shall be a maximum of 210°F at -15°F outside.

2. Chilled water supply shall be 45°F.

3. Cooling tower water supply shall be 85°F.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.01 CODES AND PERMITS

Comply with codes, laws, and ordinances in force at the building. Secure and pay for permits and inspection fees required for fulfilling requirements of these specifications.

3.02 INTERPRETATION OF SPECIFICATIONS, DRAWINGS, AND ASSOCIATED WORK

A. This Contractor shall read the entire specification including Instruction to Bidder, General Conditions and Special Conditions, and Division 1, all of which are applicable to this work and shall thoroughly examine all the project plans as he will be required to do all of the work belonging to this branch of work whether or not specifically mentioned herein, or indicated or shown on the Heating, Ventilating, and Air Conditioning plans.

B. Successful bidder will not be allowed any extra compensation by reason of any matter or thing concerning which such bidder might have informed himself prior to the bid opening. It shall be understood that the act of submitting a bid by the Contractor carries with it the agreement to all items and conditions referred or indicated or implied on the drawings and the

specifications and no consideration will be granted for any alleged misunderstanding of materials to be furnished or work to be done.

C. Any conflict between the contract drawings and specifications or the Architectural, Plumbing, and Electrical Drawings and the Mechanical Drawings, or between the Architectural, Plumbing, and Electrical Specifications and the Mechanical Specifications shall be deemed to have been estimated the more expensive way of doing the work, unless the Contractor asks and receives a decision in writing as to which shall govern, prior to submitting his bid.

D. The drawings indicate the general arrangement and approximate location of piping, ductwork, equipment, etc. Extreme accuracy is not guaranteed and field verification and coordination of all locations and dimensions of new and existing conditions and work is directed. When removing equipment, piping, ductwork, etc., contractor shall remove all supports and hangers associated with same.

E. Do not scale from the drawings, if lengths are scaled for bidding the Contractor assumes the risks of accuracy.

F. It shall be the Contractor's responsibility to notify other contractors to arrange clearances and access openings for all large equipment and to advise affected Contractors associated with this project of areas requiring coordination before any roughing-in is done, so associated work can be installed without interfering with installation of HVAC work.

3.03 VISITING THE PREMISES

A. The Contractor, before submitting his bid on the work, must visit the project site and familiarize himself with all visible existing conditions.

B. As a result of having visited the premises, the Contractor shall be responsible for the installation of the work as it relates to such visible existing conditions.

C. The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

D. This Contractor shall arrange and provide all necessary equipment required to rig, lift, or move equipment into final location.

3.04 SHOP DRAWINGS

A. Submit specified number of copies of drawings (five minimum) with dimensions, capacities, and information as soon as available from manufacturers.

B. This Contractor shall review all the shop drawings for complete compliance to the Bid Documents before submitting the drawings to the A/E. The Contractor's review shall verify the following:

1. Equipment being submitted was specified.

2. Quantities submitted are correct.

3. Physical sizes, unit access, service clearances, and capacities are as specified.

4. Electrical characteristics have been checked with the Electrical Contractor, or verified at the site.

5. Equipment to be shipped assembled or as required to fit into final location.

Any deviations from the drawings, or the specification, shall be pointed out and provided with an explanation with the submittal.

C. The Contractor shall stamp the shop drawings with his own Review for Approval stamp, or submit a separate statement indicating that the enclosed shop drawings have been reviewed in accordance with the specifications. The shop drawings shall not be reviewed without the Contractor's review statement.

D. Final review of the drawings by the A/E or his representative shall not relieve the Contractor from the responsibility of complying with the requirements of the drawings and specifications.

3.05 DIMENSIONS AND LOCATIONS

A. Verify measurements at the building, check levels, and grades, and be responsible for grading, fitting, joining, or adjusting of work to adjoining work by other Contractors.

B. Where work on existing systems is required, this Contractor shall verify all equipment locations and sizes before ordering any new materials.

C. Before the work is installed, the A/E reserves the right to slightly change location of piping, radiation, ducts, equipment, etc., without additional pay to Contractor.

D. The drawings indicate the general arrangement and approximate location of piping, ductwork, equipment, etc. Extreme accuracy is not guaranteed and field verification and coordination of all locations and dimensions of new and existing conditions of work is the responsibility of this Contractor.

3.06 COORDINATION AND COOPERATION

A. Coordinate this work with other Contractors, because no Contractor has exclusive right-of-way in installing his work.

B. Make arrangements with other Contractors for framing, openings, spacing, chases, pipe runs, duct locations, ceiling heights, etc.

3.07 SUBSTITUTION OF EQUIPMENT AND MATERIALS

The design of the HVAC systems are based upon the manufacturer listed in the schedules. Where any other equipment either listed in the specification or substituted, is used, this Contractor will be responsible for any changes required to the system or to the building due to physical limitations of the equipment, and he shall pay for all structural, mechanical, and electrical changes required by the equipment. This Contractor shall inform the Owner, A/E and all Contractors, in writing within five (5) days of award of contract, of any changes before they begin their respective work. No equipment shall be ordered prior to final review of shop drawings from the A/E. This Contractor shall bear all financial costs for rejected equipment ordered prior to final review of shop drawings from the A/E. **Submittal of manufacturers not listed in specification sections or in schedules as "equal" must be approved in writing prior to bid day.**

3.08 RECORD DRAWINGS

Record drawings shall be kept daily, noting all changes, and available upon demand. No progress payments will be approved unless record drawings are shown to be up-to-date.

3.09 ASBESTOS AND HAZARDOUS WASTE HANDLING

A. In the event that this Contractor finds that this work requires the demolition, removal, or disposal of any asbestos or other hazardous waste, he shall halt work in the affected areas and inform the Owner of all conditions.

B. The Owner shall test for asbestos and shall remove all hazardous wastes as defined by the Environmental Protection Agency.

C. The Owner shall inform the Contractor when he may proceed with the work.

3.10 MANUAL AND INSTRUCTIONS

A. Submit rough drafts of maintenance manual presenting valve charts and full details of construction, parts list, capacities, care, normal servicing and lubrication intervals, wiring diagrams, maintenance, and operation of mechanical equipment as shown on bid documents, scheduled, specified, and furnished under this Contract to A/E. Upon approval, furnish three (3) corrected copies bound in hard cover, three-ring binder with index and tabs indicating separations between equipment.

B. Contractor shall instruct Owner's maintenance personnel in operations, lubrication points, and maintenance locations of equipment furnished under this Contract.

C. All manufacturer's warranties shall be included in the manual. All extended warranties shall be included with their expiration date.

3.11 WARRANTIES

A. This Contractor shall warrant all work, materials, and apparatus installed under this Contract, for one (1) year from the completion and acceptance of the entire system, and must keep same in repair for said period unless such defects are clearly the result of bad management after apparatus is out of his control.

B. The one (1) year warranty period for equipment and materials shall begin after the entire system has been completed and accepted. It shall not start from the date of delivery, installation, or date of usage of equipment as required under "Temporary Heating". If any portion of the system is accepted by the Owner for his use prior to total completion, then the warranty period for only that portion will begin.

3.12 ALTERNATIVE BIDS –

A. Alternate #1 all demolition shown on sheet HD-1 to be provided by owner

B. Alternate #2 additional NCM’s, see Temperature Controls - See Spec sections 15900 and 15950 for details.

END OF SECTION

SECTION B15050

BASIC HVAC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

Applicable basic requirements of all HVAC work and methods described in this Section apply to all Sections listed in this Division B15000.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements

1.03 WORK INCLUDED IN THIS SECTION

3.01 Sleeves, Openings, Cutting, Patching, and Drilling
3.02 Suspended Ceiling Removal
3.03 Curbs and Bases
3.04 Painting and Finishes
3.05 Plumbing
3.06 Electrical
3.07 Lubrication
3.08 Identification
3.09 Architectural Access Panels
3.10 Vibration and Noise Control
3.11 Temporary Heating
3.12 Tests
3.13 Explosion Resistant Locations
3.14 Codes and Standards

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.01 SLEEVES, OPENINGS, CUTTING, PATCHING, AND DRILLING

A. General:

1. This Contractor shall provide and patch all duct and pipe openings in the existing building unless this work is specifically mentioned to be done by another Contractor. This Contractor shall provide required lintels.

2. This Contractor shall provide all openings for piping in new construction.

3. General Contractor will provide and patch all duct openings required in new construction. This Contractor will inform the General Contractor of all duct opening sizes and locations in walls, ceilings, roof, and partitions. Make arrangements with various other Contractors for all special sleeves, framing, spacing, and chases.

4. This Contractor shall cut duct openings, if sizes and locations were not provided to the General Contractor within 48 hours after request for this information, and if construction proceeds without openings. Obtain A/E approval before cutting or drilling any steel, concrete, or masonry, and repair any damage to his satisfaction. No chopping or breaking out is permitted. This Contractor shall pay for repair of any unnecessary damage.

5. This Contractor shall patch all openings remaining after ducts and pipes have been removed under demolition work. Finished conditions shall be not less than existing conditions.

B. Penetrations:

1. Wherever pipes or ducts penetrate smoke partitions or fire rated floors or walls, fill opening around pipes or ducts with U.S.G. Thermofiber Felt and Firecode Gypsum Cement, Dow Corning Fire Stop Sealant, or equivalent material, equal to the rating of the assembly penetrated.

2. On all ducts passing through walls, floor, and ceilings exposed to occupied spaces provide painted galvanized steel metal escutcheons or angles with mitered corners on both sides of wall having outside dimensions to cover wall opening and inside dimensions to fit duct. Securely fasten in place to floor, walls, and ceilings.

3. Wherever ducts pass through roofs from packaged rooftop units or other roof openings, the annular roof openings should be packed with glass fiber and sealed on both sides with a nonhardening material such as "Tremco" acoustical sealant. The annular roof openings shall be cleanly cut and not over 3/8" oversize.

4. Furnish each duct opening in walls, floors, and ceilings having outside dimension 1" larger than outside dimension of uninsulated ductwork, unless the wall or floor is a fire wall, in which case, only the duct shall penetrate.

5. Provide steel pipe sleeves and caulking as indicated in Section B15500.

6. Provide 2" high angle iron frames around each duct opening through floors of equipment rooms located above the basement floor, and caulk so no water leakage can occur between frames and floor.

3.02 SUSPENDED CEILING REMOVAL

This Contractor to remove all suspended ceilings required to complete work as shown on Bid Documents in existing buildings, store in area as directed by Owner, and reinstall unless this work is specifically mentioned to be done by another Contractor. Any damaged ceiling tiles or supports shall be replaced by this Contractor to exactly match the existing.

3.03 CURBS AND BASES

A. Provide concrete bases, footings, piers, platforms, curbs, pipe frames, steel grillage, etc., for all equipment as shown, or as required, unless otherwise noted on the Bid Documents. Be responsible for location, size, and any changes required by substitution of equipment.

3.04 PAINTING AND FINISHES

A. Painting will generally be done by others. Check painting specification.

B. The following shall be painted by this Contractor of colors selected:

1. Indoor piping exposed to occupied areas.

2. Uninsulated and exposed hangers in mechanical equipment rooms to match existing.

3. Insulated piping and hangers exposed in mechanical equipment rooms to match existing.

4. Structural iron provided by this Contractor. Prime plus two (2) coats.

5. Wood surfaces provided by this Contractor to be primed and covered with two (2) finish coats.

6. Any equipment which was not furnished with a factory finish. Prime plus two (2) coats.

7. Any damaged or rusted surfaces where an existing finish has been destroyed.

C. All surfaces shall be clean before painting. They shall be wire brushed free of rust and scale and then primed. All metal surfaces shall be adequately covered with two applications of rust inhibiting, zinc rich coating, of colors selected.

3.05 PLUMBING

A. The Heating Contractor shall locate final drain and cold water supply requirements for the Plumbing Contractor.

B. The Plumbing Contractor shall provide the following:

1. Floor drains.

2. Hub drains.

3. Site drains.

4. Cold water supply terminated near requirements.

C. The Heating Contractor shall provide the following:

1. Drain piping to drains. Install all cooling coil drain pans at sufficient height to properly drain through water traps.

2. Final cold water supply connections.

3.06 ELECTRICAL

A. All polyphase AC motors from 1 to 125 horsepower shall be manufactured and tested in accordance with NEMA MG1-12.53a standards for high efficiency motors. All motors shall meet as a minimum appropriate local utility rebate program guidelines. Provide motors with current characteristics verified by the Electrical Contractor. Notify the A/E of any discrepancies before ordering motors and controls.

B. Provide starters and disconnects as described or shown on drawings and motor starter schedule. Starters shall be Square D. Starters and push button stations shall be furnished by only one of the above manufacturers. Equipment manufacturers and subcontractors shall verify the particular brand with the Prime Contractor. All integral disconnect switches shall be fused type, and shall contain auxiliary contacts to disconnect control circuits entering the starters. Starters for 208 volts, and above, shall have 115 volt control circuits and transformer. Three phase starters shall be provided with three overloads. All pilot lights shall be "Push to Test" type. Coordinate starter types, required relays, and interlocks with control specifications.

C. This Contractor shall label all starters and disconnects indicating each piece of equipment being served.

D. All disconnect switches furnished with the unit as factory furnished, or factory installed, shall be furnished with fuse clips.

E. This Contractor shall consult the Electrical Contractor for the proper sized fuses to be provided for all disconnects and starters by this Contract.

F. This Contractor shall turn over all individually mounted disconnects and starters furnished under this Contract to the Electrical Contractor for installation by him.

G. The following line voltage wiring shall be done by the Electrical Contractor:

1. To all individually mounted starters.

2. To HVAC factory mounted control panels.

3. To HVAC factory mounted disconnect switches.

4. To motor control centers.

5. From starters to motors.

6. To electric heating equipment.

H. The following equipment requiring line, or low-voltage, wiring shall be done by the Heating Contractor:

1. All packaged electronic variable air volume control system wiring. Including wiring to interface with existing automatic hot water zone valves in hot water radiation and all wiring to unit control panel near unit.

I. The following equipment requiring line, or low voltage, wiring shall be done by the Controls Contractor:

1. DDC Electric thermostats.

2. Pressure electric switches.

3. Zone switches.

4. Starter interlocks.

5. Smoke dampers.

6. Power source sufficient for all electric/electronic or electric control and wiring to all controls. Coordinate with Electrical Consultant and Contractor.

7. Automatic dampers.

J. All wiring shall be installed in conduit in accordance with Electrical Specifications or Codes governing wiring in plenum ceilings. Concealed low voltage wiring shall also be installed in conduit if required by the Electrical Specifications or Codes. No exposed wiring shall be installed in finished areas. Exposed wiring shall be installed in wire mold or conduit in unfinished areas in inconspicuous manner. Install all wiring and wiring devices neatly parallel or perpendicular to building lines.

K. Furnish wiring diagrams to Electrical Contractor for all electrical equipment furnished under this Contract. Each diagram must be in accordance with actual installations. Furnish complete sets of wiring diagrams for Owner's bound maintenance manual as described under "Manual and Instructions".

L. Any changes in this Contract, after the bid opening, to the number and size of motors and starters due to substitution of equipment will become this Contractor's responsibility to inform and coordinate these changes with all affected Contractors.

M. See Section B15050: Codes and Standards.

N. Variable Speed Controllers. – Equipment manufacturer to provide all VFD's. **VFD manufacturer to be ABB drives or approved equal, manufacturers not approved prior to bid day will not be accepted. See specification section 15850.**

O. Motor Control Center.

3.07 LUBRICATION

A. All equipment must be checked and lubricated in accordance with manufacturer's instructions, before equipment is turned over to the Owner.

B. Lubrication points that are hard to get at shall have extended fittings to point of easy access; and shall be clearly marked.

3.08 IDENTIFICATION

A. Piping shall be identified with clean-cut stenciled letters at least 1" high that shall indicate content of pipe. Apply arrow marker stencils, similar to labels, with arrows pointing in direction of flow. Provide stencils at every point of pipe entry or exit through wall, at 50' intervals on straight run of pipe and at each main riser.

B. Equipment: Provide laminated plastic plates with black face and white center of minimum size 3-1/2" x 1-1/2" x 1/8" nominal thickness, engraved with 1/4" high lettering. Use 1" lettering for major equipment. Fasten nameplates securely with stainless steel fasteners in conspicuous place. Where name- plates can not be mounted on cool surface, provide

stainless steel standoffs. Identify equipment type and number (e.g. Pump No. 2) and service for areas or zones of building served e.g. south zone chilled water primary. All starters shall be similarly identified.

C. All major equipment identification shall also include the date of start-up.

D. Valve Tags: Provide Seton Name Plate Company, Style No. 2961 plastic color coded valve tags in accordance with ASA with the abbreviation "Heating" or "Cooling" above the numbers for all valves in this contract. Provide printed valve identification charts showing number, manufacturer, size, type, location, normal position (open or closed), and purpose of each valve including equipment it serves. Furnish three (3) copies of valve charts to the Owner, enclosed in a rigid vinyl covered three-ring binder. All charts must be typewritten. Fasten valve tags to valve handles with 4-1/2", size #16, Seton brass chains.

E. Ducts: Stencil all ducts at air handling units in accordance with areas served. Letters shall be at least 1" high and in conspicuous locations.

F. All insulation shall be identified as "ASBESTOS FREE" with direction arrows and termination reference points.

3.09 ARCHITECTURAL ACCESS PANELS

A. Furnish 24" by 24" (larger where required) Milcor Type "K", or Cesco, steel access panels for installation in plaster or dry walls and ceilings.

B. Furnish 24" by 24" (larger where required) Milcor Type "M", or Cesco, steel access panels for installation in masonry, brick, stone, tile, and wallboard walls and ceiling.

C. Locate access panels at all concealed devices requiring accessibility for operation or maintenance. Notify Plastering, Drywall and Acoustical Tile Contractor of proper locations for access panels. Mark the location of all dampers located above acoustical tile ceilings as inconspicuous as possible.

D. Provide fire rated access panels in all masonry shafts or ductwork requiring fire rated enclosures.

E. Furnish access panels to proper Contractors for their accurate installation.

3.10 VIBRATION AND NOISE CONTROL

A. The prime Contractor of this Contract shall provide Peabody Kinetics, Korfund, or Mason Industries vibration isolators and bases for all equipment furnished under this contract with minimum isolation as required for the installation.

B. Floor Mounted Equipment: All floor-mounted centrifugal fans, pumps, air handling units, reciprocating equipment, etc., shall be mounted on bases and isolators as indicated on the drawings.

C. Suspended Equipment: All suspended equipment shall be suspended from isolators as indicated on the drawings.

D. Fan and Motor Bases: All steel bases shall be rectangular in shape, consisting of wide flange steel frames, with the motor located within the rectangular shape. All bases shall incorporate height saving devices.

E. Pipe Hangers: See Pipe, Hangers, and Supports in Section B15500.

F. Springs: All springs shall employ unhoused, stable, free-standing springs with a horizontal to vertical spring stiffness ratio of approximately one. Snubbers to limit extreme horizontal deflections during starts and stops shall be used. All spring mounts shall be provided with ribbed or waffled neoprene pads at least 1/4" thick to prevent transmission of high frequency vibrations to the building. Pads shall be loaded approximately 50 psi, and if bolts are necessary, they shall be isolated from mounts by soft neoprene sleeves at least 1/8" thick.

G. Penetration: Wherever ducts and pipes pass through critical sound partition walls and floors, the annular openings should be packed with glass fiber and sealed on both sides with a non-hardening material such as "Tremco" acoustical sealant. The annular openings shall be cleanly cut and not over 3/8" wide.

H. General Vibration Isolation Details:

1. No rigid connections shall be made between spring mounted equipment and the structure.

2. All fans shall be connected to ducts with flexible sleeves at least 6" wide and very slack.

3. Piping connections to spring-mounted equipment shall be installed with spring type hangers at least three pipe hangers away from the unit.

4. Electrical connections to equipment must be flexible and as slack as possible.

3.11 TEMPORARY HEATING

A. Additional provisions for temporary heating are specified in Division 1.

B. Central fan system shall not be used until the systems have been modified for temporary heating and until permission is granted by the A/E.

C. This Contractor shall install all temporary located filters. Provide large return air openings in each return plenum with all supports and bracing as required to maintain these openings. Temporary air filter racks and 2" throwaway filters shall be installed in the openings and maintained by this Contractor, replacing dirty air filters with clean air filters as required during temporary heating period.

D. The supply fans shall operate while the return air fan shall not operate. The existing return ducts shall be blocked off so that all return air must pass through the temporary air filters. The return air from all rooms, and floors, shall flow to the central fan systems using open walls, doorways, stair wells, elevator shafts, and duct shafts. This Contractor shall inform the General Contractor of opening sizes required, and shall maintain all sizes to accomplish this circulation. All doors shall not be installed until after the temporary heating period.

E. This Contractor shall, at the end of temporary heating requirement, remove all temporary air filters, close up the temporary return air openings, open up all return air ducts and install all permanently located air filters.

3.12 TESTS

A. Make all tests and trials of the system. Fill and vent all water systems. Prepare systems for testing and assist the Testing Agency. See Section B15990: Testing, Adjusting, and Balancing.

B. Pressure Test: Apply a hydrostatic test to each steam or water system. Provide pressure at least 125 pounds per square inch, or 20% above working pressure, whichever is greater, and maintain this pressure for four (4) hours.

3.13 CODES AND STANDARDS

Each factory fabricated product listed in this specification shall be built, rated, and tested in conformance with applicable Codes and Standards as published in Chapter 48 of the ASHRAE 2000 HANDBOOK: HVAC SYSTEMS AND EQUIPMENT.

END OF SECTION

SECTION B15250

HVAC SYSTEMS INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

Provide all HVAC insulation for piping, tanks, breeching, stacks, chillers, ductwork, plenums, and any additional equipment as indicated on the BID DOCUMENTS.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements
B15050 - Basic HVAC Materials and Methods

1.03 INSULATION WORK INCLUDED IN THIS SECTION

2.01 Hot Water Piping
2.02 Cold Water Lines
2.03 Chilled Water Piping
2.04 Thermal Insulation (Rigid)
2.05 Thermal Insulation (Flexible)
2.06 Acoustical Insulation

3.01 General Insulation Applications

1.04 GENERAL SCOPE

A. All insulation thickness shall meet **the minimum requirements as specified in Chapter ILHR 63, Wisconsin Administrative Code,** unless herein specified to be greater.

B. All pipe covering, jackets, duct insulation, vapor barriers, adhesives, and mastics located in **sheet metal or ceiling air transfer plenums** shall have a flame spread classification of 25 or less, and a smoke developed classification of 50 or less. All pipe covering, jackets, etc., located in all other areas of the building shall have a flame spread classification of 25 or less, and a smoke developed classification of 150 or less.

C. See Section B15050: Codes and Standards.

PART 2 - PRODUCTS

2.01 HOT WATER PIPING

A. Cover piping with molded glass fiber (4 lb. density) with K-factor of 0.24 at 75°F. or molded urethane (3 lb. density) with factory applied white fire retardant jacket with self-sealing lap. Fasten with galvanized flare-type staples on 4" centers.

B. Insulate fittings with premolded fittings and valves with oversized insulation on pipes through 2". Apply 10 x 20 glass mesh and finish with Sealfas 30-36.

C. Insulate fittings, valves, and flanges on pipes 2-1/2" and up with molded fittings, or mitered segments of insulation covered with 1/4" coat of hard setting cement. Apply 10 x 20 glass mesh and finish with coat of Sealfas 30-36.

2.02 COLD WATER LINES

A. Cover piping with molded glass fiber (4 lb. density) or molded urethane (3 lb. density) with factory applied white fire retardant vapor barrier jacket with self-sealing lap. Apply 4" vapor barrier strips at all punctures with vapor-proof adhesive.

B. Insulate all fittings, flanges, and valves on pipe up to 1-1/2" with fiberglass wrapping, finish with hydraulic setting cement, apply 10 x 20 glass mesh and vapor seal with Sealfas 30-35.

C. Insulate all fittings, flanges, and valves on pipe 2" and up with molded fittings or with mitered segments of insulations, finished with Sealfas 30-35.

D. Seal ends of pipe insulation with vapor barrier adhesive at all flanges, valves, and fittings, and at intervals of not more than 20' on continuous runs of pipe.

2.03 CHILLED WATER PIPING

A. Cover piping with molded glass fiber (4 lb. density) or molded urethane (3 lb. density) with factory applied white fire retardant vapor barrier jacket with self-sealing lap. Apply 4" vapor barrier strips at all punctures with vapor-proof adhesive.

B. Insulate all fittings, flanges, and valves on pipe up to 1-1/2" with fiberglass wrapping, finish with hydraulic setting cement, apply 10 x 20 glass mesh and vapor seal with Sealfas 30-35.

C. Insulate all fittings, flanges, and valves on pipe 2" and up with molded fittings or with mitered segments of insulation, finished with Sealfas 30-35.

D. Seal ends of pipe insulation with vapor barrier adhesive at all flanges, valves, and fittings, and at intervals of not more than 20' on continuous runs of pipe.

2.04 THERMAL INSULATION (RIGID)

A. Insulation shall be minimum 4 lb. density with a compressive strength of 200 psf at 10% deformation, K factor of 0.24 at 75°F. and factory applied .0025" thick aluminum facing.

B. Apply 2" thick to blanked-off louvers, vent ducts from automatic damper to relief hood, combustion air ducts from intake to automatic damper, exhaust ducts from automatic dampers to discharge louvers, or roof hoods, outside air ducts, ductwork located outdoors, and to mixed outside and return air ducts.

C. Apply 1-1/2" thick to exposed air conditioned supply air ducts. Apply greater thickness as required to be flush with standing seams.

D. Apply 1½″ thick on all hot water coil casing at each VAV device that has a hot water coil as part of VAV device.

E. Fasten insulation with mechanical fasteners on 18" centers with a minimum of two rows of fasteners on all sides of ducts. Seal all joints and punctures with vapor barrier mastic. Imbed 4" wide 10 x 20 glass mesh at all joints to reinforce mastic.

F. On all exposed ductwork apply brush coat of Sealfas 30-35, imbed 10 x 20 glass mesh while still wet, smooth out wrinkles and apply final brush coat.

2.05 THERMAL INSULATION (FLEXIBLE)

A. Insulation shall be 1 lb. density with a K factor of 0.29 at 75°F and a factory applied reinforced foil vapor barrier jacket.

B. Apply 1-1/2" thick to concealed supply ductwork.

C. Adhere insulation to duct surfaces with 50% mastic coverage. Use mechanical fasteners on 18" centers on side and bottom sections when width exceeds 24". Butt all edges, lap all joints with 2" facing overlap and seal all joints and punctures with vapor barrier mastic. Use tying cord to secure the insulation until adhesive sets.

2.06 ACOUSTICAL INSULATION

A. Insulation shall be 1" thick Johns-Manville LinaCoustic or Owens Corning Aeroflex duct lining, minimum 1-1/2 lb. density with a K factor of 0.23 at 75°F. mean temperature, and shall meet erosion test method described in U.L. Pub-181. Apply to the inside surfaces of the following equipment:

1. The entire interior of every return-exhaust fan casing.

2. The entire interior of every central fan system casing.

3. Supply and return plenums and also 25' of supply and return ductwork from every air handling supply unit; include at least one 90° elbow in the above length, or add its equivalent to the above length.

4. Line 25' of exhaust-return duct to all exhaust-return fans; include at least one elbow in the above length, or add its equivalent length to the above length.

5. Line 25' of all exhaust ducts to exhaust fans and power roof ventilators; include at least one elbow in the above length, or add its equivalent length to the above length.

6. Line all transfer ducts, and all ducts as noted on the drawings.

7. Line all ductwork from variable air volume devices to air outlets.

8. Do not line exhaust ducts connected to kitchen hoods, fume hoods, paint spray booths, welding booths, duct collectors, transformer vaults, and similar units.

B. Apply to butted edges and to the inside of all ducts with 100% adhesive coverage and mechanical fasteners located on 12" centers and within 2" of butted edges. Apply heavy coat of mastic (CMC 17-477) and butt joints tight.

C. Ducts sizes must be increased where sound insulation occurs to maintain duct sizes as indicated on drawings.

PART 3 – EXECUTION

3.01 GENERAL INSULATION APPLICATIONS

A. Clean all piping, apparatus, and equipment to be covered, and insulate carefully without voids or the use of damaged section. Use full length pieces only.

B. Insulate sections of equipment requiring periodic servicing with removable sheet metal casings filled with the same thickness of material as the adjoining insulation.

C. Remove insulation if defects develop after insulating. After repair of defects, replace the insulation equal to original without cost to Owner.

D. Install all duct insulation without sagging, and repair all tears and punctures without cost to Owner.

E. No thermal insulation required on casings, plenums, or ducts that have an acoustical lining, or on ducts that terminate exposed to the room they serve.

F. Provide 0.016" aluminum METAL-ON jacket on all pipes that are exposed to the weather, or pass vertically exposed through occupied spaces, and as indicated on the drawings. BAND ALL JOINTS.

G. Do not cover equipment name plates with insulation.

H. See Section B15050, paragraph 3.07, Identification.

END OF SECTION

SECTION B15500

HVAC BASIC PIPING REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

Provide all piping, valves, fittings, pipe hangers, supports, anchors, sway bracing, vibration dampeners, flexible joints, specialties, etc., as specified and as schematically shown on the BID DOCUMENTS.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirement
B15050 - Basic HVAC Materials and Methods

1.03 WORK INCLUDED IN THIS SECTION

2.01 Pipe, Water, Fittings, and Valves
2.02 Pipe, Drain
2.03 Pipe, Flexible Connectors
2.04 Pipe, Hangers, and Supports
2.05 Strainers, Water
2.06 Thermometers (Stem)
2.07 Thermometers (Dial)
2.08 Gauges
2.09 Expansion Joints, Ball
2.10 Expansion Joints, Bellows

3.01 Pipe and Fitting Installation
3.02 Steam Systems
3.03 Water Systems
3.04 Cleaning Water Piping Systems
3.05 Venting Hot Water Systems

PART 2 – PRODUCTS

A. Fittings:

1. Steam Fittings: 2" and under, standard malleable or cast iron screwed, 2-1/2" and over, standard seamless steel long radius welding fittings.

2. Condensate Return Fittings: Extra heavy fittings.

3. Unions: 2" and under, 150 lb. standard malleable iron screwed, brass seat. Grinnell #463, or other approved.

4. Flanges: 2-1/2" and over, 150 lb. weld neck, flat faced flanges. All flange faces shall conform to valves specified.

5. Gasket: All sizes to be full faced 1/16" Cranite, or other approved.

6. Bolting: All bolting shall consist of heat treated alloy steel studs and nuts. Crane triplex or other approved, conforming to ASTM Specification A-193, Grades BC and B7 bolting.

B. Valves: All gate, globe, and check valves shall be Milwaukee Valve or Crane.

1. Gate Valves: 2" and under, 150 lb. brass, screwed with rising stem, Milwaukee #1151 or Crane #431UB. 2-1/2" and over, 125 lb. cast iron, flanged ends, with brass trim and rising stem, Milwaukee #F2885M or Crane 465-1/2. 6" and larger shall be equipped with 3/4" bypass piping.

2. Globe Valves: 2" and under, 200 lb. brass, screwed, with Nitra-hard plug-type disc, renewable body seat ring, and rising stem, Milwaukee #592A or Crane 212P. 2-1/2" and over, 125 lb. cast iron, flanged ends, with brass trim, Milwaukee #F2981M or Crane #351.

3. Check Valves: 2" and under, 200 lb. brass, screwed swing check, Milwaukee #508 or Crane #36. 2-1/2" and over, 125 lb. Ferro steel, flanged swing check valves, bronze trimmed with renewable seats, Milwaukee #F2974M or Crane #373.

2.02 PIPE, WATER, FITTINGS, AND VALVES

A. Hot, Cold, Chilled, and Condenser Water Pipe: 4" and under, standard weight, continuous weld, ASTM A-53, Grade F. 5" thru 10", standard weight, ERW ASTM A-53, Grade B. 12" and up, .375" wall, ERW ASTM A-53, Grade B. All piping shall be provided with a factory applied protective coating.

B. Fittings:

1. Water System Fittings: 2" and under, standard malleable or cast iron screwed. 2-1/2" and over, standard seamless steel long radius welding fittings.

2. Unions: 2" and under, 150 lb. standard malleable iron screwed, brass seat, Grinnell #463, or other approved.

3. Flanges: 2-1/2" and over, 150 lb. weld neck flat faced flanges. All flange faces shall conform to valves specified.

4. Gasket: All sizes to be full faced 1/16" Cranite, or other approved.

5. Bolting: All bolting shall consist of heat treated alloy steel studs and nuts. Crane triplex or other approved, conforming to ASTM Specification A-193, Grades BC and B7 bolting.

C. Valves: All gate, globe, and check valves shall be Milwaukee Valve or Crane. All valves shall be suitable for use when circulating antifreeze solution, cleaning solutions or cooling tower chemicals.

1. Gate Valves: 2" and under, 150 lb. brass, screwed with rising stem, Milwaukee #1151 or Crane 431UB. 2-1/2" and over, 125 lb. cast iron, flanged ends, with brass trim and rising stem, Milwaukee #F2885M or Crane #465-1/2.

2. Globe Valves: 2" and under, 200 lb. brass, screwed, with Nitra-hard plug-type disc, renewable body seat ring, and rising stem, Milwaukee #592A or Crane #212P. 2-1/2" and over, 125 lb. iron body flanged, Milwaukee #F2981 or Crane 351.

3. Check Valves (Spring Type): Check valves for all pump discharge lines shall be MUESSCO wafer type 101-AP ductile iron with bronze disc, stainless steel stem, stainless steel spring, spring loaded, silent type, 125 lb. ASA flanged.

4. Check Valves (Swing Type): 2" and under, 200 lb. brass, screwed swing check, Milwaukee #508 or Crane #36. 2-1/2" and above, 125 lb. Ferro steel, flanged swing check valves, bronze trimmed with renewable seats, Milwaukee #F2974M or Crane #373.

5. Stop or Balancing Valves: All valves indicated as "Stop or Balancing Valves" on the drawings shall be ball valves through 2", and butterfly-type for valves 2-1/2" and above.

    a. 2" and under, 150 lb. cast bronze 2-piece ball valve with stainless steel ball, 350°F reinforced Teflon seals and packing, stainless steel lever handle with vinyl grip, Milwaukee #BA100 or Crane #9302.

    b. 2-1/2" and above, 175 DeZurik, Crane #44 Quartermaster, Grinnell, Centerline, Keystone Fig. 212, or Milwaukee #ML123E iron body butterfly valves with 250°F double rubber seat, corrosion resistant bearings, #416 stainless steel shaft, aluminum bronze disc pinned to lever through 6" and an enclosed worm gear actuator on 3" and above. Valves for equipment isolation shall have lug style bodies and shall provide bubble tight shutoff at full rated pressure. Valves shall be installed with flat side of disc on higher static pressure side of the valve.

6. Flow Metering Stop Valves: All valves indicated as "Flow Metering Stop Valve" shall be flow set valve packages as manufactured by Flow Design, Inc. in sizes from 1/2" to 4" consisting of two (2) valves as follows:

    a. Flow measuring valve (F), installed on entering side of equipment, shall consist of a 400 lb. rated ball valve with bronze body, plated ball, Teflon seats, vinyl grip handle, and integral venturi section with pressure - temperature taps.

    b. Flow setting valve (S), installed on leaving side of equipment, shall consist of a 300 lb. rated bronze body butterfly valve assembly with stainless steel disc, viton seats, vinyl grip handle, memory stops, and integral pressure - temperature taps.

    c. The above valves shall be installed in the following locations as shown on the drawings:

        (1) Hot water coils
        (2) Chilled water coils
        (3) Secondary pipe loops
        (4) Pumps

(5) Main loops and branches

2.03 PIPE, DRAIN

A. Drain pipe for extensive overhead systems shall be ASTM Specification B-88, type "L" hard copper. Fittings shall be cast brass sweat-type fittings soldered with 50/50 solder.

B. Simple unit condensate drains shall be galvanized, or plastic pipe.

2.04 PIPE, FLEXIBLE CONNECTORS

A. Provide as shown on the drawings Flexonics, or equal, Series 300 bronze braided hose with screwed ends through 2" size and Series 400, type 321, stainless steel braided hose with flanged ends for pipes 2-1/2" and above. Each connector shall be rated for a minimum of 150 psi working pressure at 250°F and shall be of sufficient length to allow 3/4" offset motion. Flexible hose to be used for refrigeration service shall be cleaned, degreased, and sealed.

B. Provide Flexonics, or equal, Model L, expansion compensators for installation in baseboard radiation as shown, or required, to control expansion. Each compensator shall be rated for 70 psi working pressure at 250°F.

C. Provide Resistoflex type R6904 arch-type expansion joint complete with flanged ends and control rods with rubber grommets. Each rubber joint shall be suitable for 250°F temperature and shall be designed for a minimum of 100 psi working pressure.

2.05 PIPE, HANGERS, AND SUPPORTS

A. Provide Grinnell, Fee Mason, or Elcen adjustable hangers, special floor pipe supports, spring hangers, saddles, anchors, clamps, rods, miscellaneous iron supports and appurtenances as required. Provide any miscellaneous iron for hanger supports that may be required in addition to the building structure. All work shall conform to ASA Code B31.1 and MSS Standard Practice SP-58.

B. Where pipes are supported from structural steel, use "C" clamps (Fig. 88) for pipes through 2". For pipes 2-1/2" and up, use beam clamps (Fig. 229), or welded attachment (Fig. 66).

C. Where hangers are supported from existing beams, or concrete slabs of sufficient thickness, provide Phillips concrete fasteners, or expansion cases (Fig. 117).

D. Where hangers are supported from new concrete slabs, provide concrete inserts (Fig. 279, 281, 282) depending upon load requirements.

E. Spring-type hangers (Fig. 178) shall be installed throughout all boiler and equipment rooms where reciprocating or rotating equipment is installed. The same hangers shall be installed at least three (3) pipe hangers away from all equipment set on vibration isolators, and at the top of risers to absorb vertical movement.

F. Suspend all steam and hot water mains thru 3" from clevis-type hangers (Fig. 260) with pipe covering saddles. Suspend all steam and hot water piping from 4" through 12" from clevis-type roller hangers (Fig. 181) with pipe covering saddles. Suspend all steam and hot water piping 14" and up from trapeze-type roller hangers (Fig. 171) with pipe covering saddles. Provide spring cushion roller-type hanger (Fig. 178), in lieu of Fig. 171 and 181, where required for vertical movement.

G. Suspend all cold water, chilled water, and condenser water piping from clevis-type hangers (Fig. 260). At each chilled water hanger, provide an 18" long section of calcium silicate pipe covering, cover with a white fire retardant vapor barrier jacket and insert an insulation protection shield (Fig. 167) between the insulation and the hangers.

H. Spacing of hangers shall not exceed the following schedule. This Contractor shall provide any additional steel members required to maintain the spacing. Provide hangers adjacent to concentrated loads such as valves, pumps, flanges, etc.

PIPE SIZE-IN.	HANGER SPACING-FT.	ROD SIZE-IN.
1	7	3/8
1-1/2	9	3/8
2	10	3/8
2-1/2	11	1/2
3	12	1/2
4	14	5/8
6	17	5/8

I. Provide rods complete with adjusting and locking nuts.

2.06 STRAINERS, WATER

A. Y-Type Strainers: 2" and under, 250 lb. iron body, screwed, Keckley Style A with 1/16" perforated monel screen, 2-1/2" and above, 250 lb, iron body, flanged, Keckley Style B, with a monel screen and the following perforation:

Through 4" size: 1/16"
5" and Up: 1/8"

B. Basket Type Strainers: 2" and under, 250 lb., iron body, screwed, Keckley Style DV with a 1/16" perforated monel screen. 2-1/2" and above, 250 lb. iron body, flanged, Keckley Style DV with a monel screen and the following perforation:

Through 4" size: 1/16"
5" and Up: 1/8"

2.07 THERMOMETERS (STEM)

A. Provide Trerice BX9 Series, adjustable angle, industrial type, red appearing mercury in glass thermometers, Duro, Ashcroft, Marshalltown, or Weiss manufactured to the following specifications:

Scale: 9" size with white background and black marking.

Case: Die cast aluminum and clear acrylic plastic lens.

Stem: Aluminum installed with minimum 2" extension into pipe.

Accuracy: Within 1% of range.

Wells: Brass with 2" extension for insulation.

B. Location: Each thermometer shall be placed so that a good sample of water is taken. Locate thermometers in accessible locations for close visual observations. All thermometers shall be adjusted so that they are easily read from the floor or nearest platform.

C.

Line Designation	° F/Div.	Range (°F)
Low Pressure Steam	2	30 - 300
Chilled Water	1	0 - 100
Condensate	2	30 - 300
Hot Water	2	30 - 240

2.08 THERMOMETERS (DIAL)

A. Provide Ashcroft, Duro, Weiss Marshalltown, or Trerice bimetal 5" diameter dial every angle thermometer with 12" long stems, separable wells with lagging extension.

B. Furnish case ring and stem in #304 stainless steel. Provide heavy duty glass and hermetically sealed construction with external adjustment. Face to be white with black numbers.

C.

Line Designation	°F/Div.	Range (°F)
Low Pressure Steam	2	50 - 300
Chilled Water	1	30 - 130
Condensate	2	50 - 300
Hot Water	2	50 - 240

D. Location: Each thermometer shall be placed so that a good sample of water is taken. Locate thermometers in accessible locations for close visual observations. All thermometers shall be adjusted so that they are easily read from the floor or nearest platform.

2.09 GAUGES

A. Provide Trerice 500X, Duro, Ashcroft, Marshalltown, or Weiss 6" diameter dial duragage precision pressure gauge with white face and black numbers.

B. Gauge to be provided with stainless steel movement, bronze socket, and tube, solid front enclosure and 1/4" isolating globe valve (200 lb.) fittings and gauge cocks.

C. Select gauges so that the normal operating pressure is at the midpoint of the scale.

D.

Line Designation	PSI/Div.	Range (PSI)
Low Pressure Steam	0.5	0 - 60
Primary Pumps	1	0 - 160
Secondary Pumps	1	0 - 160
City Water	1	0 - 160
Expansion Tank	1	0 - 160

E. Provide altitude gauge Trerice #615 Series with combination scale for hot and chilled water system.

2.19 METERS, WATER, FLOW

A. Provide Gerand Venturis and Indicators, or averaging pitot tube flow meters, Pressco, Taco, or Olympic as shown on drawings.

B. Venturis to be used on all lines over 7 GPM with a maximum pressure drop of 0.8 ft. Venturis 1-1/4" through 2" brass screwed, 2-1/2 and over for butt welding to piping. Nipples, valves, and disconnects to be included with each venturi.

C. Balvalve-Indicators shall be used on all units as scheduled 7 GPM and lower sizes 1/2" through 1". Pressure drop not to exceed 25".

D. Balvalve-Indicator to consist of a brass Teflon seated tight shut-odd ball valve and locking device. A brass calibrated orifice with disconnects and metal tag will be installed on the unit side of the valve. The valve will be adjusted and locked in position corresponding to the meter reading as given on the metal tag.

E. Venturis and Indicators shall be furnished with chained metal tag showing location, size, GPM, and meter reading for GPM specified. All meters shall be installed with distances in accordance with the manufacturer's instructions for upstream and downstream valves, fittings, etc.

F. A portable 0-50" 6" dial differential meter shall be provided with this project (or rented to Contractor) for balancing flow in all units. Venturis and Indicators shall be provided with individual meters as indicated on the drawings.

PART 3 - EXECUTION

3.01 PIPE AND FITTINGS INSTALLATION

A. Pipe welding shall comply with the provisions of the latest revision of the ASME Boiler and Pressure Vessel Code, and the ANSI Code for Pressure Piping B31.1, or such state or local requirements as may supplement codes mentioned above.

B. Each Manufacturer, or Contractor, shall be responsible for the quality of welding done by his organization, and shall repair or replace any work not in accordance with these specifications.

C. Maintain sizes and locations indicated with no changes to be made unless approved by the A/E. Follow the A/E's directions in locating the pipe runs before locating openings in floor slabs and walls.

D. Welding is required on all piping located in building overhangs, underground piping, all piping 2-1/2" and over, and permitted on all, or part, of other piping in lieu of screwed joints.

E. All stop and balancing valves shall be located for ease of accessibility. Consult the A/E about relocating valves that would be inaccessible if installed as shown.

F. Pipe, valves, fittings, etc., shall be hydrostatically tested in accordance with ANSI Code for Pressure Piping B31.1.

G. All welding fittings shall be as manufactured by Ladish, Tube Turn, or Midwest. Branch connections sized under 1/2 the main pipe diameter may be made with intersection welds with no projection of the small pipe into the larger pipe.

H. Unions, Victaulic couplings and flanges shall be provided where valves, control equipment, etc., are installed in continuous runs of piping. Unions shall be provided in all screwed piping where required for disassembly, or for convenience in making repairs.

I. All piping shall be cleaned out before installation by blowing out with compressed air, or by other approved method. Provide temporary plugs, or caps, for all open ends of pipe when work is not being carried on to completion.

J. Welding of galvanized pipe or fittings will not be acceptable.

K. Provide steel pipe sleeves with minimum wall thickness of 1/4" for all pipes passing through beams and walls of concrete, brick, tile, or masonry, and 22 gauge galvanized iron sleeves for pipes passing through other parts of construction. Provide steel pipe for all sleeves penetrating floors. Set sleeves 2" above floors and caulk so no water leakage can occur between sleeves and floors. Furnish each sleeve having inside diameter 1" larger than outside diameter of each uninsulated pipe and 1" larger than outside diameter of insulated piping, unless the wall or floor is a fire wall, in which case, only the pipe shall penetrate.

   Wherever pipes penetrate sound barriers, smoke partitions, or fire rated floors or walls, fill opening around pipe with U.S.G. Thermofiber Felt and Firecode Gypsum Cement, Dow Corning Fire Stop Sealant, or equivalent material, equal to the rating of the assembly penetrated.

L. On all pipes passing through floors, walls, and ceilings, provide chrome plated brass escutcheons of approved design and finish having outside diameter to cover sleeved openings and inside diameter to fit pipe. Securely fasten in place to floors, walls, and ceilings.

M. Wherever copper, brass, or bronze piping systems are connected to steel or iron piping systems, this connection shall be made with dielectric isolators.

3.02 STEAM SYSTEMS

A. Mains and returns to be graded down in direction of flow not less than 1" in 40'.

B. Horizontal branch connections from mains to risers, and from risers to equipment, in which condensate travels in opposite direction to steam shall be graded not less than 1" in 5'.

C. Where horizontal steam mains are reduced in size in the run, install eccentric fittings to prevent lodgment of water.

D. Provide drip connections for pocketed sections of all steam piping to properly remove the condensate, whether or not shown on plans.

E. Provide drip pockets at bottom of all risers and at drip connections to mains. All drip pockets shall be full size of pipe up to 4", and 4" for larger sizes. Provide 1" valved drain on all drip pockets. Provide a 1/2" test connection between trap and valve on discharge side of trap. Piping shall be arranged so that test connections may be used for a manual blow-off, or to test conditions on each side of trap. Provide strainer ahead of all traps.

3.03 WATER SYSTEMS

A. Mains to be graded up in direction of flow, not less than 1" in 100', or run dead level where space is limited.

B. Install 3/4" Crane #58 drain valves, with hose threads, removable cap, and disc material suitable for 210°F water, at bottom of all coils, radiation, and at all low points in the system on piping up to 4" size. Install 2" globe valves on all piping 5" and up unless shown differently on the drawings, and pipe 2" drains to nearest drain. Provide a cap on all drain lines above ceilings. Install air chambers and manual air vents at all high points of the system.

3.04 CLEANING WATER PIPING SYSTEMS

A. Use Dearborn compound cleaner #19 alkaline, Mogul, Vulcan, or Nalco in the amount of 2 gallons per 100 gallons of water to preclean the piping system. Dissolve the compound so that it is in solution, preferably in warm water, and in such quantities that foaming will not be a problem.

B. Provide 2 gallon shot feeder with shut-off, throttling, and drain valves across circulating pumps for all hot and chilled water systems.

C. Circulate the solution in the system with all automatic valves fully open and water temperature at 210°F. Double the quantity of solution to be circulated in the system if heat cannot be provided. Drain the entire system after 24 hours. Fill system with clear water, and circulate for a period of 24 hours while continuously draining and filling the system. Provide a temporary and separate pump if the existing pumps can not be used adequately.

D. Obtain system water analysis one week later and treat water in accordance with the manufacturer's recommendations.

3.05 VENTING HOT WATER SYSTEMS

A. After the system has been cleaned, close all air vents except the vent at the bottom of the Airtrol tank vent fitting and begin filling the system. Leave Airtrol tank vent fitting open until water runs freely from it, and then close tightly. Do not open this vent again until system has to be drained. Vent all heating coils, radiation, and high points of the system. Feed more water to the system to provide at least 4 pounds per square inch pressure at the highest point of the system.

B. After the system has been completely filled, start all circulating pumps to circulate and dislodge small air bubbles. Stop all circulating pumps and heat water in the system up to at least 220°F, and start circulating pumps. Stop circulating pumps and again vent entire system.

END OF SECTION

SECTION B15750

MECHANICAL HEAT TRANSFER EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

Provide equipment required to transfer heat from the heating medium to areas requiring heating, or from the cooling medium to areas requiring cooling as shown on the BID DOCUMENTS.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements
B15050 - Basic HVAC Materials and Methods

1.03 WORK INCLUDED IN THIS SECTION

All mechanical equipment listed in this Master Specification shall be reviewed with the manufacturer for options and specific application to the project being designed. Each product shall include the following reference: See Section B15050: CODES AND STANDARDS.

2.01 Coils, Hot Water
2.02 Coils, Chilled Water
2.03 Pumps, Circulating

3.01 Installation, General

PART 2 - PRODUCTS

2.01 COILS, HOT WATER

A. Provide copper (0.024) tube with aluminum fin air heating coils of sizes, rows, and ARI certified capacities as shown on drawings, complete with vertical headers and horizontal tubes, or serpentine type coil, with flanged metal or sheet metal drive slip casings.

B. Coils shall be furnished with air handling units, or located in central fan systems or used as booster coils suspended from ceiling hangers. Connect to flow and return with automatic valves, balancing valves, manual air vents, and drains as shown or required.

2.02 COILS, CHILLED WATER

A. Provide drainable copper (0.024) tube with aluminum fin air cooling coils with ARI certified capacities as shown on drawings complete with vertical headers, horizontal tubes, and flanged metal casings for support and duct connections.

B. Coils shall be furnished with air handling units, or located in central fan systems. Connect to flow and return with automatic valves, balancing valves, manual air vents, and drains for each row of tubes as shown or required.

2.03 PUMPS, CIRCULATING

A. Provide Bell & Gossett or TACO circulating pumps with capacities as indicated on the drawings in the following models:

1. Side suction, in-line
2. Side suction, in-line booster.

B. All pumps shall be cast iron, bronze, fitted for 175 psi working pressure and 225°F operating temperature. In-line booster pumps shall be designed for 125 psi working pressure. Pumps shall be back pullout design to allow for servicing without disturbing piping, motor or required shaft alignment.

C. Provide tapped and plugged openings for vents and drains and for suction and discharge gauge connections.

D. Bearing assemblies shall be as follows:

1. Series 80 and 90 in-line pumps shall use NEMA JM frame motors with regreasable bearings

E. Impeller shall be single or double suction enclosed type made of bronze, hydraulically and dynamically balanced, keyed and locked to a carbon steel shaft protected by a replaceable bronze shaft sleeve.

F. Mechanical seal shall be single unbalanced type with Buna N/carbon rotating element and ceramic stationary seat.

G. Base mounted coupled pumps shall be coupled with a Woods Sure-Flex spacer type or with extended hub to allow for pump servicing. Furnish with a coupling guard. In-line pumps shall be spring coupled.

H. Motor shall meet NEMA specifications and shall be non-overloading over the entire pump curve. See Section B15050: Codes and Standards.

I. Each pump and motor is to be provided with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

J. Contractor shall install the pumps in strict accordance with manufacturer's instructions to avoid any stress and misalignment. Mount base mounted pumps on concrete base and grout pump base after installation. Pumps shall be completely removable for servicing and replacement.

K. Manufacturer to provide start-up service to verify proper wiring, rotation, base setting, alignment, lubrication and amperage draw. Service shall include capacity check of each pump, which is to be submitted directly to the Engineer indicating GPM, suction and discharge pressure and actual amperage draw. Manufacturer is to provide replacement of impellers or trimming of impellers to meet capacity requirements indicated on the plans at no additional cost to the owner.

L. Provide one spare seal and casing gasket for each pump to owner.

PART 3 - EXECUTION

3.01 GENERAL, INSTALLATION

All installations shall be done in accordance with manufacturer's instructions and as shown on the drawings.

END OF SECTION

SECTION B15850

AIR HANDLING

PART 1 - GENERAL

1.01 DESCRIPTION

Provide all air handling equipment required to move air as shown on the BID DOCUMENTS.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements
B15050 - Basic HVAC Materials and Methods

1.03 WORK INCLUDED IN THIS SECTION

A. Custom air handling units in accordance with the equipment schedules and specifications.

1.04 SUBMITTALS

A. Submit shop drawings and product data as applicable.
   1. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
   2. Product Data
      a. Provide literature that indicates dimensions, capacities, ratings, performances, gauges and finishes of materials, and electrical characteristics and connection requirements.
      b. Provide data of filter media, performance, framing and assembly.
      c. Provide fan curves with specified operating point clearly plotted.
      d. Provide coil selection with performance data
      e. Provide pressure drop calculation report indication the internal pressure loss and available external loss
      f. Submit sound power level data for fan outlet, fan inlet and casing radiation at rated capacity.
      g. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
      h. Submit performance, noise and vibration test results of the air handling unit as required by specifications. Provide test results for review prior to any air handling unit shipment to the job site.

1.05 OPERATION AND MAINTENANCE DATA

A. Submit installation, startup, operation and maintenance data.
   1. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.
   2. Include manufacturer's installation instructions.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section who issues complete catalog data on total product.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of General Conditions and Division 1 as applicable.

B. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place and fan has been test run under observation.

1.09 QUALITY ASSURANCE

A. Conform to space and access requirements; units which do not conform to space and access requirements will not be accepted.

B. Direct expansion coils shall be designed and tested in accordance with ANSI/ASHRAE 15 Safety Code for Mechanical Refrigeration.

C. Insulation and insulation adhesive shall comply with NFPA 90A requirements for flame spread and smoke generation.

All mechanical equipment listed in this Master Specification shall be reviewed with the manufacturer for options and specific application to the project being designed. Each product shall include the following reference: See Section B15050: CODES AND STANDARDS.

2.01 Units, HVAC

PART 2 PRODUCTS

2.03 MANUFACTURERS

A. Alliance Air

B. CES Group

2.04 FABRICATION

A. Unit Base: Perimeter of unit base shall be constructed from ASTM A36 structural steel 'C' channel. Internal supports shall consist of structural rectangular tubing on minimum 24" centers. All fans and coils shall be supported on minimum ¼" thick structural tubular steel. The unit base shall be fully welded. Height and section of structural members shall take into account internal loading, unit height, length and width, and split sections so as to limit base deflection to 1/200 of span. Curb mounted units shall be provided with curb angle welded on inside of structural base.

1. Prior to welding, all structural 'C' channels shall be sandblasted to remove rust and mill scale. Wire brushing or chemical treatment is not acceptable.
2. Heavy removable lifting lugs shall be added to the perimeter channel along the longest length of the unit. Removable type lifting lugs shall be provided with welded attachments. Provide a minimum of 4 lugs per section to ensure proper rigging.
3. Unit floor shall be covered with 16 gauge bright galvanized sheets as standard. The floor shall be supported by stringers and structural members on maximum 24" centers. All seams shall be supported underneath by structural supports. Floor shall be attached to base structure by welding from underneath on maximum 6" centers. Floor seams shall consist of minimum 1" standing seams, caulked and covered with cleats to ensure water and air tightness. Penetrations through unit floor are not acceptable.
4. Isolator supports shall be attached to base structural members with minimum 3/8" Grade 5 bolts. Welding to the floor skin is not acceptable.
5. Coil drain pans shall be supported by structural steel members under the floor.

B. Unit Housing: The unit housing side and roof panels shall be constructed of minumun 16 gauge galvanized steel, and shall utilize a standing seam modular panel type construction. The panels shall be attached to each other, to the roof, and to the floor using bolts so that all panels are removable. All seams shall be sealed with a high strength polyurethane sealant prior to assembling the panels. After assembly, exterior panel seams shall be filled with acrylic latex caulk for appearance. Bolting shall be zinc plated ¼-20 on maximum 8" centers. Sheet metal or 'Tek' fasteners are not acceptable for sealing pressure containing panels.

1. Fan sections shall include 20 gauge perforated galvanized interior sheet metal liners in fan blast area.
2. Cooling coil and direct evaporative sections shall include 20 gauge 304 stainless steel liner.
3. Insulation in sections lined with perforated sheets shall be faced with neoprene.
4. All floor openings shall have 1" minimum flange up around entire perimeter.
5. Roof shall be sloped at ¼" per foot for all exterior units. Slope must be maintained after installation.
6. Access doors shall be provided full height (72") where unit height permits, and shall be 24" wide where section length permits, otherwise minimum of 18" shall be used. Doors shall be 2" thick, double wall, and insulated type. Exterior door panels shall be constructed from painted A60 galvanized steel; interior panels are bright galvanized G60 steel. Door insulation shall be injected urethane foam with a minimum R value of 13-Ft^2-°F/BTU. Door frames shall be heavy aluminum extrusion with one-piece, closed cell, replaceable santoprene gasket seal.
7. Door hinges shall be die-cast zinc with provision for adjustment without the use of shims or special tools. Door latches and handles are to be bolted to the unit and made with corrosion resistant materials. Bolts, nuts and shafts for door latches, handles and hinges shall be made of zinc plated steel. Door latch and pawl assembly shall be industrial quality and corrosion resistant with a handle on

both the inside and outside of door. Latching mechanism shall be of conical roller design. Latch and pawl assembly shall be bolted together without the use of set screws allowed.

8. All doors to fan sections shall be provided with latches which require a tool to open.

9. Viewing windows shall have double thermal pane wire reinforced safety glass.

C. Insulation: Wall and ceiling panels shall be insulated with 2"-1.5#/cu.ft. fiberglass insulation. Insulation under solid lining shall be unfaced; otherwise, insulation shall be faced with an acrylic or neoprene coating. Insulation shall be tested and rated per ASTM C 423 and NFPA-90a rated. Insulation shall have thermal conductivity K factor of .24 Btu/Hr/Sq Ft/Degree F @ 75°F mean and the following sound attenuation characteristics:

Octave Bands	125	250	500	1K	2K	4K	NRC
Absorption Coefficient	.15	.77	1.11	1.08	1.00	1.03	1.00

D. Insulation under floor shall be sprayed urethane foam with a minimum thickness of 2" and a minimum aged R value of 11.5 Hr-Ft^2-°F/BTU.

E. Paint Finish: Exterior wall and roof panels shall be coated with air dry acrylic polyurethane to a minimum dry thickness of 3 mils. Finish shall have no blistering or rusting on unscribed areas after 2,000 hours in accordance with ASTM B-117 salt fog test. Entire structural steel base shall be primer painted with industrial grade epoxy primer for total thickness of 4 mils minimum.

F. Fans:

1. Housed Fan Assembly: Fan housing shall be heavy gauge galvanized steel construction. Fan scroll shall be bolted to fan frame. Bearings shall be cast iron pillow block mounted self-aligning ball type. Bearings shall be rated for a minimum average life of 200,000 hours at the maximum horsepower and speed ratings for the fan class. Fan wheel and sheaves shall be keyed to the fan shaft. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI 204-96 to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label.

2. Plenum Fan Assembly: Fan shall be SWSI arrangement 3 (Direct drive arrangement 4 is acceptable) as indicated on the schedule. Shaft shall be sized not to exceed 75% of the first critical speed at the maximum speed for the fan class. Fan frame and base shall be constructed of welded structural steel angle, and painted with 3 mils of industrial grade water-based air dry enamel. Bearings shall be cast iron pillow block mounted self-aligning ball or roller type. Bearings shall be rated for a minimum average life of 200,000 hours at the maximum horsepower and speed ratings for the fan class. Fan wheel and sheaves shall be keyed to the fan shaft. Each fan assembly, including sheaves and belts, shall be trim balanced at the factory in accordance with ANSI 204-96

to Balance Quality Grade G6.3. Fans shall be rated in accordance with AMCA Standard 210 for air performance and AMCA 300 for sound. All fans shall carry the AMCA certification label.

3. Fan Assembly Isolation Base: Fan and motor shall be mounted on an integral fully welded structural steel base. Base shall be free floating at all four corners on spring type isolators with earthquake restraints rated for Seismic Zone 4 requirements. Isolator spring deflection shall be 2" minimum or as indicated on specifications.

4. Motors and Drive: Furnish premium-efficiency open drip proof, NEMA frame, ball bearing type motors. Motor horsepower shall be in accordance with the schedule and are minimum allowable. Minimum service factor shall be 1.15 and motors shall not be selected to operate in the service factor. The motor shall be mounted on an adjustable motor base with two adjusting bolts per side. The fan motors shall be factory wired to an external junction box with flexible conduit of adequate length so that it will not have any effect on the vibration isolation. Provide V-belt type, cast-iron sheaves, and reinforced rubber belts. The belts shall be selected for 150% of the motor nameplate horsepower. Drives shall be "Browning type QD" or equal.

G. Coil Sections:

1. Chilled water coils shall be of the plate fin extended surface type. Tubes shall be seamless copper with a 0.024" minimum wall thickness. Tubes shall be mechanically expanded into the fin collars to provide a permanent mechanical bond.

2. The secondary surface shall be die formed of aluminum (copper fins are optional) with thickness as specified on the equipment schedule. Fin spacing shall not exceed 12 fins per inch. Headers shall be non-ferrous material, outside the airstream and provided with brazed male pipe connections. Drain and vent fittings shall be provided for complete coil drainage. All coil connections shall be extended to the exterior of the air handling unit.

3. All coils shall have counterflow construction with connections left or right hand as shown on the drawings. The use of internal restrictive devices to obtain turbulent flow will not be accepted.

4. Cooling coil casings shall be of minimum 16 gauge 304 stainless steel. All other coil casing shall be of 16 gauge galvanized steel. Tube sheets shall have extruded tube holes. All coil assemblies shall be tested under water at 300 psi and rated for 150 psi working pressure.

5. Main drain pans are 16 gauge 304 stainless steel with a double sloped IAQ design to ensure complete condensate drainage. Drainpans are insulated with 2" of urethane foam with an R value of at least 11.5. The insulation is protected by a 20 gauge galvanized steel liner.

6. Intermediate condensate pans are to be furnished on multiple coil units and single coils greater than 48" high. The pans shall be 16 gauge 304 stainless steel. Intermediate pans shall extend at least 6" in the direction of airflow and drain to the main drain pan through copper downspouts.

7. All water coils shall be rated in accordance with ARI Standard 410.

H. Filter Sections: Filter sections shall be factory fabricated as part of the air handling unit. Filters shall be arranged for upstream, downstream or side loading into galvanized filter frames. Provide filter holding frames to accommodate scheduled filters. Filter rack shall be thoroughly caulked and sealed for minimal filter bypass.

I. Damper Sections: Dampers shall be low leakage type with airfoil blade design. All dampers shall carry the AMCA Standard 500 certification label. Air leakage through a 48" x 48" damper shall not exceed 10 CFM/ft^2.

1. Blade gasket shall be extruded EPDM elastomer secured in an integral slot within the aluminum extrusion. Frame seals shall be extruded TPE thermoplastic. Overlapping blade design shall compress seals to ensure tight seal on closure.

2. Damper frame shall be extruded aluminum with a thickness of not less than .080" and a depth of 4". Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section.

3. Bearings shall be double seal with an inner bearing fixed to the rod within a polycarbonate outer bearing inserted into the frame so that the outer bearing cannot rotate. Bearings shall be designed so that there is no metal to metal contact.

4. Linkage hardware shall be installed outside of the frame and constructed of corrosion resistant aluminum and zinc plated steel.

J. Air Flow Measuring Stations: The flow measuring station shall consist of total pressure taps located in the inlet cone of each fan, with static pressure tap located near fan inlet panel. Any flow measuring device which creates an obstruction in the fan inlet is not acceptable.

1. Provide a Dwyer magnehelic pressure gauge with CFM scale which indicates the fan volume. Flow gauges shall be calibrated to match the flow coefficient of the fan inlet cone provided.

2. Provide a Setra model 264 electronic differential pressure transmitter mounted to the exterior of the fan section. The transmitter shall be produce a 4 – 20 mA or 0 – 5 Vdc signal linear and scaled to air volume or velocity. The transmitter shall be capable or withstanding over pressurization up to 200 times greater than span and shall be factory calibrated.

K. Access Sections: Access sections shall be installed where indicated on the drawings and shall be as specified on the equipment schedule.

1. Access sections shall have double-walled hinged doors.

L. Electrical: Provide vapor tight marine lights as specified in the submittal documents, factory wired to a single weatherproof switch located on exterior of cabinet. Provide weatherproof, 15 amps, GFCI receptacle near the light switch wired to the lighting circuit. Separate 120/1/60 power to the light switch shall be provided and installed by others.

1. All wiring shall meet N.E.C requirements.

2. All wiring shall be run in EMT conduit, raceways are not acceptable. If the unit requires splits, junction boxes shall be furnished on each section to allow the

electrical contractor to make final connections in the field. Wiring shall be clearly labeled to facilitate field connection.

3. Variable frequency drive for indoor units shall be housed in Nema 1 enclosure. Variable frequency drives for outdoor units shall be housed in suitable NEMA 3R rated enclosures, or in recessed enclosures provided inside the air handling unit, equipped with air-tight access doors and interior cooling provided by circulating conditioned air. VFD manufacturer to be ABB drives or approved equal, manufacturers not approved prior to bid day will not be accepted.
4. Motor starter panels shall carry the U.L. 508 listing.
5. Unit mounted controls shall be installed and tested by AHU manufacturer. Controls shall be provided by the temperature controls contractor and shipped to the factory for installation.

M. Testing:

1. Factory Leak Test: Air Handling Unit manufacturer shall provide a witnessed factory leakage test at 1.5 times design static pressure up to a maximum of 10" w.g. Leakage rate at test pressure shall not exceed 1% of design air volume. Unit shall be tested with all openings sealed. A pressure blower with a variable frequency drive shall be used to set the test pressure. CFM shall be determined using a calibrated orifice. Unless specified otherwise, test pressures shall be positive on positively pressurized sections and negative on negatively pressurized sections of the air handler. A report of all test results shall be written and submitted to Owner's representative for approval.
2. Factory Cabinet Deflection Test: Air handling unit manufacturer shall provide a witnessed factory Panel Deflection Test at the unit design static pressure (1.5 times design static pressure optional). Panel deflection shall not exceed L/200 of longest plane being measured the test pressure. The casing deflection shall be measured at mid point of panel and at panel seam. A report of all test results shall be written and submitted to Owner's representative for approval.

A. Warranty: The manufacturer shall provide a one (1) year parts warranty.

B. Fan sections shall have a removable panel located on the drive side of the unit, of adequate size to permit removal of the fan wheel, motor, and drive. Include factory mounted internal spring vibration isolators 2" deflection; thrust restraints and flexible connections.

C. Motors, with 1.15 service factor, and starters shall be in accordance with the drawings, V-belt drives shall be 175% rated, and totally enclosed per (OSHA) requirements.

D. Remote Economizer controls.

E. Coils, Hot Water, (See Section B15750)

F. Coils, Chilled Water (See Section B15750)

G. Frequency drive bypass switch & isolation transformer.

H. Filter box section with access on both sides with 2" thick Farr 3030 prefilters ahead of 65% rigid type filters.

I. Dwyer No. 2000 Magnehelic filter gauge.

J. Spare set of filters.

K. Unit shall have vibration isolation equipment and shall have flexible connections between ductwork and unit. See Section B15050 on Vibration and Noise Control.

L. See Section B15050: Codes and Standards.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in conformance with ARI 435.

C. Install the units as shown on the floor plans.

D. Chilled water pipe connection for cooling coils and heating hot water pipe connection to heating coils shall be offset from the coil and shall not interfere with coil pull space or access doors into the air handling unit. Contractor shall coordinate exact location with air handling unit manufacturer.

E. Air handling units shall not be operated unless the following requirements (if applicable) are met:
   1. Ductwork is clean and filters are in place
   2. Bearings are lubricated.
   3. Bearing and drive setscrews to be torqued in accordance with the installation instructions.
   4. Belts aligned and fan has been test run
   5. Shipping braces removed
   6. Condensates properly trapped.
   7. Piping connections verified and leak tested.

None

END OF SECTION

SECTION B15880

AIR DISTRIBUTION

PART 1 - GENERAL

1.01 DESCRIPTION

Provide ductwork, accessories, dampers, louvers, grilles, and all equipment related to air distribution and exhaust air ventilation as shown on the BID DOCUMENTS.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements
B15050 - Basic HVAC Materials and Methods

1.03 WORK INCLUDED IN THIS SECTION

All mechanical equipment listed in this Master Specification shall be reviewed with the manufacturer for options and specific application to the project being designed. Each product shall include the following reference: See Section B15050: CODES AND STANDARDS.

2.01 Dampers, Automatic
2.02 Dampers, Fire
2.03 Door, Pressure Relief
2.04 Ductwork, Prefabricated
2.05 Flexible Connections
2.06 Guards, Metal
2.07 Inspection, Access, Doors
2.08 Louvers
2.09 Pans, Drain
2.10 Silencers, Air
2.11 Thermometers, Air (Stem)
2.12 Thermometers, Air (Dial)

3.01 Installation, Equipment
3.02 Installation, Ductwork

1.04 DESIGN CONDITIONS

A. The entire sheet metal installation shall be fabricated of prime sheets of galvanized iron, and shall be installed in accordance with the latest editions of the HVAC DUCT CONSTRUCTION STANDARDS as prepared by SMACNA, INC., or as herein specified otherwise. The editions shall serve as a guide for minimum requirements of the installation except as herein specified otherwise. Install the ducts, risers, etc. as indicated on drawings making all necessary changes in cross sections, offsets, etc., whether or not the same is specifically indicated. If ducts cannot be run as shown on the drawings, this contractor is to install the ducts between required points by any path available, subject to the approval of the A/E.

SMACNA Standards state that if the designer does not state the pressure classification of the duct, the contractor will assume 1" w.g. for all ducts except VAV, which he will assume as 2".

All duct seams will separate when tested to 1-1/2 times the states pressure classification.

B. All ductwork shall be constructed to the following minimum SMACNA pressure standards:

1. All supply, return, and exhaust ductwork, connected to fans whose total fan design static pressure is less than 1", shall be fabricated to 1" W.G. SMACNA standards. All ductwork shall be sealed to SMACNA Seal Class B. No snap lock seams will be accepted.

2. All supply, return, and exhaust ductwork, connected to fans whose total fan design static pressure is greater than 1", shall be fabricated to 2" W.G. SMACNA standards. All ductwork shall be scaled to SMACNA Seal Class A. No snap lock seams will be accepted.

3. All supply ductwork for variable volume systems shall be fabricated to 3" W.G. SMACNA standards up to the variable volume control boxes. All ductwork shall be sealed to SMACNA Seal Class A. No snap lock seam will be accepted.

4. SMACNA Seal Class B shall be all transverse joints and longitudinal seams, Seal Class A shall be all transverse joints, longitudinal seams and duct wall penetrations.

C. Ductwork shall not be hung or supported from metal roof decking. Provide necessary support from top chord of joist or structural members.

PART 2 - PRODUCTS

2.01 DAMPERS, VOLUME

A. Provide dampers, whether indicated or not, in every supply, return, and exhaust branch from main trunk duct fitted with locking devices for adjusting the air delivery.

B. Provide elevated dial regulators for insulated ducts.

2.02 DAMPERS, AUTOMATIC

A. Install automatic outside, return air, and exhaust air dampers, furnished by the Temperature Control Contractor.

B. This Contractor shall install interior baffles to fit the dampers to the duct, and as required to eliminate any air stratification which may occur after the installation.

2.03 DAMPERS, FIRE

A. For all fire dampers, Greenheck, Phillips, or Ruskin each with a reusable UL listed 165°F fusible link. See Section B15050: Codes and Specifications. All dampers shall be dynamic rated with fan systems on, and shall comply with UL555.

B. Installed in all ductwork piercing rated walls, floors, or ceilings, or as required by Wisconsin Department of Industry, Labor, and Human Relations.

C. Factory constructed in accordance with and shall bear an approved UL label, if required.

D. Greenheck Model DFD-150 for rectangular low pressure ductwork with fire resistance rating 1-1/2 hour.

E. Greenheck Model DFD-350 for rectangular low pressure ductwork with fire resistance rating three (3) hour.

F. Greenheck Model DFD-350 for rectangular low pressure transfer air openings in walls with, or without transfer grilles and for fire resistance rating three (3) hour.

G. Greenheck Model DFD-150 CR or CO for round and oval ductwork with fire resistance rating 1-1/2 hour.

H. Greenheck Model DFD-350 CR or CO for round and oval ductwork with fire resistance rating 3 hour.

I. Pressure drop through the retracted damper shall not exceed .04" W.C. at a velocity of 2,000 FPM. Provide type B damper.

J. All fire dampers to be installed per UL555 installation instructions.

K. Provide gasketed access doors at each fire damper for access to fusible links.

L. This Contractor shall be responsible for providing the proper fire resistive rating for each as called for in Chapter 64 of the Wisconsin Administrative Code.

2.04 DOOR, PRESSURE RELIEF

A. Provide Ruskin PRD18 pressure relief door, AMCA tested, to control positive or negative pressure in a duct system due to an accidentally closed damper while the fan is still running.

B. The door shall automatically open to a factory set value between 3" and 8" static pressure, and will automatically close and reset when the static pressure is reduced to less than 3".

C. The door shall be 18" x 18" size constructed of 12 gauge galvanized steel and installed vertically.

2.05 DUCTWORK, FLEXIBLE

A. Provide Clevaflex type SFA, Genflex SFR-30a, or Therma Flex M-KE insulated ducts suitable for 6" positive or negative pressure, and 4000 fpm where indicated on the drawings. Ducts shall contain an aluminum inner duct, 1" thick 3/4 lb. density insulation and 0.004" seamless vapor barrier jacket. Provide factory installed compression clamps on each end with spin-in straight fittings equipped with volume dampers. Ducts shall be installed as follows:

1. As final connection from duct to ceiling diffuser where the total length of flexible duct shall not exceed 24 inches.

2. Where indicated as a branch run out from the main duct it shall be fully extended to a maximum length of seven (7) feet and supported to prevent excessive sagging.

3. Splicing of flexible duct shall not be allowed.

B. Flexible duct and insulation shall be fire resistive and shall have a flame spread of 25 or less, and smoke developed rating of 50 or less.

2.06 DUCTWORK, PREFABRICATED

A. Spiral Round and Oval-Double Wall: Provide United Sheet Metal Company Acousti-K-27, Dual Duct, Ajax, or Semco double walled internally insulated spiral round and oval ducts.

B. Spiral Round and Oval-Single Wall: Provide United Sheet Metal Company Uniseal, Dual Duct, Ajax, or Semco spiral round and oval ducts, a shown on the drawings.

C. Rectangular-Double Wall: Provide United Sheet Metal Company Acousti-K-27, Dual Duct, Ajax, or Semco double walled internally insulated rectangular ducts.

D. Duct Construction:

1. Inner liner of double walled ducts to be perforated metal with hole sizing and spacing to give acoustic impedance. Insulation to be 1-1/4" fiberglass type compressed to 1" thick for installation between inner and outer shell with thermal conductivity of 0.27 maximum.

2. Pressure shell for single and double walled round spiral duct to be 26 gauge for sizes 3" to 8", 24 gauge for sizes 9" to 22", 22 gauge for sizes 24" to 36", 20 gauge for sizes 38" to 50" and 16 gauge for sizes 51" to 60".

3. Pressure shell for single and double walled oval spiral ducts shall be 22 gauge. If longitudinal seam oval used, pressure shell shall be 22 gauge for a maximum width up to 10", 20 gauge for 11" to 20", 18 gauge for 21" to 40", and 16 gauge for 41" to 61". Spiral oval duct shall be externally reinforced by Sheet Metal Contractor using double angle iron trapeze hangers with 1-1/2" by 1-1/2" by 1/8" angles located on centers, in accordance with manufacturer's catalog recommendations. If longitudinal seam oval ductwork is used, structural type couplings shall be provided on 4' centers.

4. Pressure shell for rectangular double walled ducts shall conform to SMACNA standard gauges.

5. Provide all necessary joining couplings and install all joints as recommended by manufacturer for airtight installation with United tape and sealer.

6. All ducts located outside the building shall have watertight seams.

E. Duct Fittings:

1. Provide United Sheet Metal Company Acousti-K-27 double walled internally insulated fittings for all double walled ducts. Inner liner to be perforated metal with hold sizing and spacing to give acoustic impedance, and insulation shall be 1-1/4" fiberglass type

compressed to 1" thick for installation between inner and outer shell with thermal conductivity of 0.27.

2. Provide United Sheet Metal Company Uniform fittings for all single wall ducts.

3. All 90 degree taps shall be of the conical type, and mitered elbows shall be provided with acoustical turning vanes, 90 degree elbows shall be of 5-piece construction; 45 degree elbows shall be of 3-piece construction; and 30 degree elbows shall be of 2-piece construction.

4. Round fittings shall be of 20 gauge and oval fittings shall be the same metal gauge as the ductwork, or heavier.

5. Provide bellmouth fittings and insulation ends at plenum takeoffs.

F. Sealing Joints:

1. Apply sealer to outer ring of duct coupling, or outer casing of fittings, before pushing pipe inside duct to bead stop. Use pop rivets or sheet metal screws to mechanically lock joint, and apply sealer to outside of joint in a band 2" wide covering the fastener heads and bead joint thoroughly.

2. Apply single wrap of tape over wet sealer. Do not apply additional sealer over tape.

G. Testing: Pressure test system at 1-1/2 times design operating pressure with a total leakage not to exceed .5% of design CFM. Test system using United Sheet Metal test kit per instructions in duct manufacturer's installation manual. If leakage is greater than above limit, locate leaks and reseal, and retest.

2.07 FLEXIBLE CONNECTIONS

Make all inlet and discharge connections to air handling units and fans with 30 ounce Ventglas as manufactured by Ventfabrics, Inc.

2.08 GUARDS, METAL

This Contractor shall remodel all metal guards for all V-belt drives. The back side shall be completely closed with sheet metal while the exposed side shall be covered with woven wire with openings for tachometer readings.

2.09 INSPECTION, ACCESS, DOORS

A. Provide Ventlok insulated access doors where shown on the drawings, or where required, for easy access to all equipment. Doors shall be equipped with Series 100 latches on all doors less than 4 square feet in area, and Series 300 on all larger doors. Seal all doors with sponge rubber gaskets.

B. Provide double cam access doors at all booster coils and fire dampers. The door shall be at least 18" wide, unless duct size is less, and shall be at least 75% of the damper or coil height.

2.10 SILENCERS, AIR

A. Provide acoustical duct silencers as indicated on the drawings.

B. Modules shall be installed in round or rectangular ducts, of the same nominal size furnished by the Contractor and shall be sealed tight.

C. Silencers shall meet or exceed the performance characteristics as shown on the schedules. Manufacturers shall be responsible for the accuracy of the performance data.

2.11 LOUVERS

Provide 6", Greenheck or Dowco Corporation, extruded aluminum horizontal side drainable, properly reinforced louvers complete with extended or standard aluminum sills, standard heads, and 1/2" mesh aluminum wire screens on inside face of louver. Louvers shall be Greenheck Model ESD-635, or equal; finish to be epoxy enamel or color anodized, color to be selected by owner.

2.12 PANS, DRAIN

Provide stainless steel drain pans under each cooling coil. Provide a pan under each coil in a bank of coils, and drain each pan to the lower pans.

2.13 THERMOMETERS, AIR (STEM)

A. Provide Trerice BX9 Series, adjustable angle, industrial type, red appearing mercury in glass thermometers, Duro, Ashcroft, Marshalltown, or Weiss manufactured to the following specifications:

Scale: 9" size with white background and black markings.

Case: Die cast aluminum and clear acrylic plastic lens.

Stem: Aluminum installed with minimum 2" extension into pipe.

Accuracy: Within 1% of range.

Air duct thermometers shall have 12" long air sensitive bulb protected with a perforated aluminum bulb guard.

B. Location: Each thermometer shall be placed so that a good sample of air is taken. Locate thermometers in accessible locations for close visual observations. All thermometers shall be adjusted so that they are easily read from the floor or nearest platform.

C.

Line Designation	*°F/Div.*	*Range (°F)*
Air (Outside)	2	-40 - 110
Air (Tempered)	1	30 - 130

2.14 THERMOMETERS, AIR (DIAL)

A. Provide Ashcroft, Duro, Weiss Marshalltown, or Trerice bi-metal 5" diameter dial every angle thermometer with 12" long stems with duct mounting flange.

B. Furnish case ring and stem in #304 stainless steel. Provide heavy duty glass and hermetically sealed construction with external adjustment. Face to be white with black numbers.

C.

Line Designation	*°F/Div.*	*Range (°F)*
Air (Outside)	2	-40 - 110

Air (Tempered) 1 30 - 130

D. Location: Each thermometer shall be placed so that a good sample of air is taken. Locate thermometers in accessible locations for close visual observations. All thermometers shall be adjusted so that they are easily read from the floor or nearest platform.

PART 3 - EXECUTION

3.01 INSTALLATION, EQUIPMENT

Install in accordance with manufacturer's instructions.

3.02 INSTALLATION, DUCTWORK

A. Seal all low velocity ductwork corner joints with Hard Cast #601 Iron Grip. Cover the corner openings with tape and mastic if the openings are too large to be sealed with mastic only such that the total duct leakage of the system does not exceed 5% of the total design volume. See paragraph 1.04 Design Conditions this section for duct sealing requirements.

B. Where long sweep fittings cannot be installed, provide SMACNA Approved spilt runner adjustable single thickness blade turning vanes in all square and rectangular elbows and set for the proper angles. Blades shall be 2" apart with 1" extension on leaving air side or as described in SMACNA.

C. Provide 45 degree entry converging tee boot fittings at all straight tap-in connections to the trunk duct where long radius takeoffs cannot be physically installed. Provide conical fittings at round duct takeoffs to trunk duct.

D. This Contractor shall coordinate all work with the air balance and testing agency. (See Tests: Section B15050.) Furnish and install all volume dampers in locations required by the agency to adequately balance the system.

E. Increase sizes of ducts lined with sound insulation so free area will correspond to dimensions shown on drawings.

F. Provide copper flashing, or counterflashing, wherever required to make a watertight installation.

G. Install all smoke pipe, prefabricated chimneys, and breechings as shown on the drawings.

H. Install air thermometers at all central fan systems.

I. All exhaust hoods and their ducts, which are exposed to the room they serve, shall be fabricated of #304, 18 gauge stainless steel. Entire hood to be heliarc welded with all joints ground smooth.

J. Install flanged booster coils with an access door on the entering side of the booster coil.

K. Install all supply ductwork tight to back of diffuser or grille to avoid leakage around diffuser or grille inlet which may cause marking of ducts, walls, or ceilings.

L. Sleeves, Openings, Cutting, Patching, and Drilling: See Section B15050.

M. Ductwork supported with threaded rod shall be provided with adjusting and locking nut. After ductwork is completed, adjusted and insulated as required, this contractor shall cut off excess support rod and grind smooth.

END OF SECTION

SECTION 15900
FACILITY MANAGEMENT AND CONTROL SYSTEM (FMCS)

Note to Bidders: This section is based on open, interoperable system technologies.

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Facility Management and Control System (FMCS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only. The FMCS shall be capable of total integration of the facility infrastructure systems with user access to all system data either locally over a secure Intranet within the building or by remote access by a standard Web Browser over the Internet. This shall include HVAC control, electrical, gas and water metering, energy management, alarm monitoring, security and personnel access control, fire-life safety systems, and all trending, reporting and maintenance management functions related to normal building operations all as indicated on the drawings or elsewhere in this specification.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that are required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

1.2 SYSTEM DESCRIPTION and APPROVED VENDORS.

A. The entire Facility Management and Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating on an open protocol communication network to a host computer within the facility (when specified) and communicating via the internet to a host computer in a remote location. The FMCS shall communicate to third party systems such as chillers, boilers, air handling systems, energy metering systems, other energy management systems, access control systems, fire-life safety systems and other building management related devices with open, interoperable communication capabilities.

B. This shall be an extension of the existing system previously supplied by Environmental Systems Inc that serves the third floor. Please contact Environmental Systems Inc. at 262-544-8860.

1.3 SUBMITTAL

A. Eight copies of shop drawings of the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation as well as a hard copy graphical depiction of the application control programs shall also be included with the submittal package.

B. Submittal shall also include a trunk cable schematic diagram depicting the Graphical User Interface (GUI) computer, control panel locations and a description of the communication type, media and protocol.

C. Submittal shall also include a complete point list of all connected points to the DDC system.

D. Upon completion of the work, provide a complete set of ‘as-built’ drawings and application software on magnetic floppy disk media or compact disk. Drawings shall be provided as AutoCAD™ or Visio™

compatible files. Eight copies of the ‘as-built’ drawings shall be provided in addition to the documents on magnetic floppy disk media or compact disk.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. Division 15, Mechanical:

1. Providing taps and installation of wells in piping for control system sensors and flow measurement devices.

2. Installation of any control system dampers.

B. Division 16, Electrical:

1. Providing motor starters and disconnect switches (unless otherwise noted).

2. Power wiring and conduit (unless otherwise noted).

3. Provision, installation and wiring of smoke detectors (unless otherwise noted).

1.5 AGENCY AND CODE APPROVALS

A. All products of the FMCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. UL-916; Energy Management Systems

2. ULC; UL - Canadian Standards Association

3. FCC, Part 15, Subpart J, Class A Computing Devices

1.6 SOFTWARE LICENSE AGREEMENT

A. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

1.7 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.8 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.9 QUALITY ASSURANCE

A. The Manufacturer of the FMCS digital controllers shall provide documentation supporting compliance with ISO-9001 (Model for Quality Assurance in Design/Development, Production, Installation and Servicing). Product literature provided by the FMCS digital controller manufacturer shall contain the ISO-9001 Certification Mark from the applicable registrar.

B. All components and systems shall be year 2000 (Y2K) compliant.

1.10 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

FMCS	Facility Management and Control System
NAC	Network Area Controller
IDC	Interoperable Digital Controller
IBC	Interoperable BACnet Controller
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement

PART 2 MATERIALS

2.1 GENERAL

A. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, portable operator terminals, printers, network devices and other devices as specified herein. All controllers and software within FMCS shall be Year 2000 compliant and shall be supported by compliance documentation from the manufacturer.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-1995 BACnet and LonWorks technology communication protocols in one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-1995, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet.

C. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.3 NETWORKS

A. The Local Area Network (LAN) shall be either a 10 or 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local host computer system.

2.4 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Owner agrees to pay monthly access charges for connection and ISP.
2. Where no Local Area Network exists, FMCS supplier shall provide the following:
   a. 8 Port Ethernet hub (3Com, or equal)
   b. Ethernet router (Cisco or equal)

   The owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line or T1 Line. Owner agrees to pay monthly access charges for connection and ISP

2.5 NETWORK AREA CONTROLLER (NAC)

A. The Network Area Controller (NAC) shall provide the interface between the LAN the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of LonWorks controller data and BACnet controller data
7. Network Management functions for all LonWorks based devices

B. The Network Area Controller must provide the following hardware features as a minimum:

1. One Ethernet Port -10 / 100 Mbps
2. One RS-232 port
3. One LonWorks Interface Port – 78KB FTT-10A
4. Battery Backup
5. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
6. The NAC must be capable of operation over a temperature range of 0 to 55°C
7. The NAC must be capable of withstanding storage temperatures of between 0 and 70°C
8. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing

C. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

D. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

E. Event Alarm Notification and actions

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up, telephone connection, or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
    a. To alarm
    b. Return to normal
    c. To fault
4. Provide for the creation of an unlimited number of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

F. Control equipment and network failures shall be treated as alarms and annunciated.

G. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text
2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
    a. Day of week
    b. Time of day
    c. Recipient

3. Pagers via paging services that initiate a page on receipt of email message
4. Graphic with flashing alarm object(s)
5. Printed message, routed directly to a dedicated alarm printer

H. The following shall be recorded by the NAC for each alarm (at a minimum):
1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Equipment (air handler #, accessway, etc.)
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

I. Alarm actions may be initiated by user defined programmable objects created for that purpose.

J. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

K. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

L. Provide a "query" feature to allow review of specific alarms by user defined parameters.

M. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

N. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.6 Data Collection and Storage

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:
1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:

1. HTML
2. XML
3. Plain Text
4. Comma or tab separated values

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The NAC shall have the ability to archive it's log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached it's user-defined capacity of data stores
4. Provide ability to clear logs once archived

2.7 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it's user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:

1. Time and date
2. User ID
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.8 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

Note to Bidders: Direct Digital Controllers conforming to BACnet, ANSI/ASHRAE Standard 135-1995 specification may be used.

2.9 INTEROPERABLE BACnet CONTROLLER (IBC)

A. Controls shall be microprocessor based Interoperable BACnet Controllers (IBC) in accordance with the ANSI/ASHRAE Standard 135-1995. IBCs shall be provided for Unit Ventilators, Fan Coils, Heat Pumps, Variable Air Volume (VAV) Terminals and other applications as shown on the drawings. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. The system supplier must provide a PICS document showing the installed systems compliance level to the ANSI/ASHRAE Standard 135-1995. Minimum compliance is Level 3.

B. The IBCs shall communicate with the NAC via an Ethernet connection at a baud rate of not less than 10 Mbps.

C. The IBC Sensor shall connect directly to the IBC and shall not utilize any of the I/O points of the controller. The IBC Sensor shall provide a two-wire connection to the controller that is polarity and wire type insensitive. The IBC Sensor shall provide a communications jack for connection to the BACnet communication trunk to which the IBC controller is connected. The IBC Sensor, the connected controller, and all other devices on the BACnet bus shall be accessible by the POT.

D. All IBCs shall be fully application programmable and shall at all times maintain their BACnet Level 3 compliance. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the IBC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

2.10 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.

C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

D. The Web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.

3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.

6. User's shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.

        1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.

        2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

    b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

    c. View logs and charts

    d. View and acknowledge alarms

7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.11 SERVER FUNCTIONS AND HARDWARE

A. A central server, located in the maintenance office, with web supervisor software shall be provided. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote and shall support future network controllers.

B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, T1 or dial-up connection.

C. It shall be possible to provide access to all Network Area Controllers via a single connection to the server. In this configuration, each Network Area Controller can be accessed from the Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.

D. The server shall provide the following functions, at a minimum:

    1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.

2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any NAC in the network, local or remote.

3. The server shall include a master clock service for its subsystems and provide time synchronization for all Network Area Controllers (NAC).

4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.

5. The server shall provide scheduling for all Network Area Controllers and their underlying field control devices.

6. The server shall provide demand limiting that operates across all Network Area Controllers. The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.

7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Network Area Controllers. Systems not employing this prioritization shall not be accepted.

8. Each Network Area Controller supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.

9. The server shall provide central alarm management for all Network Area Controllers supported by the server. Alarm management shall include:

    1. Routing of alarms to display, printer, email and pagers

    2. View and acknowledge of alarms

    3. Query alarm logs based on user-defined parameters

10. The server shall provide central management of log data for all Network Area Controllers supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:

    1. Viewing and printing log data

    2. Exporting log data to other software applications

    3. Query log data based on user-defined parameters

E. Server Hardware Requirements: The server hardware platform shall have the following requirements:

1. The computer shall be an Intel Pentium based computer (minimum processing speed of 2.8 GHz, 2GB cache, 800MHz FSB with 1.0GB RAM, upgradeable to 2 Gb.) It shall include a CD-RW/DVD drive, dual 73Gb hard drives, Two 10/100 Network Interface Cards, dual power supplies with y power card, and 2-USB ports. A minimum 17", 28-dot pitch SVGA (1024 x 768) color monitor with a minimum 80 Hz refresh rate shall also be included.

2. Acceptable manufacturers: Dell PowerEdge

3. The server operating system shall be Microsoft Windows 2000, Windows Server 2000, Windows XP Professional or Windows Server 2003. World Wide Web Server (an ISS Windows Component) must not be installed. Include Microsoft Internet Explorer 4.0 or later or Netscape Navigator 4.5 or later.

4. Connection to the FMCS network shall be via an Ethernet network interface card, 10 or 100 Mbps.

5. A system printer shall be provided. Printer shall be laser type with a minimum 600 x 600-dpi resolution and rated for 8-PPM print speed minimum.

6. For dedicated alarm printing, provide a dot matrix printer, either 80 or 132 column width. The printer shall have a parallel port interface.

2.12 SYSTEM PROGRAMMING

A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface display shall not be acceptable.

C. Programming Methods

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.

2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.

3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.

4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.

5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.13 OBJECT LIBRARIES

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.

2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.

3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals

4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.

5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.

6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.

2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.

3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.

4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.

5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.

6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.

7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.

8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.

9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.

10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog

object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.

11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:

1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.

2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file and documentation for the device to facilitate device integration.

3. For BACnet devices, provide the following objects at a minimum:

   a. BACnet AI

   b. BACnet AO

   c. BACnet BI

   d. BACnet BO

   e. BACnet Device

4. For each BACnet object, provide the ability to assign the object to a BACnet device and object's instance number.

2.14 LEGACY SYSTEM INTEGRATION **(Alternate Bid #2 Items B, C, D)**

A. The Network Area Controller shall support the integration of device data from the existing control system. The connection to the existing system shall be via an RS-232 connection between the Network Area Controller and the existing control system.

B. Provide alternate price to replace NCM 3 and 4 in the CCB Building with new Network controllers integrated to the server supplied in the base bid. Network controllers shall communicate via N2 bus to the existing Johnson controls devices on the trunks served by NCM3 and NCM 4. Provide floor plans and graphics for each system served by the existing NCM'S per the follwing description.

C. **NCM-3** Replace NCM 3 with the necessary network controllers with an N2 bus to integrate to the existing field controllers. Provide graphical user interface for this system to include graphics and trending and time of day programming for AHU-1, 01, 7, 12, 13, S-27, S-41,. Provide graphics for heat exchangers that are on the 2nd floor and units that serve JUV 5th floor. Provide graphical user interface for NO2 system, Snow Melt system, Steam valve system, Basement chiller system, 5th floor labs and 66 vav boxes.

D. **NCM-4** Replace NCM 4 with the necessary network controllers with an N2 bus to integrate to the existing field controllers. Provide graphical user interface for this system to include graphics, trending, and time of day programming for AHU1,2,3 and vertical chiller plant.

E. The owner, and/or the existing control system representative shall ensure that the existing system's database is setup to make all data to be integrated into the FMCS available at the RS-232 port. Any modifications to the existing system database to accomplish this shall be the responsibility of the owner.

F. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the existing system data into the FMCS. Objects provided shall include at a minimum:

1. LEGACY SYSTEM Generic AI Object
2. LEGACY SYSTEM Generic AO Object
3. LEGACY SYSTEM Generic BO Object
4. LEGACY SYSTEM Generic BI Object

G. All scheduling, alarming, logging and global supervisory control functions (demand limiting, etc.), of the existing system devices, shall be performed by the Network Area Controller. Integration of the existing system's schedules, alarms, logs, etc. is neither required nor desired.

2.15 GRAPHICAL USER INTERFACE COMPUTER HARDWARE (DESKTOP)Not required owner provided

A. The desktop computer shall be an Intel Pentium based computer (minimum processing speed of 400 Mhz with 256 MB RAM and a 10-gigabyte minimum hard drive). It shall include a 32X CD-ROM drive, 3.5" floppy drive, a 100 MB Zip drive, 2-parallel ports, 2-asynchronous serial ports and 2-USB ports. A minimum 17", 28-dot pitch SVGA (1024 x 768) color monitor with a minimum 80 Hz refresh rate shall also be included.

B. A system printer shall be provided. Printer shall be laser type with a minimum 600 x 600-dpi resolution and rated for 8 PPM print speed minimum.

2.16 GRAPHICAL USER INTERFACE COMPUTER HARDWARE (LAPTOP COMPUTER) not required owner provided

A. The laptop computer shall consist of an Intel Pentium based laptop computer (minimum processing speed of 200 Mhz with 128 MB RAM and a 2-gigabyte minimum hard drive). It shall include a CD-ROM drive, a 3.5" floppy drive and appropriate connectors and cables for communication connection to the NAC, Ethernet, LonWorks or BACnet networks.

2.17 OTHER CONTROL SYSTEM HARDWARE

A. Temperature Control Air Compressor (when required): A duplex air compressor system (two compressors mounted on one tank) shall be furnished and installed by the temperature control contractor. Air compressor system shall be sized to fit the pneumatic control system, to insure no more than 33% run time. The tank shall be sized for a maximum of 6 starts per hour. An automatic alternator shall be connected to the motors and pressure switches, in a 'lead-lag' manner, and shall alternate compressor operation after each on-off cycle. Alternator shall be further connected to energize the 'lag' operation after each on-off cycle. Alternator shall be further connected to energize the 'lag' compressor at the setting of the lower pressure switch if the "lead" compressor fails or is disabled for service. Air compressor system shall include a refrigerated air dryer sized for the capacity of the air compressor. Accessories such as filters, pressure regulators, valves, spring isolators, automatic tank drain etc. shall also be furnished for a complete operating system.

B. Motorized Control Dampers (where furnished by the Temperature Control sub-contractor): Dampers shall be black enamel finish or galvanized, with nylon bearings. Blade edge and tip seals shall be included for all dampers. Blades shall be 16-gauge minimum and 6 inches wide maximum and frame shall be of welded channel iron. Dampers with both dimensions less than 18 inches may have strap iron frames.

C. Control Damper Actuators (where furnished by the Temperature Control sub-contractor): Two-position or proportional electric actuators shall be direct-mount type sized to provide a minimum of 5 in-lb torque per square foot of damper area. Damper actuators shall be spring return type. Provide one actuator per damper minimum. Pneumatic actuators shall be sized to provide a minimum of 5 in-lb torque per square foot of damper area and shall include positive positioning pneumatic relays when sequenced with other actuators or when control action is to be proportional.

D. Control Valves: Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Valves with sizes up to and including 2 inches shall be "screwed" configuration and 2-1/2 inch and larger valves shall be "flanged" configuration. Electrically controlled valves shall include spring return type actuators sized for tight shut-off against system pressures and furnished with integral switches for indication of valve position (open-closed). Pneumatically actuators for valves, when utilized, shall be sized for tight shut-off against system pressures. Three-way butterfly valves, when utilized, shall include a separate actuator for each butterfly segment.

E. Wall Mount Room Thermostats: Each room thermostat shall provide temperature indication to the digital controller, provide the capability for a software-limited set point adjustment and operation override capability. An integral LCD shall annunciate current room temperature and set point as well as override status indication. In addition, the thermostat shall include a port for connection of the portable operator's terminal described elsewhere in this specification.

F. Duct Mount, Pipe Mount and Outside Air Temperature Sensors: 10,000-ohm thermistor temperature sensors with an accuracy of ± 0.2ºC. Outside air sensors shall include an integral sun shield.

G. Current Sensitive Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

H. Power Monitoring Interface: The Power Measurement Interface (PMI) device shall include the appropriate current and potential (voltage) transformers. The PMI shall be certified under UL-3111. The PMI shall perform continuous true RMS measurement based on 32 samples-per-cycle sampling on all voltage and current signals. The PMI shall provide outputs to the FMCS based on the measurement and calculation of the following parameters: (a) current for each phase and average of all three phases, (b) kW for each phase and total of all three phases, (c) power factor for each phase and all three phases, (d) percent voltage unbalance and (e) percent current unbalance. These output values shall be hard-wired inputs to the FMCS or shall be communicated to the FMCS over the open-protocol LAN.

I. Water Flow Meters (when required): Water flow meters shall be axial turbine style flow meters which translate liquid motion into electronic output signals proportional to the flow sensed. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag. Flow meters shall be 'insertion' type complete with 'hot-tap' isolation valves to enable sensor removal without water supply system shutdown. Accuracy shall be ±2% of actual reading from 0.4 to 20 feet per second flow velocities.

J. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. All electrical devices within a control panel shall be factory wired. All external wiring shall be connected

to terminal strips mounted within the panel. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

PART 3 EXECUTION

3.1 INSTALLATION

A. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work and in the regular employment of the temperature control system manufacturer or its exclusive factory authorized installing contracting field office (representative). The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the manufacturer. Supervision, calibration and checkout of the system shall be by the employees of the local exclusive factory authorized temperature control contracting field office (branch or representative).

B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

C. Drawings of temperature control systems are diagrammatic only and any apparatus not shown, such as relays, accessories, etc., but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.

D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by the Temperature Control sub-contractor in accordance with these specifications.

E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by the Temperature Control sub-contractor.

F. All control devices mounted on the face of control panels shall be clearly identified as to function and system served with permanently engraved phenolic labels.

3.2 WIRING

A. All electrical control wiring and power wiring to the control panels shall be the responsibility of the FMCS contractor.

B. The electrical contractor (Div. 16) shall furnish all power wiring to electrical starters and motors.

C. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 16) unless otherwise allowed by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the FMCS due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the Temperature Control sub-contractor at no expense to the Owner

3.4 WARRANTY ACCESS

A. The Owner shall grant to the Temperature Control sub-contractor, reasonable access to the FMCS during the warranty period. The owner shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, the Temperature Control sub-contractor shall load all system software and start-up the system. The Temperature Control sub-contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. The Temperature Control sub-contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: Satisfactory completion is when the Temperature Control sub-contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner’s Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the FMCS hardware and software has been established the Temperature Control sub-contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. The Temperature Control sub-contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the FMCS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.

2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.

3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

PART 4 SEQUENCES OF OPERATION

4.1 SUMMARY

A. For each system listed, provide the sequence of operation as stated in this section.

4.2 AIR HANDLING UNIT 1 (AHU-1)

A. Each system consists of a draw-through air handling unit with a variable volume supply fan and return air fan with variable frequency drive (VFD), a HW heating coil, and a chilled water cooling coil.

B. Furnish automatic dampers for the minimum and maximum outside air, return air, and discharge air ductwork a three-way modulating valve for the hot water heating coil and a three-way modulating valve for the chilled water cooling coil.

C. Provide damper operators for the outside air, return air, and relief air dampers.

D. System shall be indexed from occupied to unoccupied through the Building Automation System (BAS). In the occupied mode the unit shall run continuously. In the unoccupied mode it shall be cycled from the night thermostat, outside air damper shall be closed and return damper shall be fully open.

E. Upon system start-up, the supply fan shall start and operate continuously, the VFD for the supply and return/exhaust fans shall be controlled as specified herein, the heating coil automatic valve shall become operable and the outside air, and return air dampers shall open to their respective minimum and maximum positions.

F. The discharge air temperature setpoint shall be maintained at 55°F. (adjustable) by modulating the heating coil automatic valve, outside air, return air and exhaust air automatic dampers in sequence.

G. The hot and chilled water valve shall be modulating.

H. At outside air temperatures below 55 deg. F. the cooling shall be locked out.

I. A differential floating dry bulb economizer shall position the outside air, return air and exhaust air dampers to their minimum and maximum positions. Provide an interlock to prevent the outside and relief air dampers from closing to minimum position when no cooling is available.

J. A DDC system static pressure control program, with its sensors located two-thirds of the distance down the main supply ducts shall maintain a setpoint of 1" (adjustable) water column static pressure by modulating the VFD of the supply fan and VFD of the return air fan. Verify location of sensor with test adjusting and balancing contractor.

K. A dedicated static pressure high limit controller with manual reset (not used for any other static pressure control function) shall shut down the supply fan when the static pressure in the ductwork at the supply fan exceeds 3" water column (adjustable).

L. A manual reset, low temperature protective thermostat(s), with a 20 ft. element located at the discharge of the heating coil, shall cause the system to shut down upon sensing a coil discharge temperature of less than 40°F.

M. Upon system shutdown, the supply and return-exhaust fans shall stop, the outside air and relief air dampers shall close fully, the return air damper shall open fully, the cooling coil automatic valve shall assume its fully closed position and the heating coil automatic valve shall open; a solenoid valve wired into the supply and return-exhaust fan motor starter holding coil circuit shall provide a positive interlock for the shutdown of the automatic dampers.

N. All components required for control of this system shall be installed in a temperature control panel located as shown on the plans.

O. Mount a return air smoke detector furnished by E. C. that shall shut down the supply and return-exhaust fan when smoke is detected in the ductwork. All wiring of smoke detector by Electrical Contractor (see Division 1600).

PART 5 POINT LISTS

5.1 SUMMARY

A. The points in the following table shall be accessible from the Graphical User Interface (GUI) and/or the Web browser interface (WBI). The supplier of the IDC and IBC devices shall ensure that the points listed in this table are accessible on their respective networks, by the Network Area Controller (NAC).

B. The following abbreviations apply to the point table to indicate what level of functionality must be provided:

1. D = Display only
2. M = Modify value
3. A = Alarm
4. L = Log
5. S = Schedule
6. GC = Global supervisory control routine such as demand limiting

System	**AHU-1 (Serving 4th and 5th floors)**					
Point	**D**	**M**	**A**	**L**	**S**	**GC**
Outdoor air Temp	X			X		
Mixed Air Temp		X		X		
Discharge Air Temp		X		X		
Return Air Temperature		X		X		
Discharge air Static Pressure		X	X	X		
Supply Fan Status	X				X	
Safety Alarm			X	X		
Heating Valve Command		X		X		
Cooling Valve Command		X		X		
Supply Fan Output				X		
Return Fan Output				X		
Supply Fan Command		X		X		
Return Fan Command		X		X		
Circulating Pumps (P-1 & P-2) on 3rd floor		X	X			
Return Fan Status	X				X	

END OF SECTION

SECTION B15950

AUTOMATIC TEMPERATURE CONTROL WORK

PART 1 - GENERAL

1.01 DESCRIPTION

Provide Stafa hybrid DDC and pneumatic system of temperature control in accordance with the Bid Documents and installed by equipment manufacturer and guaranteed direct to the owner for one (1) year from date of acceptance.

1.02 RELATED WORK

B15010 - Basic Mechanical General Requirements
B15050 - Basic HVAC Materials and Methods
B15990 - Testing, Adjusting, and Balancing

1.03 WORK INCLUDED IN THIS SECTION

2.01 Air Piping
2.02 Wiring
2.03 Thermostats
2.04 Receiver Controllers
2.05 Transmitters
2.06 Control Cabinet Enclosures
2.07 Automatic Control Valves
2.08 Automatic Dampers and Operators

3.01 Circulating Pump Control
3.02 Air Handling Unit Control (Hot Water / Chilled Water)
3.03 Occupied/Unoccupied Control
3.04 Automatic Damper Control
3.05 Water Temperature Control
3.06 Smoke Detection System
3.07 Emergency Fan Shutdown
3.08 Testing, Adjusting, and Balancing Coordination

1.04 SHOP DRAWINGS

Submit the required copies of shop drawings which will indicate schematically the locations of all controls with their ranges and settings given. Each schematic drawing shall be fully described by typewritten sequence of operation.

PART 2 - PRODUCTS

2.01 AIR PIPING

A. In exposed areas, such as storage rooms, equipment rooms, and rooms without ceilings, all pneumatic air piping shall be either hard drawn seamless metallic tubing, or polyethylene tubing, installed within a metallic raceway of either thin wall conduit (EMT), aluminum troughing with a snap-on cover or wiremold.

B. Bare polyethylene tubing is acceptable for air piping in concealed areas above ceilings.

C. All air piping shall be installed in a neat manner, run either parallel or perpendicular to the existing building lines and securely fastened to fixed members of the building structure at sufficient intervals to avoid excessive freedom of movement.

D. All tubing installed in poured concrete, or concrete block walls shall be metallic tubing.

E. All air piping located in finished areas shall be run concealed within walls or ceilings. All cutting and patching of existing surfaces and finishes shall be included.

F. Connection point to steam valves shall have 6" copper whip to protect polyethylene tubing from coming in contact with steam valves.

2.02 WIRING

A. See (Electrical) in Section B15050.

B. All wiring located in finished areas shall be run concealed within walls or ceilings. All cutting and patching shall be included.

C. See Section B15050: Codes and Standards.

2.03 THERMOSTATS

All room thermostats shall be two pipe, relay, fully proportioning type with adjustable sensitivity. Dual thermostats, where required, shall have two independent sensing strips which shall be capable of being calibrated independently and at different temperatures. Thermostat covers shall be blank. All setpoint adjustments shall be concealed, except in private offices, or individually controlled areas, where the set points shall be adjusted externally. Verify all thermostat locations with the owner before completing the installations.

2.04 RECEIVER CONTROLLERS

All remote mounted receiver controllers shall be fully proportioning with adjustable sensitivity. Remote readjustable instruments shall have an adjustable ratio. Each controller shall be provided with a permanently connected means for indicating the exact point within the modulating range of which the controller is operating.

2.05 TRANSMITTERS

A. All transmitters shall be capable of measuring the space or duct temperature and transmitting a pneumatic or electric signal directly proportional to the temperature. The range of the transmitter shall be 50°F or, when required, a wider range of 100°F. Each transmission system, consisting of transmitter and receiver combined shall have an accuracy of 1% of scale range. All transmitters shall be located at the point of measurement. All air sensors shall be equipped with 8' averaging bulbs. All immersion sensors shall be remote bulb type with liquid filled separable sockets. Rigid stem sensors will not be acceptable.

B. Where transmitters are used in place of capillary thermostats, the transmitters shall be of the capillary type for both duct and immersion type mounting. All immersion type sensing bulbs are to be equipped with separable sockets.

2.06 CONTROL CABINET ENCLOSURES

A. All control cabinets shall be constructed with extruded aluminum alloy frames. All corners shall be securely riveted and supported by internal angle brackets. Internal butt joints around the door shall provide a 1/2" overlap seal around the cabinet frame. The cabinet shall have a removable face and back panel. The panels shall be made of aluminum bonded on both sides of plywood core. The face panel shall be held in place with continuous solid retaining bars. The panel hinges shall be run the entire height of the panel. A key locking latch shall be provided on all cabinets to insure only authorized access. All cabinets shall be Underwriters' Laboratories, Inc. listed for line voltage applications.

B. All temperature and humidity indication, as called for in the control sequences, shall be installed on the face of the cabinet with a flush mounted 3-1/2" dial type thermometer chosen to match the transmitter range. Provide name tags to describe each reading.

2.07 AUTOMATIC CONTROL VALVES

A. All valve operators are to be fully proportional, unless otherwise specified. All operators are to fail safe, in either a normally open, or normally closed position in the event of control power failure. Where valves are operated in sequence with other valves, or dampers, they are to be equipped with pilot positioners, with adjustable ranges, for both throttling range and starting point.

B. All radiator, fin pipe, or convector valves shall have operators fully concealed behind the cover. Valves 2" and smaller shall be of the screwed type.

C. All valves shall be equipped with throttling plugs to provide linear flow characteristics. All operators shall be sized to insure smooth modulating of the valves.

D. All water valves shall be sized for a maximum of 3 psi pressure drop, or as specifically sized on the drawings.

E. All steam valves shall be sized for a maximum of 3 psi pressure drop, or as specifically sized on the drawings.

2.08 AUTOMATIC DAMPERS AND OPERATORS

A. Provide automatic dampers and operators as shown or indicated on drawings. Dampers shall be factory fabricated balanced type with formed double thickness galvanized steel or aluminum blades, with factory assembled linkages mounted in galvanized steel or aluminum frames. Blades shall have interlocking edges with compressible seals at the point of contact on both blade edges and ends. Rectangular dampers, 6" or more in a direction perpendicular to the axis, shall be louvered. Blades on louvered dampers must not be over 6" wide. Dampers shall not be more than 48" in length between bearings. Modulating dampers shall be of the opposed blade type. Two position dampers shall be parallel type.

B. Dampers, when closed, shall be guaranteed by the manufacturer not to leak air in excess of 1/2% (based on 2000 FPM approach velocity and 4" w.g. static pressure).

C. All dampers shall be sized by the control manufacturer in accordance with his recommendations. Any necessary blank-off plates or transitions, required to facilitate the standard size, shall be provided by the Sheet Metal Contractor.

D. Positive positioners shall be installed on all damper motors where required to provide sufficient power and accurate sequencing.

PART 3 - EXECUTION

3.01 CIRCULATING PUMP CONTROL

The heating system circulating pumps piped in parallel shall start through a pressure electric switch to operate continuously whenever the outside temperature is below 65°F, to provide heating during heating season. Above 65°F outside the circulating pumps shall operate continuously only on the day cycle, or when the chilled water pump is operating, to provide reheat control for air conditioning. Provide a Hawkeye current based flow detection system across each pump to sound an alarm to the DDC building system in the event that either pump fails.

3.02 AIR HANDLING UNIT CONTROL (Hot Water / Chilled Water Coils)

See Specification Section 15900

3.03 OCCUPIED/UNOCCUPIED CONTROL

Occupied/unoccupied zone control, where required, shall be accomplished via software of the DDC building management system.

3.04 AUTOMATIC DAMPER CONTROL

A. Arrange to close all outside and exhaust air dampers whenever the supply or exhaust fan is stopped using frame-mounted linkage. Face-mounted L-brackets shall not be acceptable.

B. Provide a return air thermostat for all air handling systems which will keep all outside and exhaust air dampers closed, and will prevent any exhaust fans on the zone from operating until the return air temperature has reached 70°F.

3.05 WATER TEMPERATURE CONTROL

Provide a dual outside/inside controller with adjustable ratio to automatically vary the supply water temperature in accordance with the outside temperatures by modulating the three-way mixing valve to provide 210°F water at -10°F outside and reduce to 130°F at 65°F outside. The valve shall be normally open to boiler water.

3.06 SMOKE DETECTION SYSTEM

A. Provide a fire and smoke detector system for each of the air handling units and for power roof ventilators of 2,000 CFM or over. The detectors shall be UL approved, installed in compliance with NFPA bulletin 90A and shall detect the presence of combustion gases based on the ionization principle. The detector shall use a sampling tube which shall extend diagonally across supply air chambers for 2,000 CFM to 15,000 CFM, above 15,000 CFM supply and return air chambers shall be sensed. All multi-story facilities shall be sensed at each floor of take-offs from duct risers. Detectors using photocells or refractory type principles shall not be acceptable.

B. On detection of combustion gases, the detector shall first stop the associated fan, then slowly close the supply and return smoke dampers to prevent duct rupture, and annunciate at the building automation center or fire control panel. All smoke detection wiring, both line and low voltage shall be run in conduit, per Section 16000.

3.07 EMERGENCY FAN SHUTDOWN

The Controls Contractor will arrange pneumatically or electrically to shut down all fans (as indicated on the Motor-Starter Schedule) from a Fire Emergency Switch which shall be located near the entrance. The switch shall be properly identified as to its purpose.

3.08 TESTING, ADJUSTING, AND BALANCING COORDINATION

This Contractor shall assist the Balancing Agency by completing all control work as follows:

1. Verify that all control components are installed in accordance with project requirements and are functional.

2. Verify that all controlling instruments are calibrated and set for design operating conditions.

3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

4. Allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components.

END OF SECTION

SECTION B15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION

A. All work shall be bid as an integral part of the Mechanical Contractor's total contract.

1.02 RELATED WORK

B15010 - Basic HVAC General Requirements
B15050 - Basic HVAC Materials and Methods
B15950 - Automatic Temperature Control Work

1.03 WORK INCLUDED IN THIS SECTION

3.01 Hydronic Balancing
3.02 Air Balance
3.03 Reports
3.04 Equipment and Procedures
3.05 Guarantee

1.04 GENERAL SCOPE

A. This Contractor shall be an independent hydronic and air testing agency, meeting the following minimum requirements:

1. All work performed in this section shall be in accordance with Wisconsin Administrative Code ILHR 64.53.

2. The Contractor shall be certified as a member of Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or have at least three (3) years of independent practice.

3. Upon request, provide a list of projects completed by the Contractor indicating building square foot areas, air quantities in CFM, and types of air systems that are similar in scope to this project.

4. The Contractor shall specialize in the testing, adjusting, and balancing of heating, ventilating, and air conditioning systems and all work shall be done under the direct supervision of a qualified heating and air conditioning Engineer employed by the Contractor.

5. This Contractor shall not be associated with the same Contractor installing the hydronic, or air system.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.01 HYDRONIC BALANCING

A. The Mechanical Contractor shall fill and vent the entire system ready for balancing. This Contractor shall check all systems completely. The following minimum requirements shall serve as a guide check:

1. Verify system pressures, air venting, correct water circulation through boilers, chillers, towers, pumps, coils, piping, etc.

2. Check and verify cleanliness of the system and its chemical condition.

3. Check all temperature controls for setting and operation. Request the assistance of the controls contractor to verify the settings and to assist in operating the system as herein requested.

4. Check the accuracy of the thermostat settings by taking at least 20% of all temperature readings in a typical space for each separately controlled zone. See Section B15950.

B. After the system has been prepared as stated above, proceed to provide these minimum requirements:

1. Check water flow rates through equipment by pressure drops, flow meters, curves, or amperage on the following equipment:

a) Pumps
b) Coils
c) Flow Meters

2. Advise the A/E immediately of any unusual conditions which will affect the balancing of the system.

3. Adjust all flows, and mark all balancing valve settings with permanent indicating marks. Highlight all indicating marks with over-spray of paint.

C. When the temperature is below 15°F outside, and after proper notification by the A/E, this Contractor shall recheck the heating system at no additional cost to the Owner.

D. When air conditioning is required, and after proper notification by the A/E, this Contractor shall recheck the chilled water system at no additional cost to the owner.

3.02 AIR BALANCE

This Contractor shall prepare all air systems for balancing in the following manner:

1. Open all existing volume dampers to open position. Inspect all fire and smoke positions.

2. Check all filters, automatic damper positions, and fan rotations.

3. Test and adjust blower speeds, running amperage, and adjust the system for design CFM. Make allowances for excess air at the central fan systems for duct leakage. Record leakage value in report.

4. Install Venlok instrument test openings and make pitot tube traverse of all main and branch supply, return, and exhaust ducts.

5. Test static pressures at various points at all central fan systems.

6. Adjust all zones to provide proper design CFM for supply, return, and exhaust.

7. Test and adjust all air diffusers, grilles, and outlets to within +5% of design requirements.

8. Test and adjust air velocities in each room and adjust to minimize air drafts.

9. Check all operating controls for setting and operation.

10. Test the system with mixing dampers in the minimum outside air position, 50% open and 100% open.

11. Test for possible air stratification on the central fan systems and advise the Ventilating Contractor of baffles, or other devices, required to minimize this condition.

12. Mark the setting of the volume damper with an over-spray of paint to highlight the position of the arm.

13. Balance variable air volume boxes to minimum and maximum setting and record in Balancing Report.

3.03 REPORTS

A. Report all finally adjusted test data and information on standard AABC report forms. Where such forms are unavailable, the Contractor shall develop printed, or typewritten forms on standard sheet sizes. Enclose all reports in a vinyl covered folder of the type which will allow reports to be inserted or removed as required. Submit four (4) copies of the report to the A/E for review.

B. Report data shall include the following minimum data:

1. Instruments used and their calibration dates.

2. Fan design CFM and static pressure.

3. Outlet and inlet total design CFM and static pressures.

4. Actual fan CFM and static pressure.

5. Outlet and inlet actual total CFM and static pressures.

6. Fan and motor nameplate data, actual RPM fan and motor, amps, BHP, pulleys, and belt sizes.

7. Complete fan profiles at all conditions of CFM, maximum and minimum volume with 100% outside air and minimum outside air.

8. Duct traverse sheets with all traverses included.

9. VAV box design and actual CFM at maximum and minimum CFM.

3.04 EQUIPMENT AND PROCEDURES

A. The Contractor shall provide his own, or rented, instruments necessary to effect a complete water and air balance. All instruments shall have been calibrated within the previous three (3) months, and certification of the calibration shall be sent to the A/E upon request.

B. The Mechanical or Ventilating Contractor shall replace any fixed and/or adjustable sheaves with new fixed sheaves and belt drives as necessary to achieve the design air quantities. All V-belt drives shall be inspected, and any drive with an unbalanced belt loading shall be replaced with a matched set of belts. All work shall be done at no additional cost to the owner.

C. The Ventilating Contractor shall provide all additional volume dampers, turning vanes, and baffles as required to air balance the new system.

D. The Mechanical Contractor shall provide all balancing valves, thermometers, pressure gauges, chemical cleaners, and shall fill all systems with water prior to water balancing.

3.05 GUARANTEE

The Contractor shall guarantee that the system will be tested, adjusted, and balanced to the values as set forth on the plans and specifications; and that all data reported is accurate and can be verified at the project.

END OF SECTION

SECTION C15010

BASIC FIRE PROTECTION GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Applicable requirements of instruction to bidders, conditions of contract and of Sections listed under related Sections of this Division apply to all work specified in this Division 15000.

1.02 RELATED SECTIONS OF THIS DIVISION

C15010 - Basic Fire Protection General Requirements

C15050 - Basic Fire Protection Materials and Methods

C15400 - Fire Protection Systems

1.03 RELATED WORK OF OTHER SECTIONS OR DIVISIONS

Division 1

A15000 - Plumbing

B15000 - HVAC

16000 - Electrical

1.04 WORK INCLUDED IN THIS SECTION

1.05 Work Not Included In This Section

1.06 Reference Standards

1.07 General Requirements

1.08 Visiting the Premises

1.09 Codes and Regulations

1.10 Discrepancies

1.11 Certifications

1.12 Workmanship and Materials

1.13 Manufacturer's Recommendations

1.14 Design Criteria

2.01 Submitted Data and Shop Drawings

2.02 Maintenance Manuals

3.01 Openings, Cutting, and Repairing

3.02 Cleaning Equipment and Materials

3.03 Cleanup

3.04 Record Drawings

3.05 Protection

3.06 Guarantee

1.05 WORK NOT INCLUDED IN THIS SECTION

A. Temporary Utilities and Services (Refer to Division 1 Requirements)

B. Electrical, Line Voltage Wiring

C. Painting (unless specified otherwise)

1.06 REFERENCE STANDARDS

NFPA 72 Installation, maintenance and use of protective signaling systems

Refer to 15060A for pipe and fitting reference standards.

NFPA 13 Installation of sprinkler systems.

1.07 GENERAL REQUIREMENTS

A. This is a Performance Specification for a contractor Design/Build Fire Sprinkler System remodeling. This fire protection contractor shall be the engineer of record as well as the contractor for the fire sprinkler system and related components. This section of the specifications is intended to establish a standard and a level of quality for bidding purposes and for construction. This Section of the work shall be responsible for preparing installation drawings, complete code-compliant design, engineering and construction coordination with other trades, hydraulic calculations, and submission of same to local, State, and insurance agencies having jurisdiction. Refer to Plumbing Plans for area to be remodeled. Refer to Architectural reflected ceiling plans for preferred sprinkler locations/patterns.

B. In all exposed structure ceilings, sprinkler piping shall be installed as concealed as possible to ensure an unobtrusive, aesthetically appealing installation. Refer to structural plans and coordinate piping locations and purlin and beam penetrations prior to construction.

C. Obtain information on conditions affecting work at building, including the following:

1. Complete information as to details of building constructions, pipe and equipment layout, in order to install and revise existing system to clear structural work and piping of equipment of other trades.

2. Accessibility: Minor deviations from the drawings may be made to allow for better and more coordinate accessibility. Changes of magnitude which may affect the work of other Contractors shall not be made without authorized approval.

3. Storage Space: Stored materials shall be located so as to facilitate prompt inspection. See Conditions of Contract.

D. On all conditions affecting work, obtain at building conditions of structure and surfaces to support pipe and equipment.

1. Examine details of building construction in order to install system to clear all structural work and finished work.

2. Examine electrical, heating and ventilating and special equipment and piping layouts and specifications.

1.08 VISITING THE PREMISES

A. The Contractor, before submitting his bid on the work, must visit the site and familiarize himself with all visible existing conditions.

B. As a result of having visited the premises, the Contractor shall be responsible for the installation of the work as it relates to such visible existing conditions.

C. The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

1.09 CODES AND REGULATIONS

A. Design, materials and installation shall comply with National Fire Protection Association (NFPA) Standards, State and local codes, local Fire Chief or Fire Marshall.

B. Inspection and approval of detailed plans of installation with insurance approval shall be submitted to Architect prior to installation.

1.10 DISCREPANCIES

A. The drawings and specifications are intended to cooperate. Any materials, equipment or systems related to this Section and exhibited on the Architectural and Fire Protection Drawings, but not mentioned in the Specifications are to be executed to the intent and meaning thereof, as if it were both mentioned in the Specifications and set forth on the Drawings. In the event of differences in the requirements between drawings, specifications, NFPA, State and Local codes or insurance agency, the more stringent requirement shall apply.

1.11 CERTIFICATIONS

A. Fire protection system components shall be UL listed and labeled. All components shall be Factory Mutual approved with the exception of sprinkler heads, double check valves and air compressors.

1.12 WORKMANSHIP AND MATERIALS

A. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. The Contractor shall furnish the services of an experienced superintendent who will be constantly in charge of the erection of the work until completed and accepted.

B. Unless otherwise hereinafter specified, all materials and equipment under this Division of the Specifications shall be new, or best grade and as listed in printed catalogs of the manufacturer. Each article of its kind shall be the standard product of a single manufacturer.

C. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.

D. Reference to standards are intended to be the latest revision of the standard specified.

E. Promptly inspect all shipments to insure that the materials being received are undamaged and comply with specifications.

1.13 MANUFACTURER'S RECOMMENDATIONS

A. Equipment installed under this Division of the Specifications shall be installed according to manufacturers' recommendations.

1.14 DESIGN CRITERIA

A. Remove existing sprinklers & piping from the area to be remodeled.

B. Design and install a fully operational, code compliant, approved, complete hydraulically designed automatic sprinkler system for entire remodeling area and as needed outside the remodeling area due to HVAC work, as indicated on plumbing drawings.

C. Water Supply: (Existing Fire Pump System)

1. Existing Fire Pump Capacity: 1,000 GPM.

2. Existing Fire Pump suction pressure at 0 GPM = 62 PSI.

3. Existing Fire Pump suction pressure at 1,578 GPM flowing = 48 PSI, (150% of Fire Pump rated capacity).

Verify all design criteria prior to installation drawing preparation and calculation. Perform flow tests if required for positive verification.

PART 2 – PRODUCTS

2.01 SUBMITTED DATA AND SHOP DRAWINGS

A. General: Refer to Division 1 requirements. Five (5) copies of each of brochures, shop drawings and material lists as required by the specifications, shall be prepared and submitted to the Architect for review within 30 days after award of the Contract. No work indicated on any one shop drawing shall be started until such drawings have been reviewed by the A/E.

B. This contractor shall review all the shop dr awings for complete compliance to the drawings and the specifications before submitting the drawings to the A/E. The contractor's review shall verify the following:

1. All items requiring submittal are included in first submittal.
2. Equipment being submitted was specified.
3. Quantities submitted are correct.
4. Sizes and capacities are as specified.
5. Electrical characteristics have been checked with the electrical contractor, or verified at the site.

Any deviations from the drawings or the specifications shall be pointed out and provided with an explanation with the submittal.

C. The contractor shall stamp the shop drawings with his own review stamp, or submit a separate statement that the enclosed shop drawings have been reviewed in accordance with the specifications. The shop drawings shall not be reviewed without the contractor's review stamp or written statement.

D. Final review of the drawings by the A/E or his representative shall not relieve the contractor from the responsibility of complying with the requirements of the drawings and specifications.

E. Submittal Data:

1. Submit complete brochures giving names of manufacturers and catalog figure numbers, trade names, technical data and requested information of each item listed as follows:
    a. Sprinklers
    b. Tags, Labels and Signs
    c. Installation Drawings and Calculations
    d. Spare Sprinkler Cabinet.
2. Submit shop drawings and detail description of items which are not manufactured and which have to be specifically fabricated.
3. Submit a list of all material as specified; not covered by brochures or shop drawings.
4. Submittal data shall be referenced to section and paragraph numbers of the specifications and to fixture and equipment numbers listed or scheduled and shall be assembled in

numerical order of the specification paragraphs. Submittals shall be bound in sets between cover and all sets within a section shall be identical.

5. Where equipment manufacturers named as equivalent or approved equal are proposed for use by the Contractor, he shall be responsible to coordinate the change with all trades affected. He shall submit for approval 1/4 inch scale working drawings of equipment rooms plan and section.

6. Prior to start of work, Contractor shall obtain approval of installation drawings from Owner's Insurance Company, Local Authorities having jurisdiction and Architect/Engineer.

2.02 MAINTENANCE MANUALS

A. Maintenance manuals, instructional data and operating instructions for equipment and materials in this Section shall be assembled by trade and delivered to the following:

- Three (3) copies to the Owner

PART 3 – EXECUTION

3.01 OPENINGS, CUTTING, AND REPAIRING

A. This Contractor shall cooperate with the work to be done under other Sections in providing information as to openings required in walls and floors for all piping and equipment, including sleeves where required.

B. Any drilling or cutting required for the performance of work under this Section shall be the responsibility of this Contractor and the cost thereof shall be borne by him.

C. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

D. This Contractor shall provide and patch all wall, floor and ceiling openings for installation of Fire Protection equipment in the existing building, unless this work is specifically mentioned to be done by another Contractor.

E. This Contractor shall remove and replace suspended ceiling tiles and supports as required to install new Fire Protection work. This Contractor shall pay for repair of any unnecessary damage.

F. Finished conditions shall be not less than existing conditions.

3.02 CLEANING EQUIPMENT AND MATERIALS

A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work.

B. All piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.

3.03 CLEANUP

A. Remove from the premises all unused material and debris resulting from the performance of work under this section. Refer to Division 1 requirements.

3.04 RECORD DRAWINGS

A. Record drawings, showing dimensions, locations of all piping, plugged outlets and equipment shall be kept up-to-date. Master copy shall be kept on the job. No fire protection progress

payments will be approved unless record drawings are up-to-date. Refer to project record drawings under Division 1 General Conditions.

3.05 PROTECTION

A. Open ends of all piping must be effectively closed and kept closed during construction.

3.06 GUARANTEE

A. All materials and equipment provided and/or installed under this Section of the Specifications shall be guaranteed for a period of one year from the date of acceptance of the work by the Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

B. In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Contractor and the Owner's representative.

End of Section C15010

SECTION C15050

BASIC FIRE PROTECTION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED SECTIONS OF THIS DIVISION

C15010 - Basic Fire Protection General Requirements

C15400 - Fire Protection Systems

1.02 WORK INCLUDED IN THIS SECTION

2.01 Sleeving and Fire Stopping

2.02 Hangers and Inserts

2.03 Identification

2.04 Escutcheons

2.05 Electric Wiring

3.01 Installation

3.02 Hanger Support and Spacing

3.03 Tests

PART 2 - PRODUCTS

2.01 SLEEVING AND FIRE STOPPING

A. All penetrations of walls, floors, or roofs shall be done by use of sleeves manufactured for that purpose. Sleeves in concrete, masonry, or precast concrete shall be Schedule 40 steel pipe. All other sleeves to be #22 gauge galvanized steel.

B. Installation:

1. Provide clearance of 1/2" around piping.

2. Each sleeve to pass through entire floor, wall, or roof construction and end to be set flush with surrounding surface in which it is installed; sleeves through floors must project 2" above finished floor.

3. Fire rated floor and wall penetrations: Fill opening between pipe and sleeve with Nelson CLK or Tremco or 3M Fire Stop material. Fire and smoke rating of sealant shall match rating of wall or floor being penetrated.

2.02 HANGERS AND INSERTS

A. Vertical support and bracing for steel risers shall be by use of carbon steel riser clamps at every floor and braced laterally at every floor or midspan, B-Line B3373, Grinnell 261.

B. Horizontal lines shall have hangers and rods adequate for size, material, and service. Total weight of equipment, including valves, fittings, pipe, pipe contents, and insulation, are not to exceed the limits indicated.

Hanger Rod Sizes (Per NFPA-13, Table 2-6.4)

1″ to 4″ = 3/8″ diameter rod

5″ to 8″ = 1/2″ diameter rod

C. All supports, guides, brackets, and braces shall be adequately fastened to the structure. No work shall be supported from any structural bridging angles.

D. Pipe Hangers and Supports:

1. Swivel Ring, UL listed specifically for Fire Protection, all sizes.

2. Multiple or Tapeze Hangers:

a. Steel strut channels by B-Line or Grinnell.

3. Floor Support:

a. Carbon steel pipe saddle, stand and bolted floor flange.

E. Beam Clamps:

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

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

F. All anchors, hangers, and supports to be designed to meet local structural requirements and Architect's approval.

G. All hangers of one type shall be catalog items of one manufacturer.

H. No pipes shall be hung or supported by other pipe or ductwork.

2.03 IDENTIFICATION

A. Identification of all systems and valves shall be by means of purchased signs that shall indicate portions controlled by each valve or riser, list design criteria, valve duty, etc. in conformance with NFPA and F.M. standards.

B. Signs shall be 0.022 aluminum, red and white Argco Trim-Line or approved equivalent.

2.04 ESCUTCHEONS

A. Provide on all pipe passing through finished floor, walls, and ceilings with outside diameter sufficient to cover sleeved openings and inside diameter to fit snugly around pipe.

2.05 ELECTRIC WIRING

A. All line voltage wiring shall be by Electrical Contractor; Fire Protection Contractor shall furnish wiring diagrams to Electrical Contractor for electric equipment furnished.

PART 3 - EXECUTION

3.01 INSTALLATION

A. As per NFPA rules and regulations and insurance carrier recommendations.

B. Cutting and boring through structural members shall be done only when approved by and under supervision of Architect and/or Structural Engineer.

C. Size, apply and install supports and anchors in compliance with manufacturer’s recommendations.

D. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands.

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

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

3.02 HANGER AND SUPPORT SPACING

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

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

C. Support riser piping independently of connected horizontal piping.

D. Space hangers for pipe as follows (NFPA-13, Table 4-14.2.2.1):

Pipe Material	Pipe Size	Maximum Horizontal Spacing	Maximum Vertical Spacing
Steel	1/2″ through 1-1/4″	12′ 0″	15′ 0″
Steel	1-1/2″ through 8″	15′ 0″	15′ 0″

3.03 TESTS

A. Conducted as required in accordance with NFPA Standards.

B. Test piping in sections or entire system as required by sequence of construction. Do not conceal pipe until it has been successfully tested. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Entire test must be witnessed by the **Architect's** representative.

C. Use clean water and remove air from the piping being tested where possible. Measure and record test pressure at the high point in the system.

D. Test system at 200 psi for 2 hours showing no leakage. Where system design is in excess of 150 psig, test at a pressure 50 psig above system design pressure.

E. All pressure tests are to be documented on NFPA Contractor's Material and Test Certificate forms.

End of Section C15050

SECTION C15400

FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 RELATED SECTIONS OF THIS DIVISION

C15010 - Basic Fire Protection General Requirements

C15050 - Basic Fire Protection Materials and Methods

1.02 WORK INCLUDED IN THIS SECTION

1.03 Kind and Quality of Materials

2.01 Pipe and Fitting Materials

2.02 Valves

2.03 Sprinklers and Cabinets

3.01 Installation

3.02 Valving

3.03 Protection of Finished Work

1.03 KIND AND QUALITY OF MATERIALS

A. Materials, appliances, and fixtures to be new, of best quality and grade, in strict accordance with specification requirements.

PART 2 - PRODUCTS

2.01 PIPE AND FITTING MATERIALS

A. Pipe and pipe fittings are to conform to the appropriate commercial standards or Federal or American Society for Testing Materials specifications listed.

B. Overhead Distribution: Black steel pipe; 2" and under Allied Super 40, ASTM A135/A795, Type E, Grade A (or American Tube Dyna-Thread-40 equivalent). 2-1/2" and larger Allied Super Flo ASTM 795, Type E, Grade A (or American Tube Dyna-Flow-10 equivalent).

C. Malleable Iron Class 150 ASTM A197/ANSI B16.3 or cast iron Class A, ASTM A126 threaded fittings and pipe ends for 1" thru 2" sizes. Victaulic (Central or Gruvlok) couplings and mechanical grooved end fittings with EPDM gaskets for sizes 2 1/2 inch and larger. Gaskets for mechanical joints on dry systems shall be EPDM, flush seal.

D. Absolutely no threading of Schedule 10 or thin wall pipe and no plastic pipe allowed.

E. Welding Materials: Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

F. Unions and Flanges:

1. 2″ and smaller steel: 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.

2. 2-1/2″ and larger: ASTM A181 or A105, Class 150, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. ANSI B16.1 or ANSI B16.5, Class 150 cast iron threaded flanges. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or 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.

2.02 VALVES

A. Valve manufacturers: Kennedy, Milwaukee, Nibco, Stockham, Central, Watts.

1. Drain valves shall be NIBCO KT65-UL, Milwaukee #536, bronze globe type, or Milwaukee #5361 angle globe.

2. Valves shall be suitable for tamper-switch installation on main and floor control valves.

2.03 SPRINKLERS AND CABINET

A. New sprinklers as manufactured by Viking, Star, Central, or approved equal.

B. Sprinklers:

1. Suspended Ceilings: Viking Micromatic Model "M" recessed pendant, polished chrome finish. Sprinkler with Viking Model E-1, recessed, white enamel finish escutcheon.

2. Exposed Areas without Ceilings: Viking Model "M" upright, bronze.

3. Sidewall Sprinklers: Viking Model "M", chrome finish.

4. Flexible Sprinkler Connector: Commercial Ceiling Flexhead by Flexhead Industries Series 205/205-SS.

C. Use Quick Response Sprinklers where applicable.

D. Select fusible link temperature rating to not exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (165°) fusible link except at skylights, sealed display windows, attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, or where other heat sources exist.

E. Cabinets: Furnish and install one (1) red enameled steel sprinkler cabinet having spare sprinklers, which include all types and ratings installed. Also include a special wrench for removal and installation. Cabinet to be wall mounted; install on wall next to sprinkler riser or as directed by Building Maintenance. Quantity of heads as per NFPA 13, 2-2.7.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install piping so that system can be drained. Where possible, slope to main drain valve. Slope dry pipe and preaction systems subject to freezing at minimum 1/4″/10′ on mains and 1/2″/10′ on branches. Where piping not susceptible to freezing cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or valve/nipple/cap for drainage over 5 gallons. Pipe main drain valves to grade or to air gap sewer.

B. Sprinklers: Locate sprinkler heads as indicated on fire protection plan and reflected ceiling plan maintaining minimum clearances from obstructions, ceilings and walls. Install sprinkler heads level in locations not subject to spray pattern interference. Where sprinklers are to be installed in suspended ceilings, sprinklers shall be located in the center of 2′ x 2′ tiles and in the center of 2′ x 2′ half of 2′ x 4′ tiles.

3.02 VALVING

A. Valving: Approved type test valves, control valves, and drain valves at points required throughout system. All points of system shall be able to be drained through drain valves. All drain valves shall be exposed to view below ceilings of mechanical or storage spaces.

3.03 PROTECTION OF FINISHED WORK

A. Repair, replace, and pay for breakage of glass, patching, and repairing of all damage to finished work caused by this Section of the work.

End of Section C15400

SECTION 16001

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. All requirements of Division 1 govern work under this Section.

1.02 GENERAL PROVISIONS

A. In general, the work includes: Electrical work and the kindred materials and operations as indicated on the drawings and as specified in the following articles of Section 16000, 16100, 16515 and 16722.

B. Job Information: Obtain at building including:

1. Conditions affecting this Section of the Work.
2. Accessibility
3. Storage space.

1.03 GENERAL REQUIREMENTS

A. This Section of the Specifications applies to all electrical work. The General Conditions, Supplementary Conditions, Summary of the Work, Instructions to Bidders and all Sections of the Conditions of the Contract form a part of these specifications and the Contractor shall consult them in detail. Electrical work indicated in other Sections of the Specifications to be done by the Electrical Contractor shall be included in the Work of this Section.

1.04 DEFINITIONS

A. Certain terms used herein; on the drawings; and in the contract documents, shall be defined as follows:

B. Provide: Furnish and install complete and ready for service.

C. Exposed: Exposed to view in any room, hallway, passageway, or outside.

D. Approval: The approval of the Architect in writing or by signed rubber stamp applied to drawings, illustrations, etc.

1.05 INTENT OF DRAWINGS AND SPECIFICATIONS

A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

1.06 DRAWINGS

A. The Electrical drawings do not attempt to show the complete details of building construction which affect the electrical installation. The Contractor shall refer to the architectural, civil, structural and mechanical drawings for additional details which affect the proper installation of this work. The Contractor is cautioned that diagrams showing electrical connections

and/or circuiting are diagrammatic only and must not be used for obtaining lineal runs of wire to conduit. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

1.07 MATERIAL AND EQUIPMENT

A. All material and equipment shall be new and of the quality used for the purpose in good commercial practice, and shall be standard product of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, catalog number, and capacity or rating on a nameplate, securely affixed on the equipment in a conspicuous place.

1.08 SUBSTITUTION AND APPROVAL OF MATERIAL

A. See Instructions to Bidders.

B. Such requests shall be accompanied by three copies of all necessary illustrations, cuts, drawings and descriptions of material proposed for substitution and shall fully describe all points in which it differs from the articles specified. Two copies will be retained by the Architect and one copy returned to the Contractor with approval or revisions indicated thereon.

1.09 DAMAGE TO OTHER WORK

A. The Electrical Contractor will be held rigidly responsible for all damages to the work of his own or any other trade resulting from the execution of his work. It shall be the Contractor's responsibility to adequately protect his work at all times. All damages resulting from his operations shall be repaired or the damaged portions replaced by the party originally performing the work, (to the entire satisfaction of the Architect), and all cost thereof shall be borne by the Contractor responsible for the damage.

1.10 COOPERATION WITH OTHER TRADES

A. This Contractor shall completely cooperate with all other trades in the matter of planning and executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct the work of any trade.

1.11 NEGLIGENCE

A. Should the Contractor fail to provide materials, templates, etc., or other necessary information causing delay or expense to another party, he shall pay the actual amount of the damages to the party who sustained the loss.

1.12 FIELD CHANGES

A. Should any change in drawings or specifications be required to comply with local regulations and/or field conditions, the Contractor shall refer same to Architect for approval before any work which deviates from the original requirements of the drawings and specifications is started. In the event of disagreements as to the necessity of such changes, the decision of the Architect shall be final.

1.13 CUTTING AND PATCHING IN NEW CONSTRUCTION

A. As necessary and with approval to permit the installation of conduit or any part of the work

under this branch. Any cost caused by defective or ill-timed work shall be by the party responsible therefor. Patching of holes, openings, etc. resulting from the work of this branch shall be furnished by this contractor.

B. See Division 1 for additional requirements.

C. See also “Demolition, Renovation, and Disposition of Existing Equipment” in this Section.

1.14 COMPLETION DATES

A. This Contractor shall be in a position to meet all completion dates established by the Architect and shall furnish all labor of all classes required to meet such schedules and completion dates.

1.15 STANDARDS, CODES AND PERMITS

A. All work shall be installed in accordance with National, State and Local electrical codes, laws, ordinances and regulations. Comply with all applicable OSHA regulations.

B. All materials shall have a U.L. label where a U.L. standards and/or test exists.

C. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working drawings required by them.

D. Secure and pay for all permits and licenses required.

1.16 CLEAN-UP

A. This Contractor shall at all times keep the premises free from excessive accumulation of waste material or rubbish resulting from his work, including tools, scaffolding and surplus materials, and he shall leave his work broom clean or its equivalent.

B. In case of dispute, Architect may order the removal of such rubbish and charge the cost to the responsible contractor as determined by the Architect. At the time of final clean-up all fixtures and equipment shall be thoroughly cleaned and left in proper condition for their intended use.

1.17 TESTS

A. The Contractor shall provide all instrumentation, labor and conduct all tests required by the Architect. All tests shall be made before any circuit or item of equipment is permanently energized. Circuits shall be phased out and loads shall be distributed as evenly as possible on all phases. All phase conductors shall be entirely free from grounds and short circuits. All instrumentation and personnel required for testing shall be provided by the Contractor and all tests shall be conducted in the presence of the Architect or his authorized representative.

B. System Tests:

1. The following tests are required prior to energization of the electrical system:
    a. Secondary feeders shall have an insulation resistance test utilizing a megger applying a test potential of 500 volts DC minimum.
    b. Establish secondary phase to ground voltages.
    c. Establish proper phase relationship and motor rotation.
2. The following tests are required under normal load condition:

a. Record secondary phase to phase and phase to ground voltages and phase currents at all major equipment, apparatus, and on all secondary feeders. Voltage readings shall be taken at line side terminals of distribution centers and panelboards.

b. Confirm proper phase relationship and motor rotation.

c. Confirm load balance at distribution centers and panels. Rebalance load if necessary such that the minimum unbalance between phases shall not exceed 7-1/2%.

d. Confirm operation of all electrically operated apparatus, such as circuit breakers, transfer switches, etc., by exercising same under load.

e. Record all settings and calibrations of circuit breakers, transfer switches, transformers, meters, timing devices, etc.

C. Records:

1. All test data obtained by the E.C. or manufacturer/supplier shall be recorded and filed with the maintenance manual as part of permanent job records. Test data shall include identification of instruments employed (field test only), condition of test (time, date, weather, etc.), parameters of test, personnel conducting test, and any pertinent information or conditions noted during the test.

1.18 SHOP DRAWINGS

A. Submit to Engineer for review, copies of manufacturer's shop drawings and/or equipment brochure depicting:

1. Lighting Fixtures
2. Fire Alarm System Devices
3. Wiring Devices
4. Other materials at the request of the Engineer

B. See Section 01300.

C. Shop drawings shall bear the Contractor's stamp indicating approval.

D. Any equipment fabrication prior to shop drawing review shall be at the Contractor's risk.

1.19 WORKMANSHIP

A. The installation of all work shall be made so that its several component parts will function as a workable system complete with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The work shall be executed in conformity with the best accepted standard practice of the trade so as to contribute to efficiency and appearance. It shall also be executed so that the installation will conform and adjust itself to the building structure, its equipment and its usage.

1.20 DRAWINGS OF OTHER TRADES

A. The Contractor shall consult the drawings of the work for the various other trades; field layouts of the parties performing the work of the other trades; their shop drawings, and he shall be governed accordingly in laying out his work.

B. Specifically examine shop drawings to confirm voltage, current characteristics, and other

wiring requirements for utilization equipment. Bring any discrepancies to the attention of the A/E.

1.21 FIELD MEASUREMENTS

A. The Contractor shall take all field measurements necessary for his work and shall assume the full responsibility for their accuracy.

1.22 STRUCTURAL INTERFERENCES

A. Should any structural interference prevent the installation of the outlets, running of conduits, etc., at points shown on drawings, the necessary minor deviation there from, as determined by the Architect, may be permitted. Minor changes in the position of the outlets or equipment if decided upon before any work has been done by the Contractor shall be made without additional charge.

1.23 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of the building and site which may affect the execution of his work. No extra payment will be allowed for the failure to obtain this information. If in the opinion of the Contractor there are omissions or errors in the plans or specifications, the Contractor shall clarify these points with the Architect before submitting his bid. In lieu of written clarification by addendum, resolve all conflicts in favor of the greater quantity or better quality.

1.24 GUARANTEE

A. The Contractor shall unconditionally guarantee his work and all components thereof, excluding lamps, for a period of one year from the date of his final payment. He shall remedy any defects in workmanship and repair or replace any faulty equipment which shall appear within the guarantee period to the entire satisfaction of the Architect at no additional charge.

1.25 TEMPORARY WIRING AND SERVICE

A. No temporary electrical service is required on this project. The existing electrical distribution system in the Dane County City-County Building shall provide any power required for construction.

B. All contractors shall provide and maintain their own extension cords and additional lamps as required to perform his work properly. Contractors requiring temporary connections to 3 phase power service and single phase feeders for other than lighting and small fractional horsepower motorized tools shall make arrangement with the Electrical Contractor. Contractors requiring lighting outside of the building shall make their own arrangements with the Electrical Contractor and pay all costs for installation, maintenance and removal. Contractors requiring electrical equipment over one HP, including welders, hoists, heaters and coolers shall make their own arrangements for such service beyond the main switch and shall pay all costs thereof.

C. No permanent electrical equipment or wiring shall be used for temporary connections, unless authorized by this Section, upon signed order and with approval by the Architect in behalf of the Owner. Such approvals shall not shorten guarantee period.

D. Electrical energy to be paid for by owner.

1.26 ELECTRICAL SERVICE

A. The existing electrical service in the Dane County City-County Building shall remain as is.

1. The building has a 208Y/120-volt, 3-phase, 4-wire service for general lighting and receptacle loads.

2. The building also has a 480-volt electrical service that is used for large HVAC loads.

3. Refer to the electrical drawings for partial one line riser diagrams and the work involved on the project.

1.27 BRANCH CIRCUIT WIRING

A. See plans for general arrangement of circuits, conduit runs, and ratings of branch circuits and special circuits.

B. Provide everything necessary to comply with the general scheme shown, including all types of control.

C. Circuit numbers as shown on plans are for contractor to plan his wiring and for estimating purposes. These numbers are not necessarily consecutive numbers of the panelboard breakers. Balanced load on bus is to be the determining factor in arrangement of circuits. Balance loading to within 7 1/2%.

D. Minimum size of lighting system branch circuit conductors to be #12 AWG.

E. Conductors terminating at wired outlets shall extend at least eight (8) inches beyond outlet box conduit fitting.

F. 120 volt circuit home runs greater than 50 feet in length shall have #10 AWG minimum size between panel and first receptacle or fixture outlet.

1.28 MOTOR WIRING

A. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall be furnished by others.

B. Motors shall be set in place by others and the associated motor starters and controllers shall be turned over to this Contractor for erection and line voltage power wiring.

C. Any contractor supplying starters and controllers that are not part of this contract shall index same and provide this Contractor with instructions as to proper location in sufficient time to permit the installation of a concealed raceway system.

D. Where this Contractor is required to provide control wiring, the Contractor supplying the controllers shall provide all necessary and required wiring diagrams for proper installation.

E. Low voltage (less than 115 volts) control wiring shall be by others, unless noted elsewhere in the specifications except that this Contractor shall extend circuit to associated transformers, wire and connect to same.

F. This Contractor shall examine the plans and specifications of other sections and shall include in his bid all control wiring, as referenced to be performed by Section 16001.

G. Required disconnect switches furnished by other sections shall be installed by Section

16001. Furthermore, this Contractor shall provide all disconnect switches required by code that are not furnished by other sections.

1.29 SPECIAL OUTLETS

A. General: Furnish and install outlets, wiring and receptacles accordingly, at locations required by equipment serviced or otherwise as directed. Extend wiring to outlets on equipment and make final connection.

1.30 IDENTIFICATION

A. General:

1. Materials and equipment installed under this Section shall be clearly identified as listed below.
2. Locate identification conspicuously.
3. Terminology to be approved by Architect.
4. See plans for any additional items to be identified.
5. Loads such as motors shall be described by function rather than by the system of arbitrary number as shown on electrical plans.
6. Use abbreviations sparingly.

B. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely screwed or riveted to the following equipment. Size 1" x 4" with 3/8" high letters; unless space available dictates differently.

1. Each panelboard, contactor, time switch, starter or disconnect switch. Locate on inside cover of panels.
2. Each feeder at all accessible locations.
3. Each end of empty conduit runs to indicate the intended use of the conduit and the location of opposite end. Use room numbers that are permanently assigned.

C. Typewritten Directory: Each panelboard both new and existing shall be provided with a typewritten directory attached to the inside of panel door and covered with clear plastic indicating load served and rooms served by each protective device in the respective panel. Spares and spaces shall be clearly identified.

D. Switch Station:

1. All key switches shall be engraved indicating controlled item.
2. All remote switches shall be engraved indicating controlled item.

E. Conductor Identification:

1. Identify each conductor at each wiring device, connector or splice point with permanently attached wrap-around adhesive markers as manufactured by Brady Co. or 3M.
2. This identification shall include branch circuit number, control circuit, or any other appropriate number or lettering that will expedite future tracing and trouble shooting.

1.31 LOCATIONS OF OUTLETS AND WIRING DEVICES

A. Outlets:

1. Locations of outlets and electrical equipment on the drawings are approximate only. Unless otherwise indicated on the drawings or established in the specifications, the exact locations of electrical outlets shall be established in the field by directive from the Architect. Generally, outlets shall be located as required for proper installation of equipment served and otherwise locations shall be established by construction or code requirements and such as to be coordinated with equipment of other trades.

2. This Section shall consult with the Architect and refer to all details, sections, elevations and equipment plans and the plans of other trades for exact location.

3. The Architect reserves the right to make reasonable changes in the location of outlets, apparatus or equipment up to the time of roughing in. Such changes as directed shall be made by the Contractor without additional compensation.

4. Dimensions taken by scale shall not be used to establish rough-in locations.

B. Wiring Devices:

1. The approximate location of wiring devices are indicated on the drawings; the specific location shall be determined in accordance with "Location of Outlets" of these specifications and as follows.

2. This Section is referred to equipment plans, equipment shop drawings, elevation drawings and other detail or dimensional drawings, and he shall consult with the Architect before installation of proceeding with any work dependent upon this information.

3. Generally, wiring devices shall be located as follows:

a. Wall receptacles shall generally be centered 15" above the finished floor and 6" above surface of built-in counters and tables where same abuts wall and 4" above backsplashes if counters are so equipped.

b. Special purpose receptacles shall be located as required by equipment served.

c. Switches shall be centered 48" above finished floor on latch side of door opening with edge of plate not more than 12" from door frame, except as noted on the drawings.

d. In hazardous areas, the location of wiring devices shall be established by Code requirements which shall take precedence over conflicting information on the drawings or included herein.

1.32 TELEPHONE SYSTEM

A. No work required.

1.33 DEMOLITION, RENOVATION AND DISPOSITION OF EXISTING EQUIPMENT

A. This Contractor shall note that portions of the existing building will remain in service during portions of the construction period. Areas of the building will be vacated as required to facilitate construction. This Contractor shall proceed with the completion of his work in such a manner as to cause the least possible interference with the Owner's operation. All work required in the existing building shall be done in a manner and time acceptable to the Owner.

B. Outages and other work rendering existing equipment inoperative shall be held to a minimum - prior arrangement for each shall be made with the Owner and shall be acceptable as to time and duration.

C. Electrical equipment in conflict with construction shall be removed and/or relocated as indicated on the drawings, as directed or required. This Contractor shall remove all electrical equipment released from service as a result of construction, and no equipment removed shall be reused, except as specifically directed on the drawings or elsewhere herein. All electrical equipment removed during construction shall be presented to the Owner for his acceptance or rejection. Materials rejected by the Owner become the Contractor's property and shall be removed from the site.

D. This Contractor shall be responsible for the work of other trades as may be necessary to facilitate the installation of electrical work in the existing building. Such work necessary that is normally done by other trades and is not covered as a part of other divisions of the work shall be done under the direction and at the expense of the Electrical Contractor. This work shall include but is not limited to cutting, patching, and all work necessary and required to leave existing building in condition acceptable to the Architect.

E. Any existing circuits or equipment not shown on the drawings and which are logically expected to be continued in service and which may be interrupted or disturbed during construction shall be reconnected in an approved manner. In addition, any existing circuit or equipment which may require relocations or rerouting, as a result of construction, shall be considered a part of the work of this branch and shall be done by this contractor with no additional compensation.

F. All coring that is required for electrical work shall be by this Contractor.

G. All new conduit and wiring shall be concealed where possible to do so without extensive cutting and patching. All exposed work shall be run in wiremold and installed only where approved by Architect. Routing shall be subject to Architects approval. Make use of all standard wiremold colors to match surfaces as closely as possible.

H. All ballasts and lamps removed during the project, unless part of fixtures claimed by the Owner, become the Contractor's property and he shall dispose of them in accordance with applicable DNR and EPA regulations.

1.34 SEALING AND FIREPROOFING

A. Sealing and fireproofing of openings between conduit, cable tray, wireway, trough, cablebus, busduct, etc. and fire rated surfaces shall be the responsibility of the contractor whose work penetrates the opening.

B. Sealing and fireproofing shall use materials and methods complying with ASTM E814 requirements appropriate to the rating of the material penetrated.

C. Materials by Dow-Corning, 3M, Specified Technologies, Inc., and Chase-Foam are acceptable if in accordance with (B) above.

D. Submit manufacturer's penetration details to authority having jurisdiction. Details shall confirm method's compliance with ASTM E814.

E. Include copies of penetration details in Project Operation and Maintenance Manuals.

1.35 ALTERNATE BIDS

A. See Section 01030 for descriptions of alternates required.

END OF SECTION

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

A. All requirements of Division 1 govern work under this Section.

1.02 REFERENCES

A. National Electrical Manufacturer's Association (NEMA).

B. Underwriters Laboratories, Inc. (UL).

C. American Society for Testing and Materials (ASTM).

D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

A. Product Data

1. Submit for disconnects, motor starters, panelboards, circuit breakers, overcurrent protective devices, transformers, and mini-power centers.

2. Product data sheets with printed installation instructions.

B. Shop Drawings:

1. Submit for motor starters.

2. Show enclosure dimensions, nameplate nomenclature, electrical ratings, and thermal unit schedule.

3. Wiring diagrams and schematics.

C. Approval of equipment supplied in this section is contingent upon Contractor verification of available fault current from electric utility.

1. Notify ENGINEER if available fault current is higher than specified equipment.

D. Submit in accordance with Section 01340.

E. Operation and Maintenance (O&M) Data:

1. Maintenance data for materials and products for inclusion in Operating and Maintenance specified in Section 01730.

2. Submit in accordance with Section 01340 and 01730.

F. Test Results:

1. Report of field tests and observations certified by Contractor.

1.04 QUALITY ASSURANCE

A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article

100.

B. Regulatory Requirements:
   1. National Electrical Code: Components and installation shall comply with NFPA 70.
   2. Local codes and ordinances.

PART 2 - PRODUCTS

2.01 ELECTRICAL METALLIC TUBING (EMT)
INTERMEDIATE METALLIC CONDUIT (IMC)
GALVANIZED RIGID STEEL CONDUITS (GRS)

A. Manufacturers:
   1. Allied Steel
   2. Omega
   3. Wheatland
   4. Columbia

B. Manufacturer's standard lengths and size.

C. Protected inside and out by hot-dipped galvanized or electrogalvanized coating.

D. Minimum size: 3/4 inch, except as follows:
   1. Conduit for lighting switch legs containing switched conductors only may be 1/2 inch.
   2. As noted on drawings.

E. Do not use aluminum conduit.

2.02 PLASTIC CONDUIT (PVC)

A. Manufacturers:
   1. Carlon.
   2. Genova.
   3. Certainteed.

B. Standard lengths and sizes.

C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC2 standards, UL listed, and as required by NEC.

D. Rated for 90EC cable.

E. Minimum size: 2" inches.

2.03 FLEXIBLE CONDUIT

A. Manufacturers:
   1. Triangle PWC, Inc.
   2. Anaconda
   3. Flexsteel
   4. American Flexible Conduit

B. Galvanized flexible steel.

C. Standard conduit sizes.

D. Minimum Size: 1/2 inch.

2.04 LIQUIDTIGHT FLEXIBLE CONDUIT

A. Manufacturers:
   1. O-Z/Gedney Company
   2. American Flexible Conduit
   3. Flex-Guard, Inc.
   4. Liquatite
   5. Anaconda

B. Galvanized flexible steel.

C. Standard conduit sizes.

D. Minimum Size: 1/2 inch.

E. Heavy wall PVC jacket.

2.05 FITTINGS

A. Manufacturers:
   1. Appleton Electric Company.
   2. Steel City, American Electric.
   3. Oz-Gedney Co.

B. Steel or malleable iron, zinc galvanized or cadmium plated.

C. Do not use set screw or indentor type fittings.

D. Do not use aluminum or die cast fitting.

E. EMT IMC and GRS Connectors and Couplings:
   1. Threaded.
   2. Gland compression type.
   3. Insulated throat.
   4. Rain and concrete type.

F. Flexible Conduit Connectors and Couplings:
   1. Threaded.
   2. Insulated throat.
   3. Grounding type.
   4. Gland compression type.

G. Liquidtight Flexible Conduit Fittings:
   1. Liquidtight.
   2. Insulated throat.
   3. Threaded.

4. Gland compression type.
5. Grounding type.

H. Expansion Joints:
1. Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
2. Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.

I. Seals:
1. Wall entrance, Appleton Type FSK or FSC.

J. Drain Fittings:
1. Automatic Drain Breather:
a. Explosionproof.
i. Safe for Class I, Groups C and D.
b. Capable of passing minimum 25 cc water/minimum and minimum 0.05 cubic foot air/minimum at atmospheric pressure.
2. Condensate Drain:
a. Conduit outlet body, Type T.
b. Threaded, galvanized plug with 3/16 inch drilled holed through plug.

2.06 SURFACE METAL RACEWAY

A. None required.

2.07 WIRES, CABLES, AND CONNECTORS

A. Manufacturers:
1. Wire and Cable:
a. Continental
b. Southwire.
c. Rome Cable.
d. Houston Wire and Cable.
e. Beldon.
f. Dekoron.
g. Royal
h. South
i. General
2. Connectors:
a. Burndy.
b. Thomas and Betts.
c. Blackburn, American Electric.
3. Electrical Tape:
a. 3M Scotch Brand.

b. Plymouth.

c. or equal.

B. Copper wire only.

C. 600 v insulation (ASTM standard compounds) and color code conductors for low voltage (secondary feeders and branch circuits) as required by NEC.

1. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for branch circuit and feeder conductors size No. 8 AWG and smaller.

2. Type XHHW-2 Stranded: Single conductor for branch circuits, feeders and service conductors larger than No. 8 AWG.

3. Provide grounding conductor with same insulation as circuit conductors when run with circuit conductors.

4. Type THWN-2 Stranded: Single conductor No. 12 AWG minimum for 120 v control wiring and No. 14 AWG minimum for graphic indication, nonshielded instrumentation and other control wiring operating at less than 120 v unless otherwise noted on Drawings.

a. Provide high density polyethylene jacketed multi-wire cable assemblies in underground conduit or duct.

D. Joints, Taps, and Splices:

1. Joints, Taps, and Splices in Conductors No. 10 AWG and Smaller: UL listed compression spring-type solderless connectors with plastic cover.

2. Joints, Taps, and Splices in Conductors No. 8 AWG and Larger: Solderless two or four-bolt compression type connectors of type that will not loosen under vibration or normal strains.

3. Terminations: Compression-type crimp lugs.

2.08 BOXES

A. Manufacturer:

1. Interior Outlet Boxes:

a. Appleton Electric Company.

b. Raco.

c. Steel City, American Electric.

2. Weatherproof Outlet Boxes:

a. Appleton Electric Company.

b. Crouse-Hinds Company.

c. O-Z/Gedney company.

d. Perfect-Line, American Electric.

3. Junction and Pull Boxes:

a. Hoffman Engineering Company.

b. Keystone Columbia, Inc.

c. Electromate.

B. Outlet Boxes - Flush Mounted:

1. Wall Outlets: Square corner, galvanized masonry type with internally mounted ears or 4-inches square with raised cover having square corners and internally mounted ears.
2. Ceiling Lighting Fixture Outlet Boxes: 4-inch square galvanized box with raised cover set flush with finished surface, complete with 3/8 inch fixture stud.

C. Outlet Boxes - Surface Mounted:
1. General Use: 4-inches square with raised device cover.
2. Weatherproof: Cast galvanized with threaded hub.
3. Safety outlet enclosure - Tay Mac Co. - Verify outlet configuration.
4. Hazardous Locations: Cast galvanized approved for classification of area.

D. Junction and Pull Boxes:
1. Fabricate from code gauge galvanized steel, with covers held in-place by corrosion resistant machine screws.
2. Size as required by code for number of conduits and conductors entering and leaving box.
3. Provide with welded seams where applicable, and equipment with corrosion resistant nuts, bolts, screws, and washers.
4. Finish with rust inhibiting primer.

2.09 FIRE RATED THROUGH FLOOR FITTINGS
1. None required.

2.10 WIRING DEVICES
A. Manufacturers:
1. Hubbell Wiring Device Division.
2. Pass and Seymour, Inc.
3. Leviton
4. Cooper Wiring Devices

B. Fabricated Devices:
1. Factory-fabricated, specification grade wiring devices in type, color, and electrical rating for service indicated. Ivory color or as selected by ENGINEER OR OWNER.
2. Wiring devices of one manufacturer.
3. See Drawing symbol schedule for identification of device type.

C. Switches:
1. General Use Lighting Switches: 20 amp toggle, equal to Hubbell No. 1221-I series.
2. Switches controlling equipment, operation of which is not evident from switch position, shall include flush neon pilot light in conjunction with proper switch. Each switch shall be complete with engraved plate to identify equipment being controlled (white letters on black, 1/8 inch high minimum).

D. Receptacles:
1. General use duplex receptacles: NEMA No. 5-20R, grounding type, 20 amp Hubbell

No. 5362 Specification Grade.

2. Special purpose receptacles as shown on Drawings and schedules.
3. Receptacles supplied from standby emergency system to have red face.
4. GFI receptacles shall be Hubbell GFR5352IA

E. Wiring Device Plates and Covers:

1. Wall plates for wiring devices with ganging and cut-outs as indicated, provided with metal screws for securing plates to devices, screw heads colored to match finish of plate.
2. Plates for Flush Mounted Devices: Equal to Sierra P line specifications grade Type No. 430 brushed stainless steel.
3. Telephone outlet configuration to match telephone outlet jack or cable.
4. Device plates for surface mounted Type FS or FD boxes to be Type FSK galvanized steel.
5. Device plates for surface mounted, 4-inch square bossed to be ½ inch raised galvanized steel covers.
6. Weatherproof outlet enclosure for exterior devices or devices in damp locations to be marked galvanized gray cast malleable with gasketed lift cover plate as shown on Drawings. Suitable for wet locations while in use. Enclosure must be gasketed. Provide Intermatic WP1010MC, WP1010HMC, or WP1030MC with appropriate mounting base(s) and inserts.

2.11 MOTOR STARTERS

A. None required.

2.12 MOTOR AND CIRCUIT DISCONNECTS

A. Manufacturers:

1. Eaton/Cutler-Hammer
2. Siemens
3. Square D
4. Allen Bradley
5. General Electric

B. Enclosed Circuit Breaker Construction:

1. Dual cover interlock.
2. External trip indication.
3. Provisions for control circuit interlock.
4. Padlock provisions for padlock in Off position.
5. Handle attached to box, not cover.
6. Handle position indicates On, Off or Tripped.
7. Provisions for insulated or groundable neutral.

C. Safety Switches:

1. NEMA heavy duty Type HD.

2. Dual cover interlock.
3. Visible blades.
4. Provisions for control circuit interlock.
5. Pin type hinges.
6. Tin plated current carrying parts.
7. Quick make and break operator mechanism.
8. Handle attached to box, not cover.
9. Handle position indication, On in up position and Off in down position.
10. Padlock provisions for up to 3 padlocks in Off position.
11. UL listed lugs for type and size of wire specified.
12. Spring reinforced fuse clips for Class R fuses.
13. Provisions for insulated or groundable neutral.
14. UL listed short circuit rating 200,000 RMS amp with Class R fuses.

D. Enclosures:
1. Indoor: NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.
2. Outdoor: NEMA 3R code gauge zinc coated steel with baked enamel finish.

2.13 FUSES

A. Manufacturers:
1. Bussmann
2. Gould Shawmut
3. Littlefuse
4. Brush

B. 250 v. Fuses:
1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp interrupting rating.
a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection for motor, transformer, welder, feeder, and main service protection.

C. 600v Fuses:
1. Class RK-1, 1-end rejection or to fit mountings specified, 1/10 to 600 amps, 200,000-amp interrupting rating.
a. Gould Shawmut Tri-Onic TR-R, dual element, time delay with short circuit protection for motor, transformer, welder, feeder and main service protection.
2. Class L, bolt-in 601 to 6,000 amps, 200,000-amp interrupting rating.
a. Gould Shawmut A48Y, time delay for overload and short circuit protection for motor, transformer, feeder, and main service protection.
3. Class CC, fast acting, single element, 1/10 to 30 amps, 200,000-amp interrupting rating.
a. Gould Shawmut ATDR, UL listed for motor control circuits, lighting ballasts, control transformers, and street lighting fixtures.

D. Spare Fuses:

1. 10%, minimum of 3, of each type and rating of installed fuses.

2.14 PANELBOARDS

1. Panelboards are existing.

2.15 MOLDED CASE CIRCUIT BREAKERS

A. Manufacturers:

1. Square D

B. Permanent Trip Circuit Breakers:

1. Lighting Panel Circuit Breakers:
   a. Thermal and magnetic protection.
   b. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
   c. Bolt-on type unless otherwise noted on Drawings.
   d. Quick make and break toggle action.
   e. Handle trip indication.
   f. Handle position indication, On, Off, and Tripped centered.
   g. UL listed for type of wire specified.
   h. UL listed short circuit rating (integrated equipment rating).
      i. Up to 240 v: 10,000 RMS symmetrical amp minimum.
      ii. Up to 480 v: 14,000 RMS symmetrical amp minimum.
   i. UL SWDL switching duty on 120 v. circuits for switched circuits.
   j. Switch neutral common trip per NEC 514-5 for fuel pumps.
2. Power Panel Circuit Breakers:
   a. Thermal and magnetic protection.
   b. Magnetic protection only in combination with motor starters and motor circuit protectors (MCP).
   c. Single magnetic trip adjustment.
   d. Single-handle common trip, 2 and 3 poles (handle ties not acceptable).
   e. Push-to-trip test button.
   f. Bolt-on type.
   g. Quick make and break toggle action.
   h. Handle trip indication.
   i. Handle position indication, On, Off, and Tripped centered.
   j. UL listed for type of wire specified.
   k. UL listed short circuit rating (integrated equipment rating).
      i. Up to 240 v: 10,000 RMS symmetrical amp minimum.
      ii. Up to 480 v: 14,000 RMS symmetrical amp minimum.

2.16 GROUND-FAULT CIRCUIT INTERRUPTER RECEPTACLES (GFCI)

A. Ratings:

1. 120 vac.
2. 20 amp.

B. Tripping Requirement:
1. UL Class A.

C. Construction:
1. Shallow depth.
2. Line and load terminal screws.
3. Noise suppression.
4. Feed through.
5. Standard duplex wall plates shall fit.
6. NEMA 5-20R configuration.

D. Meet requirements of UL 943 ground-fault circuit interrupters.

2.17 GROUNDING AND BONDING

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, more stringent requirements and greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper.

C. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

D. Equipment Grounding Conductor: Green insulated.

E. Grounding Electrode Conductor: Stranded cable.

F. Bare Copper Conductors:
1. Solid Conductors: ASTM B3.
2. Assembly of Stranded Conductors: ASTM B8.
3. Tinned Conductors: ASTM B33.

G. Ground Bus: Bar annealed copper bars of rectangular cross section.

H. Braided Bonding Jumpers: Copper tape, braided No. 30 gage bar copper wire, terminated with copper ferules.

I. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inches thick and 2 inches wide, except as indicated.

J. Connector Products
1. General: Listed and labeled as grounding connectors for materials used.
2. Pressure Connectors: High-conductivity-plated units.
3. Bolted Clamps: Heavy-duty units listed for application.
4. Exothermic Welded Connections: Provide in kit form and select for specific types, sizes, and combinations of conductors and other items to be connected.

PART 3 - EXECUTION

3.01 GENERAL

A. Install products in accordance with NEC, manufacturer's instructions, applicable standards, and recognized industry practices to ensure products serve intended function.

3.02 CONDUITS AND CONDUIT FITTINGS

A. Complete conduit installation prior to installing cables.

B. Unless specifically indicated otherwise on Drawings, use rigid galvanized steel conduit for general wiring.

C. Provide watertight conduit system where installed in wet places, underground or where buried in masonry or concrete.

D. EMT conduit may be used for conduit sizes up to 4 inches.

E. Conduit shall be run concealed except exposed surface conduit may be installed where noted on Drawings or where concealment found to be impractical or impossible, and only with approval of ENGINEER.

F. Continuous from outlet to outlet and from outlets to cabinets, junction or pull boxes.

G. Enter and secure to boxes ensuring electrical continuity from point of service to outlets.

H. Conduit runs extending through areas of different temperature or atmospheric conditions or partly indoors and partly outdoors shall be sealed, drained, and installed in manner preventing drainage of condensed or entrapped moisture into cabinets, motors or equipment enclosures.

I. Run conduits within concrete structures parallel to each other and spaced on center of at least three times conduit trade diameter with minimum 2-inch concrete covering. Conduits over 1 inch may not be installed in slab without approval of ENGINEER.

J. Run exposed conduits parallel to or at right angles with lines of building.

K. Route conduit runs above suspended acoustical ceilings not interfering with tile panel removals.

L. Secure conduit in-place with not less than 1 malleable corrosionproof alloy strap or hanger per 8 feet of conduit.

1. Do not use perforated strapping.

M. Connections to Motors and Equipment Subject to Vibration:

1. Flexible steel conduit not over 3 feet long or where exposed in mechanical and utility areas and not subjected to moisture, dirt, and fumes.
2. Liquidtight flexible conduit not over 3 feet long where exposed in finished areas or where subject to moisture, dirt, fumes, oil, corrosive atmosphere, exposed or concealed, with connectors to ensure liquidtight, permanently grounded connection. Locate where least subject to physical abuse.

N. Use double lock nuts and insulated bushings with threads fully engaged.

O. Connectors at fixture bodies and boxes shall be rigidly secured with galvanized lock nut and bushing.

P. Cap conduits after installation to prevent entry of debris.

Q. Install conduit expansion fittings complete with bonding jumper in following locations.

1. Conduit runs crossing structural expansion joint.
2. Conduit runs attached to two separate structures.
3. Conduit runs where movement perpendicular to axis of conduit may be encountered.

R. Install 4 feet-0 inch to 6 feet-0 inch flexible steel conduit drops from independent junction box mounted above ceiling and accessible from below ceiling to recessed ceiling mounted equipment. Allow for positioning of equipment to tile increments.

S. Negotiate beams and changes in ceiling heights with LB conduit fittings on outside corners and ells on inside corners. Arrange bends and offsets in parallel conduits to present neat symmetrical appearance.

T. In precast areas, run conduits in insulation space or in floor topping without crossing conduits, using 3/4 in. maximum conduit size.

U. Core drill through reinforced concrete with approval of ENGINEER.

V. Split, crushed or scarred conduit not acceptable.

W. Do not route over boiler, incinerator or other high temperature equipment.

X. Flexible metal conduit can only be used for final connections to motors, transformers, or to light fixtures above suspended ceilings.

3.03 SURFACE METAL RACEWAY

A. None required.

3.04 WIRE AND CABLE

A. Run wire and cable in conduit unless otherwise indicated on Drawings.

B. On branch circuits, use standard colors.

C. Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with 2 half-lap layers of vinyl plastic electrical tape and finish wrap of color coding tape, where required by code.

D. Run ground wire with power circuits; conduit shall not be grounding path.

E. Color Coding: Conductors for lighting and power wiring as indicated below.

Phase	208/120v	480/277v
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

3.05 BOXES

A. Install knockout closures to cap unused knockout holes where blanks have been removed.

B. Locate boxes to ensure accessibility of electrical wiring.

C. Secure boxes rigidly to subsurface upon which being mounted or solidly embed boxes in

concrete or masonry. Do not support from conduit.

D. Do not burn holes, use knockout punches or saw.

E. Provide outlet box accessories as required for each installation such as mounting brackets, fixture study, cable clamps, and metal straps for supporting outlet boxes compatible with outlet boxes being used and meeting requirements of individual wiring situations.

F. Location of outlets and equipment shown on Drawings is approximate. Verify exact location.

G. Minor modification in location of outlets and equipment is considered incidental up to distance of 10 feet with no additional compensation, provided notification of modification is given prior to roughing in of outlet.

H. Flush outlets shall have edges or plaster flush with finished wall or ceiling surfaces so plates can be drawn tightly to wall or ceiling surfaces.

I. Mounting heights:

1. Shall conform to ADA guidelines.
2. In general, unless otherwise shown on Drawings:
    a. Switches: 48 inches above floor to top of box.
    b. AC Receptacles and Telephone Outlets: 15 inches above floor to bottom of box or 6 inches above counters, counter backsplashes in finished areas; 48 inches to top of box above floor in unfinished areas.
    c. Wall Bracket Lighting Fixtures: 8 inches above mirrors or 6 feet-6 inches above floor.
    d. Pushbuttons: 48 inches above floor to top of box.
    e. Motor Starters and Disconnect Switches: 60 inches above floor.
        i. Thermostats: 48 inches above floor.
    f. Bells and Horns: 8 feet-0 inches above floor.
    g. Clocks: 8 ft.-0 inches above floor.
    h. Fire Alarm visual signals 80" above floor.
    i. Emergency Battery Units: 8 ft. - 0 inches above floor or 12" below ceiling.

J. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall, minimum 12 inches.

K. Where emergency switches occur adjacent to normal light switches, install in separate boxes in accordance with NEC and device plate color coding separation.

L. Light Fixture Outlet Boxes:

1. Securely mount with approved type bar hangers spanning structural members to support weight of fixture.
2. Do not support from conduit.
3. Equip with 3/8-inches fixture stud and tapped fixture ears.

3.06 FIRE RATED THROUGH FLOOR FITTINGS

A. None required.

3.07 WIRING DEVICES

A. Do not install devices until wiring is complete.

B. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or otherwise. Make circuit connections by using wire connectors and pigtails.

C. Install gasket plates for devices or system components having light emitting features such as switch with pilot light and dome lights. Where installed on rough textured surfaces, seal with black self-adhesive polyfoam.

D. Ground receptacles with insulated green ground wire from device ground screw to bolted outlet box connection or as shown on Drawings.

E. Wrap wiring devices with insulating tape.

F. Install emergency switches which occur adjacent to normal light switches in separate boxes to maintain systems isolation in accordance with NEC.

3.08 MOTOR STARTERS

A. None required.

3.09 MOTOR AND CIRCUIT DISCONNECTS.

A. Locate disconnect switches as shown on Drawings and required by NEC.

B. Provide control circuit interlock as required by NEC.

3.10 OVERCURRENT PROTECTIVE DEVICES.

A. Install fuses just prior to energizing equipment.

B. Locate circuit breakers as shown on Drawings.

C. Install GFCI receptacles as required by NEC.

3.11 PANELBOARDS

A. Panelboards are existing.

3.12 GROUNDING AND BONDING

A. Application

1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

a. Install separate insulated equipment grounding conductors with circuit conductors. Raceway may be used as equipment ground conductor where feasible in non-hazardous areas and permitted by NEC for lighting circuits. Install insulated equipment ground conductor in nonmetallic raceways unless designated for telephone or data cables.

B. Installation

1. General: Ground electrical systems and equipment in accordance with NEC

requirements except where Drawings or Specifications exceed NEC requirements.

2. Route grounding conductors along shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

C. Connections

1. General: Make connections to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   a. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
   b. Make connections with clean bare metal at points of contact.
   c. Aluminum to steel connections: stainless steel separators and mechanical clamps.
   d. Aluminum to galvanized steel connections: tin-plated copper jumpers and mechanical clamps.
   e. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
2. Exothermic Welded Connections:
   a. Use for connections to structural steel and for underground connections except those at test wells.
   b. Install at connections to ground rods and plate electrodes.
   c. Comply with manufacturer's written recommendations.
   d. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Terminations:
   a. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs.
   b. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to housing, terminate each conduit with grounding bushing.
   c. Connect grounding bushings with bare grounding conductor to ground bus in housing.
   d. Bond electrically noncontinuous conduits at both entrances and exist with grounding bushings and bare grounding conductors.

3.13 FIELD QUALITY CONTROL

A. Control Circuits, Branch Circuits, Feeders, Motor Circuits, and transformers:

1. Megger check to phase-to-phase and phase-to-ground insulation levels.
   a. Do not megger check solid state equipment.
2. Continuity.
3. Short circuit.
4. Operational check.

B. Wiring Devices:

1. Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity, proper ground connection, and wiring faults.

3.14 ADJUSTMENT AND CLEANING

A. Motor Starters and Disconnects:

1. Adjust covers and operating mechanisms for free mechanical movement.
2. Tighten wire and cable connections.
3. Verify overcurrent protection thermal unit size with motor nameplate to provide proper operation and compliance with NEC.
4. Clean interior of enclosures.
5. Touch up scratched or marred surfaces to match original finish.

B. Circuit Breakers:

1. Adjustable settings shall be set to provide selective coordination, proper operation, and compliance with NEC.

C. Restore damaged areas on PVC jacketed rigid conduit with spray type touch-up coating compound or as directed by manufacturer.

D. Pull cleaning plug through conduits to clear of dirt, oil, and moisture.

END OF SECTION

SECTION 16515

LIGHTING

PART 1 - GENERAL

1.01 SCOPE

A. All requirements of Division 1 govern work under this Section.

1.02 SUMMARY

A. Section Includes:
   1. Interior lighting fixtures.
   2. Lamps.
   3. Ballasts.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. C78 Series - Lamps.
   2. C82.2-84 - Fluorescent Lamp Ballasts.
   3. C82.4-85 - Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
   4. ANSI C2-90 - National Safety Code.

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. C62.41-91 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

C. National Fire Protection Association (NFPA):
   1. 70-93 - National Electric Code.

D. Underwriters Laboratory (UL):
   1. 844-90 - UL Standard for Safety Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
   2. 924-90 - UL Standard for Safety Emergency Lighting and Power Equipment.
   3. 935-84 - UL Standard for Safety Florescent-Lamp Ballast.
   4. 1092 (P) - UL Standard for Safety Proposed First Edition of the Standard for Process Control Equipment.
   5. 1570-88 - UL Standard for Safety Florescent Lighting Fixtures.
   6. 1571-91 - UL Standard for Safety Incandescent Lighting Fixtures.
   7. 1572-91 - UL Standard for Safety High Intensity Discharge Lighting Fixtures.
   8. 1573-85 - UL Standard for Safety Stage and Studio Lighting Units.
   9. 1574-87 - UL Standard for Safety Track Lighting Systems.
   10. UL 773-87 - UL Standard for Safety Plug-In, Locking Type Photo controls for Use with Area Lighting.

1.04 DEFINITIONS

A. Fixture: Complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery powered exit signs and emergency lighting units also include battery and means for controlling and recharging battery. Emergency lighting units are available with and without integral lamp heads and lamps.

B. Luminaire: Fixture.

C. Average Life: Time after which 50% will have failed and 50% will have survived under normal conditions.

1.05 SUBMITTALS

A. Product Data:

1. Describe fixtures, lamps, ballasts, poles, emergency lighting units, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and following information:

a. Outline drawings of fixtures indicating dimensions and principal features.

b. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.

c. Data on batteries and chargers of emergency lighting units.

2. Air and thermal performance data for air handling fixtures. Provide data required to be submitted in Section 15940.

3. Sound performance data for air handling fixtures. Provide certified test reports indicating sound power level and sound transmission class.

B. Shop Drawings: Detail nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.

C. Samples: Submit sample of fixture if different than specified.

D. Miscellaneous:

1. For substitutes only, product certifications signed by manufacturers of lighting fixtures certifying that their fixtures comply with specified requirements.

2. Warranty for rechargeable battery.

3. Coordination drawings for fixtures that require coordination with other equipment installed in same space.

E. Submit in accordance with Section 01340.

1.06 QUALITY ASSURANCE

A. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).

1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.

2. Terms "listed" and "labeled" shall be as defined in National Electric Code, Article 100.

B. Regulatory Requirements:

1. National Electric Code: Components and installation shall comply with NFPA 70.
2. Comply with ANSI C2, "National Electrical Safety Code".

C. Coordinate fixtures mounting hardware and trim with ceiling tile.

1.07 WARRANTY

A. Requirements:

1. Special Project Warranty Period (Where called for herein.): 10 years, beginning on date of Substantial Completion. Full warranty shall apply for first year of period, and prorata warranty for last 9 years.
2. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
3. Color Retention: Warranty against fading, staining, chalking due to effects of weather and solar radiation.
4. Furnish extra materials matching products installed, as described below, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to OWNER.
   a. Lamps: 10 lamps for each 100 of each type and rating installed. Furnish at least 1 of each type.
   b. Ballasts: 1 for each 100 of each type and rating installed. Furnish at least 1 of each type.

PART 2 - PRODUCTS

2.01 FIXTURES, GENERAL

A. Comply with requirements specified in Articles below and lighting fixture schedule.

2.02 FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, except as indicated. Form and support components to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White surfaces: 85%.
2. Specular Surfaces: 83%.
3. Diffusing Specular Surfaces: 75%.
4. Laminated Silver Metallized Film: 90%.

E. Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal glass except as indicated.

1. Plastic: Highly resistant to yellowing and other changes due to aging, exposure to heat and UV radiation.

2. Lens Thickness: 0.125 inches, minimum.

2.03 SUSPENDED FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount single fixture. Finish same as fixture.

C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.

D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.04 FLUORESCENT FIXTURES

A. Fixtures: Conform to UL 1570.

B. Ballasts: All fluorescent ballasts shall be electronic type and shall meet the following specs:

1. UL Listed (Class P) sound rating A and CSA certified.
2. Comply with EMI and RFI limits set by the FCC (CFR 47 part 18) or NEMA and not interfere with normal electrical equipment.
3. Meet any applicable standards set forth by ANSI.
4. Be potted or conformal coated in a metallic case and not contain PCBs.
5. Provide normal rated lamp life as stated by lamp manufacturers (i.e. rated life at 3 hour burn time per start).
6. Provide independent test results from an approved testing laboratory for all of the specifications below. This is required for all submitted ballasts.
7. Nominal power factor of .90 or higher.
8. Total harmonic distortion of less than 10% at 120 or 277 volts (universal voltage).
9. Ballast factor 0.70 through 1.2, as shown on the lighting fixture schedule.
10. Frequency of operation shall be 40 kHz - 50 kHz and units shall operate without visible flicker.
11. Ballast efficiency factor shall meet Consortium of Energy Efficiency (www.cee1.org) specifications (adopted by Focus on Energy program).
12. Multi-lamp ballasts shall operate in parallel so that when one lamp burns out, the other lamps will continue to operate at full light output.
13. Ballasts shall carry a minimum 5 year warranty with a $10 replacement labor allowance.
14. Ballasts shall not be affected by lamp failure.
15. Ballasts shall be a standard production item.
16. Ballasts shall be marked with manufacturer's name, part number, supply voltage, power factor, open circuit voltage, current draw for each lamp type and UL Listing.
17. Ballasts shall withstand line transients as defined in IEEE 587, Category A.

C. Acceptable ballast manufacturer’s names and product lines are as follows:

1. Osram Sylvania – Quicktronic High Efficiency and Quicktronic PROstart.

2. GE Lighting – Ultramax and UltraStart.
3. Maxlite – High Efficiency Ballast.
4. Advance – Optanium.
5. Universal Lighting Technologies – F32T8.

D. Manufacturer names are used to develop quality and performance requirements only. All manufacturers and their products shall meet the system performance requirements and this entire specification.

2.05 LAMPS

A. Conform to ANSI C78 series applicable to each type of lamp.

2.06 FINISH

A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.

B. Other Parts: Manufacturer's standard finish.

C. Verify and provide light fixture finishes as selected by ARCHITECT for all light fixture types. Include colored finish selection tables with product submittals. Upon request submit actual material finish swatches for A/E review.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved submittals.

B. Support For Recessed and Semirecessed Fixtures: Units may be supported from suspended ceiling support system. Install ceiling system support rods or wires at minimum of four rods or wires per fixture located not more than 6 inches from fixture corners.

1. Fixtures Smaller Than Ceiling Grid: Install minimum of four rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
2. Fixtures of Sizes Less Than Ceiling Grid: Center in acoustical panel. Support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
3. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.

C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

D. Lamping: Lamp units according to manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Give 7-day notice of dates and times for field tests.

C. Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.

D. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.03 ADJUSTING AND CLEANING

A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 16722

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Dane County City-County Building has a complete fire alarm system in place. This project will provide new devices in the area of remodeling only.

B. The existing fire alarm system within the City/County building is a Simplex 2120 fire alarm control panel that was installed in the early 1980's.

C. Under a recent project completed in 2007, the fire alarm control panel was upgraded to be a SimplexGrinnell 4100U fire alarm control panel. All new fire alarm devices shall be intelligent, addressable devices that are compatible with the 4100U fire alarm control panel currently installed.

D. The contractor shall be aware the building does meet the definition of high-rise construction and all fire alarm devices shall contain the ability for digital voice communications. Therefore, speaker/strobe devices will be used instead of horn/strobe devices. Provide any necessary power extender (NAC) panels for the visual notification devices as required.

E. Provide wiring as required to incorporate these new devices into the existing SimplexGrinnell 4100U fire alarm control panel. Coordinate this work with the Madison sales office of SimplexGrinnell.

F. The Contractor shall be aware that most of the building will remain occupied during construction of this remodeled area.

1. The Contractor shall be responsible for turning off/turning on the fire alarm system to allow for work to be performed. Also, the Contractor shall be responsible for contacting Dane County building maintenance staff at any time when the fire alarm system is down. This will allow for an announcement to be made to all building occupants.
2. All testing shall be done during non-occupied hours.
3. Extreme care should be taken on the part of the Contractor to reduce or eliminate nuisance tripping of the fire alarm smoke detectors during construction. Extensive nuisance tripping of the fire alarm system cannot be tolerated due to the high volume of occupants in the building.

1.02 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. National Fire Protection Association (NFPA):
   a. NFPA No. 70 - National Electric Code (NEC).
   b. NFPA No. 101 - Life Safety Code.
2. Wisconsin Enrolled Building Commercial Building Code 2002.
3. Underwriters Laboratories, Inc.
4. Local codes and ordinances.

B. Reference Standards:

1. National Fire Protection Association (NFPA):

a. NFPA No. 72

2. National Electrical Manufacturer's Association (NEMA).

C. System equipment to be of one manufacturer and supported by factory trained, established service organization of equipment manufacturer who shall stock parts for equipment supplied.

D. Manufacturer's Services:

1. Manufacturer's representative factory trained service engineer for equipment specified herein shall be present at job site to supervise final adjustment of system after installation complete, equipment startup, and training of OWNER'S personnel for system operation.

2. Manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system related areas.

1.03 SUBMITTALS

A. Shop Drawings to include:

1. Data sheets and equipment description.

2. Bill of materials listing components.

3. Component wiring diagrams.

4. System wiring and interconnection diagrams showing all devices – not a typical diagram.

B. Operation and Maintenance (O & M) Data: Submit in accordance with Division 1. Provide electronic record drawings in Autocad Version 2002 or newer on CD.

C. Field quality control test results.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Receive equipment at job site, verify applicable components and quantity delivered per invoice.

B. Handle equipment to prevent internal components damage, breakage, denting, and scoring enclosure and finish.

C. Do not install damaged equipment.

D. Store equipment in clean, dry space and protect from dirt, fumes, water, construction debris, and physical damage.

E. After installation, protect from damage by Work of other trades.

PART 2 - PRODUCTS

2.01 GENERAL

A. Use of manufacturer's name and model or catalog number is for purpose of establishing standard of quality, general configuration, and operating characteristics desired only.

2.02 ACCEPTABLE MANUFACTURERS

A. SimplexGrinnell

B. Due to the existence of the existing SimplexGrinnell fire alarm control panel, no other manufacturers will be accepted.

2.03 SYSTEM OPERATION

A. The system operation for the existing SimplexGrinnell 4100U fire alarm control panel shall remain as is with no modifications. This equipment was recently installed

2.04 FIRE ALARM CONTROL PANEL

A. The fire alarm control panel is an existing SimplexGrinnell 410U addressable FACP. This equipment will remain in place and the fire alarm system shall be extended to the areas of remodeling with compatibility with this fire alarm control panel.

2.05 SMOKE DETECTION

A. Duct smoke detector shall be SimplexGrinnell addressable True Alarm Photoelectric Sensor 4098-9755.
   1. Analog addressable.
   2. For air velocity between 300 and 4000 feet per minute.
   3. Sampling tube as required for duct width dimensions.
   4. Provide remote test switch/indicator station for each duct detector.

B. Isolation module:
   1. Automatically isolate wire-to-wire short circuit from SLC loop.
   2. Provide one for each 20 addressable/intelligent devices.
   3. Amber LED shall flash to indicate activation.
   4. Mount on 4 inch square or 4 inch square box with 2 gang ring.

2.06 HEAT DETECTION

A. Heat detector shall be SimplexGrinnell E-Series Electronic Heat Detector 4098 series
   1. Analog addressable fixed plus rate of rise.
   2. Dual termistors.
   3. Self restoring.
   4. Mount on 4” octagon or 4” square box with square to round ring.

2.07 MODULES:

A. Monitor module
   1. Monitor contact closing devices (Class B).
   2. Addressable.
   3. Mounts on 4” square or 4” square with 2 gang ring.

B. Control module
   1. Addressable.
   2. DPDT relay contact rated at 3.0A, 30VDC, 0.5A 110VAC.

3. Mount on 4” square or 4” square with 2 gang ring.
4. Must be located with 3’ of device being controlled.

C. Isolation module
1. Automatically isolate wire-to-wire short circuit from SLC loop.
2. Provide one for each 20 addressable/intelligent devices (Maximum of 25 devices per module).
3. Amber LED shall flash to indicate activation.
4. Mount on 4” square or 4” square with 2 gang ring.

2.08 NOTIFICATION DEVICES - SIGNALS

A. Speaker/Strobe unit shall be Wheelock Series ET70 addressable speaker/visual notification devices.
1. Speaker
a. High quality voice or tone reproduction with tamps for 1/4, 1/2 , 1 or 2 watts at 25 or 70.7 VRMS.
2. Strobe
a. 15/75cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela requirements).
3. Mounts on 4” square or 4” square with 1- or 2-gang ring.
4. All devices shall be wall-mounted wherever possible. However, where required due to existing conditions, ceiling mounted speaker/strobe devices shall be allowed to be used.

B. Strobe unit shall be Wheelock Series RSS visual notification devices mounted to RSSP plates.
1. 15/75cd, 75cd, or 110cd strobe as required (synchronized) (See plans for candela requirements).
2. Mounts on 4” square box or 4” square with 1- or 2-gang ring.

2.09 NOTIFICATION APPLIANCE CIRCUIT PANEL

A. Notification Appliance Circuit Panel (NAC) shall be SimplexGrinnell 4009 Series
1. Provides four, power-limited NACs with general alarm operation, available as Class B or Class A, each rated 2 A (expandable to eight NACs)
a. Includes 8 A power supply/charger
b. Follows coded or non-coded alarm input

2.10 SLAVE FAN RELAY

A. Slave fan relay shall be SimplexGrinnell model 4090-9002 Relay IAM

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which fire alarm system to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of Work.

3.02 INSTALLATION

A. Installation of the Fire Alarm/Life Safety System shall be in strict compliance with manufacturer's recommendations. Consult the manufacturer's Control Panel and Peripheral Equipment installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation.

B. Power Requirements:

1. The Fire Alarm Control Panel (FACP) and/or Notification Appliance Circuit (NAC) panels shall be connected to a separate 20 ampere, 120 volt dedicated branch circuit labeled as FIRE ALARM.
2. The Control Panel Cabinet shall be grounded securely using a copper grounding conductor.
3. Conduit shall enter into the Fire Alarm Control panel backbox only at those areas of the back box which have factory conduit knockouts.
4. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring: an audible and visual trouble signal will be activated until system and its associated field wiring are restored to normal condition.

C. Cables must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.

D. SLC loops shall be loaded to no more than 75% of their capacity.

E. Install wiring in accordance with Section 16001 and shall be in accordance with the NEC, NFPA 72 1999, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer. See Article 3.06 FREE AIR CABLING for further requirements.

1. SLC loop shall be 2 #16 shielded FPLR or FPLP cable as required.
2. Signal circuit wiring shall be 2 conductor #14 or 2 conductor #12 FPLR or FPLP cable as required. 2#14 or 2#12 THHN is acceptable if signal circuits are enclosed in listed raceway. Synchronization modules shall be utilized to provide audio and visual synchronization over 2 conductors. Consult loading chart for proper wire gauge and wire length to insure against excessive DC voltage drop. A minimum of 20.5V DC must be available at the last signal of a NAC under full alarm condition.
3. Provide 2 #14 from control panel or door holder power supply to door holders.

F. Provide all fire alarm system wiring drops to devices within raceways and junction boxes. Where existing conditions prohibit fishing existing walls, so as to avoid excessive cutting and restoration metallic wiremold finished to match existing wall surface shall be permitted where allowed by OWNER/ENGINEER, routing subject to OWNER/ENGINEER approval. Install conduit in accordance with Section 16001 and as shown on Drawings.

G. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

H. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage. Ref: NFPA 72, 1999 2-3.6.1.3.

I. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas if approved by Owner/Engineer before installation. All system junction boxes shall be as manufactured by system supplier or painted red and stenciled with fire alarm system designation.

J. All fire detection and alarm system devices shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas if approved by Owner/Engineer before installation.

K. All conductor identification shall be labeled in accordance with 16001 at all accessible locations including at control panel, junction boxes and at devices for future tracing and maintenance.

L. Provide concealed 3/4" conduit and wire to telephone terminal board from main fire alarm control panel.

M. Coordinate connections with supplier of central station network system.

N. Provide concealed ¾” conduit and wire to security panel for monitoring of trouble, supervisory and system alarm.

3.03 ADJUSTMENT AND CLEANING

A. Clean system equipment and enclosure of dirt and debris.

3.04 FIELD QUALITY CONTROL

A. Provide the service of a NICET certified, Level II minimum, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and test for the system.

B. System shall test free from grounds, opens, and short circuits.

C. Upon completion of installation of fire alarm equipment, CONTRACTOR shall provide ENGINEER with signed written statement substantially in form as follows.

D. "The undersigned having been engaged as the CONTRACTOR on the DANE COUNTY CITY-COUNTY BUILDING confirms the fire alarm equipment was installed in accordance with wiring diagrams, instructions, and directions provided to us by the manufacturer."

3.05 WARRANTY

A. All work performed and all material and equipment furnished under this contract shall be from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

3.06 FREE AIR WIRING

A. All wiring shall be run “free-air”, in conduit or in surface raceway. "Free-air" wiring is allowed where it can be completely concealed. If wiring cannot be concealed, it shall be installed in wiremold in finished areas and in conduit in unfinished areas.

B. Where installed “free-air”, comply with the following:

1. Cable shall run at right angles and be kept clear of other trades work.
2. Cables shall be supported according to code utilizing bridle rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
3. Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be used.
4. Cable shall never be laid directly on the ceiling grid.
5. Cables shall not be attached to or supported by, existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
6. A coil of 2 feet in each cable shall be placed in the ceiling at each “free-air” wired fire alarm device. These "service loops" shall be secured at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
7. Devices wired with conduit shall be provided with an 8-inch wire tail at each device box and 36-inch wire tails at the FACP and FAAP.
8. To reduce or eliminate EMI, the following minimum separation distances from ≤480V Power lines shall be adhered to:
    a. Twelve (12) inches from power lines of <5-kVa.
    b. Eighteen (18) inches from high voltage lighting (including fluorescent).
    c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
    d. Thirty-nine (39) inches from transformers and motors.
9. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellem grips shall be used to spread the strain over a longer length of cable.
10. Manufacturers minimum bend radius specifications shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
11. All vertical cable extensions to fire alarm devices located below the finished ceiling shall be in conduit.

C. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.

D. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a “break-away” or other approved method.

3.07 DEPARTMENT OF COMMERCE SUBMITTALS

A. This Contractor is responsible for making required Department of Commerce or City of Madison Fire Department submittals.

B. Pay any Department of Commerce or City of Madison Fire Department fees for reviewing submittal. These fees should be included in the contractors bid.

C. Make submittal after engineering review has been obtained for shop drawings.

D. Incorporate any Department of Commerce or City of Madison Fire Department comments into shop drawings and as-builts.

END OF SECTION