BID OF_____

2012

PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS

FOR

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS

CONTRACT NO. 6870

IN

MADISON, DANE COUNTY, WISCONSIN

AWARDED BY THE COMMON COUNCIL
MADISON, WISCONSIN ON_____

PLEASE RETURN PLANS AND SPECIFICATIONS TO:

CITY ENGINEERING DIVISION
1600 EMIL STREET
MADISON, WISCONSIN 53713

www.cityofmadison.com/business/pw

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

INDEX

This Proposal, and Agreement have
been prepared by:

CITY ENGINEERING DIVISION
CITY OF MADISON
MADISON, DANE COUNTY, WISCONSIN

Robert F. Phillips, P.E., City Engineer

SECTION A: ADVERTISEMENT FOR BIDS

REQUEST FOR BID FOR PUBLIC WORKS CONSTRUCTION
CITY OF MADISON, WISCONSIN

A BEST VALUE CONTRACTING MUNICIPALITY

CONTRACT NO.	PROJECT NAME:
6870	GOODMAN MAINTENANCE FACILITY BUILDING B - HEATING AND VENTILATION IMPROVEMENTS

Plans and Specifications are available at 1600 Emil Street, Madison, WI 53713; 608-267-1197 or on our website at www.cityofmadison.com/business/pw/contracts/openforBid.cfm.

PREQUALIFICATIONS

Bidders who have not been prequalified by the City Engineer and Affirmative Action Director for the period of **February 1, 2012 to January 31, 2013** must submit their application on or before 1:00 p.m., MAY 4, 2011, Room 115, City-County Building, Madison, WI 53703. Postmark is not applicable. Contractors be prequalified by the City Engineer including an affirmative action plan approved by the Affirmative Action Director prior to the bid opening or the bid will be rejected. Forms are available at the same location or on our website at www.cityofmadison.com/business/pw/forms.cfm.

OTHER REQUIREMENTS

Sealed bids must be accompanied with a Bid Bond equal to at least 5% of the bid or a Certificate of Annual/Biennial Bid Bond or certified check, payable to the City Treasurer.

Prevailing Wage Rates may be required and are attached in Section I of the contract. See Special Provisions to determine applicability.

Deadline for the Submittal of Bid is MAY 11, 2012 by 1:00 PM, at 1600 Emil Street, Madison, WI 53713.

Bid Opening will be on MAY 11, 2012 at 1:30 PM at 1600 Emil Street, Madison, WI 53713.

REQUEST FOR BIDS FOR PUBLIC WORKS CONSTRUCTION FOR THE CITY OF MADISON, WISCONSIN

A BEST VALUE CONTRACTING MUNICIPALITY

Plans and Specifications for Public Works Projects that are open for bid are available on the City of Madison website at http://www.cityofmadison.com/business/PW/contracts/openforBid.cfm or by calling City Engineering at 608-266-4751.

Sealed bids must be accompanied with a Bid Bond equal to at least 5% of the bid or a Certificate of Annual/Biennial Bid Bond or certified check, payable to the City Treasurer.

Prevailing Wage Rates may be required and are attached in Section I of the contract. See Special Provisions to determine applicability.

Bidders must be prequalified with the City Engineer and the Affirmative Action Director. Deadline date for submittal of application is noticed on our website. Forms are available on the web at http://www.cityofmadison.com/business/pw/forms.cfm or by contacting City Engineering at 608-266-4620

Publ. WSJ APRIL 27 & MAY 4, 2012

SECTION B: INSTRUCTIONS TO BIDDERS

The City of Madison Standard Specifications for Public Works Construction - 2012 Edition, as supplemented and amended from time to time, forms a part of these contract documents as if attached hereto.

These standard specifications are available on the City of Madison Public Works website at www.cityofmadison.com/Business/PW/specs.cfm or by contacting City Engineering Division, Room 115, City-County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53703.

The Contractor shall review these Specifications prior to preparation of proposals for the work to be done under this contract, with specific attention to Article 102 **"BIDDING REQUIREMENTS AND CONDITIONS"** and Article 103 **"AWARD AND EXECUTION OF THE CONTRACT."** For the convenience of the bidder, below are highlights of three subsections of the specifications.

Section 102.1: Pre-Qualification of Bidders

In accordance with Wisconsin State Statutes 66.0901 (2) and (3), all bidders must submit to the Board of Public Works proof of responsibility on forms furnished by the City. The City requires that all bidders be qualified on a biennial basis.

Bidders must present satisfactory evidence that they have been regularly engaged in the type of work specified herein and they are fully prepared with necessary capital, materials, machinery and supervisory personnel to conduct the work to be contracted for to the satisfaction of the City. All bidders must be pre-qualified by the Board of Public Works for the type of construction on which they are bidding prior to the opening of the bid.

In accordance with Section 39.02(9)(a)l. of the Madison General Ordinances, all bidders shall submit in writing to the Affirmative Action Division Manager of the City of Madison, a Certificate of Compliance or an Affirmative Action Plan at the same time or prior to the submission of the proof of responsibility forms. The bidder shall be disqualified if the bidder fails to or refuses to, prior to opening of the bid, submit a Certificate of compliance, Affirmative Action Plan or Affirmative Action Data Update, as applicable, as defined by Section 39.02 of the Madison General Ordinances (entitled Affirmative Action) and as required by Section 102.11 of the Standard Specifications.

Section 102.4: Proposals

No bid will be accepted that does not contain an adequate or reasonable price for each and every item named in the Schedule of Unit Prices.

A lump sum bid for the work in accordance with the plans and specifications is required. The lump sum bid musts be the same as the total amounts bid for the various items and it shall be inserted in the space provided.

All papers bound with or attached to the proposal form are considered a part thereof and must not be detached or altered when the proposal is submitted. The plans, specifications and other documents designated in the proposal form will be considered a part of the proposal whether attached or not.

A proposal submitted by an individual shall be signed by the bidder or by a duly authorized agent. A proposal submitted by a partnership shall be signed by a member/partner or by a duly authorized agent thereof. A proposal submitted by a corporation shall be signed by an authorized officer or duly authorized registered agent of such corporation, and the proposal shall show the name of the State under the laws of

which such corporation was chartered. The required signatures shall in all cases appear in the space provided therefore on the proposal.

Each proposal shall be placed, together with the proposal guaranty, in a sealed envelope, so marked as to indicate name of project, the contract number or option to which it applies, and the name and address of the Contractor. Proposals will be received at the place and until the hour on the date designated in the advertisement. When sent by mail, the sealed proposal marked as indicated above shall be enclosed in an additional envelope. Proposals sent by mail, submitted in person or otherwise delivered must be in the hands of the official conducting the letting by the hour on the date designated in the advertisement. Proposals received after the date designated will be returned to the bidder unopened.

The Bidder shall execute form ERD-7777 (R.9/03), a part of these proposal pages and submit same with the bidder's proposal, if applicable. REFER TO PROPOSAL SECTION.

Section 102.5: Bid Deposit (Proposal Guaranty)

No proposal shall be considered unless either (i) it is accompanied by a bid deposit of the character and amount described in the Advertisement for Bids or (ii) a biennial bid bond in an amount and form acceptable to the City of Madison has been previously submitted.

Bid deposits of unsuccessful bidders shall be returned following the award of the contract by the Common Council. Bid deposit of the successful bidders shall be returned within forty-eight (48) hours following execution of the contract and bond as required.

Bidders for this Contract(s) must be Pre-Qualified for at least one of the following type(s) of construction denoted by an ☒

Building Demolition

101 ☐ Asbestos Removal
120 ☐ House Mover
110 ☐ Building Demolition

Street, Utility and Site Construction

201 ☐ Asphalt Paving
205 ☐ Blasting
210 ☐ Boring/Pipe Jacking
215 ☐ Concrete Paving
220 ☐ Con. Sidewalk/Curb & Gutter/Misc. Concrete Work
221 ☐ Concrete Bases and Other Concrete Work
225 ☐ Dredging
230 ☐ Fencing
235 ☐ Fiber Optic Cable/Conduit Installation
240 ☐ Grading and Earthwork
242 ☐ Infrared Seamless Patching
245 ☐ Landscaping, Maintenance
250 ☐ Landscaping, Site and Street
251 ☐ Parking Ramp Maintenance
255 ☐ Pavement Sealcoating and Crack Sealing
260 ☐ Petroleum Above/Below Ground Storage Tank Removal/Installation
265 ☐ Retaining Walls, Precast Modular Units
270 ☐ Retaining Walls, Reinforced concrete
275 ☐ Sanitary, Storm Sewer & Water Main Const.
280 ☐ Sewer Lateral Drain Cleaning/Internal TV Insp.
285 ☐ Sewer Lining
290 ☐ Sewer Pipe Bursting
295 ☐ Soil Borings
300 ☐ Soil Nailing
305 ☐ Storm & Sanitary Sewer Laterals & Water Svc.
310 ☐ Street Construction
315 ☐ Street Lighting
318 ☐ Tennis Court Resurfacing
330 ☐ Traffic Control During Construction
320 ☐ Traffic Signals
325 ☐ Traffic Signing & Marking
335 ☐ Trucking
399 ☐ Other_____

Bridge Construction

501 ☐ Bridge Construction and/or Repair

Building Construction

401 ☐ Floor Covering (including carpet, ceramic tile installation, rubber, VCT
402 ☐ Building Automation Systems
403 ☐ Concrete
404 ☐ Doors and Windows
405 ☐ Electrical - Power, Lighting & Communications
410 ☐ Elevator - Lifts
412 ☐ Fire Suppression
413 ☐ Furnishings - Furniture and Window Treatments
415 ☒ General Building Construction, Equal or Less than $250,000
420 ☐ General Building Construction, $250,000 to $1,500,000
425 ☐ General Building Construction, Over $1,500,000
428 ☐ Glass and/or Glazing
429 ☐ Hazardous Material Removal
430 ☒ Heating, Ventilating and Air Conditioning (HVAC)
433 ☐ Insulation - Thermal
435 ☐ Masonry
437 ☐ Metals
440 ☐ Painting and Wallcovering
445 ☐ Plumbing
450 ☐ Pump Repair
455 ☐ Pump Systems
460 ☐ Roofing and Moisture Protection
461 ☐ Solar Photovoltaic/Hot Water Systems
465 ☐ Soil/Groundwater Remediation
466 ☐ Warning Sirens
470 ☐ Water Supply Elevated Tanks
475 ☐ Water Supply Wells
480 ☐ Wood, Plastics & Composites-Structural & Architectural
499 ☐ Other_____

State of Wisconsin Certifications

1 ☐ Class 5 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for quarries, open pits and road cuts.

2 ☐ Class 6 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for trenches, site excavations, basements, underwater demolition, underground excavations, or structures 15 feet or less in height.

3 ☐ Class 7 Blaster - Blasting Operations and Activities for structures greater than 15 ' in height, bridges, towers, and any of the objects or purposes listed as "Class 5 Blaster or Class 6 Blaster".

4 ☐ Petroleum Above/Below Ground Storage Tank Removal and Installation (Attach copies of State Certifications.)

5 ☐ Hazardous Material Removal (Contractor to be certified for asbestos and lead abatement per the Wisconsin Department of Health Services, Asbestos and Lead Section (A&LS).) See the following link for application: http://www.dhs.wisconsin.gov/Asbestos/Cert/Index.htm. State of Wisconsin Performance of Asbestos Abatement Certificate must be attached.

6 ☐ Other_____

SECTION C: SBE

Instructions to Bidders
City of Madison
SBE Program Information

SBE (Not Applicable)

SECTION D: SPECIAL PROVISIONS

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

It is the intent of these Special Provisions to set forth the final contractual intent as to the matter involved and shall prevail over the Standard Specifications and plans whenever in conflict therewith. In order that comparisons between the Special Provisions can be readily made, the numbering system for the Special Provisions is equivalent to that of the Specifications.

Whenever in these Specifications the term "Standard Specifications" appears, it shall be taken to refer to the City of Madison Standard Specifications for Public Works Construction and Supplements thereto.

SECTION 102.10: MINIMUM RATE OF WAGE SCALE

For this project, payment of prevailing wages (white sheet) is not required if either: a single trade accounts for 85% or more of the total labor costs of the project and the bid is less than $48,000; or no single trade accounts for 85% or more of the total labor costs of the project and the bid is less than $100,000. For bids not meeting either of these conditions, prevailing wages shall be required.

If required, the wages and benefits paid on the contract shall not be less than those specified in the Prevailing Wage Determination included with these contract documents for the following types of work:

- ☒ Building and Heavy Construction
- ☐ Sewer, Water, and Tunnel Construction
- ☐ Local Street and Miscellaneous Paving Operations
- ☐ Residential and Agricultural Construction

All bidders are notified that all labor employed on City contracts must be paid in accordance with the minimum rate of wage scale included in the Contract Documents.

For the information of the employees working on the project, a copy of the wage scale included in the contract documents and the provisions of Section 66.0903(8) of the Wisconsin Statutes shall be kept posted by the employer and in at least one conspicuous and easily accessible place at the site of the project.

The Contractor shall keep weekly payroll records setting forth the name, address, telephone number, classification, wage rate and fringe benefit package of each employee who worked on such City project and all other projects the employee worked in the same period, and the Contractor must keep records of the individual time each employee worked on the project and for each day of the project. Such records shall also set forth the total number of hours of overtime credited to each such employee for each day and week and the amount of overtime pay received in that week. Such records shall, in addition, set forth the full weekly wages earned by each such employee and the actual hourly wage paid to that employee. The Contractor shall submit payroll records to the Engineer every week for those periods when work is being done on the project. Said submittal shall be within twenty-one (21) calendar days of the end of the Contractor's weekly pay period.

The Contractor shall ensure that employees shall be paid unconditionally and shall receive the full amounts accrued at the time of payment, computed at rates not less than those stated in the City of Madison "Minimum Rate of Wage Scale" and that each employee's rate shall be determined by the work that is done within the trade or occupation classification which should be properly assigned to such

employee. Questions regarding an employee's classification or rate of pay within that classification, shall be resolved by the practice that predominates in the industry and on which the trade or occupation rate/classification is based. Therefore, rate of pay, classification and work jurisdiction disputes shall be resolved by relying upon practices established by collective bargaining agreements and guidelines used in such determinations by appropriate recognized trade unions operating within the City of Madison.

The Contractor shall agree that the normal rate of wage paid to the Contractor's employees on other projects shall not be reduced or otherwise diminished as a result of the requirement to pay no less than the minimum rate of wage scale on a City project. Mulcting of employees on City projects by contractors, such as by kickbacks or other such devices, is prohibited.

These contract provisions shall apply to all work performed on the contract by the Contractor with its own organization and with assistance of laborers under its immediate superintendency and to all work performed by piecework or by subcontract. No laborer, worker, or mechanic shall be employed directly upon the site of the work except on a wage basis, but this shall not be construed to prohibit the rental of equipment from individuals.

In the event of a refusal by the Contractor to submit payroll records as required by the contract, the City of Madison shall have the option to cancel this contract and request the Surety to perform or to relet the balance of the work for bids, and in that event, to charge the Contractor for any loss which the City may incur thereby.

SECTION 102.12: BEST VALUE CONTRACTING

This Contract shall be considered a Best Value Contract if the Contractor's bid is equal to or greater than $51,500 for a single trade contract; or equal to or greater than $251,000 for a multi-trade contract pursuant to MGO 33.07(7).

SECTION 105.1: AUTHORITY OF THE ENGINEER

The Engineer shall resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of the plans and Specifications, acceptable fulfillment of the contract, compensation, and disputes and mutual rights between Contractors under the Specifications. The Engineer shall determine the amount and quantity of work performed and materials furnished.

All decisions of the Engineer shall, when so requested, be rendered in writing. They shall be final and conclusive in all matters unless within ten (10) days after such decision the Contractor applies in writing to the Board of Public Works for a review of such decision.

Any change proposed by a Contractor in SBE subcontractors, vendors or suppliers from those SBEs indicated on the SBE Compliance Report must be approved by the Engineer and the City's Manager of the Affirmative Action Division (hereafter, AAD). When requested, such decision shall be rendered in writing. Such decisions shall be final and conclusive in all matters unless within ten (10) days after such decision the Contractor or the affected SBE applies in writing to the Board of Public Works for a review of such decision.

In the event the Engineer and the AAD disagree over the proper decision to be made regarding an SBE, the Mayor shall appoint a third person to resolve the disagreement, within 30 days of appointment. The decision thus rendered may be reviewed by the Board of Public Works upon request of the Contractor or the affected SBE as set forth in Sections 105.1 and 105.2 of the City's standard specifications.

SECTION 109. PROSECUTION OF THE WORK

The Contractor shall begin work on or before July 2, 2012. The total time of completion for the contract shall be NINETY (90) CALENDAR DAYS.

Work shall begin only after the start work letter is received. If it is desirable to begin the work before the above-mentioned date, the Contractor shall establish a mutually acceptable date with the Project Manager.

SECTION 109.2: LIQUIDATED DAMAGES

The fixed daily liquidated damages shall be in accordance to the section 109.9 of the Standard Specification for failure to complete work within the allotted timeframe.

SECTION 01 00 02
GENERAL REQUIREMENTS

PART 1 GENERAL

SCOPE
The work under this section includes general rules for the project. Included are the following topics:

PART 1 – GENERAL
1. Scope of Work
2. Pre-Bid Information
3. Commencement and Completion
4. Contacts
5. Qualifications of Bidder
6. Work by the City and City Furnished Equipment
7. Salvage Materials
8. Provisions for Future Work
9. Special Site Provisions
10. Alternates
11. General
12. Guarantees
13. Sustainable Construction Methods and Materials
14. Schedule of Operations
15. Documents
16. Quality Assurance
17. Codes and Permits
18. Submittals
19. Drawings and Specifications
20. Operation and Maintenance Data
21. Safeguards – Existing Equipment, Underground Utilities and Artifacts
22. Access Panels
23. Sleeves and Openings
24. Lose and Detachable Parts
25. Stairs, Scaffolds, Hoists, Elevators or Cranes

PART 2 - PRODUCTS
1. Specified Items – Substitutes
2. Approved Testing Laboratories

PART 3 - EXECUTION
1. Installation
2. General Installation Methods
3. Delivery, Handling and Storage of Materials
4. Demolition
5. Cutting, Patching and Painting
6. Excavation, Backfill, and Surface Restoration
7. Dewatering
8. Sealing and Firestopping
9. Cleaning
10. Continuity of Service and Shutdown
11. Project Meetings

12. Temporary Construction
13. Identification
14. Lubrication
15. Punch List
16. Tests and Final Acceptance
17. Training and Demonstration
18. Fence
19. Roadway
20. Signs

1. SCOPE OF WORK

Existing Conditions:
The existing 14,760 SF vehicle and maintenance facility is currently heated by a two gas-fired indirect make-up air units with mixing boxes for ventilation provisions. In the ventilation mode, the make-up air unit bring in the minimum fresh air requirements(1/2 CFM/SF) and temper the space with an indirect gas-fired bonnet. Exhaust is gravity powered by roof vents ducted to the floor. Purge exhaust fans provide exhaust from the ceiling for diesel fume removal. The existing 24 volt controls interlock the door operation with shutting down the make-up air units for ventilation.

Proposed HVAC Renovation:

1.Replace two existing make-up air units with one new direct-fired make-up air unit for ventilation purposes only.

2.Provide four suspended gas-fired radiant heaters to satisfy heating requirements providing comfortable conditions for working at the floor level.

3.Convert the existing gravity exhaust vents to mechanical powered exhaust fans to provide code required exhaust(1/2 CFM/SF) from the existing ductwork at the floor.

4.Purge roof fans will be replaced and connected to the new DDC control system with the existing local purge push buttons and a automatic shutoff timer.

5.Extend new DDC controls from Administration building through existing conduits and convert the existing controls system to a DDC Honeywell system with network supervision. The six exhaust fans and make-up air unit can be controlled and ventilation managed during occupied hours for energy savings.

6.New infrared radiant heaters will provide spacing heating and will be controlled by local sensors(4) for local temperature control as required.

2. PRE-BID INFORMATION

Contact Paul Stauffer at (608) 266-4366 to request a separate site visit.
Contact Mike Hein for technical questions.

3.CONTRACT TIME-COMMENCEMENT AND COMPLETION

Please refer to Section 105.15, 109.7, and 110.5 of the Standard Specifications, which can be found here: http://www.cityofmadison.com/Business/PW/specs.cfm.

The successful Bidder must agree to commence the work on or before a date to be specified in a written "Start work Letter" and to fully complete all the work within consecutive 90 calendar days thereafter.

4. CONTACTS

The City's designee for engineering is: Michael Hein
Company: Hein Engineering group
Address: 319 W Beltline Hwy, #111, Madison, WI 53713.
Phone: 608-288-9260
Email: hein@chorus.net

The City's designee for project management: Paul Stauffer
Company: City of Madison
Address: Room 115, 210 Martin Luther King Jr. Blvd.
Phone: 608-266-4366
Email: pstafffer@cityofmadison.com

The City's designee for the site contact: Tom Skaife
Company: City of Madison- Park Division, Badger Road Location
Address: 1501 West Badger Road
Phone: 608-225-4849
Email: tskaife@cityofmadison.com

5. QUALIFICATIONS OF BIDDER

By submitting the bid, the bidder certifies as to meeting the following requirements:

Has completed one or more projects of at least 50% of the size or value of the division of work being bid and the type of work completed is similar to that being bid. If a greater magnitude of experience is deemed necessary, other than size or value of the work, such requirements will be described in the appropriate technical section of these specifications.

Has access to all necessary equipment and has organizational capacity and technical competence necessary to do the work properly and expeditiously.

Maintains a permanent place of business.

6. WORK BY THE CITY AND CITY FURNISHED EQUIPMENT

All asbestos removal. Existing building materials that may have hazardous content and are located within the work area (example: floor tile, ceiling tile, pipe insulation) shall be sampled, tested, and removed by the City. If any suspect hazardous building materials are found by the contractor during demolition or renovation work that have not been sampled and tested, work must stop and a certified hazardous material inspector must be contacted by the City to assess the situation. Inaccessible areas may exist within the facility.

The following work will be accomplished by the City or will be let under separate contracts and will not be included under this Contract:
The City shall provide for the upgrade of the gas meter to allow for 2 psi gas. The contractor shall coordinate with the project manager. No other work or equipment will be supplied by the City or let under separate contracts.

7. SALVAGE MATERIALS

No materials removed from this project shall be reused except as specifically noted below. All materials removed shall become the property of and shall be disposed of by the Contractor.

8. PROVISIONS FOR FUTURE WORK

Not applicable to this project

9. SPECIAL SITE CONDITIONS

Unless otherwise noted, construction operations shall be limited to the hours between 7:30 a.m. and 6:00 p.m., Mondays through Fridays, except for holidays. A request must be made to the City forty-eight hours in advance for approval of work days or hours other than those stated above. Compliance is required with the City of Madison Noise Ordinance.

Vehicle parking is available for Contractor's use. Arrangements of locations and times shall be made through the site contact person at the pre-construction meeting.

No permanently reserved on-site loading zone will be provided for Contractor's use. For loading and unloading, a vehicle-parking stall may occasionally be reserved for a short time duration (e.g. one day) if arranged in advance with the site contact.

No permanently reserved on-site space for a trash container will be provided. Occasionally a trash container may be brought in for a short duration (e.g. two to three days) if arranged in advance with the site contact.

Remainder of the building and site will be occupied during construction. Contractors shall take particular care to avoid disturbance and disruption to the existing building structure and to the ongoing activities of the occupants.

A temporary field office and temporary toilets are not required. The Contractor's labor force may use City facilities upon approval by the City. The Contractor shall maintain the toilets and other spaces provided by the City in clean and sanitary condition at all times.

10. ALTERNATES

Base Bid and Alternates include costs of all supporting elements required, so that the combination of Base Bid and any Alternates are complete.
The scope of work for Alternates shall be in accordance with applicable Drawings and Specifications.
Except as otherwise indicated, complete work described in Alternates with no increase in Subcontract Time.
This section includes non-technical descriptions of Alternates. Refer to specific sections of the Specifications and to Drawings for technical descriptions of Alternates.
Coordinate related work and modify surrounding work as required to integrate Alternates into the Work.
Base Bid includes all work indicated, except work described as Alternates.

11. GENERAL

The City of Madison Standard Publications for Public Works Construction – current Edition, as supplemented from time to time, forms a part of these contract documents as if attached hereto.

These Standard Specifications are available upon request form the City Engineer, City Engineering Division, Room 115, City County Building, 210 Martin Luther King Jr. Blvd., Madison, WI 53710. An electronic copy is available from the City Website http://www.cityofmadison.com/business/pw/specs.cfm. The Contractor shall review these specifications prior to preparation of proposal for the work to be done under this contract. Failure to do so does not relive the Contractor from meeting all requirements.

All articles in these General Requirements are applicable to all Divisions and Sections apply to each Division of these Specifications as fully as if repeated within that Division. The Conditions of the Contract, General and Supplementary General Conditions, and these General Requirements shall apply to the Contractor and engaged in this work. Items listed under Scope of Work for each Division of the Specifications are not necessarily all inclusive.

Portions of these specifications are of the abbreviated, simplified type and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "in conformity with", "shall be", "as noted on the drawings", "in accordance with details", are intentional. Omitted words or phrases shall be supplied by inference in the same manner, as they are when a note occurs on the drawings. Such terms as approved, reviewed, equal, as directed, as required, as permitted, acceptable, satisfactory mean by or to the City Engineer or designee.

These specifications and drawings are intended to include everything necessary to perform the entire work properly. Every item necessarily required might not be specifically mentioned or shown. Unless expressly stated, all systems and equipment shall be complete and operable. The words "furnish", "install", and "provide" shall mean the same in a sense that the Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the equipment and systems installation herein specified, except such parts as are specifically exempted herein. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, largest quantity or most closely fits the City's intent. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the City's or designee's inspections, tests and approval from the commencement until the acceptance of the completed work. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy. If items are too large to fit into existing space Contractor shall provide smaller model of same type upon approval by The City at no cost to the City. All sizes as given are minimum except as noted. Prior to bidding bidder must visit site to become familiar and verify existing conditions. Failure to do so does not relieve the bidder from the responsibility to verify existing conditions, to point out errors in drawings or specifications or code violations.

Bidders shall bring inadequacies, omissions or conflicts to the City's attention at least ten (10) days before the date set for bid opening. Prompt clarification will be supplied to all bidders of record by addendum. Failure to request clarification or interpretation of the drawings and specifications will not relieve the successful Bidder of responsibility. Signing of the contract will be considered as implicitly denoting that the Contractor has thorough understanding of the scope of work and comprehension of the contract documents. The City is not responsible for verbal instructions.

Information pertaining to existing conditions that are described in the specifications or appear on the drawings is based on available records. While such data has been collected with reasonable care, there is

no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing. This information is provided to inform the Contractor of known, existing conditions so that due diligence is taken by the Contractor to avoid damage. Where site observation or documents indicate existing underground utilities/services in close proximity (within four feet horizontally and/or four feet vertically) to necessary new construction work, the Contractor shall be responsible to test, probe or otherwise determine exact locations so as to prevent damage to such utilities/services.

It is expected that Contractors have access to their own cell phone for their own use. No additional telephone service will be provided.

The City will not furnish Watchpersons. The Contractor shall provide such precautionary measures, to include the furnishing of watchpersons if deemed necessary, to protect persons and property from damage or loss where the Contractor's work is involved.

Contractors shall cooperate with all the testing consultants and verify system completion to the testing consultants. Demonstrate the starting, interlocking and control features of each system so the testing Contractor can perform its work. Testing and balancing (TAB) Contractor shall be direct subcontractor to the Contractor and shall not be the mechanical Contractor or subcontractor to mechanical Contractor.

The Contractor assumes responsibility for all work specified in this contract except for work explicitly noted as being done by the City or a Contractor separately hired by the City. The Contractor shall immediately inform the City of the name of the person(s) designated as Superintendent representing the Contractor at the site.
The Contractor shall take complete charge of the work under this contract and coordinate the work of all trades on the project. All Contractors shall work in cooperation with the Contractor and with each other, and fit their work into the structure as job conditions may demand. The City shall make all final decisions as to the right-of-way and run of pipe, ducts, etc., at prearranged meetings with responsible representatives of the Contractors involved. Contractor(s) shall coordinate the work with adjacent work with other Contractors prior to installation and shall cooperate with all other trades to facilitate the general progress of the work. The Contractor shall coordinate and schedule the work of all its subcontractors, and shall furnish all information required by them for proper scheduling and execution of the work. In the same manner, the Contractor shall coordinate the work with that of the City, and any other Contractor operating in the area, including reasonable adjustments of schedule in order to allow other Contractors or the City to do their work. Coordinate all work with other Contractors prior to installation. Any installed work that is not coordinated and that interferes with other Contractor's work shall be removed or relocated at the installing Contractor's expense.

Each trade shall afford all other trades every reasonable opportunity for the installation of their work and for the storage of their material. In no case will the Contractor(s) be permitted to exclude from the premises or work, any other Contractor or employees thereof, or interfere with any other Contractor in the executing or installation of their work. In case it is indicated which trade is responsible for which work, this is meant as a suggestion and it is the Contractor's responsibility in its contracts with subcontractors to clarify who ultimately will do the work. If conflicts arise between the Contractor and subcontractor about who is responsible for which work to be done it is the Contractor's responsibility to make sure the work gets done in time even if the dispute between Contractor and subcontractor gets settled later.

The City Engineer shall have the right to make final and binding decisions on disputes between the Contractor and any other subcontractor operating in the area regarding: (a) access to the site with work force, equipment, and/or materials to their work area or (b) their adjacent work areas.

The Contractor shall cooperate with other trades and City personnel in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical or piping or

ducting work to better fit the general installation, such work shall be done at no extra cost to the City, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.

The Contractor shall provide and maintain in working order during the entire construction period, a minimum of three (3) fire extinguishers on each floor level, including basement of the building, and one (1) in temporary office. Extinguishers shall be nonfreezing type such as A-B-C rated dry chemical, of not less than 10-pound capacity each. In addition, any subcontractor who maintains an enclosed shed on the site shall provide and maintain, in an accessible location, one or more similar nonfreezing type fire extinguisher in each enclosed shed.

The area to be set aside for the work under this contract is shown on the drawings, and the Contractor shall confine the construction to the immediate area within the construction limits. The Contractor shall immediately upon entering the site for purpose of beginning work, locate general reference points and take such action as is necessary to prevent their destruction. The Contractor shall lay out its work and be responsible for all lines, elevations and measurements of the building and other work executed under its Contract. The Contractor must exercise proper precaution to verify dimensions on the drawings before laying out work and will be held responsible for any error resulting from failure to exercise such precaution. The Contractor shall verify grades, lines, levels, locations, and dimensions as shown on drawings and report any errors or inconsistencies to the City before commencing work. Starting of work by the Contractor shall imply acceptance of existing conditions. Confine all operations, equipment, apparatus and storage of materials, to the immediate area of work to the greatest possible extent. Contractor shall ascertain, observe and comply with all rules and regulations in effect on the project site, including but not limited to parking and traffic regulations, use of walks, security restrictions and hours of allowable ingress and egress. Any special traffic control during construction involving lane closures shall be in accordance with the federal standard, Manual of Uniform Traffic Control Devices.

Using datum, the lot lines and present levels have been established as shown on the drawings. Other grades, lines, levels and benchmarks, shall be established and maintained by the Contractor, who shall be responsible for them. As work progresses, the Contractor shall lay out on forms and floor, the locations of all partitions, walls and fix column centerlines as a guide to all trades. The Contractor shall make provision to preserve property line stakes, benchmarks, or datum point. If any are lost, displaced or disturbed through neglect of any Contractor, Contractor's agents or employees, the Contractor responsible shall pay the cost of restoration.

The City's payment and guarantee provisions and when and how the City will accept the work are listed in the Standard Specifications under Sections 105.15 and 110.5.

12. GUARANTEES

All work, material and equipment is guaranteed by the Contractor to be free of faults for at least one year or longer if specified elsewhere. This year begins from the date of final acceptance from the City, which is stated in the Standard Specifications under Section 105.16. The Contractor agrees to return to the project and commence work as directed upon notification by the City and will furnish at his own expense all necessary labor and material to make proper repairs or corrections made necessary by defective material or inferior workmanship furnished or performed under this contract. If a subcontractor is not complying, the Contractor is held responsible.

All corrections and repairs are to be made no more than 30 days after notification of the Contractor for equipment and material that is not critical to the operation of the building. Critical equipment and material, including but not limited to HVAC, roofing, electrical, elevator, shall be repaired or brought into temporary and safe working condition in less than 7 days and temporary alternatives have to be provided

by the Contractor. If Contractor fails to do so the City reserves the right to perform the work himself or subcontract a different Contractor and charge the Contractor the full cost of the repair and correction and cost of any material, rental fee, labor and equipment to provide temporary relief and protection to enable safe operation of the building.

13. SUSTAINABLE CONSTRUCTION METHODS AND MATERIALS

All construction methods and materials shall meet these requirements unless specified differently elsewhere. Contractor is to provide all documentations, certifications and other material necessary to prove compliance to the City and third party certifiers.

Construction Activity Pollution Prevention:

- Follow Requirements in Storm Water Pollution Prevention Plan (SWPPP) and Erosion and Sedimentation Control (ESC) Plan
- Stabilize any relocated and moved soil with fast growing grasses and place mulch (hay, woodchips, straw) on it to cover and hold soil
- Divert surface runoff from distributed areas into sediment basin or sediment traps with a mound of stabilized soil
- Construct posts with filter fabric media to remove sediment from stormwater leaving the site.

Site Development:

- Follow requirements in site development plan and don't disturb areas beyond the marked areas

Construction Waste Management:
The contractor shall be responsible for meeting all the requirements of the Madison General Ordinance, Chapter 10, Section 10.185, Recycling and Reuse of Construction and Demolition Debris, for commercial buildings. The contractor shall be required to obtain the Certification and Audit of Compliance as required. In addition the contractor shall make all reasonable efforts to:

- Recycle all recyclable material. This includes any material for which there is a recycling facility in Wisconsin.
- Separate all waste material in plastic, metal, paper, acoustical tile, brick, concrete, clean wood, glass, gypsum drywall, carpet and insulation and provide designated on-site collection areas.
- Keep track of volume and weight of each material and track if it was recycled or disposed otherwise.
- Keep track of volume and weight of donated material and site reused on site
- Haul all recyclable material to recycling facility if one is available in the county at no cost to the City.
- It is permissible to separate waste off-site by specialized recycling contractor. This contractor needs to be provide proof of recycling and needs to be WASTECAP certified as "Accredited Professional in Construction and Demolition Debris Recycling".

Indoor Air Quality:

- During construction the recommended control measures of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ guidelines for occupied buildings under construction, (1995, chapter 3) must be met or exceeded.
- Stored on-site or installed absorptive material must be protected from moisture damage.
- In case permanently installed air handlers are used for ventilation, filtration media with a Minimum efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Contractor shall replace all filtration media immediately prior occupancy.
- All to be installed ductwork, air handlers and other equipment later connected to the indoor air path are to be protected from dirt and debris.

14. SCHEDULE OF OPERATIONS

Within 10 calendar days after the effective date of Start Work Letter, the Contractor shall provide an installation schedule to the project manager. This schedule must show the completion of the project within the stated Contract Time of Completion for the project. Extensions to Contract Time of completion must be made in writing to the project manager or as the requirements of the City's Standard Specifications section 109.8.

Updated scheduled shall be provided to the project manager as the duration of the project changes.

Install work in phases to accommodate City's occupancy requirements. During the construction period coordinate electrical schedule and operations with the City.

15. DOCUMENTS

All electronic files used or created for this project become property of the City. All files have to be submitted to the City upon request and once each phase (design, construction) is completed. Only Microsoft Office, PDF, and AutoCAD version 2008 and lower documents are acceptable. All documents that once existed in Microsoft or AutoCAD version must be submitted in such. AutoCAD files have to be submitted in original drawing form for further use in future projects. Sheet-set files alone will not be sufficient. All AutoCAD files must be submitted as PDF in addition. The Contractor can use CAD files and other files necessary for this project upon request.

The City or designee will provide the Contractor with a suitable set of Contract Documents on which daily records of changes and deviations from contract shall be recorded. Dimensions and elevations on the record drawings shall locate all buried or concealed piping, conduit, or similar items.

The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted. During the first week of each month, the Contractor shall present, at the project site, the job copy showing variations and changes to date to the City for review.

During first week of each month, the Contractor shall present at the project site all changes to architectural/engineering plans for review. At completion of the project, the Contractor shall submit the marked-up record drawings to the City prior to final payment.

Contractor shall provide list with all equipment installed. This list shall contain, but not limited to, type, make and special product key and number. For grant purposes the contractor may have to provide detailed information about equipment installed and labor provided to third party institutions, such as Focus on Energy.

16. QUALITY ASSURANCE

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

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

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the

performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

Contractor shall assume the responsibility for the protection of all finished construction under the Contract and shall repair and restore any and all damage of finished work to its original state. Wheeling of any loads over any type of floor, either with or without plank protection, will be permitted only in rubber-tired wheelbarrows, buggies, trucks or dollies. Where structural concrete is also the finished surface, care must be taken to avoid marking or damaging those surfaces. All structures and equipment shall be constructed, installed and operated with guards, controls and other devices in place.

Contractor shall obtain complete data at the site and inspect surfaces that are to receive the Work before proceeding with fabricating, assembling, fitting or erecting any work under this contract. Contractor shall notify the City in writing in case of discrepancies between existing work and drawings, and of any defects in such surfaces that are to receive the Contractor's work. The City will evaluate the notice and direct what remedial action will be taken.

Starting of work implies acceptance of existing work or the work of others. Removal and replacement of work applied to defective surfaces, in order to correct defects, shall be done at the expense of the Contractor who applied work to defective surfaces.

The Contractor shall:

- Provide, erect and maintain all required planking, barricades, guard rails, temporary walkways, etc., of sufficient size and strength necessary for protection of stored material and equipment; paved surfaces, walks, curbs, gutters and drives; streets adjacent to or within project area; adjoining property and all project work to prevent accidents to the public and the workmen at the job site.
- Notify adjacent property owners if their property interferes with the work so that arrangements for proper protection can be made.
- Provide and maintain proper shoring and bracing to prevent earth from caving or washing into the building excavation. Provide temporary protection around openings through floors and roofs, including elevator openings, stairwells, and edge of slabs.
- Provide and maintain proper shoring and bracing for existing underground utilities, sewers, etc., encountered during excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.
- Provide protection against rain, snow, wind, ice, storms, or heat to maintain all work, materials, apparatus, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged. Remove snow and ice as necessary for safety and proper execution of the work.

- Protect the building and foundations from damage at all times from rain, ground water and back up from drains or sewers. Provide all equipment and enclosures as necessary to provide this protection.
- Damaged property shall be repaired or replaced in order to return it to its original condition. Damaged lawns shall be replaced with sod.
- Protect materials, work and equipment, not normally covered by above protection, until construction proceeds to a point where the general building protection of the area where located, dispenses with the necessity therefore. Protect work outside of the building lines such as trenches and open excavations, as specified above.
- Take all necessary precautions to protect the City's property as well as adjacent property, including trees, shrubs, buildings, sanitary and storm sewers, water piping, gas piping, electric conduit or cable, etc., from any and all damage which may result due to work on this project.
- Repair work outside of property line in accordance with the requirements of the authority having jurisdiction.
- Repair any work, damaged by failure to provide proper and adequate protection, to its original state to the satisfaction of the City or remove and replace with new work at the Contractor's expense.
- Protect trees indicated on the drawings to remain and trees in locations that would not interfere with new construction, from all damage. Do not injure trunks, branches, or roots of trees that are to remain. Do cutting and trimming only as approved and as directed by the City.
- The value of trees destroyed or damaged will be charged against the account of the Contractor responsible for the damage in an amount equal to the expense of replacing the trees with those of similar kind and size.

The contractor shall be fully responsible for inspecting the work of its suppliers, and subcontractors to assure that the work complies with the standards for materials and workmanship required by the contract documents.

The Contractor shall:

- Monitor quality control over subcontractors, suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of the quality specified in the contract documents.
- Comply fully with manufacturer's instructions, including each step in sequence.
- Request clarification from the City before proceeding with work when manufacturers' instructions or reference standards conflict with Subcontract Documents.
- Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or manufactures instructions require more precise workmanship.
- Ensure that work is performed by persons specializing in the specific trade and class of work required, and qualified to produce workmanship of specified quality.
- Secure products in place with positive anchorage devices designed and sized to withstand seismic, static and dynamic loading, vibration, physical distortion or disfigurement.

If reference standards or manufacturers' instructions contain provisions that would alter or are at variance with relationships between the parties to the contract set forth in the contract Documents, the provisions in the contract Documents shall take precedence.

When required by individual Specification sections, Contractor shall provide the following services from a manufacturer's representative:

- Review of Specifications and design and concurrence or suggestions for modification.
- Site observation of conditions of use and substrate.
- Observation of the installation work in progress and on completion.
- Start up, testing, and adjustment of equipment.
- Instruction to the City in operation and maintenance.

- Provide written signed report by manufacturer's representative documenting services provided and any comments or recommendations.

The work will be inspected by City inspectors and/or independent inspection service personnel under coordination of the City. All work is subject to inspection and shall remain accessible and exposed until it has been inspected by the City. The contractor shall notify the City inspector when critical work inspections points of the project are visible or uncovered as required by the City inspector. Any work covered up or made inaccessible before such inspection shall be uncovered and made accessible without additional expense to the City. The City can request inspection of delivered material to confirm meeting of standards and specifications. An installation under supervision of the City can be requested to check proper installation. Contractor is to grant access to all material and finished and unfinished work at any time upon request. At least 3 business days notice has to be given to the City prior to arrival of material and equipment to be inspected. This includes concrete, which will be sampled and tested by the City.

Inspection or testing performed by the City Engineer or his designee shall not relieve the Contractor from responsibility for performing his own quality control and for complying with the requirements of the contract Documents. The City will not be responsible for the Contractor's failure to carry out work in accordance with the contract Documents.

Cooperate and arrange meetings with City or designee (Cx) with any commissioning process . Fill out and submit all documents required by Cx. Commissioning checklists need to be filled out truthfully at the time indicated. This includes but is not limited to delivery checklist (at time of delivery), installation checklist (at time of installation) and start up checklist (at time of startup).
Commissioning involves among other things:

- Inspection of material arriving at site regarding right type, number and undamaged package and proper storage.
- Inspection of installation
- Test of proper function
- Review of Training and submitted O&M material
- Test of proper function before end of warranty period

17. CODES AND PERMITS

Applicable provisions of Public Law, the Constitution and Laws and Statutes of the State of Wisconsin and the codes and regulations of the Department of Energy are hereby referred to and made a part of this contract and all work performed shall be in accordance with such laws, regulations and the latest edition or supplement or amendment thereto in effect at the time of submittal of bid shall be considered to be the issue in effect (unless shown otherwise) of all applicable codes including, but not limited to:

1. Wisconsin Building Code
2. Wisconsin Electrical Code
3. Wisconsin Mechanical Code
4. Wisconsin Plumbing Code
5. Wisconsin Energy Code
6. Wisconsin Fire Code
7. NFPA 70 National Electrical Code
8. General Services Administration 41 CFR Part 101-19
9. Americans with Disabilities Act (ADA)
10. Energy Conservation Performance Standards,
11. Local Codes

Contractor is expected to know or to ascertain, in general and in detail, the requirements of all codes and ordinances, and all rulings and interpretations of code requirements being made by all authorities having jurisdiction over the work performed by them, applicable to the construction and operation of systems covered by this contract. Where codes or standard specifications other than those listed in this paragraph are referred to in the different Divisions of these specifications, it is understood that they apply as fully as if cited here. Where differences exist between codes affecting this work, the code affording the greatest protection to the City shall govern.

Maintenance clearances shall be maintained around equipment as required by the Codes and Standards, and as recommended by the equipment manufacturers. The maintenance envelope and equipment access shall be kept clear of any obstruction. It is Contractor's responsibility to enforce these requirements with all the Contractors. The Contractor shall be responsible for correcting any infringement on this requirement at no cost to the City.

All cost for items and procedures necessary to satisfy requirements of all applicable codes, ordinances and authorities, whether or not these are specifically covered by drawings or specifications. All cases of serious conflict or omission between the drawings, specifications, and codes shall be brought to the City's attention as herein before specified. The Contractor shall carry out work and complete construction as required by applicable codes and ordinances and in such a manner as to obtain approval of all authorities whose approval is required.

Contractor is responsible for obtaining permits at its own cost including expenses for supporting documents. Deliver original permits to the City before work starts. Obtain and pay for all required installation inspections except those provided by the City. Deliver originals of these certificates to the City. Include copies of the certificates in the Operating and Maintenance Instructions. Contractor shall arrange all required inspections and correct all deficiencies at no cost to the City.

The Contractor must maintain all licenses required for the work performed and required by authorities. In addition all licenses and certificates required elsewhere have to be maintained. If a Contractor loses a license for whatever reason he must inform the City immediately after learning about that himself. The Contractor must submit proof of holding the license or certificate upon request.

18. SUBMITTALS

Documents have to be submitted in electronic form (PDF) as described elsewhere in addition to hardcopies no later than 3 business days after start work letter is issued. The City or designee will review, and process shop drawings and other required submittals with reasonable promptness. No delay will be allowed in the progress of the job attributable to Contractor's failure to supply submittals in time.

The Contractor shall submit three (3) prints of all shop drawings, submittal data consisting of brochures, product data sheet, catalogs, material lists, wiring diagrams, Material Safety Data Sheets (MSDS), samples, erection drawings, and equipment layouts for review by the City Engineer or his designee. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked. Submittals shall be processed with such promptness as not to cause delay to the work or to that of any other Contractor. Each submittal shall be provided together with a transmittal letter or form. The following information shall be included on all submitted documents: Agency/Location/Address obtained, project number, building name, project name. Submittals shall be grouped to include complete submittals of related systems, products, and accessories in a single submittal. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered equipment.

Submit all original documents providing information regarding sustainability requirements including but not limited to recycled content, VOC, certified wood, disposal certificates and transportation distance. Contractor is required to prove that material and methods used meet all requirements specified elsewhere.

The City or designee will return the marked and stamped drawings together with transmittal letter or form to Contractor. If re-submittal is required, the City Engineer or designee will so note and Contractor shall make another submission for review after correction resolving the review comments on the prior submittals. The above procedure shall be repeated until the City Engineer or designee favorably reviews the submittal. The submittals must be approved before material is ordered and fabrication is authorized.

The City Engineer's or designee's favorable review of shop drawings and other submittals shall not relieve the Contractor of responsibility for deviations from drawings or specifications, unless the Contractor has in writing called the City Engineer's or designee's attention to such deviations at the time of submission, and the City Engineer or designee has acknowledged in writing such deviations; nor shall it relieve the Contractor from responsibility for errors of any sort in such drawings. If deviations, discrepancies, or conflicts between shop drawing submittals and the drawings and specifications are discovered either prior to or after the shop drawing submittals are reviewed by the City Engineer or designee, the drawings and specifications shall control and shall be followed. The Contractor shall be responsible for and shall check the correctness of all documents including those subcontractors prior to submitting them to the City for review.

The Contractor shall furnish prints of the favorably reviewed final shop drawings, erection drawings, equipment layouts and vendor data to subcontractors and suppliers for the proper coordination of their work. The Contractor shall keep one (1) complete set of the above documents at the job site for the use of the City.

After the completion of the project, and prior to final payment, submit:

- One (1) copy of the Waste Manifest Records to the The City, if required in accordance with "Safety and Environment" Requirements Article "HAZARDOUS SUBSTANCES".
- The original and one (1) copy of all guarantee/warranty documents.

19. DRAWINGS AND SPECIFICATIONS

Drawings indicate approximate locations of the various items. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items on-the-job measurements in conformance with code and cooperation with other trades. Before locating items, confer with the City as to desired location in the various areas. In no case items shall be located by scaling drawings. Contractor must relocate items and bear cost of redoing work or other trades' work necessitated by failure to comply with this requirement.

If electrical items are to be relocated within 10 feet of location shown on drawings and Contractor is informed before work is begun on this portion of the job, the relocation shall be at Contractor's expense. Drawings are schematic in nature and are not intended to show exact locations of conduit but rather to indicate distribution, circuitry, and control.

Standard Specifications: Standard Specifications such as ANSI, AASHO, AWWA, AISC, Commercial Standards, Federal Specifications, NEMA, UL, and the like incorporated in the requirements by reference shall be those of the latest edition at time of receiving bids, unless otherwise specified. The manufacturers, producers and their agents of required materials shall have such specifications available for reference and are fully familiar with their requirements as pertains to their product or material.

Contract Drawings and Specifications on the Job: contract drawings shall be kept on the job by the Contractor shall include at least one copy of Drawings and Specifications, all approved shop and erection drawings and schedules, lists of materials and equipment, as-built drawings, addenda and bulletins, documents relevant to the work. The list of Subcontract drawings is attached to these Specifications.

Maintain a complete, precise, accurate dimensioned record of actual locations of the work, including concealed and embedded work, size and type of equipment, and every change or deviation from original contract drawings at the site. Keep this record legible and correct weekly as the job progresses on black or blue-line prints. Keep Record Drawings available for inspection at all times. Drawings will be inspected before approval of requests for payment.

It shall be the responsibility of the Contractor to submit to the City within ten (10) days after final inspection, one complete marked-up set of contract drawings fully illustrating all revisions made by all the crafts in the course of the work. This shall include all field changes, adjustments, variances, substitutions and deletions, whether covered by Change Order or not. Underground utility installations must be located precisely as constructed on the marked-up drawings.

The Contractor shall not take advantage of any apparent error or omission in the plans or specifications, and the City shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications.

In addition to verifying at the site all measurements shown on the Drawings, Contractor shall consult the Drawings and Specifications of related work or existing construction that may in any manner affect the work of this contract. Contractor shall promptly report to the City, in writing, any errors, omissions, violations, or inconsistencies that may be discovered as a result of such verifications; otherwise, it shall be understood that Contractor accepts all such related data and conditions without reservations.

Layout of existing piping, conduits, and locations of equipment are shown as exactly as could be determined during design of the facilities; but their accuracy, particularly when such layouts and drawings are schematic, cannot be guaranteed. Contractor shall check all Specifications including the Drawings for possible interference with electrical, mechanical, and structural details, as well as interference with existing building or equipment, and shall notify the City of the interference for resolution of the interference before commencing work. Any completed work that interferes shall be corrected by Contractor at Contractor expense so that the original design can be followed.

20. OPERATION AND MAINTENANCE DATA

Submit data bound in 8-1/2 x 11 inch (A4) text pages, Use three D side rings if necessary and binders with durable plastic covers. Submit all documents in electronic form as well as in hardcopy. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.

Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 20-pound white paper, in three parts as follows:

- Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, subcontractors, and major equipment suppliers.

- Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

1. Significant design criteria.
2. List of equipment (including assigned equipment numbers).
3. A description of recommended replacement parts and materials, which the City should stock.
4. Parts list for each component.
5. A summary of equipment vendors, or location where replacement parts can be purchased.
6. List indicating types and grades of oil and/or grease, packing materials, normal and abnormal tolerances for devices, and method of equipment adjustment.
7. Copies of all approved submittals.
8. Operating instructions.
9. Maintenance instructions for equipment and systems, Preventive maintenance recommendations.
10. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
11. Manufacturer's wiring diagrams for electrically powered equipment.
12. A complete set of record control drawings.
13. Additional information as indicated in the technical specification sections

- Part 3: Project documents and certificates, including the following:

1. Product data.
2. Air and water balance reports.
3. Certificates.
4. Photocopies of warranties.
5. Name, address, and telephone number of the person or office to contact for service during the warranty period.
6. Name, address, and telephone number of the person or service organization to be contacted for service after the warranty period.

Submit 1 draft copy of completed volumes 15 [fifteen] days after approval of applicable submittal or receipt of the product. Revise content of all document sets as required prior to final submission. Submit 2 [two] sets of revised final volumes, within 10 [ten] days after final inspection.

21. SAFEGUARDS - EXISTING EQUIPMENT, UNDERGROUND UTILITIES AND ARTIFACTS

Existing utilities, including those listed as abandoned, shall not be moved or otherwise disturbed without written verification by the City that the utility is abandoned.

When altering existing facilities, the Contractor shall take every precaution to preserve and protect existing facilities, both those to be altered and those to remain unaltered that are within the limits of the work.

The Contractor shall notify the City of structural members, piping, conduit, or equipment not indicated for removal that may cause interference with the work. Work shall not proceed in the affected area until instructions have been issued. Do not drill or penetrate existing structures without prior permission. The removal of existing work shall be by methods that will not jeopardize the integrity of structures or systems that are to remain.

Existing utilities, including but not limited to roof drainage systems, underground cables, ducts, roadways, manholes, building fire alarm, public address or telecommunications wiring shall not be moved

or otherwise disturbed, nor electrical circuits or switches operated or taken in or out of service, without prior consent of the City. Contractor shall compensate loss to the City resulting from damage to utilities.

If bones or artifacts are encountered during digging, the City requires that the Contractor stop work within a 50-foot radius of the find and immediately notify the City. Work may continue only with approval from the City.

22. ACCESS PANELS AND DOORS

All serviceable and replaceable devices, including but not limited to valves, boxes, and dampers shall receive an access at a location and in a size that enables proper servicing and repair of the device without removal of other material. The sizes described below are minimum sizes and might be increased if the type and size of device requires it. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the City or designee making sure that access is available for all equipment and specialties. Relocate access panel or door if equipment is not properly accessible to perform all maintenance and repair at no cost to the City.

LAY-IN CEILINGS:
Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration are sufficient; no additional access provisions are required unless specifically indicated.

CONCEALED SPLINE CEILINGS:
Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used.

METAL PAN CEILINGS:
Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09500.

PLASTER WALLS AND CEILINGS:
16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

23. SLEEVES AND OPENINGS

The Contractor requiring sleeved openings shall furnish and install all sleeves required for their penetrations. Contractors furnishing sleeves to others for installation shall do this in a timely manner so as not to impede the project schedule.

Openings that are required and are not shown on the structural and/or architectural drawings shall be the responsibility of the Contractor requiring the openings. The Contractor shall install sleeves for these openings or cut openings as needed (including floor openings within chases).

The Contractor shall be responsible for coordinating locations of their sleeves with work of other trades. The Contractor who requires sleeves and/or openings shall submit through the Contractor, to the City for review and approval, layout drawings of all such required sleeves and/or openings. Sleeve and opening layout drawings shall be received by the City a minimum of two weeks prior to installation of the sleeves and openings. Sleeve and opening sizes and locations shall be dimensioned from column lines and floor elevations or from a point of reference approved by the City.

Provide galvanized sheet metal sleeves for pipe and conduit penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 2 inches above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

For floor penetrations through existing floors in mechanical, food service areas, parking ramps, sanitary pumping stations, swimming pool equipment rooms, chemical storage and hazardous waste storage rooms and other wet locations or locations that can get wet by accident or failure of a component, core drill opening and provide a sleeve fastened to floor surrounding the penetration or group of penetrations to prevent water from entering the penetration. Top of sleeve shall be 4 inches above the adjacent floor. Provide urethane caulk between angles and floor and fasten angles to floor a minimum of 8" on center. Seal corners water tight with urethane caulk. Or, core drill sleeve openings large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement. Size sleeve to allow insulated pipe to pass through sleeve and paint the sleeve.

Pipe sleeves for conduits 6" in diameter and smaller, in new poured concrete construction, shall be schedule 40 steel pipe, plastic removable sleeve or sheet metal sleeve, all cast in place.

24. LOOSE AND DETACHABLE PARTS

Contractor shall retain all loose and small detachable parts of apparatus and equipment furnished under this Contract, until completion of the work and shall turn them over to the City to receive them.

Furnish one can of touch-up paint for each different color factory finish furnished by the Contractor. Deliver touch-up paint with other "loose and detachable parts".

25. STAIRS, SCAFFOLDS, HOISTS, ELEVATORS OR CRANES

The Contractor shall furnish and maintain equipment such as temporary stairs, fixed ladders, ramps, chutes, runways and the like as required for proper execution of work by all trades, and shall remove them on completion of the work. The Contractor shall erect permanent stair framing as soon as possible. Provide stairs with temporary treads, handrails, and shaft protection. Contractors requiring scaffolds shall make arrangements with the Contractor, or shall provide their own and remove them on completion of the work. The Contractor shall underlay its interior scaffolds with planking to prevent uprights from resting directly on the floor construction.

Contractor shall provide and pay for its own hoist/crane or other apparatus necessary for unloading/setting or moving their equipment and materials. Installation and removal of equipment for this activity must be accounted for in the Project Schedule. Equipment and operations for this activity shall comply with applicable Department of Commerce and OSHA requirements. No material hoist may be used to transport personnel unless it meets Department of Commerce and OSHA requirements for that purpose.

Existing elevators may be used on a limited basis with the City's permission and agreement. The Contractor will pay costs of warranty extensions and additional service work required. Appropriate protection must be provided by the using Contractor and that Contractor shall be responsible for any structural, mechanical or finish damage to the elevator and its parts and to adjoining building finishes and components.

PART 2 – PRODUCTS

1. SPECIFIED ITEMS – SUBSTITUTES

Wherever catalog numbers and specific or trade names are used in conjunction with a designated material, product, thing, or service mentioned in these Specifications, they are used to establish the standards of quality, utility, and appearance required. Substitutions, which are equal in quality, utility, and appearance to those specified, will be approved, subject to the following provisions:

All Substitutions must be accepted by the City Engineer or designee in writing. The City Engineer or designee will accept, in writing, such proposed substitutions as are in his or her opinion, equal in quality, utility, and appearance to the items or materials specified. Such acceptance shall not relieve the Contractor from complying with the requirements of the drawings and specifications, and the Contractor shall be responsible at Contractor's own expense for any changes resulting from Contractor proposed substitutions which affect the other parts of Contractor's own work or the work of others.

The manufacturer shall be a company specializing in the manufacture of the specified equipment and accessories with minimum five years documented experience.

Failure of the Contractor to submit proposed substitutions for approval in the manner described above and within the time prescribed shall be sufficient cause for disapproval by the City Engineer or designee of any substitutions otherwise proposed.

2. APPROVED TESTING LABORATORIES

The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:

- Underwriters Laboratories Inc.
- Electrical Testing Laboratories, Inc.
-

PART 3 – EXECUTION

1. INSTALLATION

Install in accordance with manufacturer's instructions and all code requirements. Provide the City or designee with copy of manufacturer's instructions prior to installation. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment to provide access space for servicing all components. Install in accordance with recognized industry practices. The manufacturer's latest recommendations at the time of bidding shall be used.

Startup and test equipment and adjust operating and safety controls for proper operation.

Contractor shall coordinate work with existing equipment so that all systems, equipment and other components will fit the available space, and will allow proper service and repair. Each location needs to be approved by the City or designee. This also applies to existing equipment if newly installed equipment interferes with its accessibility. Location of equipment has to fit into existing panels, decoration or finish. The City can request minor position changes of equipment before the work has begun.

The Contractor shall cooperate in reducing objectionable noise or vibration. If noise or vibration is a result of improper material or installation, these conditions shall be corrected at no cost to the City. Abnormal buzzing in equipment is not acceptable.

Carpentry, Cutting, Patching, and Core Drilling:
Provide carpentry, cutting, patching, and core drilling required for installation of material and equipment specified in the scope of work. Do not cut, core, or drill structural members without consent of the The City.

Waterproof Construction:
Maintain waterproof integrity of penetrations of materials intended to be waterproof. Provide flashings at exterior roof penetrations. Caulk penetrations of foundation walls and floors watertight. Provide membrane clamps at penetrations of waterproof membranes. Provide waterproof NEMA 3R enclosures for all equipment or devices mounted outside or otherwise exposed to the weather.

Workmanship:
Install using procedures defined in NECA Standard of Installation and shall be conform with all codes and regulations. Materials and equipment of the types for which there are National Board of Fire Underwriters' Laboratories (UL) listing and label service shall be so labeled and shall be used by Contractor.

Modifications to existing construction and Alterations:
Alter, extend and reconnect existing conduit as necessary. Reconnect existing conduits, which were reused, cut or exposed because of construction as quickly as possible. Where wiring is involved, new wires shall be "pulled in" between the nearest available accessible reused outlets to the extent allowed by the governing code. Furnish and install new conduits for wires if they cannot be "pulled in" to existing conduits. All new conduits, wiring, and electrical items shall be connected to the existing systems so as to function as a complete unit. Where existing electrical equipment, devices, fixtures, electrically operated items, etc., interfere with any remodeling work, they shall be removed and reinstalled in another location to avoid such interferences. all existing and relocated equipment shall be left in good operating condition. Include in bid removal from service of existing electrical material and equipment as specified hereinafter, as noted on the drawings, or as needed by field conditions.

Painting of Equipment and Hardware:
Provide moisture resistant paint for all exterior painting. Colors shall be as shown on the drawings unless specified. Refer to individual Sections and construction drawings for painting requirements. All exposed conduits, raceways and gutters inside and outside the building shall be painted to match the wall color.

2. DELIVERY, STORAGE AND HANDLING OF MATERIALS

Contractor or the Contractor's authorized representative must be present to accept delivery of all equipment and material shipments. The City will not knowingly accept, unload or store anything delivered to the site for the Contractor's use. Inadvertent acceptance of delivered items by any or employee of the City shall not constitute acceptance or responsibility for any of the materials or equipment. It is the Contractor's responsibility to assume liability for equipment or material delivered to the job site.

Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays. Materials and equipment shall be delivered to the site in adequate time to ensure uninterrupted progress of the work and inspection of material by the City. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Care shall be taken to prevent damage to materials and equipment during loading, transporting and unloading. Packaged materials and equipment shall be delivered to the site in original, undamaged containers bearing manufacturer's name, with seals unbroken. Packaged units shall be delivered in their original crates. Store in a clean and dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic. Promptly inspect shipments to insure that the material is undamaged and complies with specifications. Materials or equipment, which do not conform to the Specifications or are damaged shall not be incorporated in the work and shall be immediately removed from the site.

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

Contractor shall confine equipment, apparatus, storage of materials and operations to limits indicated on the drawings or by specific direction of the City. The storage of materials on the grounds and within the building shall be in strict accordance with the instructions of the City. Storage of materials within the building shall at no time exceed the design carrying capacity of the structural system. The City assumes no responsibility for materials stored in building or on the site. The Contractor assumes full responsibility for damage due to the storage of materials. Repairing of areas used for placing of sheds, offices, and for storage of materials shall be done by the Contractor.

Material shall be stored according to manufacturer's recommendations as a minimum. Provide and maintain watertight storage sheds on the premises where directed, for storage of materials that might be damaged by weather. Sheds shall have wood floors raised at least 6" above the ground. Materials, construction sheds, and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing lines. Should it be necessary at any time to move material sheds or storage platforms, the Contractor shall move it at the Contractor's expense, when directed by the City. All materials affected by moisture shall be stored on platforms and protected from the weather. In addition, material must be stored in a location protected from vandalism and weather. If material is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If necessary, material will be stored off site at the Contractor's expense. Offsite storage agreements will not relieve the Contractor from using proper storage techniques. Storage and protection methods must allow inspection to verify products.

All materials shall be stored in a manner that prevents release of hazardous material to the environment. All hazardous materials, including motor fuels, shall be properly handled and contained to prevent spills or other releases. The Contractor shall develop and maintain a contingency plan to provide emergency response, containment, and cleanup of spills of hazardous materials resulting from contract activities. All spills and releases shall be reported to the City as soon as possible. Please note that the Standard Specifications Section 107.4(f) must be followed and overrides any provision in these specifications.

Cover pipes and ducts to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, duct, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Store windows and doors in upright position, off ground, under cover and protected from sunlight, weather and construction activities.

3. DEMOLITION

Perform all demolition as indicated on the drawings to accomplish new work. Demolition Drawings are based on casual field observation and/or existing record documents. Verify field measurements and circuiting arrangements as shown on Drawings, verify that abandoned wiring, piping, ducting and equipment serve only abandoned facilities. Report discrepancies to the City before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

Before demolition of any load bearing concrete a ground-penetrating radar or concrete X-ray scan needs to be performed to detect any rebar. This work shall be performed at least a week before demolition starts to give A/E the opportunity to resolve any issues by rebar or other obstacles in unexpected locations. Drawings with existing subsurface obstacles may not be correct and shall not be relied on.

Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or duct is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the City to minimize disruption to the existing building occupants.

All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. Maintain the condition of material and/or equipment that is indicated to be reused equal to that existing before work began. All piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the City. Verify whether or not PCB ballasts exist in light fixtures, which will be disposed of. If PCB light fixture ballasts exist, then follow requirements in other sections related to electrical work.

Patch holes and openings caused by removal of material and equipment, or formerly covered by such, with like material and texture of surrounding surface. Painting is not necessary unless noted otherwise.

Approval of all legal institutions shall be obtained prior to disposal of any equipment and materials. All disposal has to be in compliance with all local, county, state and nationwide regulations. All disconnected wiring shall be removed from all raceway systems, panels, enclosures pull boxes, junction boxes etc. irrespective of whether the removal is specified in the construction documents or not. The empty raceway systems shall be tagged spare on both ends of each termination.

Don't demolition equipment and material that is to stay in place. Repalce and repair any equipment and installations that get damaged during demolition.

4. CUTTING, PATCHING AND PAINTING

Cutting and patching required to access work in existing walls, in chases, above inaccessible ceilings, below floors, etc., shall be by the Contractor who requires the access, unless shown on the bid documents otherwise or noted otherwise.

The Contractor shall do all cutting, or fitting of the work as required to make its several parts fit together, or to receive the work of others, as shown or reasonably implied by the drawings or specifications, or as may be directed by the City. Holes cut in exterior walls and/or roofs shall be waterproofed.

The Contractor who cuts shall also be responsible for patching. Where cutting and patching is required, the Contractor shall hire individuals skilled in such work to do cutting and patching. The Contractor who removes or relocates building components which leaves a remaining opening shall be responsible for patching the opening.

Patching includes repairing openings to match adjacent construction and painting the surface to match existing surface including texture.

Painting means covering the entire wall where patching is to be done to nearest break point or corner unless indicated to be done by other trades. All paining will require patching. This includes all painting included in other sections.

Contractor shall not endanger any work by cutting, digging or otherwise and shall not cut or alter the work of others without their consent.

Do not pierce beams or columns without permission of the City and then only as directed in writing. If any ductwork, piping, conduit, etc. is required through walls or floors where no sleeve has been provided, use a core drill or saw cut to prevent damage and structural weakening.

Wherever any material, finish, or equipment, is damaged, the skilled trade shall accomplish the repair or replacement, in that particular work and the cost shall be charged to the party responsible for the damage. The City reserves the right to disallow any means and/or methods that, in the opinion of the City, are harmful to and/or not in the best interest of preserving the improvements receiving the work.

The contractor shall use manufacturer authorized contractors when making penetrations in the roof in order to maintain the roof's warranty. All work shall be pre approved by the roofing manufacturer.

5. CONCRETE WORK

Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support or installation of electrical, mechanical, plumbing piping, fixtures, specialties and equipment. This includes but is not limited to piping thrust restraints, pipe supports, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with other trades.

Unless noted otherwise provide cast in place concrete for equipment pads, manhole bases and thrust blocks. Concrete to be 3,000 psi at 28 days, 3/4 inch aggregate, five bags cement, three inch slump, air entraining admixture. The ACI 614 Recommended Practice for Measuring, Mixing and Placing of Concrete shall constitute the execution requirements.

6. EXCAVATION, BACKFILL, AND SURFACE RESTORATION

The Contractor shall take all measures necessary to become acquainted with the location of underground service, utilities, structures, etc., which may be encountered or be affected by the Contractor's work, and shall be responsible for damage caused by neglect to provide proper precautions or protection. As a minimum to become acquainted with such underground appurtenances, the Contractor shall: 1) Observe existing conditions visible at the site immediately prior to commencement of work; 2) Review available site plans incorporated in the contract documents and/or provided by the City; 3) Final check with the City for additions to or changes from conditions indicated on site plans for the facility.

Before excavation in areas with utilities nearby, a ground-penetrating radar or ground radar scan needs to be performed to detect any subsurface obstacles. This work shall be performed at least a week before demolition starts to give A/E the opportunity to resolve any issues by utilites or other obstacles in unexpected locations. Drawings with existing utilites may not be correct and shall not be relied on.

Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap. Existing pipes, electrical work, and all other utilities encountered, which may interfere with new work, shall be re-routed, capped, cut off, or replaced by the Contractor.

Perform all excavation and backfill work necessary to accomplish indicated systems installation. Excavate to below bottom of pipe and structure bedding (4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil). Finish bottoms of excavations to true, level surface. Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure there is no disturbance of bearing soil. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the City Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping. Bedding up to a point 12" inches above the top of a pipe or conduit shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand

Sieve Size	% Passing (by Wt)
1 inch	100
No. 16	45 - 80
No. 200	2 - 10

Gradation for Crushed Stone Chip Bedding

Sieve Size	% Passing (by Wt)
1/2 inch	100
No. 4	75 - 100
No. 100	10 - 25

Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the City Engineer, maintained in place until other permanent support approved by the City Engineer is provided.

Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed by the work

and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.

Strip topsoil from area to be excavated, free from subsoil and debris, and store separately for later re-spreading. No topsoil shall be removed from site and all topsoil is property of the City. Remove surplus excavated non-topsoil materials from site and dispose properly.

At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.

Three days before backfilling, the City shall be notified so that the City Surveyor can obtain the three-dimensional coordinates of all buried utilities. Buried utilities including the pipeline and any other utilities exposed during construction shall not be covered with backfill without the prior approval of the City. Coordination of this survey requirement is the responsibility of the Contractor. Surveyors will be provided by the when scheduled. The cost for delay or dig-up related to the Contractor's failure to schedule the utility survey shall be paid by the Contractor. Alternately, the Contractor shall install reference points consisting of nail and hub/flagging at all changes in grade or alignment of the new pipeline and for all other utilities exposed by the excavation. The Contractor shall keep a separate written record referenced to each point with the following information:

(1) Offset and depth to top and centerline of utility, accurate to 0.1 feet
(2) Type of utility (i.e. gas, water, etc.)
(3) Size of utility (i.e. 2", 4", 16" wide duct, etc.)
(4) Type of material of utility (i.e. cast iron, PVC, etc.)

2. Identification tape shall be installed 12" above the buried utility crown. The identification tape shall be continuous for the entire length of utility. Before backfilling for buried utilities over identification tape, the City construction inspector will verify that identification tape has been installed.

Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

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

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

Completely restore the surface of all disturbed areas as described below to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment. Topsoil shall be spread upon order from the City, typically right before any planting to avoid disturbance of topsoil by construction activities.

Lawns: Topsoil with 4" of clean, friable, fertile topsoil conforming to D.O.T. Section 625, free from debris, lumps, rocks, roots, plants and seeds. Grade surfaces to match adjacent elevations. Rake smooth, free of lumps and debris. Sod with good quality nursery sod conforming to D.O.T. Section 631, be uniform, dense, free from weeds and consist of approximately 60% Kentucky blue grass and the balance perennial rye, fescue and white clover. Place sod with joints staggered and abutting. Maintain lawn areas for one month after installation. Department will be responsible for necessary watering and mowing. Contractor needs to inform Department about watering needs. Do necessary weeding, repair, reseeding or resodding until uniform catch is obtained.

Curb and Gutter: Concrete curb and gutter conforming to the City requirements and D.O.T. Section 601, Type D or L.

Sidewalk and Walkways: Non-reinforced concrete conforming to D.O.T. Section 602, thickness to match existing, cross slope of one-fourth inch per foot, scored into squares approximately equal to width.

Bituminous Concrete Pavements: 4" thick crushed stone base course conforming to D.O.T. Section 304 (excluding 304.2.4) and two pass bituminous concrete pavement conforming to D.O.T. Section 407, first course 1-1/2" binder, second course 1-1/2" surface.

7. DEWATERING

Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

Temporary pumps required for pumping water from building excavation or from building proper shall be provided by the Contractor, including temporary connections. Permanent sump pumps shall not be installed until building is substantially complete and when approved by the City. The Contractor shall remove temporary pumps and connections when approved by the City.

8. SEALING AND FIRESTOPPING

The Contractor penetrating a fire rated wall/floor/ceiling is responsible for sealing this opening to the same rating as the wall/floor/ceiling is rated.

Sealing and firestopping of sleeves/openings between conduits, cable trays, wire ways, troughs, cablebus, busduct, pipes, ducts etc. and the structural or partition opening shall be the responsibility of the Contractor whose work penetrates the opening. The Contractor responsible shall hire individuals skilled in such work to do the sealing and firestopping. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

FIRE AND/OR SMOKE RATED PENETRATIONS:

Install approved product in accordance with the manufacturer's instructions where an installation penetrates a fire/smoke rated surface. When pipe is insulated, use a product, which maintains the integrity of the insulation and vapor barrier.

Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support substantial weight.

Whenever possible, avoid penetrations of fire and smoke rated partitions. When they cannot be avoided, verify that sufficient space is available for the penetration to be effectively fire and smoke stopped. All firestopping systems shall be by the same manufacturer. Firestop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce. The Contractor will be responsible for selecting the appropriate UL tested fire stop system for each application required on the project and will submit this to the City or designee for review. Each firestop manufacturer has specific details for different applications they have tested.

Manufacturers: 3M, STI/SpecSeal, Tremco, Hilti or approved equal.

Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

NON-RATED PENETRATIONS:
Conduit Penetrations Through Below Grade Walls:
In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated conduit and the cored opening or a water-stop type wall sleeve.

Conduit and Cable Tray Penetrations:
At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core-drilled opening.

In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.

At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

9. CLEANING

The Contractor shall clean up and remove from the premises, on a daily basis accumulation of surplus materials, rubbish, debris and scrap and shall repair all damage to new and existing equipment resulting

from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

All installed items shall be cleaned at time of installation, and all lens exteriors shall be cleaned just prior to final inspection. Equipment shall be thoroughly cleaned of all stains, paint, spots, dirt and dust. All temporary labels not used for instruction or operation shall be removed. Dust, dirt and other foreign matter shall be removed completely from all internal surfaces of all mechanical and electrical units, cabinets, ducts, pipes, etc. Dirt, soil, fingerprints, stains and the like, shall be completely removed from all exposed finished surfaces.

Contractor shall wash all glass immediately prior to the occupancy of this project. Work shall include the removal of labels, paint splattering, glazing compound and sealant. Surfaces shall include mirrors and both sides of all glass in windows, borrowed lights, partitions, doors and sidelights. In addition to the above, the Contractor shall be responsible for the general "broom" cleaning of the premises and for expediting all of the cleaning, washing, waxing and polishing required within the technical sections of the specifications governing work under this Contract. The Contractor shall also perform "final" cleaning of all exposed surfaces to remove all foreign matter, spots, soil, construction dust, etc., so as to put the project in a complete and finished condition ready for acceptance and use intended.

If rubbish and debris is not removed, or if surfaces are not cleaned as specified above, the City reserves the right to have said work done by others and the related cost(s) will be deducted from monies due the Contractor.

10. CONTINUITY OF SERVICE AND SHUTDOWN

Contractor shall provide and maintain continuous service (power, controls, alarms, communication, elevators, HVAC, roads etc.) during the entire construction period. No outages shall be permitted on existing systems except at the time and during the interval specified by the City. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines and might be scheduled during after-hours if regular business hours are not acceptable to the City. No extra costs will be paid to the Contractor for such outages, which must occur outside of regular weekly working hours. Cost to the utility is paid by Contractor. The Contractor shall provide temporary utility services and bypasses for any disruptions not completed within this period. The Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

If the building is occupied and continues operation during construction, retrofit or demolition, Contractor must maintain ventilation and air conditioning for as large parts of the building as technically feasible. Spreading of dirt, dust and other construction related material must be kept to a minimum. Occupied and work areas must be separated by seals. All work affecting air conditioning and ventilation must be coordinated with the daily work in the building and approved by the supervisor or department head at the building. If air conditioning, heating and ventilation has to be taken out of service for longer periods of time in parts of the building and work would be affected negatively, the Contractor shall provide temporary sufficient air conditioning, heating and ventilation in coordination with the department. All such taking out of service has to be coordinated and approved by the supervisor or department head at the building.

If the shutdown involves the interface with, or modification of, existing building energy system(s), the Contractor shall be required to show the reviewed submittal and shop drawings of the proposed modifications. Shutdown schedules shall have been reviewed and approved by the City at least 72 hours prior to date of shutdown. Postponement by the City of scheduled shutdowns shall not constitute a basis for additional charges to the City.

Prior to the shutdown of any building energy system(s) the Contractor shall provide the following:

- Proof of receipt of all materials required for the shutdown or a written commitment from the responsible suppliers that the required materials will be available at the time of the shutdown.
- A list of the qualified Contractor personnel assigned to perform the work.
- Analysis of any affect on the utility or building energy system(s) and the estimated duration of the shutdown.
- Work plan for the shutdown
- A twenty-four-hour emergency callback phone number to be used by the City in the event of any problems or concerns with the modifications made to the building system(s) after the Contractor has left the site.

The startup of electrical and mechanical utility systems constructed by Contractor shall be performed by Contractor in coordination with the City.

11. PROJECT MEETINGS

A pre-construction meeting shall take place after the signing of the contract and prior to the start of the project. The contractor and any subcontractors will be required to attend. Non-mandatory attendees shall include the owner's representative, architect or engineer's representative, and the general contractor's representative. The general contractor and City's representative shall review all pertinent requirements for the project, including but not limited to, site conditions, product storage, waste removal, scheduling, hours of work, security, and any other issues related to the completion of the project.

Project meetings will be held at the time designated by the City. If the principal of the firm does not attend meetings, a responsible representative of the Contractor who can bind the Contractor to a decision at the meetings shall attend. The City or designee will write a report covering all items discussed and decisions reached and copy of such report distributed to all parties involved.

During construction, weekly project meetings may be held at the discretion of the City. The minutes of these meetings will be prepared by the Contractor and one copy issued as expeditiously as possible to the each party. Involved in the project the Contractor will submit, in writing, questions and/or answers (previously obtained verbally) to be confirmed at each meeting.

12. TEMPORARY CONSTRUCTION

Temporary construction shall conform to all requirements and laws of state and local authorities, which pertain to operation, safety, and fire hazards. Contractor shall furnish and install all items necessary for conformance with such requirements, whether called for under separate sections of these Specifications or not. Contractor shall provide, maintain, and remove upon completion of his work:

- Temporary crossovers and bypass to utilities, electrical connections, traffic and footbridges, and walkways used to maintain services or communications, which cannot be interrupted or curtailed.
- Temporary rigging, scaffolding, shoring, hoisting equipment, and all other temporary work as required for this project.
- Temporary barricades around openings and excavations for this project.

Temporary lighting, if necessary during the period of construction, shall be supplied and maintained by the Contractor at Contractor expense so that construction work can be safely performed. The temporary lighting system shall be sufficient to enable all trades to safely complete their work and to enable the City to check all work as it is being done. Illumination shall be 5 foot-candles minimum in all areas and, in

addition, shall meet or exceed the requirements of 29 CFR 1926.56 Illumination (OSHA regulations). In accordance with the latest issue of the National Electrical Code, all temporary electrical circuits for construction purposes shall be equipped with combination ground fault interrupter and circuit breakers meeting the requirements of UL for Class A, Group 1 devices. The ground fault interrupter portion shall be solid-state type, insulated and isolated from the breaker mechanism. A test button shall be provided for checking the device. The breaker mechanism shall provide overload and short circuit protection and shall be operated by a toggle switch with over center switching mechanism so that contact cannot be held closed.

TEMPORARY HEAT

All heating required after enclosure of the building shall be classified as TEMPORARY HEAT and be provided by the Contractor. It shall be the responsibility of the Contractor to see that every precaution is used to prevent unnecessary escape of heat. The Contractor shall provide and pay for temporary heat. A minimum temperature of 45 degrees and a maximum temperature of 65 degrees for the building shall be maintained, except for a period of at least ten days prior to the placing of interior woodwork and throughout the placing of this and other finish, varnishing, painting, tiling etc., and until substantial completion to provide sufficient heat to insure a temperature in the spaces involved of not less than 70 degrees nor more than 80 degrees. Temperatures must be checked during nighttime and on weekends. Restitution shall be made by Contractor responsible for damage to building and contents caused by overheating, freezing, fumes, soot or residue given off by temporary heating or lack of thereof.

Permanent heating system may be used for temporary heating. Warranty period may not be affected by use of permanent heating. If permanent system is used, the Heating Trade shall install in their permanent location heating coils or connectors as approved by the City, with controls to maintain temperatures required. Temporary filters shall be used in the permanent system. Provide bases, shields, etc., around heating elements to prevent too rapid drying of adjacent concrete, masonry or plaster. Relocation of some of the permanent heating system equipment may be required during construction to prevent interference with new construction. Temporary units may be installed in such areas during the time permanent equipment is not operating due to relocation. The temporary heating system shall be removed after the permanent heating system has been installed and is operating. Surfaces and structure shall be patched as required. Temporary heating equipment shall be relocated by the Heating Trade as required during construction to prevent interference with new construction.

The use of temporary units whose product of combustion will damage fresh concrete, mortar or other building materials, will not be allowed. Use of coke or oil salamanders is prohibited. All portable temporary heating units shall be properly ventilated to prevent combustion gases from remaining in the heating area.

If electrical power is required for oil or gas portable heating units, it may be taken from the available temporary power source and paid for by the Contractor. Heating units and the area surrounding the units shall be kept in a clean and safe condition.

TEMPORARY ELECTRICAL SERVICE

The Contractor shall make all arrangements with the local utility company for metered electrical service, pay for the installation of all temporary service to utility point of termination shown on drawings, and upon completion of project, pay for removal of temporary service. The Contractor shall patch surfaces and structure after services have been removed. The Contractor shall pay for all electrical energy consumed for construction purposes for all trades including temporary offices, for operation of ventilating equipment, for heating of building, and for testing and operating of all equipment. The Contractor shall continue to pay for energy used until substantial completion even though equipment has been connected to the permanent wiring.

Contractor shall provide and maintain 200 ampere electrical services in single phase or multiphase as required by equipment to be used. Provide at multiple services to ensure service to run at less than 75% of its capacity at all times and to enable short cable runs of less than 300 ft to equipment to be used.

The Contractor shall provide meter base and wiring to point of utility termination, provide main fused service switch, and fused or breaker distribution panel(s). The Contractor shall also provide, at no cost to others, all lamps, wiring, switches, sockets and similar equipment required for temporary system until substantial completion. Upon completion of the project, the Contractor shall remove the temporary system.

After Substantial Completion of the permanent electrical system and building wiring, permanent receptacles may be used during finishing work. Permanent wiring for lighting fixtures, switches and receptacles shall be installed only after all masonry and plastering has been completed, but this wiring shall not be used for motors larger than fractional HP or for welding equipment. Circuits for larger motors and welding equipment may be provided with special circuits to mains of electrical panels at the expense of those trades requiring them, provided that special permission is obtained from the City and the installation is made by skilled electricians.

All temporary wiring and electrical installations shall be in accordance with applicable codes. Any power outage occasioned by tying into the existing electrical system for temporary or permanent use shall be coordinated with the City. The City does not guarantee the quantities or quality of power or water available for Contractor's use, nor will it be responsible in any manner for interruptions in service or for the effects of interruptions.

All Trades shall furnish their extension cords and lamps other than those furnished for general lighting. All Trades and other separate Contractors shall be allowed to use the service provided for general lighting and fractional horsepower hand tools at no cost.

If a Contractor contemplates the use of equipment that requires a different voltage or greater capacity than that specified, then that Contractor must arrange with Utility for this additional service and pay for installation of the service and the necessary additional switches and wiring required. The meter shall be taken out in the Contractor's name.

TEMPORARY WATER, SEWER AND PUMPS

The Contractor shall supply all water required for construction and other purposes until the permanent water supply system is accepted and in operation. As soon as possible Contractor shall install and pay for permanent water mains into new building, provide temporary gate valve and freezing protection, extend piping and provide a ¾" hose bib for use by all Contractors. Permanent lines maybe used.

Waste of water shall be avoided and valves, connections, pumps pipes and hoses shall be provided by Contractor kept in perfect condition.

Sewer work shall be started and finished as soon as possible. Including backfill.

Water supply used by workmen shall be kept clean and sanitary at all times.

TOILETS

The Contractor shall provide and maintain sanitary temporary toilets, located where directed by the City, in sufficient number required for the force employed. The toilets shall comply with International Building Code Chapter 29 on Plumbing Systems. Toilets shall be self-contained chemical type.

As soon as conditions will allow, the Plumbing Trade shall provide temporary toilets within the building, where directed, and equip the room with at least two temporary water closets and one temporary lavatory, each with connections to cold water and sanitary sewer. The Contractor shall provide a temporary wood enclosure with doors; remove when directed. After directed by the City, the Plumber shall remove the temporary fixtures and replace them with permanent fixtures. After temporary toilet accommodations are provided within the building, the Contractor shall remove the temporary outside toilets.

The Contractor shall maintain the temporary toilets in a sanitary condition at all times and shall supply toilet paper until completion of the job.

FIELD OFFICES
The Contractor shall provide, maintain and remove upon completion a temporary watertight office where directed for use by the Contractor and Trades. The office shall be equipped with a plan rack, a suitable table for examination of plans and shall have adequate equipment for document files and space for job meetings. Exterior of offices shall be of neat appearance, and if deemed necessary by the City, shall be painted to achieve such appearance; heat offices during cold weather; provide each office with at least one glazed movable window and one door with a cylinder lock and latch set. Provide and maintain artificial light, minimum of 40 foot-candles, and two duplex outlets where directed. When directed, move the office into a suitable area in the building.

13. IDENTIFICATION

Identify all equipment by stenciling (not less than 1 inch high letters/numbers) with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Where stenciling is not appropriate for equipment identification, engraved name plates may be used (White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady)

Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Label all pipes with name of loop and arrows for flow direction with permanent label. Label all gauges. Use one coat of black enamel against a light background or white enamel against a dark background.

Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

Provide all buried utilities, conduit and pipes with detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape.
Manufacturers: Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton.

All underground non-metallic sewers/mains and water services/mains shall be provided with tracer wire installations. Tracer wire installations shall conform with Section 182.0715(2r) of Wisconsin Statutes and prevailing Department of Commerce Chapter 84 requirements. Tracer wire shall be continuous solid copper or steel plastic coated with split bolt or compression-type connectors.

SNAP-AROUND PIPE MARKERS:
One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, ¾" min. size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

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

14. LUBRICATION

Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the City. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

15. PUNCH LIST

Contractor's supervisor at site shall acknowledge receipt of punch list.

Multiple punch lists can be submitted.

If Contractor fails to perform required corrective work in less than 30 days upon receipt of punch list by Contractor, the City can perform corrections himself and charge the Contractor.

Contractor shall advice the City or designee that the necessary work has been performed. If the City or designee verify if punch list items were not resolved and the work was not performed in less than 30 days upon receipt of punch list by Contractor, the Contractor shall be required to compensate the for additional site visits at a rate of $ 100/hour plus mileage with the amount paid to the City or designee prior to processing the final payment.

16. TESTS AND FINAL ACCEPTANCE

The complete installation consisting of the several parts and systems and all equipment installed according to the requirements of the Contract Documents, shall be ready in all respects for use by the City and shall be subjected to a test at full operating conditions and pressures for normal conditions of use.

Proper notice has to be given to enable the City or designee to attend all tests. Failure to give proper notice can result in repeated tests to be paid for by the Contractor. Tests are acceptable on properly working equipment only and have to be repeated as often as required by the City at no cost to the City. If

tests have to be repeated by an City-hired Contractor due to equipment not installed or working properly, the Contractor shall reimburse the City for additional testing expenses.

Contractor shall make all necessary adjustments and replacements affecting the work, which is necessary to fulfill the City's requirements and to comply with the directions and recommendations of the manufacturer of the several pieces of equipment, and to comply with all codes and regulations, which may apply to the entire installation. Contractor shall also make all required adjustments to comply with all provisions of the drawings and specifications.

Prior to acceptance, all elements of operating equipment, including those of mechanical nature and those that slide, swing, turn, or are intended to move in any way and those of an electrical nature, shall be given an operating test to assure to the satisfaction of the City that such equipment operates as required. Contractor shall make all adjustments, replacements, and such other modifications as needed. If it is necessary to run equipment in order to complete the work, for periods that exceed the manufacturer's recommended maintenance interval, the Contractor will provide such required maintenance at no additional cost to the City.

Notice that the work is ready for final inspection and acceptance shall consist of a written notice issued to the City by the Contractor stating that the Contractor has carefully inspected all portions of the work, has reviewed in detail the drawings and specifications, and that to the best of the Contractor's knowledge all conditions of the contract documents have been fulfilled. Upon receipt of this notice, the City and the Contractor shall make a joint inspection of the work. After deficiencies, if any, have been corrected or accounted for, and after all work is satisfactorily complete, the City will accept the work; and Notice of Completion will be filed by the City.

Prior to final acceptance, filing of the Notice of Completion or processing of final payment, the following shall be done and submitted reviewed and accepted by the City:

- Certificates of compliance and guarantees required under various Sections
- Operating and maintenance manuals
- Instruction to City personnel, as required
- Test reports (TAB, fire alarm, elevator etc.)
- Certifications and registrations (boiler etc.)
- All keys
- Replacement material as required in specifications
- All required operations tests
- All documents required by commissioning, LEED certification and other project related documents
- Satisfy all commissioning requirements
- As –built documents
- All punch list items resolved
- All training provided (except deferred seasonal training)
- All warranty issues brought to Contractor's attention so far resolved
- Warranty documents signed by representative of manufacturer, guarantee documents, roofing agreement and other warranty related documents

No official closeout and final payment will be made before all requirements are met.

17. TRAINING AND DEMONSTRATION

The City's facility staff (and occupants and service Contractors as needed), shall receive orientation and training on features, systems and equipment in this facility requisite with the complexity and criticality of the system and the City's needs.

Additional training requirements may be found in specific equipment sections. The City may videotape all training sessions.

Only training on equipment that works as designed is acceptable.

The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed on all equipment per the Specifications. Unless otherwise required or approved, the training shall be given during regular business hours during a regular work week.

The City or designee will be responsible for coordinating and approving the content and adequacy of the training of the City personnel for commissioned equipment. The City or designee will develop an overall training plan after meeting with the City and appropriate facility staff to determine needs and areas of emphasis for this project. The City or designee will develop criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The City or designee recommends approval of the training to the City.

Training shall consist of, as needed and at the discretion of the City or designee, the installing technician, installing Contractor and the appropriate trade or manufacturer's representative on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment as installed in this project is required. More than one party will be required to execute the training on primary equipment. The Contractor shall attend and present at sessions in addition to the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

Follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Training Shall Include the Following:

- Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
- A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, and special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover, as applicable, and any emergency procedures.
- Discussion of relevant health and safety issues and concerns.
- Discussion of warranties and guarantees.
- Common troubleshooting and maintenance issues, problems and solutions.
- Explanatory information included in the O&M manuals and the location of all related plans and manuals in the facility.
- Discussion of any peculiarities of equipment installation or operation.
- The format and training agenda in The HVAC Commissioning Process, ASHRAE Guideline 1 is recommended, as applicable.
- Hands-on training shall include start-up, operation in all modes possible, including manual, shutdown and any emergency procedures and preventative maintenance for all pieces of equipment.
- Training shall occur after functional testing and piping and equipment labeling are complete unless approved otherwise by the City.

<u>HVAC control systems:</u>

- For the primary HVAC equipment, the controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
- The standard operating manual for the system and any special training manuals shall be provided for and retained by each trainee. In addition, the system technical manual shall be demonstrated

during training. Manuals shall include detailed description of the subject matter for each session. The manuals shall cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the City or designee.

- The trainings will be tailored to the needs and skill-level of the trainees and be oriented to the specific system installed in this project.
- The trainers shall be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified trainer(s) shall be used. The City shall approve the instructor prior to scheduling the training.
- During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.

There shall be three training sessions:
Training I - Control System: The first training shall be 4 hours in length.
Training II - Building Systems: The second session shall be held on-site for a period of 12 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

- A review of the as-built drawings and O&M manuals, a walk-through of the facility to identify control panels and device locations.
- Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.
- Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
- All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees will actually set-up trends in the presence of the trainer.
- Every screen shall be completely discussed, allowing time for questions.
- Use of keypad or plug-in laptop computer at the zone level.
- Use of remote access to the system via phone lines or networks.
- Setting up and changing an air terminal unit controller.
- Graphics generation.
- Point database entry and modifications.
- Understanding FMCS field panel operating programming (when applicable).

Training III - Deferred On-Site: The third training will be conducted on-site 6 months after occupancy and consist of 8 hours of training in one session. The session will be structured to address specific topics that trainees need to discuss and to answer questions concerning operation of the systems.

Testing Adjusting and Balancing: The Contractor shall have the following special training responsibilities relative to the testing, adjusting and balancing (TAB) work:
The TAB technician shall meet with facility staff after completion of TAB and instruct them on the following:

- Go over the final TAB report, explaining the layout and meanings of each data type.
- Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
- Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
- Discuss any temporary settings and steps to finalize them for any City-furnished, City-installed equipment.

- Other salient information that may be useful for facility operations, relative to TAB.

18. ROADWAY

The Contractor may build a temporary roadway for delivery of materials at the Contractor's own expense and maintain it until completion of construction or until service drives are installed. Where possible, build temporary roadway within the confines of the new roadway and allow others to use it at no cost. Any gravel topping used for temporary roadway shall be at least 6" below finished elevation of permanent drives. If temporary roadway is not intended to be converted to a permanent road, all road materials shall be removed upon termination of access need, and the confines of the temporary roadway shall be repaired to match adjacent area.

19. FENCE

The Contractor shall provide a neat appearing protective fence where indicated on the drawing, constructed of standard studded T-Posts of sufficient length for line posts and spaced not to exceed 8'-0" apart. Corner posts and gate posts are to be galvanized steel pipe of not less than 2 1/2" o.d. and shall be properly braced. A 4-foot high wooden snow fence shall be securely fastened to the supports. Plastic fencing is not acceptable. The snow fence shall project 4" above the fence posts. Provide gates, properly constructed and braced, complete with hinges, hasps, and padlocks in number and location required for proper control, delivery and distribution of material and equipment. Gateposts shall be adequately back tied and anchored to insure a rigid installation. All protective fencing shall be maintained in an upright, orderly fashion throughout the construction schedule. In areas where existing trees are to be protected, the area inside the protective fencing shall not be used for any purpose related to construction activities, such as material storage, vehicle parking, portable toilets, or other disruptive activities that would result in damage of any kind to the site inside the fence.

20. SIGNS

Contractor shall furnish and install signs, located as directed by the City. The signs shall be readily legible to the general public, subcontractors, material men, and truck drivers approaching the site and shall include the following information:

- Project.
- Subcontract No.
- Subcontractor Name.
- Access to Buildings: Contractor shall keep access to existing buildings clear at all times.
- Posting of prevailing wages rates.

The Contractor shall order, paint and erect the sign. The sign shall be placed on the property where directed and shall be maintained for the duration of the construction period.

No individual advertising signs, plaques or credits, temporary or permanent, will be permitted on the building or premises, except the name of the Contractor on Contractor's office or material shed.

END OF SECTION

SECTION 15010 - HVAC GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. HVAC work includes:

1. Furnish all labor and materials necessary for the complete installation of heating, ventilating and air conditioning system as shown on the drawings and/or specified herein.
2. Drawings: Refer to H-Series drawings for graphic representations, schedules and notations showing HVAC work.
3. Specifications: Applicable portions of Division 1 govern all work under this Section. Refer to Division 15000B Sections for primary technical specifications of HVAC work, as listed below:

   15010 HVAC General Provisions
   15043 Testing Adjusting and Balancing
   15090 Supports and Anchors
   15200 Vibration Isolation
   15250 Mechanical Insulation
   15350 Natural Gas Piping
   15800 Gas-fired Make-up Air Units
   15810 Gas-fired Radiant Heat Units
   15820 Fans
   15840 Ductwork
   15860 Ductwork Accessories
   15960 Starting of Mechanical Systems

4. HVAC demolition and remodeling.
5. Equipment structural supports, prime painted.
6. Motors for all HVAC equipment.
7. Secure and pay all fee
8. Test, adjust and balance HVAC systems.
9. Cutting and patching existing conditions for HVAC equipment by the HVAC Contractor.

1.2 RELATED DOCUMENTS

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

1. Refer to Division 1 for special work hours requirements for this project.

B. Temperature Control specifications are provided for reference and coordination purposes only; all temperature control work will be the responsibility of a separate prime Temperature Control Contractor. Temperature Control Specifications Sections consist of the following:

   15900C Controls and Instrumentation
   15910C Direct Digital Control Systems
   15950C Control Sequence
   15951C DDC Point List

C. General Work by Lead Contractor - HVAC Contractor :

1. Field painting of all exposed piping, ductwork, hangers, supports and related metal work, unless noted specifically in the Drawings or Specifications herein.
2. Building provisions for all recesses and chases intended as equipment space for ductwork and piping in new construction.

3. Lintels and openings for ducts and piping through existing walls, floors and ceilings.
4. Line voltage (greater than 100 volts) wiring, conduit and connections.
5. All equipment starters not furnished as integral part of HVAC equipment.

D. Coordination of Work:

1. General: Contract Documents are diagrammatic in showing certain physical relationships which must be established within HVAC work, and in its interface with other work including electrical work, and that such establishment is the exclusive responsibility of the Contractor.
2. Arrange HVAC work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction, and with minimum of 7 foot overhead clearance where possible.
3. Give right-of-way to piping which must slope for drainage.
4. Advise other trades of openings required in their work for subsequent move-in of large units of HVAC work.
5. Install all sensor wells, dampers and valves provided by the Temperature Control Contractor.

1.3 SHOP DRAWINGS AND SAMPLES

A. The Contractor shall submit to the Architect for approval, shop drawings, giving details, dimensions, capacities, accessories, wiring diagrams, etc., of all materials as indicated in respective specification sections.

B. All shop drawings shall include proper identification of equipment by name and/or number, as indicated in the specification and/or shown on the plans.

C. Shop drawings shall be submitted for approval as soon as practicably possible after award of contract. Shop drawings must be approved before installation of materials and equipment. Drawings shall be submitted in accordance with the requirements outlined in Division 1 of the Specifications.

D. The examination and approval of shop drawings shall not relieve the Contractor from any obligation to perform the work strictly in accordance with the Contract Drawings and Specifications. The responsibility for errors in shop drawings shall remain with the Contractor.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For the actual fabrication, installation and testing of work under this Section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.

B. In acceptance or rejection of installed work, the Architect will make no allowance for lack of skill on the part of the workmen.

C. Reference Standards: Specifically, for HVAC work in addition to standards specified in individual work section, the following standards are imposed, as applicable to work in each instance:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standard Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
IEEE	Institute of Electrical and Electronics Engineers

MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electric Manufacturer's Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
UMC	Uniform Mechanical Code
UL	Underwriter's Laboratories

All federal, state, local codes, ordinances and utility regulations.

D. Environmental design conditions for all occupied areas are as follows:

	Winter	Summer
Inside:	70 degrees F	74 deg. F 50% RH
Outside:	-10 degrees F	91 deg. dbF/75 deg. wbF

E. Approval of Materials: Refer to General Conditions, Supplementary General Conditions and other requirements of Division 1 for approval of materials and requirements of substituted equipment.

1.5 JOB CONDITIONS

A. Building Access: Arrange for the necessary openings in the building to allow for admittance of all HVAC equipment.

B. Temporary Services: No service shall be interrupted or changed without the prior approval of the Owner. Refer to Division 1 requirements.

C. Compatibility: Provide products which are compatible with other products of HVAC work, and with other work requiring interface with HVAC work. Provide products with proper or correct power characteristics, fuel-burning characteristics and similar adaptation for Project. Coordinate selections from among options for compatibility of products. Design and layout is based on equipment scheduled on drawings or in specifications.

1. Contractor shall coordinate installation of equipment supplied by other approved equal manufacturers and shall make necessary field modifications to allow for installation of this equipment at no additional expense to the Owner.

D. Record Drawings: Refer to Division 1 requirements.

PART 2 - PRODUCTS

2.1 ELECTRICAL PROVISIONS OF HVAC WORK

A. General: The electrical provisions of HVAC work, where indicated to be furnished integrally with HVAC equipment, can be summarized, but not by way of limitation, to include the following: 1) Motors, 2) Motor starters, 3) Control switch, pilot lights, interlocks, and similar devices, and 4) Drip pans to protect electrical work.

1. Temperature Control Contractor (T.C.C.) shall furnish and install control wiring as part of the Temperature Control Contractor work.
2. Power wiring, connections to equipment, motor control wiring and related work by Electrical Contractor.
3. Motor starters, disconnects, relays, pushbuttons, pilot lights and related motor control items not furnished integrally with HVAC equipment shall be furnished by Electrical Contractor.

4. Provide equipment list, locations and wiring diagrams to Electrical Contractor for all HVAC equipment requiring electrical connections.

B. Motors:

1. Standards: Where not otherwise indicated, comply with applicable provisions of the NEC, NEMA Standards, and sections of Division 16 of specifications. All motors 1 HP and larger shall be NEMA Premium Efficiency motors meeting or exceeding values tested in accordance with IEEE Standard 112, Method B procedures as stated in NEMA MG 1-12.53a and shall be EPACT approved.
2. Temperature Rating: Class B insulation for 70 degree C temperature rise, except where otherwise indicated or required for service.
3. Phases and Current: 1/6 HP and smaller is Contractor's option; up to 1/2 HP, capacitor-start, 120 or 277 volt, 60 cycle single-phase; 1/2 HP and larger, squirrel-cage induction NEMA rated 208 or 477 volt, three-phase, 60 cycle.
4. Service Factor: 1.15 for motors in drip-proof enclosures, all other enclosures to have minimum 1.0 service factor.
5. Construction: Select motors for conditions in which they will be required to perform: i.e., general purposes, splash proof, explosion proof, standard duty, high torque or other special type as required by manufacturer's recommendations. Enclosures shall be of the type recommended by manufacturer for the specified application.
6. Frames: NEMA Standard for horsepower specified.
7. Bearings: Permanently lubricated and sealed ball bearings, 1/8 HP and less may be shaded pole type permanently oiled unit bearings.
8. Overload Protection: Built-in thermal; with internal sensing device for stopping motor, and for signaling where required.

C. Starters, Switches: All starters shall have thermal overload and low voltage protection, and shall comply with Electrical Division 16 sections of specifications.

D. Wiring Connections:

1. Motors: Wired connections in flexible conduit, except where plug-in electrical cords are indicated and permitted by governing regulations.
2. General Wiring: Comply with applicable provisions of Electrical Division 16 sections of specifications.

E. Drip Pans: Furnish drain pans below piping which passes directly above electrical work. Locate pan immediately below piping and extend a minimum of 6 inches on each side of piping and lengthwise 18 inches beyond equipment. Fabricate of galvanized sheet metal or copper with 2 inch deep watertight pan, copper drain piping and drain valve

2.2 FLOOR, WALL, ROOF AND CEILING OPENINGS

A. Provide sleeves for pipes and ducts passing through masonry, concrete or other similar construction. Openings for pipes shall be 1" larger in diameter than pipe passing through, including insulation, where indicated. Openings for ductwork shall be 1/2" larger on all sides than size of duct passing through, including duct insulation, where indicated. Coordinate additional space requirements for fire or smoke damper installation.

1. Pipe sleeves: Standard weight steel pipe.
2. Duct sleeves: 24 gauge galvanized sheet metal, unless noted otherwise.

B. Grout openings between sleeves and concrete or masonry walls and floors with sand-cement mortar consisting of one part portland cement and three parts sand, by volume. Add sufficient water to make a stiff placeable mortar.

C. Close joints between sleeves and non-masonry walls and floors with suitable caulking applied over polyethylene foam backer, compatible with caulking used.

D. Pack annular space between sleeves and insulation pipe or ducts with glass fiber blanket insulation and seal with Urethane caulking compound.

E. Where penetrations occur through fire rated walls or floors, fill annular space with fire-resistive insulation similar to U.S. Gypsum Thermafiber batts. Seal annular space through fire rated walls or floors with a UL listed fire resistant sealant.

2.3 CUTTING AND PATCHING

A. General: Perform all cutting and patching required for complete installation of HVAC systems, unless specifically noted otherwise. Provide all materials required for patching unless otherwise noted. All cutting and patching necessary of structural members to install any HVAC work shall not be done without permission, and then only carefully done under the direction of the Architect.

B. All new work cut or damaged shall be patched and restored to its original condition.

2.4 EQUIPMENT ACCESS

A. General: All valves, volume dampers, equipment and accessories shall be installed to permit access to equipment for maintenance, servicing or repairs. Any relocation of piping ductwork, equipment or accessories required to provide maintenance access shall be accomplished by the HVAC Contractor at no additional cost to the Owner.

B. Provide access doors where equipment is located in chases or generally inaccessible. Access doors used in fire-rated construction must have UL label. Minimum access panel size 12" x 12" or of sufficient size to allow total access for maintenance. Coordinate location with General Contractor.

C. Access panels shall be furnished and installed by the HVAC Contractor in plaster walls, ceilings and related inaccessible surfaces.

D. Access Doors: Milcor or approved equal, steel frames and door, prime coated, except stainless steel in areas subject to excessive moistures, such as toilet rooms.

2.5 EQUIPMENT SUPPORTS

A. General: Provide all supporting steel and related materials not indicated on structural drawings as required for the installation of equipment and materials, including angles, channels, beams and hangers.

2.6 EQUIPMENT GUARDS

A. General: Provide equipment guards over belt-driven assemblies, pump shafts, exposed fans and elsewhere, as indicated in this specification or required by code.

2.7 CONCRETE FOR HVAC WORK

A. General: All concrete work for HVAC equipment by the General Contractor.

B. General Standards: Except as otherwise indicated, comply with applicable provisions of Division 3 for concrete work.

C. Concrete Equipment Pads: For each piece of HVAC equipment as indicated on the drawings, arrange for the General Contractor to install a 4" concrete housekeeping pad a minimum of 4 inches

wider than full size of the respective equipment's base. Equipment pads are required for the following equipment.

1. None anticipated for this project.

2.8 PAINTING HVAC WORK

A. General: All painting of mechanical equipment will be done by the HVAC Contractor unless equipment is hereinafter specified to be furnished with factory applied finish coats. Coordinate the exterior finish painting and color of exterior HVAC equipment with the General Contractor.

1. Exposed ductwork in finished areas outside mechanical rooms shall be cleaned for accepting a paint finish or have factory-applied paint grip finish.

B. Prime paint all field fabricated metal work under HVAC work, comply with applicable provisions of Division 9.

C. All equipment shall be provided with factory applied prime finish, unless otherwise specified.

D. Interior duct surfaces, dampers and other accessories visible through grilles, registers and diffusers shall be painted with flat black paint.

E. If factory finish on any equipment is damaged in shipment or during construction of the building, the equipment shall be refinished by the Contractor to the satisfaction of the Architect.

2.9 HVAC SYSTEM IDENTIFICATION

A. General: Provide adequate marking of HVAC system and control equipment to allow identification and coordination of maintenance activities and maintenance manuals. Tag and label HVAC equipment located in exposed or in accessible areas to conform to ANSI A13.1-1981. After painting and/or covering is complete, identify all equipment, piping and ductwork by its abbreviated generic name as shown/scheduled/specified.

B. Equipment: Identify all major HVAC equipment with plastic-laminate signs or 2" minimum high painted stencils and contrasting background. Provide text of sufficient clarity and lettering to convey adequate information at each location and mount permanently. Identify control equipment by 1-1/2" x 4" plastic nameplates with 1/2" high lettering.

C. Piping and Ductwork: Identify piping and ductwork once every 30 feet at each branch, at termination of lines, and near valve or equipment connections. Place flow directional arrows at each pipe or duct identification. Provide 2" minimum high letters on wrap-around siphonage, adhesive-backed or paint stenciled.

D. Valves: Identify all valves with 1-1/2" minimum polished brass stamp-engraved or plastic laminate tags. Prefix or color-code tags for each generic piping service. Prepare and submit valve tag schedule, listing location, service and tag description, incorporate in Instruction Manual. Mount valve tag schedule behind glass in mechanical room at location determined by Owner.

E. Operational Tags: Where needed for proper or adequate information on operation and maintenance of HVAC systems, provide tags of plasticized or laminated card stock, typewritten to convey the message.

PART 3 - EXECUTION

3.1 HVAC WORK CLOSEOUT

A. Lubrication: Upon completion of the work and before turning over to the Owner clean and lubricate all bearings except sealed and permanently lubricated bearings. Use only lubricant recommended by the
manufacturer.

B. Contractor is responsible for maintaining lubrication of all mechanical equipment under his contract until work is accepted by the Owner.

C. Cleaning: After installation has been completed, Contractor shall clean all systems. All piping and ductwork shall be cleaned both internally and externally to remove all dirt, plaster dust or other foreign materials. All temporary throwaway or replaceable media air filters used during the construction period shall be replaced by new filters or new filter media after construction has been completed and before the building is turned over to the Owner. Check all strainers for clean screens.

D. All dirt, plaster dust and other foreign matter shall be blown and/or vacuum cleaned from coils, terminal devices, diffusers, registers and grilles. Equipment shall be thoroughly cleaned of all stains, paint spots, dirt and dust.

E. Housecleaning and Cleanup: Periodically as work progresses and/or as directed by the Architect, the Contractor shall remove waste materials from the building and leave his area of work broom clean. Upon completion of work, remove all tools, scaffolding, broken and waste materials, etc., from the site.

3.2 INSTRUCTION AND MAINTENANCE MANUALS

A. Instruction Manuals: Upon completion of work, but before final acceptance of the system, furnish to the Engineer for approval, three (3) instruction and maintenance manuals in loose leaf binders. One approved copy shall be returned for use during instructional period. Manual shall have an index of contents and tab for each piece of equipment or system, as well as the following:

1. Manufacturer's O&M instructions, parts list and data sheets.
2. Copies of all shop drawings.
3. Wiring diagrams.
4. Start-up and shutdown procedures.
5. Composite electrical diagrams, and flow diagrams.
6. Test records.

C. Equipment Parts Lists: Include a complete list of all equipment furnished for project, with a tabulation of descriptive data of all the equipment replacement parts proposed for each type of equipment or system. Properly identify each part of part number and manufacturer.

D. Instruct Owner's maintenance personnel in the operation and maintenance of all equipment, including composite operating cycle of all equipment. Include not less than 8 hours of instruction, using the O&M manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment.

E. Service Organizations: At time of substantial completion, Contractor shall provide Owner with listing of qualified service organizations, including addresses and telephone numbers for each piece of major equipment.

3.3 RECORD DRAWINGS

A. Refer to Division 1 for further requirements.

B. Maintain a record set of as-built drawings for all HVAC work performed. As-built drawings shall be continuously updated as the project progresses and be available or periodic inspection by the A/E.

3.4 GUARANTEE PERIOD

A. Guarantee all equipment, materials, and workmanship to be free from defects for one year after acceptance by the Owner. Repair, replace or alter systems found defective at no extra cost to the Owner.

B. At the time of substantial completion, turn over the prime responsibility for operation of HVAC equipment and systems to the Owner's operating personnel. During guarantee period, provide one operating engineer, familiar with the work, to consult with and continue training Owner's personnel on an as-need basis.

END OF SECTION

SECTION 15043 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. General Requirements: Contractor shall be responsible for providing complete test-adjust-balance (TAB) work of all hydronic and air systems including distribution systems and the equipment and apparatus connected.

B. Work Included:

1. The extent of TAB work is indicated by the requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, hydronic and air distribution systems, and associated equipment and apparatus of HVAC work.
2. The work consists of setting speed and volume (flow) adjusting facilities provided for the systems, recording data, conducting tests, preparing and submitting reports, and recommending modifications to the work as required by the Contract Documents.
3. The component types of testing, adjusting and balancing specified in this section include but are not limited to the following HVAC equipment:
   a. Air handling units and fan units.
   b. Air diffuser distribution.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15800 Gas-fired Make-up Air Units
2. 15820 Fans
3. 15900C Controls and Instrumentation

1.3 QUALITY ASSURANCE

A. Tester: Performed by an Independent Trade who is specifically and actively engaged in the balancing business and regularly does such work. Certified by the NEBB (National Environmental Balancing Bureau), AABC (Associated Air Balance Council) or approved equal in those testing and balanced disciplines similar to those required for this project.

B. Reference Standards: Comply with AABC's Pub. No. 12173, "National Standards for Field Measurements and Instrumentation, Total System Balance", as applicable to HVAC air and hydronic distribution system and associated equipment and apparatus.

C. Industry Standards: Comply with ASHRAE recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.

D. Submittals:

1. Submit six (6) certified test report and types of instruments used and their most recent calibration data with submission of final test report.
2. Final test report shall bear the name of the person who recorded the data and the seal of the supervisor of the balancing trade.

E. Guarantee: Guarantee that all TAB work be performed in accordance with NEBB or AABC standards and that all air systems operate within plus or minus 10 percent of the design flow rates as shown on the plans and/or as scheduled.

1.4 JOB CONDITIONS

A. Do not proceed with testing, adjusting and balancing work until the work to be TAB'ed has been completed and is operable. Ensure that there is no latent residual work still to be completed.

1. Do not proceed until the work scheduled for TAB'ing is clean and free from debris, dirt and discarded building materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Materials:

1. Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housing which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.
2. At Tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housing.

B. Test Instruments: Utilize test instruments and equipment for the TAB work required, of the type, precision and capacity as recommended for the following TAB standards: AABC's National Standards for Field Measurements and Instrumentation, Total Balance System.

PART 3 - EXECUTION

3.1 ADJUSTMENT AND TESTING

A. Tester must examine the installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Notify the Contractor in writing of conditions detrimental to the proper completion of the test-adjust-balance work. Do not proceed with the TAB work until unsatisfactory conditions have been corrected in a manner acceptable to the Tester.

B. Test, adjust and balance the environmental systems and components, as indicated, in accordance with the procedures outlined in the applicable standards.

C. Prepare report of the test results including instrumentation calibration reports in format recommended by the applicable standards.

D. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in a manner recommended by the original Installer.

E. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

3.2 AIR SYSTEMS

A. Test, adjust and balance systems in accordance with the following procedure:

1. Preliminary:
   a. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals; check all system components for proper installation and operation.
   b. Use manufacturer's ratings for all equipment to make required calculations except where field test shows ratings to be impractical.
   c. Verify that all instruments are accurately calibrated and maintained.
   d. Install clean filters furnished by the mechanical contractor in all equipment.
2. Central System:

a. Test, adjust and record supply fan RPM design requirements within limits of mechanical equipment provided.
b. Test and record motor voltage and running amperes including motor nameplate data and starter heater ratings.
c. Make Pitot tube traverse of main supply, return and fresh air return ducts, determine and record CFM at fan and adjust fan to design CFM.
d. Test and record total system static pressure and suction and discharge static pressure across coils, filters and related air handling sections.
e. Test and adjust systems for design recirculated air; CFM.
f. Test and record cooling apparatus entering air temperatures; dry bulb and wet bulb.
g. Test and record heating apparatus entering and leaving air temperatures; dry bulb.

3. Each Fan:
   a. Each outlet and inlet average velocity, area, CFM.
   b. Test and record total system static pressure at suction and discharge of fan coils.
   c. Fan RPM motor RPM.
   d. Motor name plate current testing.
   e. Motor current draw.
4. Distribution: Adjust zones or branch ducts to proper design CFM, supply; return and exhaust.
5. Air Terminals:
   a. Identify each air terminal from reports as to location and determine required flow reading.
   b. Test, adjust and balance each air terminal to within 10% of design requirement. Record readings.
   c. Set minimum and maximum flow rates for VAV terminals at specified supply duct pressures and 90% system diversity(10% terminal units at minimum flow rate).
6. Verification:
   a. Prepare summation of reading of observed CFM for each system, compare with required CFM and verify that values are within 10% of specified quantities. Determine final coil and filter static pressure drops.
   b. Verify design CFM at fans as described above.

3.3 AUTOMATIC CONTROL SYSTEM

A. Temperature control manufacturer's representative sets and adjusts automatically operated devices to achieve required sequence of operations.

B. Testing organization verifies all controls for proper calibration and list those controls requiring adjustment by temperature control system installer.

END OF SECTION

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SECTION 15090B - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Pipe hangers and supports for mechanical system piping.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15080 Piping Specialties
2. 15200 Vibration Isolation
3. 15250 Mechanical Insulation

1.3 QUALITY ASSURANCE

A. Standards:

1. ANSI B31.1: Power Piping
2. MSS SP58 & SP69

1.4 SUBMITTALS

A. Submit shop drawings for the following:

1. Schedule of all manufactured hanger and support devices, indicating type of device for each pipe size range and type of service, including shielding devices as specified.

1.5 MANUFACTURERS

A. Grinnell, Fee and Mason, Michigan Hanger, B-Line or Elcen, or approved equal.

B. Grinnell figures listed as reference only.

PART 2 - PRODUCTS

2.1 GENERAL

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

B. Design supports of strength and rigidity to suit loading, service, and in manner, which will not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing whenever practical. Do not use perforated iron, chain or wire as hangers.

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

2.2 EQUIPMENT SUPPORTS

A. Provide all supporting steel, not indicated on the structural drawings, that is required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

B. Refer to HVAC Drawing details for further requirements.

2.3 PIPE HANGERS AND SUPPORTS

A. Manufacturers: Grinnell, Fee and Mason, Michigan Hanger, B-Line or Elcen similar to the Grinnell figures listed.

B. Pipe Hangers Application:

1. 2" and smaller: Adjustable, swivel split ring type Grinnell Fig. 104 or lightweight, adjustable clevis type Grinnell Fig. 65.
2. 2-1/2" and larger: Adjustable clevis type Grinnell Fig 260.

C. Hangers for copper pipe without insulation shall be either copper plated or PVC coated.

2.4 PIPE HANGER RODS

A. Support rods shall conform to the latest MSS standards except as modified herein.

B. Size rods for individual hangers and trapeze support as indicated in the following schedule:

Pipe size	Maximum Rod Diameter	Load (lbs.)
Up to 2"	3/8"	610
2-1/2" and 3"	1/2"	1130
4" and 5"	5/8"	1810
6"	3/4"	2710
8" thru 12"	7/8"	3770

C. Furnish rods complete with adjusting and lock nuts.

D. In piping 4 inches and larger, each valve shall be supported.

2.5 HANGERS AND SUPPORT SPACING

A. Space pipe hangers and supports in accordance with the following schedule, with exceptions as indicated herein:

Pipe size	Steel	Copper
Up thru 1-1/4"	8'-0"	6'-0"
1-1/2" and 2"	10'-0"	8'-0"
2-1/2" and 3"	12'-0"	10'-0"
4" and 5"	14'-0"	10'-0"
6" to 12"	14'-0"	10'-0"

B. Place hangers to meet the requirements of the piping section of this specification, with regard to pitch for drainage and venting, and clearance between services.

C. Place hangers within one foot of each elbow and at each valve and strainer for piping 4" and above.

2.6 BEAM CLAMPS

A. Grinnell Fig. 87 Series beam clamps with retaining clip for hanger rods to 5/8". Maximum load 440 lbs.

B. Grinnell Fig. 228 beam clamps with links for hanger rods 3/4" and above.

2.9 RISER CLAMPS

A. Grinnell Fig. 261 for steel pipe, CT-121 for copper tubing.

2.7 CONCRETE INSERTS

A. Grinnell Fig. 285, 281 or 282, poured concrete ceiling insert, suitable for rod diameter and weight supported.

B. Inserts drilled and placed after concrete pour shall have steel shell with expander plug, not depending on soft lead for holding power.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

END OF SECTION

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SECTION 15200 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of vibration isolation work required by this section is indicated on drawings and schedules, and/or specified in other Division 15 sections.

B. Types of vibration isolation products specified in this section include the following:

1. Vibration Isolation Springs.
2. Flexible Duct Connectors.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15860 Ductwork Accessories

1.3 DESIGN CRITERIA

A. Isolate all motor driven mechanical, unless otherwise noted, form the building structure, and from the systems which they serve, to prevent equipment vibrations from being transmitted to the structure.

B. Consider equipment weight distribution to provide uniform deflections.

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

1.4 SUBMITTALS

A. Submit shop drawings of isolation devices indicating isolation materials, isolator heights both free & operating, isolator dimensions, deflections, and isolation efficiency based on lowest operating speed.

1.5 SUPERVISION AND INSPECTION

A. Vibration isolation manufacturer or his qualified representative to provide supervision to assure correct installation and adjustment of the isolators.

1. Upon completion of the installation and after the system is put into operation, the manufacturer, or his representative, shall make a final inspection and submit his report to the A/E in writing, certifying the correctness of installation and compliance with the specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All isolation devices shall be designed for the equipment with which they will be used. Materials used shall retain their isolation characteristics for the life of the equipment served. All elastomeric materials shall be industrial grade neoprene.

B. Isolation devices subject to weather shall have hot-dipped galvanized finish and be furnished with limit stops to resist wind.

C. Coordinate the selection of devices with the isolator and equipment manufacturer.

2.2 MANUFACTURERS

A. Products and methods of fabrication shall be as manufactured by Mason Industries, Korfund Co., Amber/Booth Co., Vibration Mounting & Controls, or Kinetics, similar to the manufacturers model listed.

2.3 TYPE FD FLEXIBLE DUCT CONNECTORS

A. Laminated flexible sheet of cotton duct and sheet elastomer (butyl, neoprene or vinyl), reinforced with steel wire mesh where required for strength to withstand duct pressure indicated. Form connectors with full-faced flanges and accordion bellows to perform as flexible isolation units. Equip each unit with galvanized steel retaining rings for airtight connection with ductwork.

2.4 TYPE B MOUNTS

A. Mason type SLF, combination spring and neoprene with rib-molded base. Spring type isolator shall be free standing and laterally stable without any housing and complete with 1/2" neoprene acoustical friction pads between the baseplate and the support.

B. All mounting shall have leveling bolts that must be rigidly bolted to the equipment. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load.

2.5 TYPE C MOUNTS

A. Mason type SLR, combination spring and neoprene with rib-molded base. Isolator housing shall have vertical limit stops with 1/2" minimum clearance. Housing shall be free hot-dipped galvanized with 1/2" neoprene acoustical friction pads between the baseplate and the support.

B. All mounting shall have leveling bolts that must be rigidly bolted to the equipment. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load.

2.6 TYPE D HANGERS

A. Mason type 30N, vibration hangers with steel spring and 0.3" deflection neoprene element in series. Neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box shall permit hanger rod to swing 30 deg. arc before contacting the hole and short circuiting the spring.

B. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

2.7 PERFORMANCE

A. Select all vibration isolation devices to provide minimum 95% isolation efficiency or based on the minimum static deflection and mounting criteria listed below, whichever greater.

B.

	Floor Span					
	On Grade		20 feet		30 feet	
	Min. Static		Min. Static		Min. Static	
	Type	Defl.	Type	Defl.	Type	Defl.
1. Suspended Fans:	--	--	FD	1.5"	FD	1.5"

Note: Air Handling Units are internally isolated and do not require external vibration isolation.

PART 3 - EXECUTION

3.1 GENERAL

A. Except as otherwise indicated, apply the following types of vibration isolators at indicated locations or for the following indicated items of equipment. Selection is Installer's option where more than one type is indicated.

B. Spring Isolators:

1. Suspended Fans

C. Flexible Duct Connectors:

1. Duct connections with air handling equipment mounted on vibration isolators.

3.2 INSTALLATION

A. General: Except as otherwise indicated, comply with manufacturer's instructions for installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short-circuited by other contact or bearing points.

B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.

C. Install vibration isolation devices as specified, as shown on the drawings and according to the manufacturer's installation instructions.

D. In no case shall the installation short circuit the isolation device. Flexible piping connections are to be installed on the equipment side of shut-off valves.

END OF SECTION

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SECTION 15250 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of mechanical insulation required by this section is indicated on drawings, and by requirements of this section.

B. Work shall include all labor, equipment, accessories, materials and services required to furnish and install all insulation, fittings and finishes for piping, ducts and related mechanical equipment in the Heating, Ventilating and Air Conditioning Systems.

C. The following types of insulation are specified in this section:

1. Duct insulation.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15090 Support and Anchors
2. 15840 Ductwork

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturers:

1. Owens-Corning
2. Schuller
3. Certainteed

B. All insulating products delivered to the construction site shall be labeled with the manufacturer's name and description of materials.

C. All insulation installation methods shall be performed in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions, except as modified in this section of specifications.

1.4 DEFINITIONS

A. Concealed Ductwork: Concealed areas, where indicated in this section, shall apply to shafts, furred spaces, space above finished ceilings, low tunnels and crawl spaces.

B. Exposed Ductwork: Exposed ductwork, include mechanical rooms, walk-through tunnels, and similar installations subjecting ductwork insulation to physical damage and tearing.

1.5 SUBMITTALS

A. Submit shop drawings for insulation systems, including a schedule for all insulating materials, including adhesives, fastening methods, fitting materials, installed thickness and intended use of each material.

B. Submittal shall include catalog sheets indicating density, thermal characteristics, jacket, and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All products including vapor barriers and adhesives shall conform to NFPA Section 90A. All products except pipe insulation shall possess a flame spread rating of not over 25, without evidence of continued progressive combustion, and a smoke developed rating no higher than 50.

2.2 EXPOSED DUCTWORK INSULATION

A. Material: Rigid Glass Fiber Board: Rigid or semi-rigid glass fiber insulating board shall have a minimum density of 3.0 PCF with thermal conductivity of not more than 0.23 at 75 degrees F mean temperature and suitable for 450 degrees F with FSK facing complying with ASTM E-136 and C612 Class 3 for flat surfaces and semi-rigid flexible board. Attached with mastic bands and mechanical weld pins with washers.

1. Jacket shall be of heavy duty fire retardant material with glass fiber reinforcing foil kraft laminate factory applied with paintable white finish. Permeance shall not exceed 0.02 perms. Beach puncture resistance shall be 25 units minimum.

B. Material: Flexible Glass Fiber Wrap: Flexible glass fiber insulation shall have a minimum density of 0.75 PCF with thermal conductivity of not more than 0.31 at 75 degrees F mean temperature and suitable for 240 degrees F with FSK aluminum foil reinforced vapor barrier jacket. Material shall meet NFPA 90A and 90B.

1. Jacket shall be glass fiber reinforced foil kraft laminate factory applied with paintable white finish. Permeance shall not exceed 0.04 perms. Beach puncture resistance shall be 15 units minimum.

2.3 DUCTWORK INSULATION SCHEDULE

A. Exposed - Combustion Air Ducts:

1. Type Insulation: 1-1/2" Flexible Wrap.
2. Radiant Heater combustion air ducts.

B. Exposed - Fresh Air Ducts:

1. Type Insulation: 1-1/2" Rigid Board.
2. Fresh air louver to Motorized Damper(MD).

D. Exposed Exhaust Air Ducts - General Exhaust:

1. Type Insulation: 1-1/2" Rigid Board.
2. Motorized Damper (MD) to Ambient Outlet (Gravity Vent).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Application of insulation materials to piping, equipment, tanks and ductwork shall be done in accordance with manufacturer's written recommendations. Where thickness of insulation is not specified, use applicable thickness recommended by manufacturer and required by applicable codes.

B. All insulation shall be continuous through wall and ceiling openings and sleeves. All covered pipe and ductwork is to be located a sufficient distance from walls, other pipe, ductwork and other obstacles to permit the application of the full thickness of insulation specified. (If necessary, extra fittings and pipe are to be used.).

3.2 DUCTWORK INSULATION INSTALLATION

A. Insulation shall be installed per manufacturer recommendations with mechanical fasteners. Seal all joints and fasteners with UL labeled vapor proof tape.

B. Provide finished edges at all access doors and ends.

3.3 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction; period, to avoid damage and deterioration.

END OF SECTION

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SECTION 15350 - NATURAL GAS PIPING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of natural gas piping system work, is indicated on drawings and schedules and by requirements of this section.

1. Building natural gas distribution system from gas meter to locations as indicated on Drawings, shall be provided and installed by this Contractor.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15010 HVAC General Provisions.
2. 15090 Supports and Anchors.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of natural gas piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with at least 3 years of successful installation experience on projects with natural gas piping system work similar to that required for project.

C. ANSI Code Compliance: Comply with applicable provisions of ANSI B31.2 "Fuel Gas Piping".

D. Natural Fuel Gas Code Compliance: Comply with applicable provisions of NFPA 54 (ANSI Z223.1) "National Fuel Gas Code".

E. International Fuel Gas Code: IFGC 2009.

E. Local Utility Compliance: Comply with requirements of local gas utility company.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING MATERIALS AND PRODUCTS

A. General: Provide piping material and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements.

1. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures.
2. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in natural gas piping systems.
3. Where more than one (1) type of materials or products are indicated, selection is installer's option.

2.2 BASIC IDENTIFICATION

A. General: Provide identification complying with Division 15A Basic Materials and Methods, in accordance with the following listing:

1. Paint all exterior and interior gas piping yellow and identify the use as specified above.

2.3 BASIC PIPE, TUBE AND FITTINGS

A. General: Provide pipe, tube, and fittings complying with Division 15A Basic Materials and Methods ", in accordance with the following listing:

1. Building Distribution Piping: (Exposed Pipe Only)
   a. Pipe Size 2" and smaller: Black steel pipe.
   b. Pipe Weight: Schedule 40.
   c. Fittings: Malleable iron threaded.

2. Pipe Size 2.5" and Larger: Black steel pipe.
   a. Pipe Weight: Schedule 40.
   b. Fittings: Wrought-butt welding.

2.4 SPECIAL VALVES

A. General: Special valves required for natural gas piping systems include the following types:

B. Gas Cocks:

1. Gas Cocks 2" and Smaller: 150 psi non-shock WOG, bronze straightway cock, flat or square head, threaded ends.
2. Gas Cocks 2.5" and Larger: 125 psi non-shock WOG, iron body bronze mounted, straightway cock, square head, flanged ends.

C. Pressure Regulating Valves: 150psi WOG non-shock, cast iron body, threaded ends, aluminum spring and nitrite diaphragm, vent port.

1. Provide ventless pressure regulating valves, where possible.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gas cocks which may be incorporated in the work include, but are not limited to the following:

1. DeZurik; Unit of General Signal.
2. Jenkins Bros.
3. Lunkenheimer Co., Div. of Conval Corp.
4. NIBCO, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF BASIC IDENTIFICATION

A. General: Install mechanical identification in accordance with Division 15A Basic Materials and Methods.

3.2 INSTALLATION OF NATURAL GAS PIPING

A. General: Install natural gas distribution piping in accordance with Division 15A Basic Materials and Methods, and in accordance with applicable codes and local utility company requirements.

B. Use sealants on metal gas piping threads, which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.

D. Do not install defective piping or fittings. Do not use pipe with threads, which are chipped, stripped or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

F. Install drip-legs in gas piping where required by code or regulation at each gas appliance.

G. Install "Tee" fitting with bottom outlet plugged or capped, at bottom of pipe risers.

H. Use dielectric unions where dissimilar metals are joined together.

1. Install piping with 1" drop in 60' pipe run (0.14%) in direction of flow.

3.3 INSTALLATION OF PIPING SPECIALTIES

A. Install piping specialties in accordance with manufacturers recommendations in compliance with IFGC.

3.4 INSTALLATION OF SUPPORTS, ANCHORS AND SEALS

A. Install supports, anchors, and seals in accordance with Division 15A Basic Materials and Methods.

3.5 INSTALLATION OF VALVES

A. Gas Cocks: Provide at connection to gas train for each gas-fired equipment item, and also on risers and branches, where indicated.

B. Locate gas cocks where easily accessible, and where they will be protected from possible injury.

C. Vent all pressure regulators to outside, unless ventless listed valve.

3.6 EQUIPMENT CONNECTIONS

A. General: Connect gas piping to each gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.

3.7 PIPING TESTS

A. Test natural gas piping in accordance with ANSI B31.2, and local utility requirements.

END OF SECTION

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SECTION 15800 – GAS-FIRED MAKEUP AIR UNITS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Direct-fired, Indoor Make-up Air Units.

1.2 RELATED DOCUMENTS

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

B. Specified elsewhere:

1.	15043	Testing, Adjusting and Balancing
2.	15960	Starting of Mechanical Systems
3.	15900C	Controls and Instrumentation

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Reference Standards:

AGA	American Gas Association
ANSI Z83.4	Direct Gas Fired Makeup Air Heaters
ANSI Z83.6	Gas Fired Infrared Heaters
ANSI Z21.64	Direct Vent Central Furnaces
GAMA	Gas Appliance Manufacturers Association
NEC	National Electrical Code

B. WARRANTY:

1. Gas-fired primary and secondary heat exchangers warranted for 20 years under normal use and maintenance. Remainder of heating components warranted for 1 year from date of startup

1.5 SUBMITTALS

A. Refer to division 1, General Conditions, Submittals.

B. Submit complete product data, manufacturer's installation instructions and accessories required for complete system.

PART 2 - PRODUCTS

2.1 DIRECT-FIRED MAKE-UP AIR UNITS

A. Furnish fully assembled and wired gas-fired direct-fired make-up air units in the size and capacity as shown on the Drawings.

B. Furnish fully assembled and wired direct-fired outdoor make-up unit with blower/filter section, and duct furnace section in the size and capacity as shown on the Drawings and specified herein. Designed for 100% make-up air applications with ETL certified compliance with ANSI Standard Z83.18 and Z83.4.

C. Casing: Shall be complete with insulated double-wall galvalume steel contruction in weatherized cabinet, removable side panels, filters (2" 30% - MERV 8) and external angled filter rack. Unit shall be configured for indoor horizontal discharge with rail mounting. Access panels shall employ locking cams with tool-less door access handles to access equipment.

D. Bonnet Section: AGA certified and constructed of AGA defined corrosion resistant material with a built-in draft diverter. Burners shall be cast iron construction with stainless steel mixing plates. Burner shall employ an electronic modulating gas design for 25:1 turndown ratio.

E. Blower Section: Shall be factory installed with NEMA standard motor, IEC contactor or starter, dynamically-balanced class I or II centrifugal blower fan and adjustable belt drive.

F. Gas Train:

1. Units shall be provided with gas valves suitable for Class 2, maximum inlet pressure of 0.5 psi (14 inch W.C.) on natural gas.
2. The 24-volt combination automatic gas valves must include a main operating valve, pilot safety shutoff, pressure regulator, manual main and pilot shutoff valve, and adjustable pilot valve.
3. Gas valves shall be electronic modulating gas valve. Ignition shall be at full fire (100% input) and modulate the gas input from 100 to 4% rated input. Gas valve shall be energized through duct thermostat control with reset from the space selector thermostat. Maxitrol Series 14 amplifier or approved equal.

G. Controls:

1. A factory installed control box or junction box shall be provided for all power connections. A 24-volt control transformer, high limit, and fan time delay relay must be provided. Fan time delay relay will delay the fan start until the heat exchanger reaches a predetermined temperature and allow the fan to operate after burner shutdown to remove residual heat from the heat exchanger.
2. A solid-state ignition control system shall ignite the pilot by spark during each cycle of operation. When pilot flame is proven, main burner valve shall be open to allow gas flow to burner. Pilot and burners must be extinguished during the off cycle.

H. Accessories: (Refer to Schedules for further requirements)

1. Low voltage duct thermostat, modulating control and remote control station as scheduled for discharge air temperature control.
2. 230 volt/1-phase electric service with control transformers.
3. Indoor filter section with locking access door.
4. Double-wall construction.
5. Painted enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with all applicable codes, standards and local utility requirements. Install units per manufacturer's instructions.

B. Connect natural gas line to gas-fired equipment and adjust pilot flame, gas input and pressure per manufacturer's recommendations.

C. Install and adjust integral and remote temperature controls for proper operation.

END OF SECTION

SECTION 15810 – GAS-FIRED RADIANT HEAT UNITS

PART 1 - GENERAL

1.2 DESCRIPTION OF WORK

A. Gas-fired Radiant Heat Units.

1.3 RELATED DOCUMENTS

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

B. Specified elsewhere:

1.	15043	Testing, Adjusting and Balancing
2.	15900C	Controls and Instrumentation

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Air Conditioning and Refrigeration Institute, ARI:
   a. ARI 210: Unitary Air Conditioning Equipment.
2. Reference Standards:

AGA	American Gas Association
ANSI Z83.4	Direct Gas Fired Makeup Air Heaters
ANSI Z83.6	Gas Fired Infrared Heaters
ANSI Z21.64	Direct Vent Central Furnaces
GAMA	Gas Appliance Manufacturers Association
NEC	National Electrical Code

B. WARRANTY:

1. Furnace primary and secondary heat exchangers warranted for 20 years under normal use and maintenance. Remainder of furnace components warranted for 1 year from date of start up.

1.5 SUBMITTALS

A. Refer to division 1, General Conditions, Submittals.

B. Submit complete product data, manufacturer's installation instructions and accessories required for complete system.

PART 2 - PRODUCTS

2.1 GAS-FIRED RADIANT HEATERS

A. Furnish fully assembled and wired sealed-combustion gas-fired radiant heaters in the size and capacity as shown on the Drawings.

B. Radiant Heater: Tubular radiant heaters shall be constructed of seam or arc welded with emissive tubes with polished reflectors. Units shall be suspended or mounted from overhead supports. The burners shall enclosed in with sight glass for observing flame and terminal board for thermostat connections. Power shall be supplied with a grounded 115-volt cord.

C. The burner shall be equipped with a blower for supplying combustion air with a direct spark burner ignition system. Motor shall be 115 volt, 1-phase, 60 cycle arranged for 100% safety, shut-off on both

main burner and pilot gas. Integral power vent system, fully factory-assembled to a sealed flue collection chamber.

1. Separated combustion flue/combustion air ducted intakes and roof terminations.
2. Two-stage heat.

D. Combustion chamber: shall be 4 inch O.D. 16ga. Titanium stabilized aluminized steel (150-200MBH to allow for the operating temperature to exceed the 1030F as set forth in the ANSI Z83.20 standard) or aluminized steel (below 150 MBH), finished with a high emissivity rated, corrosion resistant, black coating with an emissivity level documented at .92 or higher.

E. Emitter tube: shall be 4 inch O.D. 16ga. aluminized steel finished with a high emissivity rated, corrosion resistant, black coating with an emissivity level documented at .92 or higher.

1. Burner type: Unit shall be a positive pressure power burner with a combustion fan upstream of the burner and exhaust gases for component longevity, maximum combustion efficiency, and energy transfer. Negative pressure (pull through) type appliances will not be allowed.
2. Fan enclosure: Combustion fan shall be totally housed inside burner control box and not exposed. Appliances with exposed combustion/exhauster fans shall not be permitted.
3. Burner: Stainless-steel venturi burner. The flame anchoring screen shall have a minimum temperature rating equivalent to 304 grade stainless steel. Non stainless steel burners shall not be permitted.
4. Tube connections: The heater's combustion chamber and radiant emitter tube shall incorporate a 4 inch slip-fit, interlocking connection in which the upstream tube slides into the next tube and is held by a bolted clamp. A butted tube connection system shall not be permitted.
5. Ignition system : Hot surface silicon carbide capable of temperatures achieving 2400 F. Igniter shall be readily accessible and serviceable without the use of tools. Spark ignition systems shall not be permitted.
6. Reflectors: Shall be .025 polished aluminum with a multi-faceted design which includes reflector end caps. Reflector shall have a polished bright finish with clear visual reflection ability. Reflector shall have a minimum of 7 sheet metal bends in its fabrication to optimize downward radiation. Reflectors shall be rotatable from 0 to 45 degrees when required. The heater's reflector hanging system shall be designed to permit expansion while minimizing noise and/or rattles.

F. Control box: Heater's exterior control chassis shall be constructed of corrosion resistant enameled steel.

1. Air intake: An air intake collar shall be supplied as part of the burner control assembly to accept a 4 inch O.D. supply duct.
2. The heater's control compartment shall be accessible without the use of tools and serviceable while heater is operating.
3. Heaters shall be equipped with a sight glass allowing a visual inspection of igniter and burner operation from the floor. Sight glass visible only at a appliance level shall not be permitted.
4. The heaters shall utilize a downstream turbulator baffle for maximum heat transfer.
5. Heater shall be supplied with a stainless steel flexible gas connector.

G. Burner Safety Controls: Heater controls shall include a safety differential pressure switch to monitor combustion air flow, as to provide complete burner shutdown due to insufficient combustion air or flue blockage. The heater shall incorporate a self-diagnostic ignition module, and recycle the heater after an inadvertent shutdown.

1. The heater's control system shall be designed to shut off the gas flow to the main burner in the event either a gas supply or power supply interruption occurs.
2. The heater's blower motor shall be thermally protected and the motor's impeller shall be balanced.
3. Heater control assembly shall include three indicator lights that define the units operating input ranges. One indicator shall validate air flow. Two indicator lights shall indicate low

and high stages.

4. The heater's air flow control system shall provide a 45 second pre-purge prior to initiating burner operation and a 90 second post-purge upon completion, effectively removing all products of combustion from heat exchanger and/or radiant tubes.
5. No condensation shall form as a result of combustion in the combustion chamber or radiant tubes while at operating temperatures.
6. Thermostat control shall be two-stage operating on 24 volts.
7. Venting: shall be per manufacturer approval and specifications.
8. Control Transformer: Integrally mounted.

H. Acceptable Manufacturers:

1. Detroit Radiant Products Co. HL3 series.
2. Approved equal.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. General: Comply with all applicable codes, standards and local utility requirements. Install units per manufacturer's instructions.

B. Connect natural gas line to furnace and adjust pilot flame, gas input and pressure per furnace manufacturer's recommendations.

C. Install and connect combustion air and flue vents per manufacturer's recommendation. Slope flue vent back to gas-fired unit. All combustion and vent pipes and connections must be air-tight and water tight. Provide sleeves and water-tight seal at wall or roof penetrations.

3.2 RADIANT HEATER INSTALLATION

A. Install and connect gas-fired radiant heaters, associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

B. Suspended units: suspend from substrate using chain hanger kits and building attachments.

C. Maintain manufacturers' published clearances to combustibles.

D. Adhere to manufacturers' installation instructions.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to gas-fired radiant heaters to allow service and maintenance. Refer to manufacturers' instructions for proper gas connection details.

C. Gas Piping: comply with NFPA 54 and manufacturer's installation instructions.

D. Vent Connections: adhere to manufacturers' installation instructions.

E. Install electrical devices furnished with heaters but not specified to be factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Obtain adjustment instructions from gas-fired radiant heater manufacturer before making any adjustments to burners or other heating components.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gas-fired radiant heaters.

END OF SECTION

SECTION 15820 - FANS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of fan work is shown on drawings and schedules, and by requirements of this section.

B. Types of fans required for project include the following:

1. Centrifugal Roof Exhaust Fans.
2. Centrifugal Inline Exhaust Fans.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1.	15043	Testing, Adjusting and Balancing
2.	15200	Vibration Isolation
3.	15900C	Controls and Instrumentation

1.3 QUALITY ASSURANCE

A. Manufacturers:

1. Greenheck
2. Cook
3. Carnes.

B. AMCA Compliance: Provide fans bearing the Air Movement and Control Association, Inc. (AMCA) Certified Rating Seal.

C. UL Compliance: Provide power roof ventilator electrical components which have been listed and labeled by Underwriters Laboratories (UL).

1.4 SUBMITTALS

A. Submittals shall include all product data, performance, materials of construction, and installation instructions.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF EXHAUST FANS

A. Roof exhaust fans shall be the belt or direct drive, centrifugal type, complete with housing, prefabricated roof curb, bird screen, back draft damper and disconnect.

B. The fan wheel shall be centrifugal with backward inclined, airfoil or forward curved blades, as scheduled. The fan wheel shall be statically and dynamically balanced. Provide grease fittings with caps for all bearings.

C. The fan shall be quiet operating and vibration free. Fan performance shall be certified by an AMCA ratings seal. The fan shaft shall be mounted in permanently lubricated ball bearing pillow blocks.

D. The fan motor shall be a NEMA approved, ball bearing type permanently lubricated with thermal overloads. Belt drives shall be adjustable, and the entire drive assembly shall be mounted on neoprene vibration isolators. The fan and motor housing shall be heavy gauge aluminum. Provide a hinged and latched cover for access to the motor and drive. The fan outlet shall be protected by a 1/2" galvanized or aluminum bird screen.

E. Provide motorized bacdraft damper as indicated on drawings.

2.2 CENTRIFUGAL IN-LINE FANS

A. Centrifugal in-line fans shall be the belt or direct-driven, centrifugal type, as schedule.

B. The fan wheel shall be centrifugal with backward inclined, airfoil, or forward curved blades, as scheduled. The fan wheel shall be statistically and dynamically balanced. The fan shall be quiet operating and vibration free. Fan performance shall be certified by an AMCA ratings seal.

C. The fan shaft shall be mounted in lubricated ball bearing pillow blocks. Bearings shall be provided with grease fittings and caps. Bearings shall be rated for 200,000 hours.

D. The fan housing shall be steel construction with 1/2" thick, 1-1/2" lb. density fiberglass lining. Belt drives shall have a sliding or pivoting motor plate for belt tensioning, and the belt shall be totally enclosed by a belt guard with tachometer holes. The fan motor shall be a NEMA approved, ball bearing type. Provide casing access for checking fan speeds. Provide variable-speed control switch when scheduled.

E. Accessories: As specified herein and indicated on drawings schedules:

1. Spring vibration isolation supports.
2. Belt guard.
3. Flexible duct connections.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Examine areas and conditions under which fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FANS

A. General: Except as otherwise indicated or specified, install ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure that ventilators serve their intended function.

B. Coordinate ventilator work with work of roofing, walls and ceilings, as necessary for proper interfacing.

C. Ductwork: Refer to Division 15 Section 15840B "Ductwork". Connect ducts to ventilators in accordance with manufacturer's installation instructions.

E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical installer.

1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

2. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.

F. Install vibration isolation as scheduled and specified in Section 15200.

3.3 FIELD QUALITY CONTROL

A. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, and then retest to demonstrate compliance. Replace units, which cannot be satisfactorily corrected.

3.4 SPARE PARTS

A. General: Furnish to Owner, with receipt, one spare set of belts for each belt drive power ventilator.

END OF SECTION

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SECTION 15840 - DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of ductwork requirements is indicated on the Drawings and by requirements of this section.

B. The ductwork requirements for this project include the following:

1. Low-Pressure Ductwork
2. Plenums
3. Flexible Ductwork.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15250 Mechanical Insulation
2. 15860 Ductwork Accessories

1.3 QUALITY ASSURANCE

A. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards" first edition 1985 for fabrication and installation of metal and flexible ductwork.

B. ASHRAE Standards: Comply with ASHRAE Handbook and Product Directory, 1979 Equipment Volume, Chapter 1 "Duct Construction", for fabrication and installation of ductwork.

C. NFPA Compliance: Comply with ANSI/NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and ANSI/NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems."

D. ACIGH Industrial Ventilation 24th Edition 2001.

1.4 SUBMITTALS

A. Submit product data and specifications for ductwork materials.

B. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for low and high-pressure and exhaust ductwork systems.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

A. Above ground, general ductwork: Galvanized steel, lock-forming quality, ASTM A527; 1.25 oz. zinc coating each side, mill phosphatized, ASTM A525.

1. Round – Spiral wound ductwork.

B. Steel Ducts: Galvanized steel, lock-forming quality, ASTM A527; 1.25 oz. zinc coating each side, mill phosphatized, ASTM A525.

C. Stainless Steel Ducts: ASTM A167, Type 304.

D. Flexible Duct:

1. Spiral wire Reinforced Fabric: Spiral wire reinforced fabric type flexible duct shall be made of a corrosion-resistant reinforcing wire helix bonded to a continuous layer of fabric. Class I Air Duct Material, UL Standard 181.

E. Insulated Flexible Duct: Insulation shall be cellular glass, 1-1/2" nominal thickness of 1-1/2 pound density per cubic foot. The insulation shall encase the flexible duct and shall be sheathed with vapor barrier having a permeability of not over 2.0 perm. Insulation and vapor barrier shall be factory installed.

F. Flexible Fiberglass Duct Liner: Flexible coated glass fiber duct liner; ANSI/ASTM C553; 'K' value of 0.26 at 75 degrees F; 1-1/2 lbs./cu. ft. minimum density; coated air side for maximum 4,000 ft./min. air velocity.

1. Lagging Adhesives: Fire resistive to ASTM E84, NFPA 255.
2. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad or mechanical fastener type as recommended, insulation manufacturer.

G. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant gaskets and tapes as compounded and recommended by the manufacturer specifically for sealing joints and seams in ductwork.

H. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

I. Drive Screws and Clamps: As recommended by SMACNA.

J. Factory Made Joints: Ductmate system as manufactured by Ductmate Industries, Inc., Nexus system as manufactured by Exanno, or other approved product may be used.

2.2 DUCTWORK PRESSURE-VELOCITY CLASSIFICATION

A. General: Construct ductwork in conformance to SMACNA "HVAC Duct Construction Standards" 1st edition 1985.

B. Low Pressure Ductwork:

1. Static Pressure Class: +2" W.G.
2. Maximum Velocity Level: 2500 FPM.

2.3 DUCTWORK SEALING CLASSIFICATION

A. General: Construct ductwork in conformance to SMACNA "HVAC Duct Construction Standards" 1st edition 1985.

B. Low Pressure Ductwork:

1. Seal Class: B seal transverse joists and longitudinal seams.

2.4 FABRICATION

A. Shop fabricate ductwork in 4, 8, 10, or 12 foot lengths, unless otherwise indicated or required to complete runs. Pre-assemble work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembling and coordinated installation.

B. All dimensions indicated on drawings are free area ductwork requirements. Increase ductwork dimensions to accommodate ductwork lining requirements.

C. Accessories:

1. Fabricate ductwork with accessories such as air turns, extractors, and volume dampers, installed during fabrication to greatest extent possible.
2. Fabricate ductwork with duct liner in each section of duct where required.

D. Variation: No variation of duct configuration or sizes permitted except by written permission.

E. Directional Change:

1. Construct tees, bends, and elbows with radius minimum 1-1/2 times width of duct on center lines.
2. Where not possible and where rectangular elbows used, provide airfoil type turning vanes.
3. Where acoustical lining is required, provide turning vanes of perforated metal type with fiberglass inside.

F. Size Change:

1. Increase duct sizes gradually, not exceeding 15 deg. divergence wherever possible.
2. Maximum divergence upstream of equipment to be 30 deg. and 45 deg. convergence downstream.

G. Seams and Joints:

1. Seams and joints fabricated in accordance with SMACNA standards.
2. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so not to breathe, rattle, vibrate, or sag.

2.5 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on center line. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

1. Where acoustic lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

F. Connect flexible ducts to metal ducts with adhesive and draw bands.

G. Round Duct Take-Offs: Provide conical or bellmouth low-pressure fittings.

H. Square Duct Take-Offs: Provide 45 degree leading edge at square take-off with 4: minimum depth.

2.7 DUCTWORK APPLICATION SCHEDULE

	Air System	Classification	Material
A.	Combustion air:	Low Press	Steel
B.	Exhaust air:	Low Press	Steel
C.	Fresh air:	Low Press	Steel

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble and install ductwork in accordance with SMACNA standards, and which will achieve airtight and noiseless systems, capable of performing each indicated service.

1. Align ductwork accurately at connections.
2. Support ducts rigidly with suitable ties, braces, hangers and anchors of type, which will hold ducts straight, plumb and free of sags and vibration.

B. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and other electrical equipment spaces and enclosures.

C. Metal Duct Support:

1. Support ductwork from building structure as required and, where not otherwise indicated, anchor with bolts, concrete inserts, steel expansion anchors, welded studs, C-clamps or special beam clamps.
2. Support vertical ducts, at 12 foot spacing, by attachment to adjacent vertical structural surfaces or by direct bearing at floor penetrations and similar locations.
3. Support horizontal ducts located against structural walls and other similar adjacent vertical surfaces, at 8 foot spacing for ducts up to 40 inches horizontal dimension and 4 foot spacing for larger ducts.
4. Hang horizontal rectangular ducts from overhead structure, at 10 feet spacing for duct widths up to 60 inches and 8 foot spacing for larger ducts.
5. Arrange hangers, supports and duct rests to permit free, unrestrained and noiseless expansion and contraction of duct.
6. Where duct lining not used, vertical members may be fastened to duct sides with sheet metal screws.
7. Where duct lining is used, do not puncture sheet metal.

D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

G. Connections:

1. Connect duct to equipment with flexible fabric, sheet metal clips, screws and washers.
2. Connect branch take-offs to include prefabricated air scoops formed of same material as associated duct system.
3. Connect diffusers or plenum boots to low-pressure ducts with 10-foot maximum length of flexible duct, held in place with strap or clamp.

3.2 ADJUSTING AND CLEANING DUCTWORK

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment, which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Clean duct systems with high power vacuum machines. Protect equipment, which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.3 DUCT LEAKAGE

A. Inspect all ductwork for leak sources and repair.

B. Do not insulate ductwork until it has been accepted for duct leakage.

C. Refer to Section 15043 for Testing, Adjusting, and Balancing requirements of ductwork system.

D. Low pressure ductwork leakage rate shall not exceed 5%.

END OF SECTION

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SECTION 15860 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of duct accessories work is indicated on drawings and in schedules, and by requirements of this section.

B. Types of duct accessories required for this project include the following:

1. Dampers:
   a. Manual dampers
   b. Control dampers
2. Turning vanes
3. Duct hardware
4. Duct access panels
5. Flexible connections

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15200 Vibration Isolation
2. 15250 Mechanical Insulation
3. 15840 Ductwork
4. 15900C Controls and Instrumentation

1.3 QUALITY ASSURANCE

A. SMACNA Compliance: Comply with applicable portions of Sheet Metal and Air Conditioning Contractor's National Association SMACNA "HVAC Duct Construction Standards" 1st edition, 1985.

B. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers Inc. (ASHRAE) recommendations pertaining to construction of duct accessories, except as otherwise indicated.

C. UL Compliance: Construct, test, and label fire dampers in accordance with Underwriters Laboratories (UL) Standard 555 "Fire Dampers and Ceiling Dampers".

D. NFPA Compliance: Comply with applicable provisions of ANSI/NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of duct accessories.

PART 2 - PRODUCTS

2.1 DAMPERS

A. Manual Dampers: Provide dampers of single blade type (up to 6" height) or multiblade type (over 6" height), constructed in accordance with SMACNA Standards. Provide damper operator with locking devices and damper position indicator.

B. Automatic Control Dampers (ACD): Refer to Division 15900C section "Controls and Instrumentation" for automatic control damper requirements. Furnished by Temperature Controls Contractor.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering dampers which may be incorporated in the work include, but are not limited to the following:

1. Honeywell.
2. Vent Products
3. Ruskin Mfg. Co.

2.2 TURNING VANES

A. Manufactured Turning Vanes: Provide turning vanes constructed of 1.5" wide curved blades set at 1.5" spacing O.C., supported with bars perpendicular to blade set at 2" O.C., and set into side strips suitable for mounting in ductwork. Double wall type turning vanes shall be 2" radius, 2-1/8" spacing O.C.

1. Ducts over 24-inch dimension shall use double-wall airfoil type turning vane.
2. Ducts with air velocity over 2500 FPM shall use double-wall airfoil type turning vane.

B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

1. Provide where acoustic duct liner is required.

2.3 DUCT HARDWARE

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:

1. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct hardware which may be incorporated in the work include, but are not limited to the following:

1. Ventfabrics, Inc.
2. Young Regulator Co.

2.4 DUCT ACCESS PANELS

A. General: Provide where indicated, duct access panels of size indicated. Minimum size 12" x 12". Access panels are required at the following equipment, but are not limited to these locations:

1. Upstream and downstream of reheat or duct-mounted coils.
2. Fire Dampers.
3. Backdraft and motorized dampers.
4. Automatic Control Dampers - internally mounted.
5. Louvers.

B. Construction: Construct of same or greater gauge as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one (1) handle-type latch for doors 1/2" high and smaller, 2 handle-type latched for larger doors.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering duct access door which may be incorporated in the work include, but are not limited to the following:

1 Air Balance Inc.
2 Duro Dyne Corp.
3 Ruskin Mfg. Co.
4 Ventfabrics Inc.

2.5 FLEXIBLE CONNECTIONS

A. General: Provide flexible duct connections, wherever ductwork connects to vibration-isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

B. Refer to Section 15200B Vibration Isolation.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which duct accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install duct accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA Standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90 deg. elbows in supply and exhaust air systems, and elsewhere as indicated.

C. Install access doors to open against systems air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork as necessary to interface installation of duct accessories properly with other work.

1. Install control dampers provided by Temperature Control Contractor.

E. Field Quality Control: Operate installed duct accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak proof performance.

END OF SECTION

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SECTION 15960 - STARTING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Contractor:

1. Provide material and labor required for start up of all equipment and systems installed under general contract.
2. Coordinate start-up work with pipe cleaning, pipe system leak tests, and initial system fill and venting.
3. Provide all information and assistance required for cooperation with testing, adjusting and balancing services.
4. Contractor shall coordinate start-up of mechanical equipment with manufacturer's representative to be present for supervision and certification of correct operating procedures.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15043 Testing, Adjusting and Balancing
2. 15900C Controls and Instrumentation

1.3 START-UP PROCEDURES

A. Bearings:

1. Inspect for cleanliness, clean and remove foreign materials.
2. Verify alignment.
3. Replace defective bearing and those which run rough or noisy.
4. Lubricate as necessary in accordance with manufacturer's recommendations.

B. Motors:

1. Check each motor for amperage comparison to nameplate value.
2. Correct conditions, which produce excessive current flow, which exist due to equipment malfunction.

C. Drives:

1. Adjust tension in V-belt drives, and adjust vari-pitch sheaves and drives for proper equipment speed.
2. Adjust drives for alignment of sheaves and V-belts.
3. Clean and remove foreign materials before starting operation.

D. Air Systems:

1. Set and calibrate draft gages of air filters and other equipment.
2. Replace filter media with new clean units.
3. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment when needed.
4. Check each electrical control circuit to assure that operation complies with specifications and requirements to provide desired performance.

E. Adjustments:

1. Provide such periodic continuing adjustment services as necessary to insure proper functioning of mechanical systems after occupancy of the Project, and for a period of one year after Date of Substantial Completion.
2. Note: Adjustment services are not maintenance services.

PART 2 - PRODUCTS

- - - NOT USED - - -

PART 3 - EXECUTIONS

- - - NOT USED - - -

END OF SECTION

BUILDING AUTOMATION SPECIFICATIONS

SECTION 15900C - CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Includes:

1. Complete system of Direct Digital Automatic controls system.
2. Complete integration into existing Honeywell WebsAX network at Goodman Parks Adminstration Building
3 Electrical control system.
4 Control devices, components, wiring and material.
5 Instructions for users.

1.2 DESCRIPTION OF WORK

A. Extent of controls and instrumentation work is indicated on drawings and schedules and by requirements of this section.

B. Control system for gas-fird make-up air units shall be factory installed and provide primary control. DDC system shall overlay gas-fired controls for start-stop and monitoring purposes.

C. Existing gas purge panels and related 24 volt controls can be reused to the extent of complying with the sequence of operation with DDC control loop logic.

1. New carbon monoxide and nitrous oxide sensors to be provide by and installed the Control Trade, along with door position sensors.
2. Existing control contactors for the overhead doors and purge fans at the roof(PRV-1 & 2) can be reused with the new plan.

D. Radiant heaters shall be controlled by DDC space sensors for control.

E. Motorized dampers for exhaust fans and make-up air unit shall be supplied by the HVAC Contractor and interlocked with the fan operation using line voltage wiring. The wiring interlock is the responsibility of the Electrical Contractor.

F. Duct-mounted smoke detector at MAU-1 is provided by and wired by the HVAC Contractor for fan shutdown upon detection of smoke; Control Trade to monitor smoke detection alarm.

G. Instruction of Owner's personnel.

1.3 RELATED WORK

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

B. Specified Elsewhere:

1. 15910C Direct Digital Control Systems
2. 15950C Control Sequence
3. 15951C DDC Point List

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC
2. National Electrical Manufacturers Association, NEMA
3. Underwriter's Laboratories, UL

B. All equipment provided, including control panels, dampers, valves, controllers, transmitters, sensors and other control devices shall bear the manufacturer's nameplate.

C. Entire control system including piping and wiring shall be installed by mechanics specifically authorized by the Temperature Control equipment manufacturer for the installation and having acceptable experience installing and servicing similar control equipment.

D. Acceptable Manufacturers/Contractor:

1. Honeywell XL5000/WebsAX Network

E. Authorized Controls Integrator: The control contractor shall be a Honeywell ACI – Authorized Integrator.

F. Guarantee: Guarantee the controls and instrumentation to maintain the temperature within one degree of the setpoint and further guarantee all work, materials, equipment, and controls against defects in workmanship and material, and provide service for a period of one (1) year from date of final acceptance.

1.5 SUBMITTALS

A. Shop Drawings:

1. Schematic control diagrams giving specific data on all settings, ranges, action, adjustments, and normal positions.
2. Wiring diagrams detailed adequately for field construction and include all related wiring.
3. Control valve and damper schedules with complete sizing data giving required design flow and temperature or pressure, and any other pertinent data.
4. Sequence of operation for each system corresponding to control schematics.
5. Panel drawings including complete internal wiring and piping schematics and complete data on all mounted components.
6. Damper operator schedule, listing quantity, size of operators and mounting arrangement.
7. Space thermostat sensor schedule indicating types of covers and adjustment means for each space.

B. Control Diagrams:

1. Furnish and mount in each equipment room or space prints of schematic control diagrams and corresponding sequences of operation for all systems located therein.
2. Diagrams and sequences mounted in frames under clear plastic and located in easily visible location or as directed by A/E.

C. Product Data:

1. Submit published descriptive data on each item of equipment and accessories.
2. Submit manufacturer's installation instructions.

D. Report:

1. At completion of work, submit report of check-out of automatic control system.
2. Report actual setpoints with record drawings.

1.6 CALIBRATION AND ADJUSTMENTS

A. After completion of the installation, perform final calibrations and adjustments of the control equipment provided under this contract and supply services incidental to the proper performance of the automatic control system under warranty.

B. Submit letter to Engineer indicating all controls are calibrated and operating per sequence of control.

1.7 SYSTEM START-UP AND ACCEPTANCE PROCEDURE

A. Upon completion of the calibration, the Control Contractor shall start up the system and perform all necessary testing and run diagnostic tests to ensure proper operation. Control Contractor shall be responsible for generating all software and entering all database necessary to perform the sequence of control and specified software routines. An acceptance test in the presence of the Owner's representative or engineer shall be performed.

1.8 OWNER TRAINING

A. Provide sufficient but not less than 8 hours of training to the Owner's representatives, concerning the proper operation and maintenance of all control systems, sensing, monitoring and control equipment. Training sessions shall be conducted during normal business hours after system start-up and acceptance by the Owner.

B. Submit operating and maintenance manuals to Owner a minimum of five (5) working days prior to training session. Use these manuals as the basis for instruction at all training sessions.

C. Provide two follow-up visits for troubleshooting and instruction, one six months after substantial completion and the other at the end of the warranty period. Length of each visit to be not less than four (4) hours or the time necessary to provide required information and complete troubleshooting and inspection activity.

1.9 DELIVERY, STORAGE AND HANDLING

A. Factory shipping cartons for each piece of equipment.

B. Factory-applied plastic end caps on each length of pipe and tube.

C. Maintain cartons and end caps through shipping, storage and handling as required to prevent equipment and pipe-end damage, and to eliminate dirt and moisture from equipment and inside of pipe and tube.

D. Where possible, store equipment and materials inside and protected from weather.

E. When necessary to store outside, elevate well above grade and enclose with durable waterproof wrapping.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Provide complete control systems consisting of thermostats, sensors, control valves, dampers, operators, indicating devices, interface equipment, and other apparatus required to operate mechanical system and to perform functions specified and in compliance with the sequence of operations described herein.

B. Provide necessary materials, labor and field work necessary to connect control components factory supplied as part of equipment controlled.

2.2 COORDINATION OF TEMPERATURE CONTROL WORK

A. Electric Wiring: All electric wiring in connection with the automatic temperature control system shall be furnished and installed by the Controls Trade, except for equipment starter interlocks, which are the responsibility of the Electrical Trade.

1. All 120 (line) volt or larger electrical service wiring and connections to equipment and motor starters is the responsibility of the Electrical Trade.
2. All additional line voltage power requirements beyond which is indicated on the Drawings and Specifications for the temperature control system shall be the responsibility of the Controls Trade.

B. Valves and Piping Wells: Furnish by Controls Trade, installed by HVAC Trade under supervision.

C. Dampers, Valves, Actuators and related Controlled Devices: Furnished by Controls Trade, installed by HVAC Trade under supervision.

2.3 CONTROL PANELS

A. Provide local panels of unitized cabinet type for each system under automatic control. Mount relays, switches, and controllers with control point adjustment in cabinet and temperature indicators, pressure gages, pilot lights, push buttons, and clocks and switches flush on cabinet panel face. All components within the control panels shall be prewired to numbered terminal strips, ready for field connection to field-mounted control components.

B. Control panels shall be constructed of steel or extruded aluminum with hinged door and keyed lock, with baked enamel finish of manufacturer's standard color.

C. Panel mounted indicators or thermometers shall indicate the temperature sensed by each remote built sensor as shown or as required. Indicators or thermometers shall be 3-1/2" in diameter and have an accuracy of 1% of scale range.

D. Mount panels adjacent to associated equipment on vibration free walls or free standing steel angle supports. One cabinet may accommodate more than system in same equipment room. Provide engraved plastic name plates for instruments and controls inside cabinet and on cabinet face.

2.4 ELECTRICAL EQUIPMENT REQUIREMENTS

A. Provide electrical devices and relays that are UL listed and of a type meeting current and voltage characteristics of the project.

2.5 SENSORS/TRANSMITTERS

A. Temperature Sensors (Room): Use a surface mount zone temperature sensor housed in a durable, ventilated plastic wall-mount enclosure, with broad aluminum faceplate. The sensing element to be a 1,000 ohm RTD (nickel or silicon) 0-10 VDC, or 4-20 MA accuracy +/- 1/2% span.

1. Tamperproof locking covers and concealed adjustment in public areas.

B. Temperature Sensors (Discharge and Return Duct): Use a surface mount duct temperature sensor housed onto a standard metal handibox. The sensing element to be a 10,000 ohm RTD (nickel or silicon) 0-10 VDC, or 4-20 MA. House sensor in a 8-1/2" stainless steel probe. Accuracy +/- 1/2% span.

C. CARBON MONOXIDE (CO) SENSOR: Provide a Carbon Monoxide (CO) sensor that shall utilize electro-mechanical technology. The sensor shall have a linear analog output over a range of 0-200 ppm and have built in display of CO level. The sensor shall have an automatic calibration algorithm that will compensate for sensor drift over time due to sensor element degradation. Unit shall be provided with a 0-10VDC or 4-20mA analog output that is selectable and a field adjustable relay alarm output. Accuracy shall be better than ±3% of full scale. The sensor shall be user calibratible with a minimum calibration interval of five years.

D. NITROUS DIOXIDE (NO_2) SENSOR: Provide a Nitrous Dioxide (NO_2) sensor that shall utilize electro-mechanical technology. The sensor shall have a linear analog output over a range of 0-10 ppm and have built in display of NO_2 level. The sensor shall have an automatic calibration algorithm that will compensate for sensor drift over time due to sensor element degradation. Unit shall be provided with a 0-10VDC or 4-20mA analog output that is selectable and a field adjustable relay alarm output. Accuracy shall be better than ±3% of full scale. The sensor shall be user calibratible with a minimum calibration interval of five years.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all control equipment, wiring and air piping in a neat and workmanlike manner.

B. All immersion wells, pressure tappings and any associated shut-off valves, flow switches, level switches and other such items furnished by the control manufacturer shall be installed by the mechanical contractor under the coordinating control and supervision of the control contractor.

C. Install all control devices in an accessible location.

D. Electrical Wiring: All electrical wiring for the automatic control system, excluding line voltage power to control panels, as indicated on the Drawings, shall be furnished and installed by the Temperature Control Contractor in accordance with this specification section. All the electrical sections of this specification and all applicable electric codes shall apply to the required work.

1. Sensor and/or control wiring shall be provided with conduit independent of those used for high voltage, switches AC or other signals which may create interference or cause induced voltages which promote signal drift or reduced accuracy. Sensor and high voltage wiring may not be run in the same conduit.

3.2 INSTALLATION

A. Check and verify location of thermostats, room sensors and other exposed control sensors with plans and piping details before installation. Locate thermostats and sensors 60 inches above floor.

1. Isolated from exterior walls as recommended by manufacturer.
2. Located where not exposed to direct rays of sun, and where not influenced by concealed or adjacent heating, domestic hot water piping or warm air currents.

B. Valve tops, inserts or bonnets, sensors, thermostats, thermometers, gauges, and damper motors of all types:

1. Provide with access doors and/or access panels, in building construction so that they may be readily removed, replaced and serviced.
2. Access doors and access panels by HVAC Contractor.

C. Control Wiring of all Kinds:

1. All control wiring to be labeled at both ends identifying termination and origination point.
2. In conduit and included with temperature control system.
3. Concealed low voltage control wiring may be routed as cabling.
4. Exposed control wiring shall be in EMT conduit.
5. Conforming to all requirements of Electrical Specifications, Division 16.

D. Locate controls, relays, instruments, switches, valves, devices and accessories so they are readily accessible for adjustment, service, and replacement or as indicated on the drawings.

E. Install control valves horizontal with power unit up unless otherwise indicated. Maximum variation from vertical is 45 degrees.

F. Locate, size and support temperature sensing elements in water streams to properly sense the representative temperature.

1. For controlling, transmitting and indicating elements, sensing device located, sized and of the type to sense the average condition.
2. Wells shall not obstruct the flow of the fluid being measure.
3. Pipes 1" and smaller shall be increased at least one pipe size at point of insertion.

G. Where insulation on piping, ductwork or equipment is punctured or penetrated due to the installation of sensing elements or tubing, reseal the openings air and vapor tight.

H. Where control devices are to be located on insulated surfaces, provide brackets to clear the finished surface of the insulation avoiding punctures of the vapor seal.

I. Locate support, enclose and install control devices and equipment so that they will not be subject to:

1. Vibration
2. Excessive temperatures
3. Dirt, moisture or other harmful effects.
4. Conditions beyond their rated limitations.

J. Conceal all piping except piping in mechanical rooms and other areas where mechanical system piping may be exposed.

K. Install all exposed piping and conduit parallel to or at right angles to the building structure and support adequately at uniform intervals. Use only tool made bends.

L. Make tests on piping from time to time during the progress of installation to insure against leaks.

3.3 TESTING, ADJUSTING AND PERFORMANCE DEMONSTRATIONS

A. All controlling devices which are a part of the automatic temperature control system, shall be tested and adjusted by the Contractor before system is offered for final acceptance.

1. All associated devices, valves, operators and dampers adjusted.
2. All operating and positioning of all dampers verified.

B. After all calibrations, adjustment and checking have been completed and all systems are operational:

1. Demonstrate to User's representative, the complete and correct functioning of all control systems and equipment.
2. Demonstrations shall consist of operating the controls through their normal full ranges and sequences.
3. Simulate abnormal conditions to demonstrate proper functioning of safety devices.

4. Readjust all settings to their correct design values and after sufficient time, observe ability of controls to establish the desired conditions, noting any abnormal deviations.
5. Make any necessary repairs, replacements or adjustments on all items which fail to perform satisfactorily, all to the satisfaction of the Owner's representative.

C. Upon completion of the work and testing, but prior to final acceptance:

1. A representative of the control system manufacturer shall spend such length of time as necessary to instruct the Owner's personnel in proper operation, adjustment and maintenance of the control equipment and systems.
2. Instruction shall be performed by competent, trained, full-time employees of the control system manufacturer who have a complete working knowledge of the systems and equipment installed in this job.

END OF SECTION

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BUILDING AUTOMATION SPECIFICATIONS

SECTION 15910C - DIRECT DIGITAL CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. The DDC control work associated with this section shall be bid as part of the Temperature Control Contract scope of the Work.

B. The Building Automation System (BAS) shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.

C. The BAS shall consist of the following:

1. Direct Digital Control Panels.
2. Standalone Application Specific Controllers (ACSs).
3. Network wiring.

D. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASCs, and operator devices.

E. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

1.2 RELATED WORK

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

B. Specified elsewhere:

1.	15900C	Controls and Instrumentation
2.	15950C	Control Sequences
3.	15951C	DDC Point List
4.	Division 15	HVAC Specifications
5.	Division 16	Electrical Specifications

1.3 QUALITY ASSURANCE

A. Acceptable Manufacturer/Installer: A firm regularly engaged in manufacture of DDC control equipment similar to the specified equipment and has been in satisfactory similar service for not less than five (5) years. Subject to compliance with requirements, provide DDC control system from the following manufacturers:

1. Manufacturer: Honeywell
2. Installer Qualifications: A firm specializing and experienced in DDC control system installation with a local service office within 60 miles of Madison metropolitan area and experience with a minimum of five(5) similar installatons for no less than five(5) years experience with Honeywell Control installations. All work to be done by qualified mechanics in the direct employ of this manufacturer.

B. Electrical Standards: Provide electrical products which have been tested, listed and labeled by Underwriters' Laboratories (UL) and comply with NEMA standards.

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

1.4 SUBMITTALS

A. Product Data:

1. Submit manufacturer's specifications for each control device furnished, including installation instructions and startup instructions. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked.
2. Annotated software program documentation shall be submitted for system sequenced, along with descriptive narratives of the sequence of operation of the entire system involved.
3. Submit wiring diagram for each electrical control device with other details required to demonstrate that the system has been coordinated and will function as a systems.

B. Maintenance Data: Submit maintenance data and spare parts lists for each control device. Include this data in maintenance manual.

C. Record Drawings: Prior to request for final payment, provide complete composite record drawings to incorporate the DDC and Electric field work

1.5 MATERIAL DELIVERY AND STORAGE

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

PART 2 - PRODUCTS

2.1 NETWORKING/COMMUNICATIONS

A. The design of the BAS shall be networked as shown on the attached system configuration drawing. Inherent in the system's design shall be the ability to expand or modify the network either via a local network, auto-dial telephone line modem connections, or a combination of the two networking schemes.

B. Building Operator's Station: Owner will provide CPU, monitor, keypad, mouse, printer, desk and chair.

C. Local Network:

1. Building Operator's Station /Panel Support: The Building Operator's Station or Digital Panel shall directly oversee a local network such that communications may be executed directly to and between ASCs. The Operator's Terminal version or Digital Panel version shall be referred to as the "Digital Panel(s)" throughout this document.
2. Data Access: All operator devices either network resident or connected via dial-up modems, shall have the ability to access all point status and application data on the network. Access to system data shall not be restricted by the hardware configuration of the facility management system.
3. Global Data Sharing: global Data Sharing or Global point broadcasting shall allow point data to be shared between ASCs, when it would be inefficient or impractical to locate multiple sensors.
4. General Network Design: Network design shall include the following provisions:
   a. Data transfer rates for alarm reporting and quick point status from multiple ASCs. The minimum baud rate shall be 9600 baud.

b. Support of any combination of ASCs. A minimum of 100 ASCs shall be supported on a single local network. The bus shall be addressable for up to 255 ASCs.
c. Detection of single or multiple failures of the ASCs or the network media.
d. Error detection, correction, and retransmission to guarantee data integrity.
e. Commonly available, multiple sourced, networking components shall be used.
f. Use of an industry standard protocol, such as Optomux, and IEEE RS-485 communications interface.

2.2 DIGITAL PANELS

A. General: Digital Panels shall be microprocessor-based, multi-tasking, multi-user, digital control processors.

B. Memory: Each Digital Panel shall have sufficient memory to support its own operating system and databases including:

1. Control Processes
2. Energy Management Applications
3. Alarm Management
4. Trend Data
5. Maintenance Support Applications
6. Operator I/O
7. Dial-Up Communications
8. Manual Override Monitoring

C. Expandability: The system shall be modular in nature, and shall permit easy expansion through the addition of field controllers, sensors, and actuators.

D. Serial Communication Ports: Digital Panels shall provide at least two RS-232C serial data communication ports for simultaneous operation of multiple operator I/O devices such as laptop computers, Personal Computers, and Video Display terminals.

E. Hardware Override Monitoring: Digital Panels shall monitor the status of al overrides, and include this information in logs and summaries to inform the operator that automatic control has been inhibited.

F. Integrated On-Line Diagnostics: Each Digital Panel shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment. The Digital Panels shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each Digital Panel.

G. Surge and Transient Protection: Isolation shall be provided at all network terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high as to allow all signal wiring to be run in the same conduit as high voltage wiring where acceptable by electrical code.

H. Powerfail Restart: In the event of the loss of normal power, there shall be an orderly shutdown of the Digital Panels to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery back-up shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

Upon restoration of normal power, the Digital Panels shall automatically resume full operation without manual intervention.

2.3 SYSTEM SOFTWARE FEATURES

A. General

1. All necessary software to form a complete operating system as described in this specification shall be provided.
2. The software programs specified in this section shall be provided as an integral part of the Digital Panel and shall not be dependent upon any higher level computer for execution.

B. Graphic Requirements: Provide color graphic backgrounds with operational information interface for the following systems:

1. Each Make-up Air Unit.
2. Each Radiant Heater.
3. Each Exhaust Fan Unit.
4. Building Floor Plan graphic for temperature sensor informational and terminal unit service designations.

C. Control Software Description:

1. Equipment Cycling Protection: Control software shall include a provision for limiting the number of times each piece of equipment may be cycled within any one-hour period.
2. Heavy Equipment Delays: The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
3. Powerfail Motor Restart: Upon the resumption of normal power, the DDC panel shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling, and turn equipment on or off as necessary to resume normal operation.

D. Energy Management Applications: Digital Panels shall have the ability to perform any or all of the following energy management routines:

1. Time of Day Scheduling
2. Calendar Based Scheduling
3. Holiday Scheduling
4. Temporary Schedule Overrides
5. Optimal Start
6. Optimal Stop
7. Demand Limiting
8. Load Rolling
9. Heating/Cooling Interlock
10. Average/High/Low Signal Select and Reset

All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow user customization. Programs shall be applied to building equipment as described in the "Execution" portion of this specification.

E. Programming Capability: Digital Panels shall be able to execute configured processes defined by the user, to automatically perform calculations and control routines.

1. Process Inputs and Variables: It shall be possible to use any of the following in a custom process:
   a. Any system-measured point data or status
   b. Any calculated data
   c. Any results from other processes
   d. Boolean logic operators (and, or,)
2. Process Triggers: Configured processes may be triggered based on any combination of the following:
   a. Time of Day
   b. Calendar Date

c. Other Processes
d. Events (e.g., point alarms)

3. Data Access: A single process shall be able to incorporate measured or calculated data from any and all other ASCs.

In addition, a single process shall be able to issue commands to points in any and all other NCUs on ASCs local network.

F. Alarm Management: Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each Digital Panel shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall the Digital Panel's ability to report alarms be affected by either operator activity at the local I/O device, or communications with other ASCs on the network.

1. Alarm Messages: In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 60-character alarm message to more fully describe the alarm condition or direct operator response.
2. Each Digital Panel shall be capable of storing a library of at least 100 Alarm Messages. Each message may be assignable to any number of points in the panel.
3. Auto-Dial Alarm Management: In dial-up applications, only critical alarms shall initiate a call to a remote operator device. In all other cases, call activity shall be minimized by time-stamping and saving reports until an operator scheduled time, a manual request, or until the buffer space is full. The alarm buffer must store a minimum of 50 alarms.

G. Trend Analysis: A data collection utility shall be provided to automatically sample, store and display system data.

Measured and calculated analog and binary data shall be assignable to user-definable trends for the purpose of collecting operator-specified performance data over extended periods of time. Sample intervals of 5 seconds to 24 hours, in one-minute or one-hour intervals, shall be provided. Each Digital Panel shall have a dedicated buffer for trend data, and shall be capable of storing 32 trend logs. Each trend log shall have up to 4 points trended at 168 data samples each. data shall be stored at the Digital Panel.

Trending: The BAS will be capable of trending all data points for 5 years with logging intervals of 15 minutes, and be available to trend all data points with an interval of 5 seconds or less for up to at least two hours. The format of the trending data will be in a format acceptable by MS Excel-2003 or newer.

The trend data shall be in a table with date and time in the first column(s) and the trending data in consecutive columns. All columns shall have the heading on the first row(s) and the data for that heading in the same column in the following rows. All headings will be explained in detail such that there is no uncertainty as to what was measured and the location of that sensor. All columns headings shall include the units for the trended data.

The trending data files shall not contain more than 200 columns and 65,000 rows each.

H. Runtime Totalization: Digital Panels shall automatically accumulate and store runtime hours for binary input and output points as specified in the "Execution" portion of this specification.

1. The Totalization routine shall have a sampling resolution of one minute.
2. The user shall have the ability to define a warning limit for Runtime Totalization. Unique, user-specified messages shall be generated when the limit is reached.

I. Event Totalization: Digital Panels shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly, or monthly basis.

1. The Event Totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.
2. The user shall have the ability to define a warning limit. Unique, user-specified messages shall be generated when the limit is reached.

2.4 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each Digital Panel shall be able to extend its performance and capacity through the use of standalone Application Specific Controllers (ASCs).

B. Each ASC shall operate as a standalone controller capable of performing its specific control responsibilities independently of other controllers in the network. Each ASC shall be of microprocessor-based, multi-tasking, real-time digital control processor.

C. Each ASC shall have sufficient memory to support its own operating system and data bases including:

1. Control Processes
2. Energy Management Applications
3. Operator I/O (Portable Service Terminal)

D. The operator interface to any ASC point data or programs shall be through the Digital Panel or portable operator's terminal connected to any ASC on the network.

E. ASCs shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures
2. Display status
3. Display setpoints
4. Display control parameters
5. Override binary output control
6. Override analog setpoints
7. Modification of gain and offset constants

F. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

G. Application Descriptions:

1. VAV Terminal Unit Controllers:
   a. VAV Terminal Unit Controller shall support, but not be limited to, the control of the following configurations of VAV boxes to address current requirements described in the "Execution" portion of this specification, for future expansion.
      1.) Single Duct Only (Cooling Only, or Cooling with Reheat)
      2.) Fan Powered (Parallel/Side Pocket, Series On/Off Logic Series/Proportional Fan)
      3.) Dual Duct (Constant Volume, Variable Volume)
      4.) Supply/Exhaust.
   b. VAV Terminal Unit Controller shall support the following types of point inputs and outputs:

1.) Proportional Cooling Outputs
2.) Box and Baseboard Heating Outputs: (Proportional or 1 to 3 Stages)
3.) Fan Control Output: (On/Off Logic, or Proportional Series Fan Logic)

c. VAV Terminal Unit Controllers shall support the following library of control strategies to address the requirements of the sequences described in the "Execution" portion of this specification, and for future expansion:

1.) Daily Schedules
2.) Comfort/Occupancy Mode
3.) Economy Mode
    Standby Mode
    Unoccupied
    Shutdown
4.) Lighting Logic Interlock to Economy Mode
5.) Temporary Override Mode

c. Alarm Management: Each VAV Terminal Unit Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

2. Unitary Controllers:

a. Unitary Controllers shall support, but not be limited to, the following types of systems to address specific applications described in the "Execution" portion of this specification, and for future expansion:

1.) Unit Vents (ASHRAE Cycle I., II, III, or W)
2.) Heat Pumps (Air-to-Air, Water-to-Air)
3.) Packaged Rooftops
4.) Fan Coils (Two-Pipe, Four-Pipe)
5.) Generic Point Multiplexing

b. Unitary Controllers shall support the following types of point inputs and outputs:

1.) Economizer Switchover Inputs
    a.) Drybulb
    b.) Outdoor Air Enthalpy
    c.) Differential Temperature
    d.) Binary Input from a separate controller
2.) Economizer Outputs
    a.) Integrated Analog with minimum position
    b.) Binary Output to enable self-contained
    c.) Economizer Actuator
3.) Heating and Cooling Outputs
    a.) 1 to 3 Stages
    b.) Analog Output with two-pipe logic
    c.) Reversing valve logic for Heat Pumps
4.) Fan Output
    a.) On/Off Logic Control

c. Unitary controllers shall support the following library of control strategies to address the requirements of the sequences described in the "Execution" portion of this specification, and for future expansion:

1.) Daily Schedules
2.) Comfort/Occupancy Mode
3.) Economy Mode:
    Standby Mode/Economizer Available
    Unoccupied/Economizer Not Available
    Shutdown

4.) Lighting Logic Interlock to Economy Mode
5.) Temporary Override Mode:
Temporary Comfort Mode (Occupancy-Based Control)
Boost (Occupant Warmer/Cooler Control)

d. Alarm Management: Each VAV Terminal Unit Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

3. AHU Controllers
a. AHU Controllers shall support, but not be limited to the following configurations of systems to address current requirements as described in the "Execution" portion of this specification, and for future expansion:
1.) Air Handling Units
Mixed Air-Single Path
Mixed Air-Dual Path
100% Single Path
100% Dual Path
Generic Point Multiplexing
b. AHU Controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally standalone fashion.
c. AHU controllers shall have a library of control routines and program logic to perform the sequence of operation as specified in the "Execution" portion of this specification.
d. Continuous Zone Temperature Histories: Each AHU Controller shall automatically and continuously, maintain a history of the associated zone temperature to allow users to quickly analyze space comfort and equipment performance for the past 24 hours. A minimum of two samples per hour shall be stored.
e. Alarm Management: Each AHU Controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
f. Each AHU Controller shall come with a hand-held Zone Terminal permanently mounted at the controller to allow interface with the controller. This device will allow the user to monitor or adjust set points and time scheduling within a specific zone.

4. Lab and Central Plan (LCP) Controllers:
a. LCP controllers shall support, but not be limited to, the following configurations of systems to address current requirements described in the "Execution" portion of this specification, and for future expansion.
1.) Single boiler or chiller plants with pump logic
2.) Cooling towers
3.) Zone pressurization of labs
4.) Air Handling Units and Roof-top units with complex controls sequences
5.) Plant Heating and Cooling circuits
6.) Heat exchangers
b. LCP controllers shall support all the necessary point inputs and outputs to perform the specified control sequences in a totally standalone fashion. A minimum of 30 I/O points expandable to 94 shall be supported by the LCP.

2.5 OPERATOR INTERFACE

A. Basic Interface Description:

1. Command Entry/Menu Selection Process: Operator interface software shall minimize operator training through the use of English language prompting, English language point identification.

The operator interface shall have the option of using a mouse or similar pointing device for a "point and click" approach to facilities management. Users shall be able to start and stop equipment or change setpoints from graphical displays through the use of a mouse or similar pointing device.

2. Password Protection: Multiple-level password access protection shall be provided to allow the user/manager to limit control, display and database manipulation capabilities as he deems appropriate for each user, based upon an assigned password.

   a. Passwords shall be exactly the same for all operator devices.
   b. A minimum of four (4) levels of access shall be supported:
      1.) Level 1 = Data Access and Display
      2.) Level 2 = Level 1 + Operator Overrides and Commands
      3.) Level 3 = Level 2 + Operator Management
      4.) Level 4 = Level 3 + Database Generation and Modification
   c. A minimum of eight (8) passwords shall be supported at each Digital Panel.
   d. Operators will be able to perform only those commands available for their respective passwords. Menu selections displayed at any operator device, shall be limited to only those items defined for the access level of the password used to log-on.
   e. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices logged on.

4. Operator Commands: The operator interface shall allow the operator to perform commands including, but not limited to, the following:

   a. Start-up or shutdown selected equipment
   b. Adjust setpoints
   c. Add/Modify/Delete time programming
   d. Enable/Disable process execution
   e. Lock/Unlock alarm reporting for each point
   f. Enable/Disable Totalization for each point
   g. Enable/Disable Trending
   h. Enter temporary override schedules
   i. Define Holiday Schedules
   j. Change time/date
   k. Enter/Modify analog alarm limits
   l. Enable/Disable demand limiting
   m. Enable/Disable duty cycle
   n. Enable/Disable average/high/low signal select and reset

5. Logs and Summaries: Reports shall be generated manually, and directed to the displays. As a minimum, the system shall allow the user to easily obtain the following types of reports:

   a. A general listing of all points in the network shall include, but not be limited to, the following:
      1.) Points currently in alarm
      2.) Off-line points
      3.) Points currently in override status
      4.) Points in Weekly Schedules
      5.) Holiday Programming
   b. Summaries shall be provide for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the facility management system. Under no conditions shall the operator need to specify the address of hardware controller to obtain system information.

B. System Configuration and Definition: All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

1. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:

   a. Add/Delete/Modify Application Specific Controllers
   b. Add/Delete/Modify points of any type, and all associated point parameters, and tuning constants
   c. Add/Delete/Modify alarm reporting definition for each point
   d. Add/Delete/Modify energy management applications
   e. Add/Delete/Modify time- and calendar-based programming
   f. Add/Delete/Modify Totalization for every point
   g. Add/Delete/Modify Historical Data Trending for every point
   h. Add/Delete/Modify configured control processes
   i. Add/Delete/Modify dial-up telecommunication definition
   j. Add/Delete/Modify all operator passwords
   k. Add/Delete/Modify Alarm Messages

2. Programming Description: Definition of operator device characteristics, ASCs, individual points, applications and control sequences shall be performed through fill-in-the-blank templates.
3. System Definition/Control Sequence Documentation: All portions of system definition shall be self-documenting to provide hardcopy printouts of all configuration and application data.
4. Database Save/Restore/Back-Up: Back-up copies of all ASC and Digital Panel databases shall be stored in at least one personal computer or laptop. Users shall also have the ability to manually execute downloads of an ASC or Digital Panel data base.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the control system in accordance with manufacturer's instructions.

3.2 DEMONSTRATION

A. The system manufacturer or his representative shall provide start-up and adjustment service for the control system.

B. The system manufacturer or his representative shall provide a minimum four (4) hours of training for the Owner's personnel on the operation and maintenance of the packaged control system.

END OF SECTION

BUILDING AUTOMATION SPECIFICATIONS

SECTION 15950C - CONTROL SEQUENCE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section 15900C - Controls and Instrumentation, applies to the work of this section.

1.2 RELATED DOCUMENTS

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

B. Refer to schematic layout of control and HVAC equipment on HVAC drawings.

C. Specified Elsewhere:

1.	15900C	Controls and Instrumentation
2.	15950C	Direct Digital Control Systems
3.	15951C	DDC Point List

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Section 15900C - Controls and Instrumentation.

PART 3 - EXECUTION

3.1 CONTROL SEQUENCE

A. Systems shall perform in accordance with the following descriptions of the control strategy intent.

B. BAS = Building Automation System (DDC Controls).

3.2 GAS-FIRED MAKE-UP AIR UNIT MAU-1

A. System consists of a draw-through single path air handling unit with constant volume supply fan, filter bank, inlet motorized fresh air dampers and modulating gas-fired bonnet.

1. Furnish filter pressure drop monitoring and alarm signal.

B. Remote control panel with summer/off/winter control and indicator lights is provided by the MAU supplier and installed by the HVAC Contactor.

1. Control Contractor to enable MAU and monitor status only.
2. Provide 5 hours per day of "Ventilation Mode" operation as scheduled by the Owner.

C. Inlet motorized damper and operator is lined voltage and provided by the MAU supplier and wired by the Electrical Contractor.

1. Furnish filter pressure drop monitoring and alarm signal.

D. Ventilation Mode: MAU supply fan shall run continuously. Motorized fresh damper opens 100%. Discharge air controller shall modulate direct gas-fired bonnet capacity to maintain discharge air temperature setpoint(heating only). Discharge air temperature setpoint shall be set by remotely at control panel.

E. Deactivated Mode: MAU supply fan will be deactivated with motorized fresh damper shall close.

F. Smoke Detector: Smoke detector in the filtered fresh air ductwork shall shut down MAU supply fan and close motorized fresh air damper upon detection of products of combustion. Duct-mounted smoke detector shall be provided by the MAU supplier and mounted by the HVAC Contractor. Electrical Contractor shall wire interlocks to fan starter/controller for shutdown. Temperature Control Contractor shall monitor smoke alarm signal and issue BAS alarm.

3.3 GAS-FIRED RADIANT HEATERS

A. Cycle fan and burner stages upon a call for heating from space sensor.

1. Two-stage burners.

3.4 PURGE EXHAUST FANS

A. PRV-1 & 2(Roof Purge Fans): Interlock PRV operation and motorized exhaust damper to open with a BAS control.

1. West End Purge: Upon detection of Nitrous Dioxide(NO_2) levels of 1.0 PPM at ceiling sensors on west end of building start PRV-1 and open OH doors #1, #2, #3 & #4. Continue to operate PRV-1 for a minimum period of 15 minutes(adj.) or until NO_2 levels drop below 0.7 PPM, then shutdown PRV-1 and close OH doors #1, #2, #3 & #4.

   a. Lock-out radiant heaters RH-1 & 2 during purge fan operation.
   b. Lock-out MAU-1 operation during purge fan operation.

2. East End Purge: Upon detection of Nitrous Dioxide(NO_2) levels of 1.0 PPM at ceiling sensors on east end of building start PRV-2 and open OH doors #5 & #6. Continue to operate PRV-2 for a minimum period of 15 minutes(adj.) or until NO_2 levels drop below 0.7 PPM, then shutdown PRV-2 and close OH doors #5 & #6.

   a. Lock-out radiant heaters RH-3 & 4 during purge fan operation.
   b. Lock-out MAU-1 operation during purge fan operation.

3. Provide electronic count-down timer at manual purge operation controls(3 remote panels) to automatically shut down purge operation after 15 minutes(adj.) for PRV-1 & PRV-2 systems.

B. EF-1 & 2(Wall Purge Fans): Interlock EF operation and motorized exhaust damper to open with a BAS control.

1. Floor Purge: Upon detection of Carbon Monoxide(CO) levels of 35.0 PPM at any of four(4) wall sensors start EF-1 & EF-2 fans(four). Continue to operate EF-1 & EF-2 fans for a minimum period of 15 minutes(adj.) or until CO levels drop below 25 PPM, then shutdown EF-1 & EF-2 fans.

   a. Interlock MAU-1 operation during purge fan operation.
   b. Provide 5 hours per day of "Ventilation Mode" operation in conjunction with MAU-1 as scheduled by the Owner.

END OF SECTION

BUILDING AUTOMATION SPECIFICATIONS

SECTION 15951 - DDC POINT LIST

PART 1 - GENERAL

1.1 DESCRIPTION

A. Direct Digital Control (DDC) Point List.

1.2 RELATED DOCUMENTS

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

B. Refer to schematic layout of control and HVAC equipment on HVAC drawings.

C. Specified Elsewhere:

1. 15900C - Controls and Instrumentation
2. 15910C- Direct Digital Control Systems
3. 15950C- Control Sequence

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to Section 15900C - Controls and Instrumentation.
B. Refer to Section 15950C - Direct Digital Control Systems.

PART 3 - EXECUTION

3.1 DDC POINT LIST

A. Controls systems shall provide the DDC input/output control points and related as scheduled on the attached sheets 15951C-2.

END OF SECTION

DDC POINT LIST

POINT DESCRIPTION	TYPE	OPERATION SCHEDULE	ALARM	HISTORY	FIELD DEVICE
MAKE-UP AIR UNIT MAU-1					
MAU-1	DIGITAL OUTPUT	ENABLE/DISABLE	--	RUNTIME	CONTACTS @ CONTROL PANEL
MAU-1(SF)	DIGITAL INPUT	STATUS	FLOW FAIL	--	CURRENT SENSOR
MAU-1 SD	DIGITAL INPUT	STATUS	SMOKE	30 MIN.	AUX. CONTACT @ SD
MAU-1 FILTER APD	DIGITAL INPUT	PRESS	H PRESS.	30 MIN.	DIFF. PRESS. SW.
RADIANT HEATER UNITS					
RAD HTRS- STAGE 1	BINARY OUTPUTS	ON/OFF	--	--	CONTROL CONTACTS(TYP 4)
RAD HTRS- STAGE 2	BINARY OUTPUTS	ON/OFF	--	--	CONTROL CONTACTS(TYP 4)
SPACE SENSORS	ANALOG INPUT	TEMP	H/L	30 MIN	TEMP SPACE SENSOR(TYP 4)
PURGE FANS					
NO2 SENSORS	ANALOG INPUT	NO2 PPM	H/L	30 MIN	NO2 SENSORS(TYP 4)
CO SENSORS	ANALOG INPUT	CO PPM	H/L	30 MIN	CO SENSORS(TYP 4)
OH DOOR	BINARY OUTPUT	OPEN/CLOSE	--	--	RELAY @ CONTACTOR(TYP 6)
OH DOOR	BINARY INPUT	STATUS	--	--	DOOR POSITION SENSOR(TYP 6)
PURGE PRV FANS	BINARY OUTPUT	START/STOP	--	RUNTIME	RELAY @ CONTACTOR(TYP 2)
PURGE PRV FANS	BINARY INPUT	STATUS	FLOW FAIL	--	CURRENT SENSOR(TYP 2)
PURGE EF FANS	BINARY OUTPUT	START/STOP	--	RUNTIME	RELAY @ CONTACTOR(TYP 4)
PURGE EF FANS	BINARY INPUT	STATUS	FLOW FAIL	--	CURRENT SENSOR(TYP 4)

END OF SECTION

SECTION 16050 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Applicable provisions of Division 1 shall govern Work under this Section.

B. Furnish all labor, materials, equipment and accessories required to complete all electrical work as shown on the Drawings and specified herein, and shall include, but is not necessarily limited to:

16050 Basic Materials and Methods
16100 Electrical Demolition and Alterations
16110 Raceways
16120 Wires and Cables
16130 Boxes
16150 Motors and Motor Wiring
16155 Motor Starters
16170 Motor and Circuit Disconnects
16185 Equipment Connections
16190 Supporting Devices
16450 Grounding and Bonding

C. Work Included in Division 16:

1. General: The mention hereinafter of article, operation, material, equipment or method requires that the E.C. shall provide such article of quality noted, in the quantity required, shall perform each operation, and use such method, material or equipment prescribed, all in complete accordance with the conditions stated. The E.C. shall provide all materials, labor, tools, equipment and transportation as necessary to complete the project in conformity with the drawings, the specifications, and other Contract Documents. In general, this work includes everything essential for a complete electrical system in operating order as shown or implied on the drawings or hereinafter specified.
2. All work shall be in accordance with all Local & State Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and connected by the E.C. All materials shall bear a UL label where a UL Standard and/or test exists.
3. Before submitting his bid, each bidder shall examine the drawings relating to this work and shall become fully informed as to the extent and character of the work required and its relation to other work in the building. No consideration will be granted for any alleged misunderstanding of
materials to be furnished or work to be done, it being understood that the tender of a proposal carries with it the agreement to all items and conditions referred to herein or indicated on the accompanying drawings.
4. The E.C., in conjunction with the Architect's representative, shall establish exact location of all materials and equipment to be installed in consideration of construction features, equipment of other trades and requirements and purpose of equipment installed by the E.C.

D. Summary of Electrical Work:

1. Drawings and Specifications: Electrical drawings are schematic. Reference shall be made to architectural drawings and dimensions, type of construction, layout, door swings, ceiling types, etc. Unless dimensioned, electrical items are shown in approximate locations. Minor relocations of these items may be made by the Architect/Engineer prior to rough in at no expense to the Owner.
2. Any conflict between the drawings and specifications shall be brought to the attention of the Architect/Engineer.

3. Note that the electrical drawings are only a portion of the complete set of plans. The complete set of plans shall be used to define the electrical work. This shall include, but not be limited to, using the architectural plans for dimensions, the structural plans for concrete details, equipment plans for rough-in requirements, and mechanical plans for equipment sizes and locations.
4. The complete specifications will be utilized to define the electrical work. Electrical work which is not defined on the electrical drawings or in the electrical or specifications, but is defined elsewhere on the drawings or in the specifications, shall be the responsibility of the Contractor equally with work which is defined on the electrical drawings and in the electrical specifications.
5. General Outline: The facilities and systems of the electrical work can be described (but not by way of limitation) as follows:
   a. Electrical power distribution system, including the electrical connecting of equipment not specified to be connected as work of another Division.
   b. Motor starters and control/protection work as indicated.

E. Coordination of Electrical Work:

1. General: This Contractor shall coordinate his work with all other trades and the Architect/Engineer. The Contractor shall confer with the other trades and the Architect/Engineer so that all concerned will be thoroughly familiar with the specific items and areas of the coordination.
2. Conflicts of any type shall be immediately reported to the Architect/Engineer.
3. Equipment shall be assembled at the place of its permanent location if the size of the building openings does not permit passage of completely assembled units. This practice shall not waive or infringe upon any Manufacturer's warranty of guarantee.
4. The Contractor shall furnish and be responsible for the proper installation of all reinforcement required for wall or ceiling attached equipment.
5. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction.
6. Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.
7. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).
8. All conduit shall be concealed except in mechanical and electrical rooms.
9. Coordinate Drawings: For locations where several elements of electrical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

1.2 RELATED DOCUMENTS

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

1. Refer to Division 1 for special work hours requirements for this project.

1.3 DEFINITIONS

A. Provide: Furnish and install, complete and ready for service.

B. Exposed: Exposed to view in any room, corridor or stairway.

C. E.C.: Electrical Contractor.

D. The Engineer: HEIN Engineering Group.

E. Owner: City of Madison.

F. A/E: Architect/Engineer.

G. ANSI: American National Standards Institute

H. NEC: National Electric Code

I. NEMA: National Electric Manufacturers Association

J. NFPA: National Fire Protection Association

K. UL: Underwriters Laboratories, Inc.

1.4 PERMITS AND LICENSES

A. Prepare and submit to all authorities having jurisdiction, for their approval, all applications and working drawings required by them. Secure and pay for all licenses and permits required.

1.5 QUALITY ASSURANCE, STANDARDS AND SYMBOLS

A. General: Specifically, for the electrical work (in addition to standards specified in individual work section), the following standards are imposed, as applicable to the work in each instance:

1. Standards for Materials and Workmanship: All materials shall conform with the standard of the UL in every case where the UL has established a standard of such materials. In addition, these materials shall bear the UL label to show their conformance. Materials not covered by UL standards shall be processed, supplied or manufactured to NEMA, IEEE, or other accepted industry standards for these materials and shall also be labeled or properly identified as being in conformance with the appropriate standards. Substitute standards for those listed are not acceptable. Materials and equipment shall be protected during delivery and handling to prevent damage; and shall be stored in a clean dry area to prevent contamination. Damaged materials shall not be used.
2. All materials and work shall conform to the applicable portions of the latest issues of the following standards:
   a. UL
   b. NEMA
   c. NEC
   d. NECA
   e. ANSI
   f. IEEE
   g. ASTM
   h. NFPA
   i. IPCEA
   j. FM
   k. ETL
   l. FIA
3. All work shall be installed in accordance with National and State laws, ordinances and regulations. Comply with all applicable OSHA regulations.
   a. IBC.
   b. IECC.
   c. State of Wisconsin Electrical Code.
4. All materials shall have a UL label where a UL Standard and/or test exists.
5. All work shall be executed in a neat and workmanlike manner by workers thoroughly qualified in the trade of duties they are to perform. A rough or unworkmanlike installation will be cause for removal and replacement of said installation.

B. Substitution of Materials:

1. All requests for substitution shall be in writing and shall include sufficient product information to permit the Architect/Engineer to evaluate the request.
2. The Architect/Engineer specifically reserves the right to reject or approve any and all substitute materials or equipment in order to insure compliance with the minimum standards of quality established for the project herein specified, and also to insure that any substitute materials or equipment maintains the trends of style and appearances established for this project.
3. When an item is approved as an equal, either by specification or by approved substitution, this item shall give the same end results, to the Architect/Engineer's satisfaction, as the item it has replaced from the specification. Any modification, additional fittings or change to the approved item or to concomitant items to accomplish these results shall be at the expense of the Contractor.
4. The Contractor shall choose from the listed manufacturers for specific items or a substitute manufacturer if approved, but once a manufacturer has been chosen all similar items shall be by the same manufacturer.

1.6 JOB CONDITIONS

A. Job Site:

1. The Contractor shall be familiar with conditions which will affect his work, and locations where the work will be performed and other pertinent factors.
2. The Contractor shall furnish all labor and materials to complete each installation ready for use.
3. No additional allowances will be granted because the Contractor's knowledge of job site conditions was incomplete.

B. Products, Electrical Work:

1. Product Listing: Prepare the product listing for electrical work. Include listing of each significant item of equipment and material used in the work; and indicate the generic name, product name, manufacturer, model number, related specification number(s).
   a. Submit list to the Architect/Engineer for approval.
2. Compatibility: Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with the other work.

1.7 WORK SEQUENCE

A. The Contractor shall review the work sequence and determine if any dates of completion can not be met for his work. Any conflicts with completion dates shall be brought to the Engineer's attention prior to submitting a bid. No time extensions will be granted after contracts are awarded unless permitted in other parts of these specifications.

1.8 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electrical work are diagrammatic and depict, in their approximate location, symbols representing electrical equipment. The exact location shall be established in the field in accordance with instructions from the Architect.

B. Unless specifically stated to the contrary, no measurement of an electric drawing by scale shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject, in each case, to measurements of adjacent or previously completed work and all such measurements necessary shall be taken before undertaking any work dependent upon time.

1.9 DRAWINGS

A. The E.C. shall prepare, at his expense, complete field installation drawings necessary for the proper installation of his work. These drawings shall be submitted to the Engineer when requested for review and such copies of same as are necessary shall be provided for others as directed.

B. The E.C. shall keep a detailed record, up-to-date, of the manner and location in which all installations are actually made, properly indexing each feeder, pull box and protective device.

C. As Built Drawings: See General Requirements - Division 1.

D. In the event of a conflict between the drawings and specifications the E.C. shall base his bid on the greater quantity, cost or quality of the item in question, unless such conflict is resolved by addenda.

1.10 MATERIALS AND EQUIPMENT

A. Provide all new materials and equipment to form a complete installation, unless otherwise specified.

B. All equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions will be allowed except as provided in Instructions to Bidders.

C. All items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute current product.

1.11 FLOOR, WALL AND CEILING OPENINGS

A. Pipe sleeves must be set for all pipes passing through new masonry construction. Coordinate with G.C. as to size and location of openings.

B. Coordinate the location of sleeves, openings, chases, furred spaces, etc., with the other Contractors. Provide all sleeves, hangers and inserts that are to be built into the structure during the progress of construction.

C. Pipe sleeves shall be Schedule 40 galvanized steel pipe and shall extend completely through the construction.

D. Sleeves for pipe 4" and smaller shall beat least two pipe sizes larger than the pipe passing through.

E. Sleeves shall extend 3/8" above the finished floor. In mechanical rooms and other areas where water may accumulate, sleeves shall extend 2" above the finished floor.

F. Pack annular space between sleeves and insulation or pipe with fiberglass. Where penetrations occur through mechanical rooms or fire rated walls, floors, fill with Dow-Corning 3-6548 Silicone RTV Foam.

1.12 SHOP DRAWINGS

A. Submit to Engineer for review, in accordance with Division 1, shop drawings and/or equipment brochures for the following:

1. Motor Starters.
2. Disconnects.

B. Submit in advance of construction requirements and as to cause no delay in the E.C.'s work and to allow the Engineer reasonable time to review them to make necessary corrections.

C. All data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear the name and location of the project, the name of the E.C., the date of submittal, the date of the drawings and the date of each correction and revision. If more than one type of lighting fixture (or other materials) are on submitted sheet, the one specified shall be conspicuously checked with red pencil by the E.C..

D. It will be taken for granted that the E.C. has examined the shop drawings and equipment brochures prior to submission and that materials and equipment depicted thereon will readily fit into the construction. Also, all work completed, related to materials or equipment depicted thereon, has been properly installed and all work to be done prior to the installation of the materials and equipment in question will be done in accordance with requirements thereon.

E. No materials or equipment subject to prior review shall be fabricated or installed by the E.C., save at his own risk, without such review. The Engineer's review of such drawings and brochures shall not relieve the E.C. or responsibility for deviations from the requirements of the drawings and specifications, unless he has, in writing, called the Engineer's attention to such deviations at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings or equipment brochure.

1.13 DELIVERY STORAGE AND HANDLING

A. All materials shall be suitably stored and protected prior to installation and all work shall be protected after installation, during construction and all work prior to acceptance.

B. The E.C. shall furnish and remove upon completion of the project, all scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of all equipment and apparatus required to be installed by the E.C..

1.14 MAINTENANCE MANUALS

A. The E.C. shall assemble and submit to the Architect for subsequent submission to the Architect/Engineer, in accordance with Division 1, complete sets of a Manual of Operation and Maintenance for each of the separate systems furnished as a part of the electrical subcontractor.

B. Each manual shall consist of an approved loose-leaf type bound volume instructing the Architect/Engineer's personnel in the use, operation and maintenance of the system in question. The manual shall cover all phases of operation of the equipment and it shall be illustrated with photographs, drawings, wiring diagrams, etc., as required to accurately and adequately describe the operation, construction and adjustable features of the complete system and each component part. The manual shall be complete with an equipment parts listing to facilitate the ordering of spare and replacement parts.

C. Each manual shall contain two sets of final shop drawings depicting equipment as installed.

1. Equipment Parts Lists: Include a complete list of all equipment furnished for project, with a tabulation of descriptive data of all the equipment replacement parts proposed for each type of equipment or system. Properly identify each part of part number and manufacturer.

1.15 CLEANING AND PAINTING

A. All rubbish resulting from this work shall be removed and disposed of on a daily basis and in such manner as to be acceptable to the Architect.

B. The E.C. shall clean all exposed iron work, interior and exterior of panels and pull boxes, etc., and remove all rubbish and debris resulting from the work.

C. Where painted surfaces of equipment have been abused, removed, or rusted during construction, the E.C. shall paint same to match original factory or surrounding finish.

1.16 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical installations done does not constitute an acceptance of the work by the Architect/Engineer. The final acceptance is to be made after the E.C. has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

B. After the work is completed and prior to acceptance, the E.C. shall conduct the following tests, tabulate data, date, sign and submit to the Engineer: clamp ammeter test on each feeder conductor with all utilization equipment energized. The load current in each phase conductor of the feeder of the portion thereof supplying the panel shall not differ from the average connected load currents in the several conductors by more than 10%. If the load current does differ by more than 10%, the E.C. shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.

C. At the time of connection, or energizing, check all motors for proper rotation, conferring with contractor furnishing equipment, if necessary, to determine proper direction.

D. Upon completion of the installation, the E.C. shall furnish certificates of approval from all authorities having jurisdiction. He shall demonstrate that all work is complete and in perfect operating condition, with raceway and conduit system properly grounded, all wiring free from grounds, shorts, and that the entire installation is free from any physical defects. In the presence of the Engineer and the Architect/Engineer, the E.C. shall demonstrate the proper operation of all miscellaneous systems.

E. All materials and workmanship is subject to inspection, examination and tests by the Architect/Engineer at any time.

1.17 WARRANTY

A. The Contractor shall warranty: All materials furnished to be perfect in every respect; and, if not, replace same immediately. Replace any material or part showing defects within a minimum of one year of acceptance, or within warranty period of the item if greater than one year. This one year warranty period shall be binding even though it may exceed the product warranty period normally furnished by some manufacturers. Repair or replacement shall bear an additional 12 months warranty as called for, dated from final acceptance of the repairs or replacement. The apparatus to be installed in strict accordance with these specifications and the various code covering this work. Neither the final acceptance nor any provisions in the Contract Documents shall relieve this Contractor of the responsibility for negligence, faulty materials or workmanship within the extent and period provided by this contract.

1.18 IDENTIFICATION

A. General:

1. Materials and equipment 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. All panels and cabinets shall be stenciled with 2" letters indicating usage, plan designation and voltage. In Equipment and Mechanical Rooms this identification may be on the exterior of unit; in other areas identification shall be inside door or cover.

C. Junction and pull boxes shall be stenciled utilizing a coded identification system. The following junction and pull boxes shall be identified using a coded system. Coding shall be submitted to Engineer for approval.

1. Light and Power - 120/240V.

D. On all 3-phase systems, each phase shall be identified at all terminals using code markers.

E. Laminated Bakelite Plates: Engraved plastic nameplate shall be securely fastened to the following equipment. Size 1" x 4" with 3/8" high letters unless space available dictates differently.

1. Each section of main distribution switchboards and panelboards. Mount one next to each protection device to identify load served by each circuit breaker.
2. Each contractor, time switch, metering cabinet, starter, motor disconnect switch. In Equipment and Mechanical Rooms this identification may be on the exterior of unit, in other areas identification shall be inside door or cover.
3. Each feeder at all accessible locations, i.e., panels, junction boxes, pull boxes, etc. (strap plate to feeder conductors in junction boxes or pull boxes).
4. 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.

F. Typewritten Directory: Each panelboard shall be provided with a typewritten directory in a steel frame with plastic cover contained on the inside of panel door. These directories shall indicate load served and rooms served by each protective device in the respective panel.

G. Conductor Identification:

1. Identify each conductor at each conductor or splice point with permanently attached wrap around adhesive markers as manufactured by Brady Company.
2. This identification shall include branch circuit number, control circuit number, or any other appropriate number or lettering that will expedite future tracing and "trouble shooting".
3. All wire shall be color-coded per the NEC. In addition, color-coding shall be used to identify phases, neutral, ground and voltages. Coding shall be:

120/240V
- Phase A - Black
- Phase B - Red
- Neutral - White
- Ground - Green

1.19 ACCESS PANEL

A. Access panels required by code or otherwise to electrical equipment shall be provided by Electrical Contractor. Access panels shall be in accordance with Division 1 complete with master cylinder lock.

PART 2 - PRODUCTS

- - - Not Used - - -

PART 3 - EXECUTION

- - - Not Used - - -

END OF SECTION

SECTION 16100 - ELECTRICAL DEMOLITION AND ALTERATIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 1 shall govern work in this section.

1.2 JOB CONDITIONS

A. There is an existing building on the property that will be demolished electrically. The Electrical Contractor shall work with MG&E(Electrical Utility) to coordinate the disconnection of the all electrical services to the building. It is the responsibility of the demolition contractor for demolition of any interior electrical equipment. The Electrical Contractor shall verify for demolition contractor that all electrical equipment is de-energized prior to demolition.

B. Prior to demolition or alteration of structures, the following shall be accomplished:

- Disconnection of electrical power to equipment and circuits removed or affected by demolition work.
- Electrical services rerouted or shut off outside area of demolition.
- Coordinate sequencing with Owner and other Contractors.
- Survey and record condition of existing facilities to remain in place that may be affected by demolition operations. After demolition operations are completed, survey conditions again and restore existing facilities to their predemolition condition.

C. Notify utilities prior to razing operations to permit them to disconnect and remove and/or relocate any equipment that served existing facilities.

D. Contractor shall dispose of all obsolete material.

E. Contractor shall notify the Engineer of any existing code violations observed during the course of performing his work. The Engineer will decide if corrective action needs to be taken. Corrective actions that change the scope of the work will be considered a change order and will be processed accordingly.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 REMOVAL

A. Remove or relocate conduit, wire, boxes, and fixtures.

B. Remove electrical equipment released from service as a result of construction or as indicated on drawings.

C. Do not reuse removed electrical equipment.

D. Where existing equipment is being removed, removal shall include all equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors, etc. When boxes are removed from existing walls which will remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand as required flush with adjacent surfaces. The General Contractor shall be responsible for final finish work unless specifically indicated otherwise on the plans.

3.3 DISPOSAL

A. Dispose of equipment that is removed unless specifically indicated on the drawings.

B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

C. The Contractor shall tour demolition areas with the Owner to determine the status of all other equipment to be removed during demolition. All equipment that is to be salvaged for reuse by the Owner shall be removed by the Contractor and transported to an owner designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

END OF SECTION

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide complete raceway system as specified for power, emergency power and fire alarm systems. Maintain raceway system in new condition until final acceptance by Owner.

1. Conduit and box raceway system.
2. Surface raceway system.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 16050 Basic Materials and Methods
2. 16120 Wires and Cables
3. 16130 Boxes
4. 16190 Supporting Devices
5. 16450 Grounding and Bonding

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC: Comply with NEC/NFPA No. 71 as applicable to construction and installation of electrical conduit.
2. National Electrical Manufacturer's Association, NEMA: Comply with applicable portions of NEMA standards pertaining to non-metallic duct and fittings for underground installation.
3. Underwriters Laboratories: Provide electrical conduit listed and labeled by UL.

1.4 DELIVERY, STORAGE AND HANDLING

A. Provide color-coded end-cap thread protectors on exposed threads of threaded metal conduit.

B. Storage:

1. Store pipe and tubing inside and protect from weather.
2. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.

C. Handle conduit and tubing carefully to prevent bending and end damage and to avoid scarring the finish.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Conduit:

1. Allied Tube and Conduit Corporation.
2. Wheatland Tube Company.
3. Steelduct Conduit Products.

B. Couplings:

1. Appleton Electric Company.
2. Crouse-Hinds Company.
3. Killark Electric Manufacturing Company.

C. Flexible Conduit:

1. Anaconda Metal Hose.
2. I.B.C. Corporation.
3. Electri-Flex Company.

D. Fiber Optic and Telecommunication Conduit:

1. American Pipe & Plastics.

E. Surface Raceway System:

1. Panduit.
2. Wiremold.

2.2 MATERIALS

A. Conduit:

1. Rigid Threaded: Steel, ANSI C80.1
2. Electrical Metallic Tubing: ANSI C80.3
3. Rigid Nonmetallic Tubing: Schedule 40 PVC; NEMA TC-2 & WC-1094

B. Rigid Steel Conduit and Fittings:

1. Manufactured to ANSI C80.1 standards
2. Fittings: Threaded steel type as per ANSI/NEMA FB1

C. Electrical Metallic Tubing and Fittings:

1. EMT ANSI C80.3 galvanized tubing.
2. Fittings:
   a. Compression or setscrew type, formed steel construction per ANSI/NEMA FB1.
   b. *Cast or indenter-type fittings will not be accepted.*

D. Flexible Metal Conduit & Fittings:

1. Steel construction as per FS WW-C566.
2. Fittings: Setscrew type, formed all steel construction, ANSI/NEMA FB1.

E. Liquid-Tight Flexible Conduit Fittings:

1. Conduit: Flexible metal conduit with PVC jacket.
2. Fittings as per ANSI/NEMA FB1.

F. Plastic Conduit & Fittings:

1. Conduit: NEMA TC-2 schedule 40 PVC.
2. Fittings: PVC solvent welded as per NEMA TC-3.

G. Fiber Duct Plastic Conduit & Fittings:

1. Conduit: AMFO and AMTEL multi-conduit system; D1785, D2241& CAO-8546 type C.

2. NEMA TC-2 schedule 40 PVC or SDR 21 and SDR19.
3. Fittings: PVC solvent welded as per NEMA TC-9; minimum 36" radius.

H. Rigid Nonmetallic Tubing.

I. Intermediate Metallic Tubing.

2.3 STEEL TWO-PIECE SURFACE RACEWAY SYSTEM

A. Steel Two-piece Surface Raceway Systems:
This specification covers a surface raceway system used for branch circuit wiring. The steel raceway system shall consist of raceway, appropriate fittings, and accessories to complete installation per electrical drawings.

B. Approved Raceway System: Wiremold 200, 500 or 700 series surface raceway system or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wiring: All wiring shall be installed in raceways as herein specified. All raceway runs shown on the drawings are diagrammatic; exact locations shall be determined in the field.

1. Conceal all conduit in finished areas.
2. Concealed raceways shall be installed in the walls, above ceilings, below floors or in furred out spaces so as to be completely concealed from view by occupants during their normal activities in use of the space.
3. Exposed raceways shall be run in straight lines at right angles or parallel with walls, beams and columns.
4. Provide raceways as required by the access control equipment controls for door operating and monitoring.

B. Raceway Installation: All raceways, which are not buried or embedded in concrete shall be supported by straps, suitable clamps or hangers to provide a rigid installation. Perforated strap or wire hangers will not be acceptable. In no case shall raceways be supported or fastened to other pipe. No raceway smaller than 1/2" shall be used, except that light fixture switch legs may be 3/8".

1. Bends: Not more than three 90 degree bends will be allowed in one raceway run. Where more bends are necessary, a conduit or pull box shall be installed. All bends in 1" and smaller conduit or electrical metallic tubing shall be made with proper bender. All other bends shall be machine made.
2. Joints: Joints in rigid metal shall be threaded type made up watertight with white lead or compound applied to male threads only and all field joints shall be cut square, reamed smooth and properly threaded to receive couplings. Electrical metallic tubing systems shall utilize watertight compression type fittings throughout. No indenter type fittings or running threads will be permitted.
3. Locknuts: Double locknuts shall be provided on all conduit terminations with the exception of conduits terminating in threaded hubs and couplings. Locknuts shall be of a type that have sharp beveled teeth that dig into the metal when tightened and will not loosen through vibration.
4. Bushing: Bushing shall be provided on all conduits with the exception of conduits terminating in hubs and couplings. Insulating bushings consisting of insulating inserts in metal housing shall be provided on all installations. Insulating bushings shall be grounding type where required by the National Electrical Code.
5. Heating Ducts and Pipes: Care shall be used to avoid proximity to heating duct and hot water lines. Where such crossings are unavoidable, raceway shall clear covering or line by at least 6".

C. Utilize rigid steel conduit or rigid nonmetallic conduit where exposed to moisture, buried in earth or in concrete.

D. Utilize electrical metallic tubing(EMT) or intermediate metal conduit in other above-grade locations.

E. For underground conduit: use PVC-coated rigid conduit or rigid non-metallic conduit.

F. Connections:

1. Motors and equipment: Minimum 1/2" size; PVC jacketed flexible conduit and liquid-tight connectors.
2. Flexible conduit sufficient length to avoid vibration transmission.
3. Use 3/8" flexible conduit only for light fixture whips(72" max.)and control wiring.
4. Coordinate service conduit connections with location of service transformers.

G. Install conduit and tubing products as indicated, in accordance with manufacturers written instructions and applicable requirements of NEC and NEMA Standard and Installation.

H. Install conduit concealed in all areas excluding mechanical, electrical and other unfinished rooms, connections to motors and connections to surface cabinets.

I. Coordinate installation of conduit in masonry work.

J. Do not install conduit larger than 1" in concrete slabs.

K. Install conduit free from dents and bruises.

L. Plug conduit end to prevent entry of dirt or moisture.

M. Clean out conduit before installation of conductor.

N. Alter conduit routing to avoid structural obstructions, minimizing cross-overs.

O. Seal conduit with oakum or fiberglass where conduits leave heated area and enter unheated area.

P. Roof Penetrations: Provide flashing and pitchpockets making watertight joints where conduits pass through roof or waterproofing membrane.

Q. Building Expansion Joints:

1. Install UL listed expansion fittings complete with grounding jumpers where conduits cross building expansion joints.
2. Provide bends or offsets in conduits adjacent to building expansion joints where conduit is installed above suspended ceiling.

R. Route all exposed conduits parallel or perpendicular to building lines.

S. Allow minimum 6" clearance at flues, steam pipes and heat source.

T Underground Conduit: Direct burial minimum.

1. Support multiple runs vertically and horizontally with plastic spacers 8' on center.
2. Slope conduit to drainage point.
3. Adjust final layout to coordinate with existing utilities.
4. Trench and backfill as detailed on drawings.
5. Encase conduit with 3" concrete cover under driveways.

U. Cap all spare conduits.

V. Provide all empty raceways with a heavy duty nylon cord, full length of raceway. Tag cord for identification.

W. Maintain safe clearances from hazardous adjacent equipment, hot water piping, flues, high temperature piping, ductwork, etc.

END OF SECTION

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SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Provide all wires and cables required for a complete electrical system.

1.2 RELATED WORK

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

B. Specified Elsewhere:

1. 16110 Raceways
2. 16130 Boxes

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to construction and installation of electrical cable, wire and connectors.
2. Underwriter Laboratories, UL: Electrical cable, wire and connectors listed and labeled by UL.

B. References: National Electrical Manufacturers Association/Insulated Power Cable Engineer's Association, NEMA/IPCEA.

1.4 DELIVERY, STORAGE AND HANDLING

A. Provide factory-wrapped waterproof flexible barrier material for covering wire and cable on wood reels, where applicable; and weather-resistant fiberboard containers for factory-packaging of cable, wire and connections to protect against physical damage in transit.

B. Store cable, wire and connectors in factory-installed coverings in clean, dry indoor space which provides protection against weather.

C. Do not install damaged cable, wire and connectors; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Wire and Cable:

1. Anaconda Wire and Cable Company.
2. Collyer Insulated Wire Company, Division.
3. Electrical Cable Division.
4. General Cable Corporation.
5. General Electric Company.
6. Phelps Dodge Cable and Wire Company.

B. Connectors:

1. AMP, Inc.
2. Burndy Corporation.
3. General Electric Company.

4. Ideal Industries, Inc.
5. 3M Company.
6. O.Z./Gedney Company.
7. Thomas and Betts Company.
8. Buchanon.

2.2 MATERIALS

A. Wire and Cable:

1. 98% conductivity copper.
2. 600 volt insulation.
3. Branch circuit wiring #10 and smaller shall be solid or standed THWN or THHN. Sizes #8 and larger stranded type THWN or THHN. Stranded wire shall be used for all motor connections regardless of size. Lighting fixture wiring shall be 90 deg C THHN.
4. Conductors smaller than No. 12 AWG gauge not permitted except for alarm and signal circuits which may be #14 AWG minimum.
5. Color code and identify all wiring as specified in Section 16050.

B. Exterior Wiring: Comply with NEC for wet location wiring.

C. Wiring for systems other than power:

1. Conform to system manufacturer standards as to size, type and coding, subject to specified minimums.
2. Size conduit as required by system manufacturer, but no smaller than shown.

D. Connectors: Splices and taps for No. 10 or smaller shall be with twist-on insulated connectors. Splices in wire No. 8 and larger shall be made with split-bolt or compression connectors equal to Burndy Hydent requiring a tool and die application. Tape all non-insulated compression connectors to achieve full 600V insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make conductor length for parallel feeders identical.

B. Lace or clip groups of feeder conductors at new panel board.

C. Conductors size indicated on drawings indicates ampacity requirements using copper conductors and type THHN insulation unless otherwise noted.

1. Provide XHHW for exterior services.

D. Install wire and cable in NEC Code conforming raceway.

E. Pulling:

1. Use wire pulling lubricant for pulling No. 4 AWG and larger wire. Use special care to avoid overstraining of conductors.
2. Pull conductors together where more than one is being installed in raceway.
3. Do not use pulling means, including fish tape, cable or rope which can damage raceway.
4. All raceways shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place. All ends of raceways shall be tightly plugged with tapered plugs or capped bushings until the conduits are pulled to prevent water and debris from entering conduits. All conduits stubbed up through floors shall be capped and aligned during construction by the use of spacers and caps.

F. Install wire in conduit runs after concrete and masonry work is complete, conduit shall be clean and dry.

G. Splicing:

1. Splice only in accessible junction boxes.
2. Install splices and taps which have equivalent or better mechanical strength and insulation as conductor.
3. Use splice and tap connectors which are compatible with conductor material.
4. No. 10 and smaller joints: Utilize connectors as hereinfore specified with PVC or nylon covers.
5. No. 8 and larger joints: Clean and join with tool and die compression type fitting.

END OF SECTION

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SECTION 16130 - BOXES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all boxes not supplied by others for a complete installation.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 16110 Raceways
2. 16120 Wires and Cables
3. 16140 Wiring Devices
4. 16450 Grounding and Bonding

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC: Comply with applicable portions of NEC, Standard of installation.
2. National Electrical Manufacturer's Association, NEMA: Comply with NEMA standards as applicable.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boxes:

1. Appleton Electric Company.
2. Crouse-Hinds Company.
3. General Electric Company.
4. Killark Electric Manufacturing Company.
6. Lew Electric Fitting Company.
7. O.Z./Gedney Company.
8. Raco, Inc.
9. Square D Company.
10. Steel City Division.
11. Thomas and Betts Company, Inc.
12. Wiremold/Walker.

2.2 MATERIALS

A. Pull Boxes and Junction Boxes:

1. Pull Boxes and Junction Boxes: NEC metal construction with screw or hinged cover.
2. Flush Mounted Pull Boxes: Overlapping covers with flush head cover retaining screws, prime coated.

B. Recess Activated Floor Box:

1. Flush Service Head: Floor box shall be steel or cast iron construction, concrete tight,

adjustable height, separate power and low voltage compartments with provisions for separate multiple conduit entry.

2. Finish: Carpet flange shall be die cast aluminum alloy with standard 3 mil textured epoxy finish.
3. Mounting: Unit shall poured into the floor slab.
4. Recessed activated boxes: Hinged cover with cable entry slots. Walker RAKM II series or approved equal.

C. Floor Boxes:

1. Fully Adjustable Floor Boxes: Walker 880 series, concrete tight, compatible Brass carpet or tile cover plate for service provided.
2. Separate power, data and voice, where applicable.

D. Flush Poke-thru Floor Boxes:

1. Multiservice(power/data): Walker RC700 series, concrete tight, compatible brass or black painted die cast zinc alloy carpet or tile cover plate for service provided.
2. Separate power, data and voice, where applicable.
3. Fire rated for 3" cored hole.

E. Outlet Boxes:

1. Boxes:
   a. Metallic hot-dipped galvanized, 1.25 oz. per square foot or cadmium plated.
   b. Non-metallic, PVC thermoplastic or thermoset polyester.
2. Interior Boxes:
   a. Pressed sheet steel, blanked for conduit.
   b. Provide attached lugs for locating.
3. Exterior Boxes: Cast aluminum, deep type, corrosion proof fasteners, water tight, gasketted with threaded hubs. Provide inuse GFI boxes per NEC.
4. For Ceiling: 4-inch octagon boxes for 1 fixture, including fixture studs and maximum 2 connecting conduits.
5. For Flush Mounting in Walls:
   a. Boxes with matching plaster cover for single or two gang outlets.
   b. Two-gang box or larger or deep masonry box for conductors, conductor joints, conduit terminations and wiring devices.
6. Surface Mounted: 4 inches square.

F. Surface Raceway:

1. Divided power/voice data: Wiremold 4000 series with divided channel.
2. Multi-outlet strip: Wiremold NM2000 series with nonmetallic construction.

G. Conduit Bodies:

1. Galvanized or aluminum cast-metal of type, shape and size to fit each respective location.
2. Constructed with threaded conduit ends, removable cover and corrosion-resistant screws.

H. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistance punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushing, type and size to suit respective use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pull Boxes and Junction Boxes: Locate pull boxes and junction boxes above removable ceilings or in electrical rooms, utility rooms or storage areas.

B. Flush Through Floor Fitting:

1. Confirm exact placement with related work before installing.
2. Core drill 3" diameter hole.
3. Securely anchor fitting into floor assembly.
4. Installation to be as recommended by manufacturer to obtain UL listing.

C. Floor Boxes:

1. Confirm exact placement with related work before installing.
2. Securely anchor fitting to floor box.
3. Where mounted on conduit floor stubs, provide independent anchorage to floor to prevent fitting movement.

D. Outlet Boxes:

1. Mount outlet boxes flush in area other than mechanical rooms, electrical rooms and above removable ceilings.
2. Adjust position of outlets in finished masonry walls to suit masonry course lines.
3. Do not install boxes back-to-back in same wall.
4. Masonry Walls:
   a. Coordinate cutting of masonry walls to achieve neat openings for boxes.
   b. Locate boxes in masonry walls so that only corner need be cut from masonry walls.
5. Do not use sectional or handy boxes unless specifically requested.
6. For boxes mounted in exterior walls, make sure that there is insulation behind outlet boxes.
7. For outlets mounted above counters, benches or splashbacks, coordinate locations and mounting heights with built-in units.
8. Adjust outlet mounting height to agree with required location for equipment served.

E. Voice/Data Boxes:

1. Confirm final location and mounting height.
2. Install flush with wall with 3/4" conduit stubbed to an accessible ceiling space.
3. Provide blank plate at locations not to be used.

F. Boxes supplied by others: Verify exact mounting location and type of mounting.

G. Provide knockout closures to cap unused knockout holes where blanks have been removed.

H. Support all boxes independently of conduit.

END OF SECTION

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SECTION 16150 - MOTORS AND MOTOR WIRING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide motor branch circuit wiring, motor starters, and disconnect switches to make a complete code complying motor branch circuit for each motor on project.

B. Mounting of all equipment under this contract.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 16110 Raceways
2. 16155 Motor Starters
3. 16170 Motor and Circuit Disconnects
4. 16185 Equipment Connections
5. Division 15 Mechanical

C. Each motor shall have an individual means of disconnect within equipment cabinet in finished area. Adjacent to motor in sight of and within 25'-0" of motor in all other areas.

D. Disconnect shall be heavy-duty, horsepower-rated fused switch for three phase motors and fused toggle switch or manual fractional motor starter switch for single phase motors, unless noted otherwise in Motor Schedules or otherwise.

E. Enclosures for outdoor locations and those marked "WP" shall be NEMA Type 3R elsewhere, unless otherwise noted, enclosures shall be NEMA Type 1.

F. All controls shall be 120 volt or less. Control wiring shall have all controls wired in hot line (fused for three or more control devices and all fuel burners) with other side grounded. Control panel protected per NEC 430 and 440. Control wiring by contractor furnishing motor except as noted.

G. Contractor who furnished and installed motor or other current using equipment shall furnish to Electrical Contractor all line voltage(greater than 100 volts) control devices for installation.

1. Specified manual, automatic, local and remote motor and other control devices and switches, including thermostats, pressurestats, aquastats and other devices when specified as supplied by others.
2. Detailed wiring diagrams, installation and operating instructions in form of reviewed shop drawings for complete wiring installations of above equipment.
3. Motors will be set and aligned by contractor furnishing motor.

1.3 QUALITY ASSURANCE

A. Motor and related equipment shall conform to NEMA standards for the type and application.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motors smaller than 1/2 HP: 120-volt, single phase, and 60-cycle current.

B. Motors 1/2 HP and larger:

1. In accordance with NEMA Standards, unless otherwise indicated.
2. 230-volt, 1-phase, 60 cycle current.

C. Characteristics: Quiet, non-overloading under operating conditions, 1.15 series factor, suitable for intended services, accessible for servicing and with oiling devices arranged for easy access.

D. Motor Protection:

1. Motor protection integral with motor starter, thermal overload type, including manual reset.
2. Automatic reset type overloads or built-in overload not acceptable.
3. Provide motor protection for each speed of multiple speed motors.

E. Factory Wired Panels:

1. Factory wired panels supplied as integral part of equipment provided by Division 15 Contractor.
2. Factory wired panel includes responsibility for totally wired control system as indicated on control drawings by Division 15 Contractor.
   a. Furnished with completely integrated control panel, including switches, starters, certain disconnects, protective devices and control transformers mounted on associated mechanical equipment.
   b. "Factory wired panel" does not mean wired at factory, but does mean provided by the Heating, Ventilating or Plumbing Contractor specified in Division 15.
   c. In certain cases, as indicated, Electrical Contractor provides disconnect switch ahead of factory wired panel.

G. Temperature Control Panels: Electrical Contractor shall provide line voltage power to control panels as indicated on the Drawings and Schedules. Additional line voltage wiring requirements shall be the responsibility of the Temperature Control Contractor to retain an electrical trade to complete temperature control power requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide wiring, disconnect devices, final connection to all equipment noted.

B. Furnish, install and wire all such electrical devices, controls, interlocks, including main, control and interlocking wiring, final connections and testing in full compliance with all requirements of contract.

C. Perform all such work under direct supervision of Contractor who provided motor or equipment. Latter Contractor shall have full responsibility for complete motor, current using device, controls and wiring installations, including all work done by Electrical Contractor and shall guarantee all such work as if he had installed it.

D. All conductors shall be stranded for motor feeders.

E. Provide liquid tight flexible conduits at motors and other vibrating equipment.

F. Grounding wire shall be provided in all flexible conduits. All motors shall be grounded per NEC 250.

G. When a motor box serves more than one motor and motor branch wire size is smaller than wire size in motor outlet box, motor branch shall be protected as required by NEC.

H. Examine the drawings and specifications covering all contracts to ascertain what equipment is furnished by others. Furnish the necessary labor and materials to wire said equipment unless material and wiring is called for under the specifications.

I. Locate and install control devices, as indicated. Coordinate requirements with all other trades.

J. In finished areas, mount motor protection switches flush and install suitable coverplates.

K. Install overload heater or related with full load current of motors provided. Provide actual field measurements of equipment operating under normal loads to verify proper heater selection.

L. Set all protective devices to suit motors provided.

M. Mount and wire all controlling equipment furnished in Division 15.

N. Verify motor sizes for starters, including verification of required number of auxiliary contacts.

O. Install all power and control wiring including conduit to and from starters to motors and to all remote devices required for complete system operation as indicated on drawings.

P. Install all motor starter, pilot lights, pushbuttons, selector switches, thermal overloads and local disconnect switches at motors, except those devices specified as part of integral factory wired panels or as provided under Division 15.

Q. E.C. is responsible for connections, proper phase relationships and motor rotation.

END OF SECTION

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SECTION 16155 - MOTOR STARTERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide and install motor starters where indicated on plans and elsewhere in these specifications.

B. Submittals: Provide submittal as required in 16050.

PART 2 - EQUIPMENT

2.1 MOTOR STARTERS

A. All motor starters shall be furnished by the Electrical Contractor unless otherwise noted. Starters shall be Square D or approved equal.

B. Magnetic starters shall be non-reversing, full voltage across-the-line type in a NEMA-1 enclosure; where located exterior provide NEMA 3R enclosure.

1. Starters shall have external manual reset thermal overload relays, undervoltage protection, 120V holding coil voltage, "Hand-Off Automatic" selector and pilot light.
2. Each starter shall have 3 melting alloy overload protectors. See Drawings for size and voltage.
3. Auxiliary contacts required for interconnection of controlled equipment shall be furnished by the Electrical Contractor after consultation with the temperature control and other mechanical contractors.
4. When interlocking or automatic control of single-phase motors is required, motors shall have magnetic across-the-line starters.
5. Each starter shall be complete with magnetic circuit breaker and front operated position - indicating handle. Each circuit breaker shall have means of padlocking external operating handle in the off position.
6. The starter door shall be interlocked so that the circuit breaker must be "off" before the door can be opened. Each starter shall be equipped with a control transformer 208 or 480 volt, 2 wire primary and 120 volt, wire secondary.
7. Each control transformer shall be equipped with a Bussman type KTK fuse on the secondary side.

C. Manual starter shall have melting allow type trip-free thermal overload relays furnished in NEMA-enclosure with toggle switch disconnect and pilot light. Refer to Motor Schedule for sizes and voltage requirements.

PART 3 - EXECUTION

3.1 GENERAL

A. Install motor starters where shown on plans and as indicated on Motor Equipment Schedule.

B. Verify all overload heaters are correctly sized.

C. Coordinate all motor line voltage control wiring for starters with other Trades

D. Torque all conductor and busbar connections to manufacturer's recommendations.

END OF SECTION

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SECTION 16185 - EQUIPMENT CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Power and selected control wiring for all equipment including, but not limited to:

1. HVAC motors and control panels.

B. Coordinate all equipment requirements with the various contractors and the Owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 15000 HVAC
2. 16050 Basic Materials and Methods
3. 16110 Raceways
4. 16120 Wire & Cable
5. 16150 Motors and Motor Wiring
6. 16170 Motor and Circuit Disconnects

PART 2 - PRODUCTS

2.1 SEE 1.2 ABOVE AND DRAWINGS.

PART 3 - EXECUTION

3.1 HVAC CONNECTIONS

A. Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters and disconnects to motors or to packaged control panels.

1. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.
2. Include starters disconnects and overload protection if not included in packaged control panels.

B. Provide 120 volts circuits to each temperature control panel as indicated on the Drawings.

1. Line voltage wiring requirements for temperature control beyond the requirements shown on the drawings and schedules shall be the responsibility of the Temperature Control Contractor to retain the electrical trade and pay for such work.

C. Unless otherwise specified, all electrical motors and control devices such as aquastats, float and pressure fan powered VAV boxes, switches, electropneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired for low-voltage connections (less than 100volts) by the Contractor supplying the devices or the Temperature Control Contractor, as specified elsewhere.

D. Each motor terminal box shall be connected with a maximum 36" piece of flexible conduit to a fixed junction box. A green wire run through the flexible conduit shall interconnect the motor frame and the rigid conduit system. Use Liquid tight flexible metal conduit for all motor connections.

E. Check for proper rotation of each motor.

END OF SECTION

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Conduit and equipment supports.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 16110 Raceways

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to supports.
2. Underwriters Laboratories, UL: Supports listed and labeled by UL.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Material:

1. Single Runs:
   a. Galvanized two-hole conduit straps or ring-bolt type hangers with specialty spring clips.
   b. *Do not use plumber's perforated straps.*
2. Multiple Runs: Conduit rack with 25% spare capacity.
3. Vertical Runs: Channel support with conduit fittings.
   a. 25 ft intervals.

B. Anchor Methods:

1. Hollow Masonry: Toggle bolts or spike type expansion anchors.
2. Solid Masonry: Lead expansion anchors or preset inserts.
3. Metal Surfaces: Machine screws, bolts or welded studs.
4. Wood Surfaces: Wood screws.
5. Concrete Surfaces: Self-drilling anchors or power driven studs.

C. Light Fixtures:

1. Provide grid troffer clips in accordance with NEC 410-16.

D. Mounting Racks and Supports:

1. Provide rack and supports of galvanized or painted steel channel sections with bolted or welded fittings.
2. Provide exterior treated 3/4" fire-retardant plywood mounting surface with gray paint finish on both sides and edges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Maintain headroom, neat mechanical appearance and to support equipment loads.

B. Suspend, support from and attach only to the structural elements at intervals required by code, with threaded rod, channels, "stand-off" and other clips and NECA approved devices.

1. Do not use "stand-off" clips for attachment to walls and partitions.
2. Install raceways tight to wall.

C. To the fullest extent possible, group several conduits together and run parallel, supporting with rod and channel.

END OF SECTION

SECTION 16450 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide and install materials for a complete grounding system integral with the power distribution in accordance with the National Electrical Code.

B. Equipment grounding system.

1.2 RELATED DOCUMENTS

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

B. Specified Elsewhere:

1. 16110 Raceways
3. 16120 Wires and Cables
4. 16150 Motors and Motor Wiring

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Institute of Electrical and Electronic Engineers, IEEE: Comply with applicable IEEE Standards pertaining to electrical grounding.
2. National Electrical Code, NEC: Comply with NEC/NFPA No. 70, as applicable to materials and installation of electrical grounding systems and associated equipment and wiring.
3. Underwriters Laboratories:
   a. Comply with UL Standards pertaining to electrical grounding and bonding.
   b. UL 467: Grounding and Bonding Equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials used for grounding conductors shall be as called for in National Electrical Code Article #250-81.

B. Ground Fittings:

1. OZ Company:
   a. Type BF
   b. Type OG
   c. Type LG
   d. Type MG

PART 3 - EXECUTION

3.1 INSTALLATION

A. Damp Locations: All convenience outlets, switches, fixtures, boxes and plates in damp locations or outdoors shall be fully grounded by a separate green grounding conductor.

B. Bonding Jumpers:

1. Maintain ground continuity by separate insulated green ground wire in fixture cords, flexible connections or similar location where raceway system is interrupted.
2. Light Fixtures: Provide separate green wire grounded from fixture housing to nearest conduit system box, where flexible conduit is used.
3. Receptacles: Provide green wire bonding jumper from all new receptacles to metal back box.

C. Motors: Provide insulated grounding conductor from motor connection to distribution panel grounding bus for all motors.

1. Where motors are connected to conduit systems with flexible conduit section, install greenfield grounding conductor in flexible conduit section.

D. Equipment Grounding Conductors: Provide separate, insulated grounding conductor within each feeder raceway.

1. Ground cable tray at intervals not exceeding 100 feet.

E. Device Boxes: Provide new green wire ground from panel ground bar to all new devices located in the raceway systems.

1. Provide dedicated ground wire to GFI and surge suppression receptacles.

END OF SECTION

SECTION E: PROPOSAL

GOODMAN MAINTENANCE FACILITY
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CONTRACT NO. 6870

Bidder must state a Unit Price and Total Bid for each item. The Total Bid for each item must be the product of quantity, by Unit Price. The Grand Total must be the sum of the Total Bids for the various items. In case of multiplication errors or addition errors, the Grand Total with corrected multiplication and/or addition shall determine the Grand Total bid for each contract. The Unit Price and Total Bid must be entered numerically in the spaces provided. All words and numbers shall be written in ink.

1. The undersigned having familiarized himself/herself with the Contract documents, including Advertisement for Bids, Instructions to Bidders, Form of Proposal, City of Madison Standard Specifications for Public Works Construction - 2012 Edition thereto, Form of Agreement, Form of Bond, and Addenda issued and attached to the plans and specifications on file in the office of the City Engineer, hereby proposes to provide and furnish all the labor, materials, tools, and expendable equipment necessary to perform and complete in a workmanlike manner the specified construction on this project for the City of Madison; all in accordance with the plans and specifications as prepared by the City Engineer, including Addenda to the Contract Nos. _____ through _____ issued thereto, at the prices for said work as contained in this proposal.
2. If awarded the Contract, we will initiate action within seven (7) days after notification or in accordance with the date specified in the contract to begin work and will proceed with diligence to bring the project to full completion within the number of work days allowed in the Contract or by the calendar date stated in the Contract.
3. The undersigned Bidder or Contractor certifies that he/she is not a party to any contract, combination in form of trust or otherwise, or conspiracy in restraint of trade or commerce or any other violation of the anti-trust laws of the State of Wisconsin or of the United States, with respect to this bid or contract or otherwise.
4. Accompanying this Proposal is ☐ Bid Bond or ☐ Certified Check in the amount of _____ Dollars ($_____) or ☐ a Certificate of Biennial Bid Bond as required by the Advertisement for Bids.
   (IF BID BOND IS USED, IT SHALL BE SUBMITTED ON THE FORMS PROVIDED BY THE CITY. FAILURE TO DO SO MAY RESULT IN REJECTION OF THE BID).
5. I hereby certify that all statements herein are made on behalf of _____
   (name of corporation, partnership, or person submitting bid)
   a corporation organized and existing under the laws of the State of _____ a partnership consisting of _____; an individual trading as _____; of the City of _____; State of _____; that I have examined and carefully prepared this Proposal, from the plans and specifications and have checked the same in detail before submitting this Proposal; that I have fully authority to make such statements and submit this Proposal in (its, their) behalf; and that the said statements are true and correct.

_____
SIGNATURE

_____
TITLE, IF ANY

Sworn and subscribed to before me this
_____ day of _____, 20_____

_____
(Notary Public or other officer authorized to administer oaths)
My Commission Expires _____
Bidders shall not add any conditions or qualifying statements to this Proposal.

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
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State of Wisconsin
Department of Workforce Development
Equal Rights Division
Labor Standards Bureau

Disclosure of Ownership

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

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

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

(3) This form must ONLY be filed, with the state agency or local governmental unit that will be awarding the contract, if **both (A) and (B) are met**.

(A) The contractor, or a shareholder, officer or partner of the contractor:

(1) Owns at least a 25% interest in the "other construction business", indicated below, on the date the contractor submits a bid or completes negotiations.

(2) Or has owned at least a 25% interest in the "other construction business" at any time within the preceding three (3) years.

(B) The Wisconsin Department of Workforce Development (DWD) has determined that the "other construction business" has failed to pay the prevailing wage rate or time and one-half the required hourly basic rate of pay, for hours worked in excess of the prevailing hours of labor, to any employee at any time within the preceding three (3) years.

Other Construction Business

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

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

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

Street Address or P O Box	City	State	Zip Code

If you have any questions call (608) 266-0028

ERD-7777-E (R. 09/2003)

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
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Best Value Contracting

1. The Contractor shall indicate the non-apprenticeable trades used on this contract.

_____

_____

_____

_____

_____

_____

_____

2. Some Contractors are exempt due to the size of the work force. Apprenticeable trades are those trades considered apprenticeable by the State of Wisconsin.

☐ Check Here if the Contractor has a total skilled work force of four or less individuals in all apprenticeable trades combined. This contractor is exempt from Best Value Contracting.

3. The Contractor shall indicate on page E-4 which apprenticeable trades are to be used on this Contract and shall indicate by checking the appropriate box for the trades used, how the contractor will comply with Madison General Ordinance 33.07(7).

Legend

Number of Journeyworkers	The Contractor shall indicated for trades to be used on this Contract only, the number of journeyworkers that the Contractor has employed company wide.
W-ATT	The Contractor is an active trade trainer in the State of Wisconsin for the trade indicated.
US-ATT	The Contractor is an active trade trainer in an apprenticeship program approved by the U.S. Department of Labor or another state apprenticeship agency in the trade indicated.
SB-ATT	The Contractor shall become an active trade trainer prior to beginning work on the Contract in the trade indicated.

☐ The Contractor has reviewed the list on page E-4 and shall not use any apprenticeable trades on this project.

☐ The Contractor has reviewed this list on E-4 and has checked the appropriate box by each apprenticeable trade to be used on the project.

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
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Apprenticeable Trades

Check the box in the column "Trade Used on This Project" for each apprenticeable trades used on this project. For those trades used on the project indicated the number of journeyworkers that are employed company wide and check a box to the right of the trade as to how the Contractor will comply MGO 33.07(7). Refer to the legend on page E-3 for the meaning associated with each heading. The Contractor must check one of the boxes on the right for each apprenticeable trade used and checked on the left.

Trade Used on Contract	Apprenticeable Trades	Number of Journeyworkers	W-ATT	US-ATT	SB-ATT
☐	Bricklayer		☐	☐	☐
☐	Carpenter		☐	☐	☐
☐	Cement Mason / Concrete Finisher		☐	☐	☐
☐	Cement Mason (Heavy Highway)		☐	☐	☐
☐	Construction Craft Laborer		☐	☐	☐
☐	Data Communication Installer		☐	☐	☐
☐	Electrician		☐	☐	☐
☐	Environmental Systems Technician / HVAC Service Tech/HVAC Install / Service		☐	☐	☐
☐	Glazier		☐	☐	☐
☐	Heavy Equipment Operator / Operating Engineer		☐	☐	☐
☐	Insulation Worker (Heat & Frost)		☐	☐	☐
☐	Iron Worker		☐	☐	☐
☐	Iron Worker (Assembler, Metal Bldgs)		☐	☐	☐
☐	Painter & Decorator		☐	☐	☐
☐	Plasterer		☐	☐	☐
☐	Plumber		☐	☐	☐
☐	Residential Electrician		☐	☐	☐
☐	Roofer & Waterproofer		☐	☐	☐
☐	Sheet Metal Worker		☐	☐	☐
☐	Sprinklerfitter		☐	☐	☐
☐	Steamfitter		☐	☐	☐
☐	Steamfitter (Refrigeration)		☐	☐	☐
☐	Steamfitter (Service)		☐	☐	☐
☐	Taper & Finisher		☐	☐	☐
☐	Telecommunications (Voice, Data & Video) Installer-Technician		☐	☐	☐
☐	Tile Setter		☐	☐	☐

PROPOSAL

NAME OF BIDDER

GOODMAN MAINTENANCE FACILITY BUILDING B - HEATING AND VENTILATION IMPROVEMENTS

CONTRACT NO. 6870

ACCT NO: CB53-58401-810714-53W1414, CB60-58401-810397-00-53W1414-60121S10-00000000

		TOTAL BID
	LUMP SUM BID	

SECTION F: BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT _____
(a corporation of the State of _____) (individual), (partnership), hereinafter referred to as the "Principal") and _____, a corporation of the State of _____ (hereinafter referred to as the "Surety") and licensed to do business in the State of Wisconsin, are held and firmly bound unto the City of Madison, (hereinafter referred to as the "Obligee"), in the sum of five per cent (5%) of the amount of the total bid or bids of the Principal herein accepted by the Obligee, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that, whereas the Principal has submitted, to the City of Madison a certain bid, including the related alternate, and substitute bids attached hereto and hereby made a part hereof, to enter into a contract in writing for the construction of:

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

1. If said bid is rejected by the Obligee, then this obligation shall be void.

2. If said bid is accepted by the Obligee and the Principal shall execute and deliver a contract in the form specified by the Obligee (properly completed in accordance with said bid) and shall furnish a bond for his/her faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

   If said bid is accepted by the Obligee and the Principal shall fail to execute and deliver the contract and the performance and payment bond noted in 2. above executed by this Surety, or other Surety approved by the City of Madison, all within the time specified or any extension thereof, the Principal and Surety agree jointly and severally to forfeit to the Obligee as liquidated damages the sum mentioned above, it being understood that the liability of the Surety for any and all claims hereunder shall in no event exceed the sum of this obligation as stated, and it is further understood that the Principal and Surety reserve the right to recover from the Obligee that portion of the forfeited sum which exceed the actual liquidated damages incurred by the Obligee.

   The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Obligee may accept such bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, on the day and year set forth below.

Seal

_____ _____

Principal Date

By: _____

_____

Name of Surety

By: _____ _____

Date

This certifies that I have been duly licensed as an agent for the above company in Wisconsin under License No. _____ for the year _____, and appointed as attorney in fact with authority to execute this bid bond and the payment and performance bond referred to above, which power of attorney has not been revoked.

_____ _____

Date Agent

_____

Address

_____

City, State and Zip Code

_____

Telephone Number

NOTE TO SURETY & PRINCIPAL

The bid submitted which this bond guarantees may be rejected if the following instrument is not attached to this bond:

Power of Attorney showing that the agent of Surety is currently authorized to execute bonds on behalf of the Surety, and in the amounts referenced above.

Certificate of Biennial Bid Bond

TIME PERIOD - VALID (FROM/TO)
NAME OF SURETY
NAME OF CONTRACTOR
CERTIFICATE HOLDER City of Madison, Wisconsin

This is to certify that a biennial bid bond issued by the above-named Surety is currently on file with the City of Madison.

This certificate is issued as a matter of information and conveys no rights upon the certificate holder and does not amend, extend or alter the coverage of the biennial bid bond.

Cancellation: Should the above policy be cancelled before the expiration date, the issuing Surety will give thirty (30) days written notice to the certificate holder indicated above.

_____

Signature of Authorized Contractor Representative

_____

Date

SECTION G: AGREEMENT

THIS AGREEMENT made this _____ day of _____ in the year Two Thousand and Twelve between _____ hereinafter called the Contractor, and the City of Madison, Wisconsin, hereinafter called the City.

WHEREAS, the Common Council of the said City of Madison under the provisions of a resolution adopted _____, , and by virtue of authority vested in the said Council, has awarded to the Contractor the work of performing certain construction.

NOW, THEREFORE, the Contractor and the City, for the consideration hereinafter named, agree as follows:

1. **Scope of Work.** The Contractor shall, perform the construction, execution and completion of the following listed complete work or improvement in full compliance with the Plans, Specifications, Standard Specifications, Supplemental Specifications, Special Provisions and contract; perform all items of work covered or stipulated in the proposal; perform all altered or extra work; and shall furnish, unless otherwise provided in the contract, all materials, implements, machinery, equipment, tools, supplies, transportation, and labor necessary to the prosecution and completion of the work or improvements:

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

2. **Completion Date/Contract Time.** Construction work must begin within seven (7) calendar days after the date appearing on mailed written notice to do so shall have been sent to the Contractor and shall be carried on at a rate so as to secure full completion SEE SPECIAL PROVISIONS, the rate of progress and the time of completion being essential conditions of this Agreement.

3. **Contract Price.** The City shall pay to the Contractor at the times, in the manner and on the conditions set forth in said specifications, the sum of _____($_____) Dollars being the amount bid by such Contractor and which was awarded to him/her as provided by law.

4. **Wage Rates for Employees of Public Works Contractors**

General and Authorization. The Contractor shall compensate its employees at the prevailing wage rate in accordance with section 66.0903, Wis. Stats., DWD 290 of the Wisconsin Administrative Code and as hereinafter provided.

"Public Works" shall include building or work involving the erection, construction, remodeling, repairing or demolition of buildings, parking lots, highways, streets, bridges, sidewalks, street lighting, traffic signals, sanitary sewers, water mains and appurtenances, storm sewers, and the grading and landscaping of public lands.

"Building or work" includes construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work, except for the delivery of mineral aggregate such as sand, gravel, bituminous asphaltic concrete or stone which is incorporated into the work under contract with the City by depositing the material directly in final place from transporting vehicle.

"Erection, construction, remodeling, repairing" means all types of work done on a particular building or work at the site thereof in the construction or development of the project, including without limitation, erecting, construction, remodeling, repairing, altering, painting, and decorating, the transporting of materials and supplies to or from the building or work done by the employees of the Contractor, Subcontractor, or Agent thereof, and the manufacturing or furnishing of materials, articles, supplies or equipment on the site of the building or work, by persons employed by the Contractor, Subcontractor, or Agent thereof.

"Employees working on the project" means laborers, workers, and mechanics employed directly upon the site of work.

"Laborers, Workers, and Mechanics" include preapprentices, helpers, trainees, learners and properly registered and indentured apprentices but exclude clerical, supervisory, and other personnel not performing manual labor.

Establishment of Wage Rates. The Department of Public Works shall periodically obtain a current schedule of prevailing wage rates from DWD. The schedule shall be used to establish the City of Madison Prevailing Wage Rate Schedule for Public Works Construction (prevailing wage rate). The Department of Public Works may include known increases to the prevailing wage rate which can be documented and are to occur on a future specific date. The prevailing wage rate shall be included in public works contracts subsequently negotiated or solicited by the City. Except for known increases contained within the schedule, the prevailing wage rate shall not change during the contract. The approved wage rate is attached hereto.

Workforce Profile. The Contractor shall, at the time of signature of the contract, notify the City Engineer in writing of the names and classifications of all the employees of the Contractor, Subcontractors, and Agents proposed for the work. In the alternative, the Contractor shall submit in writing the classifications of all the employees of the Contractor, Subcontractors and Agents and the total number of hours estimated in each classification for the work. This workforce profile(s) shall be reviewed by the City Engineer who may, within ten (10) days, object to the workforce profile(s) as not being reflective of that which would be required for the work. The Contractor may request that the workforce profile, or a portion of the workforce profile, be submitted after the signature of the contract but at least ten (10) days prior to the work commencing. Any costs or time loss resulting from modifications to the workforce profile as a result of the City Engineer's objections shall be the responsibility of the Contractor.

Payrolls and Records. The Contractor shall keep weekly payroll records setting forth the name, address, telephone number, classification, wage rate and fringe benefit package of all the employees who work on the contract, including the employees of the Contractor's subcontractors and agents. Such weekly payroll records must include the required information for all City contracts and all other contracts on which the employee worked during the week in which the employee worked on the contract. The Contractor shall also keep records of the individual time each employee worked on the project and for each day of the project. Such records shall also set forth the total number of hours of overtime credited to each such employee for each day and week and the amount of overtime pay received in that week. The records shall set forth the full weekly wages earned by each employee and the actual hourly wage paid to the employee.

The Contractor shall submit the weekly payroll records, including the records of the Contractor's subcontractors and agents, to the City Engineer for every week that work is being done on the contract. The submittal shall be within twenty-one (21) calendar days of the end of the Contractor's weekly pay period.

Employees shall receive the full amounts accrued at the time of the payment, computed at rates not less than those stated in the prevailing wage rate and each employee's rate shall be determined by the work that is done within the trade or occupation classification which should be properly assigned to the employee.

An employee's classification shall not be changed to a classification of a lesser rate during the contract. If, during the term of the contract, an employee works in a higher pay classification than the one which was previously properly assigned to the employee, then that employee shall be considered to be in the higher pay classification for the balance of the contract, receive the appropriate higher rate of pay, and she/he shall not receive a lesser rate during the balance of the contract. For purposes of clarification, it is noted that there is a distinct difference between working in a different classification with higher pay and doing work within a classification that has varying rates of pay which are determined by the type of work that is done within the classification. For example, the classification "Operating Engineer" provides for different rates of pay for various classes of work and the Employer shall compensate an employee classified as an "Operating Engineer" based on the highest class of work that is done in one day. Therefore, an "Operating Engineer's" rate may vary on a day to day basis depending on the type of work that is done, but it will never be less than the base rate of an "Operating Engineer". Also, as a matter of clarification, it is recognized that an employee may work in a higher paying classification merely by chance and without prior intention, calculation or design. If such is the case and the performance of the work is truly incidental and the occurrence is infrequent, inconsequential and does not serve to undermine the single classification principle herein, then it may not be required that the employee be considered to be in the higher pay classification and receive the higher rate of pay for the duration of the contract. However, the Contractor is not precluded or prevented from paying the higher rate for the limited time that an employee performs work that is outside of the employee's proper classification.

Questions regarding an employee's classification, rate of pay or rate of pay within a classification, shall be resolved by reference to the established practice that predominates in the industry and on which the trade or occupation rate/classification is based. Rate of pay and classification disputes shall be resolved by relying upon practices established by collective bargaining agreements and guidelines used in such determination by appropriate recognized trade unions operating within the City of Madison.

The Contractor, its Subcontractors and Agents shall submit to interrogation regarding compliance with the provisions of this ordinance.

Mulcting of the employees by the Contractor, Subcontractor, and Agents on Public Works contracts, such as by kickbacks or other devices, is prohibited. The normal rate of wage of the employees of the Contractor, Subcontractor, and Agents shall not be reduced or otherwise diminished as a result of payment of the prevailing wage rate on a public works contract.

Hourly contributions. Hourly contributions shall be determined in accordance with the prevailing wage rate and with DWD. 290.01(10), Wis. Admin. Code.

Apprentices and Subjourneypersons. Apprentices and subjourneypersons performing work on the project shall be compensated in accordance with the prevailing wage rate and with DWD 290.02, and 290.025, respectively, Wis. Admin. Code.

Straight Time Wages. The Contractor may pay straight time wages as determined by the prevailing wage rate and DWD 290.04, Wis. Admin. Code.

Overtime Wages. The Contractor shall pay overtime wages as required by the prevailing wage rate and DWD 290.05, Wis. Admin. Code.

Posting of Wage Rates and Hours. A clearly legible copy of the prevailing wage rate, together with the provisions of Sec. 66.0903(10)(a) and (11)(a), Wis. Stats., shall be kept posted in at least one conspicuous and easily accessible place at the project site by the Contractor and such notice shall remain posted during the full time any laborers, workers or mechanics are employed on the contract.

Evidence of Compliance by Contractor. Upon completion of the contract, the Contractor shall file with the Department of Public Works an affidavit stating:

a. That the Contractor has complied fully with the provisions and requirements of Sec. 66.0903(3), Wis. Stats., and Chapter DWD 290, Wis. Admin. Code; the Contractor has received evidence of compliance from each of the agents and subcontractors; and the names and addresses of all of the subcontractors and agents who worked on the contract.

b. That full and accurate records have been kept, which clearly indicate the name and trade or occupation of every laborer, worker or mechanic employed by the Contractor in connection with work on the project. The records shall show the number of hours worked by each employee and the actual wages paid therefor; where these records will be kept and the name, address and telephone number of the person who will be responsible for keeping them. The records shall be retained and made available for a period of at least three (3) years following the completion of the project of public works and shall not be removed without prior notification to the municipality.

Evidence of Compliance by Agent and Subcontractor. Each agent and subcontractor shall file with the Contractor, upon completion of their portion of the work on the contract an affidavit stating that all the provisions of Sec. 66.0903(3), Wis. Stats., have been fully complied with and that full and accurate records have been kept, which clearly indicate the name and trade or occupation of every laborer, worker or mechanic employed by the Contractor in connection with work on the project. The records shall show the number of hours worked by each employee and the actual wages paid therefor; where these records shall be kept and the name, address and telephone number of the person who shall be responsible for keeping them. The records shall be retained and made available for a period of at least three (3) years following the completion of the project of public works and shall not be removed without prior notification to the municipality.

Failure to Comply with the Prevailing Wage Rate. If the Contractor fails to comply with the prevailing wage rate, she/he shall be in default on the contract.

5. **Affirmative Action.** In the performance of the services under this Agreement the Contractor agrees not to discriminate against any employee or applicant because of race, religion, marital status, age, color, sex, disability, national origin or ancestry, income level or source of income, arrest record or conviction record, less than honorable discharge, physical appearance, sexual orientation, political beliefs, or student status. The Contractor further agrees not to discriminate against any subcontractor or person who offers to subcontract on this contract because of race, religion, color, age, disability, sex or national origin.

The Contractor agrees that within thirty (30) days after the effective date of this agreement, the Contractor will provide to the City Affirmative Action Division certain workforce utilization statistics, using a form to be furnished by the City.

If the contract is still in effect, or if the City enters into a new agreement with the Contractor, within one year after the date on which the form was required to be provided, the Contractor will provide updated workforce information using a second form, also to be furnished by the City. The second form will be submitted to the City Affirmative Action Division no later than one year after the date on which the first form was required to be provided.

The Contractor further agrees that, for at least twelve (12) months after the effective date of this contract, it will notify the City Affirmative Action Division of each of its job openings at facilities in Dane County for which applicants not already employees of the Contractor are to be considered. The notice will include a job description, classification, qualifications and application procedures and deadlines. The Contractor agrees to interview and consider candidates referred by the Affirmative Action Division if the candidate meets the minimum qualification standards established by the Contractor, and if the referral is timely. A referral is timely if it is received by the Contractor on or before the date started in the notice.

Articles of Agreement
Article I

The Contractor shall take affirmative action in accordance with the provisions of this contract to insure that applicants are employed, and that employees are treated during employment without regard to race, religion, color, age, marital status, disability, sex or national original and that the employer shall provide harassment free work environment for the realization of the potential of each employee. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training including apprenticeship insofar as it is within the control of the Contractor. The Contractor agrees to post in conspicuous places available to employees and applicants notices to be provided by the City setting out the provisions of the nondiscrimination clauses in this contract.

Article II

The Contractor shall in all solicitations or advertisements for employees placed by or on behalf of the Contractors state that all qualified or qualifiable applicants will be employed without regard to race, religion, color, age, marital status, disability, sex or national origin.

Article III

The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a notice to be provided by the City advising the labor union or worker's representative of the Contractor's equal employment opportunity and affirmative action commitments. Such notices shall be posted in conspicuous places available to employees and applicants for employment.

Article V

The Contractor agrees that it will comply with all provisions of the Affirmative Action Ordinance of the City of Madison, including the contract compliance requirements. The Contractor agrees to submit the model affirmative action plan for public works contractors in a form approved by the Director of Affirmative Action.

Article VI

The Contractor will maintain records as required by Section 39.02(9)(f) of the Madison General Ordinances and will provide the City Affirmative Action Division with access to such records and to persons who have relevant and necessary information, as provided in Section 39.02(9)(f). The City agrees to keep all such records confidential, except to the extent that public inspection is required by law.

Article VII

In the event of the Contractor's or subcontractor's failure to comply with the Equal Employment Opportunity and Affirmative Action Provisions of this contract or Section 39.03 and 39.02 of the Madison General Ordinances, it is agreed that the City at its option may do any or all of the following:

1. Cancel, terminate or suspend this Contract in whole or in part.

2. Declare the Contractor ineligible for further City contracts until the Affirmative Action requirements are met.

3. Recover on behalf of the City from the prime Contractor 0.5 percent of the contract award price for each week that such party fails or refuses to comply, in the nature of liquidated damages, but not to exceed a total of five percent (5%) of the contract price, or five thousand dollars ($5,000), whichever is less. Under public works contracts, if a subcontractor is in noncompliance, the City may recover liquidated damages from the prime Contractor in the manner described above. The preceding sentence shall not be construed to prohibit a prime Contractor from recovering the amount of such damage from the non-complying subcontractor.

Article VIII

The Contractor shall include the above provisions of this contract in every subcontract so that such provisions will be binding upon each subcontractor. The Contractor shall take such action with respect to any subcontractor as necessary to enforce such provisions, including sanctions provided for noncompliance.

Article IX

The Contractor shall allow the maximum feasible opportunity to small business enterprises to compete for any subcontracts entered into pursuant to this contract.

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

IN WITNESS WHEREOF, the Contractor has hereunto set his/her hand and seal and the City has caused these presents to be sealed with its corporate seal and to be subscribed by its Mayor and City Clerk the day and year first above written.

Countersigned:

_____
Company Name

_____ _____
Witness Date President Date

_____ _____
Witness Date Secretary Date

CITY OF MADISON, WISCONSIN

Provisions have been made to pay the liability that will accrue under this contract.

Approved as to form:

_____ _____
Finance Director City Attorney

Signed this _____ day of _____, 20_____

_____ _____
Witness Mayor Date

_____ _____
Witness City Clerk Date

SECTION H: PAYMENT AND PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____
as principal, and _____
Company of _____as surety, are held and firmly bound unto the City of Madison, Wisconsin, in the sum of _____($_____) Dollars, lawful money of the United States, for the payment of which sum to the City of Madison, we hereby bind ourselves and our respective executors and administrators firmly by these presents.

The condition of this Bond is such that if the above bounden shall on his/her part fully and faithfully perform all of the terms of the Contract entered into between him/herself and the City of Madison for the construction of:

GOODMAN MAINTENANCE FACILITY
BUILDING B - HEATING AND VENTILATION IMPROVEMENTS
CONTRACT NO. 6870

in Madison, Wisconsin, and shall pay all claims for labor performed and material furnished in the prosecution of said work, and save the City harmless from all claims for damages because of negligence in the prosecution of said work, and shall save harmless the said City from all claims for compensation (under Chapter 102, Wisconsin Statutes) of employees and employees of subcontractor, then this Bond is to be void, otherwise of full force, virtue and effect.

Signed and sealed this _____day of _____,

Countersigned:

_____
Company Name (Principal)

_____ _____
Witness President Seal

_____
Secretary

Approved as to form:

_____
Surety Seal
☐ Salary Employee ☐ Commission

_____ By _____
City Attorney Attorney-in-Fact

This certifies that I have been duly licensed as an agent for the above company in Wisconsin under License No. _____ for the year 20_____, and appointed as attorney-in-fact with authority to execute this payment and performance bond which power of attorney has not been revoked.

_____ _____
Date Agent

MINIMUM WAGE SCALE

FOR

PUBLIC WORKS IMPROVEMENTS

APPROVED BY: BOARD OF PUBLIC WORKS

MADISON, WISCONSIN

February 7, 2012

The attached "Prevailing Wage Rate Determination: (Pages 1 through 30), issued February 7, 2012, is hereby approved as the Minimum Wage Scale of the City of Madison.

State of Wisconsin
Department of Workforce Development
Equal Rights Division

DEPARTMENTAL ORDER

ISSUE DATE: 1/13/2012

PROJECT:

ALL PUBLIC WORKS PROJECTS UNDER SEC 66.0903, STATS.-CITY OF MADISON
MADISON CITY, DANE COUNTY, WI
Determination No. 201200105

PROJECT OWNER:	REQUESTER:
ROBERT F. PHILLIPS, CITY ENGINEER CITY OF MADISON-ENGINEERING 210 MARTIN L KING JR BLVD, RM 115 MADISON, WI 53703	ROBERT F. PHILLIPS, CITY ENGINEER CITY OF MADISON-ENGINEERING 210 MARTIN L KING JR BLVD, RM 115 MADISON, WI 53703

ADDITIONAL CONTACT:

NORMAN DAVIS, CONTRACT COMPLIANCE
CITY OF MADISON-DEPT OF CIVIL RTS-AA DIV
210 MARTIN L KING JR BLVD, RM 523
MADISON, WI 537033342

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

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

Enclosures

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

ISSUED BY:

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

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

PREVAILING WAGE RATE DETERMINATION
Issued by the State of Wisconsin
Department of Workforce Development
Pursuant to s. 66.0903, Wis. Stats.
Issued On: 1/13/2012

DETERMINATION NUMBER:	201200105
EXPIRATION DATE:	Prime Contracts MUST Be Awarded or Negotiated On Or Before 12/31/2012. If NOT, You MUST Reapply.
PROJECT NAME:	ALL PUBLIC WORKS PROJECTS UNDER SEC 66.0903, STATS.-CITY OF MADISON
PROJECT LOCATION:	MADISON CITY, DANE COUNTY, WI
CONTRACTING AGENCY:	CITY OF MADISON-ENGINEERING

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

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

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

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

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

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

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

BUILDING OR HEAVY CONSTRUCTION

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

SKILLED TRADES

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

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
118	Line Constructor (Electrical)	35.97	18.08	54.05
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	32.66	16.20	48.86
121	Metal Building Erector	22.00	4.11	26.11
122	Millwright	30.66	15.21	45.87
123	Overhead Door Installer	18.00	4.86	22.86
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
127	Pipeline Fuser or Welder (Gas or Utility)	29.54	18.84	48.38
129	Plasterer	29.03	15.16	44.19
130	Plumber	36.20	15.02	51.22
132	Refrigeration Mechanic Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
133	Roofer or Waterproofer	28.06	0.00	28.06
134	Sheet Metal Worker	34.23	20.19	54.42
135	Steamfitter Future Increase(s): Add $.85/hr on 12/1/11; Add $.90/hr on 6/1/12; Add $.85/hr on 12/1/12.	40.35	16.21	56.56
137	Teledata Technician or Installer	21.26	6.99	28.25
138	Temperature Control Installer	32.55	18.68	51.23
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	23.77	16.00	39.77
142	Tile Setter Future Increase(s): Add $.50/hr on 6/1/2012; Add $ .80/hr on 6/1/2013.	29.71	16.00	45.71
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	25.32	15.30	40.62

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
147	Siding Installer	16.74	2.58	19.32
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

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

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $.50/hr. on 06/04/2012; Add $.75/hr. on 06/03/2013 Premium Increase(s): Add $1.00/hr for certified welder; Add $.25/hr for mason tender	24.14	13.45	37.59
302	Asbestos Abatement Worker	23.96	12.88	36.84
303	Landscaper	17.00	6.36	23.36
310	Gas or Utility Pipeline Laborer (Other Than Sewer and Water)	20.39	12.20	32.59
311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51
314	Railroad Track Laborer	14.00	4.77	18.77

HEAVY EQUIPMENT OPERATORS
SITE PREPARATION, UTILITY OR LANDSCAPING WORK ONLY

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
501	Air Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Asphalt Milling Machine; Boring Machine (Directional, Horizontal or Vertical); Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Backhoe (Track Type) Having a Mfgr's Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Crane, Shovel, Dragline, Clamshells; Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Grader or Motor Patrol; Master Mechanic; Mechanic or Welder; Robotic Tool Carrier (With or Without Attachments); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Tractor (Scraper, Dozer, Pusher, Loader); Trencher (Wheel Type or Chain Type Having Over 8 Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40
502	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Environmental Burner; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Jeep Digger; Screed (Milling Machine); Skid Rig; Straddle Carrier or Travel Lift; Stump Chipper; Trencher (Wheel Type or Chain Type Having 8 Inch Bucket & Under).	31.89	14.44	46.33
503	Air Compressor (&/or 400 CFM or Over); Augers (Vertical & Horizontal); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Crusher, Screening or Wash Plant; Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Greaser; High Pressure Utility Locating Machine (Daylighting Machine); Mulcher; Oiler; Post Hole Digger or Driver; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
504	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01
505	Work Performed on the Great Lakes Including Crane or Backhoe Operator; Assistant Hydraulic Dredge Engineer; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder; 70 Ton & Over Tug Operator. Premium Increase(s): Add $.50/hr for friction crane, lattice boom or crane certification (CCO).	37.45	19.45	56.90

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
506	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
507	Work Performed on the Great Lakes Including Deck Equipment Operator, Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks - Great Lakes ONLY.	27.75	19.15	46.90

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

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
508	Boring Machine (Directional); Crane, Tower Crane, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of Over 100 Tons, Self-Erecting Tower Crane With a Lifting Capacity of Over 4,000 Lbs., Crane With Boom Dollies; Crane, Tower Crane, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 176 Ft or Over; Master Mechanic. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.50/hr at 200 ton: Add $1.00/hr. at 300 ton; Add $1.50/hr at 400 ton; Add $2.00/hr at 500 ton.	34.62	17.98	52.60
509	Backhoe (Track Type) Having a Mfgr's Rated Capacity of 130,000 Lbs. or Over; Boring Machine (Horizontal or Vertical); Caisson Rig; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With or Without Attachments, With a Lifting Capacity of 100 Tons or Under, Self-Erecting Tower Crane With A Lifting Capacity Of 4,000 Lbs. & Under; Crane, Tower Crane, Portable Tower, Pedestal Tower or Derrick, With Boom, Leads &/or Jib Lengths Measuring 175 Ft or Under; Pile Driver; Versi Lifts, Tri-Lifts & Gantrys (20,000 Lbs. & Over). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013. Premium Increase(s): Add $.25/hr for cranes with lifting capacity of 45 ton or over.	33.62	17.98	51.60
510	Backhoe (Track Type) Having a Mfgr.'s Rated Capacity of Under 130,000 Lbs., Backhoe (Mini, 15,000 Lbs. & Under); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump (Over 46 Meter), Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Dredge (NOT Performing Work on the Great Lakes); Forklift (Machinery Moving or Steel Erection, 25 Ft & Over); Gradall (Cruz-Aire Type); Hydro-Blaster (10,000 PSI or Over); Milling Machine; Skid Rig; Traveling Crane (Bridge Type). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	32.42	17.98	50.40

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
511	Air, Track, Rotary or Percussion Drilling Machine &/or Hammers, Blaster; Bulldozer or Endloader (Over 40 hp); Compactor (Self-Propelled 85 Ft Total Drum Width & Over, or Tractor Mounted, Towed & Light Equipment); Concrete Pump (46 Meter & Under), Concrete Conveyor (Rotec or Bidwell Type); Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Environmental Burner; Gantrys (Under 20,000 Lbs.); Grader or Motor Patrol; High Pressure Utility Locating Machine (Daylighting Machine); Manhoist; Material or Stack Hoist; Mechanic or Welder; Railroad Track Rail Leveling Machine, Tie Placer, Extractor, Tamper, Stone Leveler or Rehabilitation Equipment; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yd or More Capacity; Screed (Milling Machine); Sideboom; Straddle Carrier or Travel Lift; Tining or Curing Machine; Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type Having Over 8-Inch Bucket). Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	31.89	17.98	49.87
512	Backfiller; Broom or Sweeper; Bulldozer or Endloader (Under 40 hp); Compactor (Self-Propelled 84 Ft Total Drum Width & Under, or Tractor Mounted, Towed & Light Equipment); Concrete Batch Plant, Batch Hopper; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Conveyor System; Concrete Finishing Machine (Road Type); Fireman (Pile Driver & Derrick NOT Performing Work on the Great Lakes); Grout Pump; Hoist (Tugger, Automatic); Industrial Locomotives; Jeep Digger; Lift Slab Machine; Mulcher; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Screw or Gypsum Pumps; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Stump Chipper; Trencher (Wheel Type or Chain Type Having 8-Inch Bucket & Under); Winches & A-Frames.	35.59	19.10	54.69
513	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Boatmen (NOT Performing Work on the Great Lakes); Boiler (Temporary Heat); Crusher, Screening or Wash Plant; Elevator; Farm or Industrial Type Tractor; Fireman (Asphalt Plant NOT Performing Work on the Great Lakes); Forklift; Generator (&/or 150 KW or Over); Greaser; Heaters (Mechanical); Loading Machine (Conveyor); Oiler; Post Hole Digger or Driver; Prestress Machine; Pump (3 Inch or Over) or Well Points; Refrigeration Plant or Freeze Machine; Rock, Stone Breaker; Skid Steer Loader (With or Without Attachments); Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $1/hr on 6/3/2012; Add $1/hr on 6/2/2013.	29.19	17.98	47.17
514	Gas or Utility Pipeline, Except Sewer & Water (Primary Equipment). Future Increase(s): Add $2/hr. on 1/1/2013.	34.89	19.68	54.57
515	Gas or Utility Pipeline, Except Sewer & Water (Secondary Equipment).	30.32	17.40	47.72
516	Fiber Optic Cable Equipment	22.00	7.27	29.27

SEWER, WATER OR TUNNEL CONSTRUCTION

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

SKILLED TRADES

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

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
146	Well Driller or Pump Installer	24.22	14.80	39.02
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	32.37	16.48	48.85
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	28.78	15.16	43.94
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	17.80	9.00	26.80
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86
154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

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

LABORERS

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

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

HEAVY EQUIPMENT OPERATORS
SEWER, WATER OR TUNNEL WORK

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

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

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

AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION

Includes all airport projects (excluding buildings) and all projects awarded by the Wisconsin Department of Transportation (excluding buildings).

SKILLED TRADES

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	15.92	48.58
105	Carpenter	30.23	15.16	45.39
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; Add $1.87 on 6/1/15; Add $1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	30.68	15.68	46.36
109	Electrician	37.25	14.68	51.93
111	Fence Erector	35.62	0.00	35.62
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	28.00	11.15	39.15
125	Pavement Marking Operator	26.65	14.92	41.57
126	Piledriver	29.56	15.16	44.72
133	Roofer or Waterproofer	28.06	0.00	28.06
137	Teledata Technician or Installer	21.26	6.99	28.25
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.42	12.90	48.32
151	Light Equipment Operator -ELECTRICAL LINE CONSTRUCTION ONLY	35.50	14.27	49.77
152	Heavy Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	25.18	14.07	39.25
153	Light Truck Driver - ELECTRICAL LINE CONSTRUCTION ONLY	23.38	12.48	35.86

154	Groundman - ELECTRICAL LINE CONSTRUCTION ONLY	21.30	10.97	32.27

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	22.35	16.19	38.54
203	Three or More Axle Future Increase(s): Add $1.75/hr on 6/1/2012; Add $1.85/hr on 6/1/2013. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	22.50	16.19	38.69
204	Articulated, Euclid, Dumptor, Off Road Material Hauler	24.91	15.63	40.54
205	Pavement Marking Vehicle	23.84	14.76	38.60
206	Shadow or Pilot Vehicle	24.76	15.35	40.11
207	Truck Mechanic	24.91	15.35	40.26

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer Future Increase(s): Add $1.60/hr on 6/1/2012: Add $1.70/hr on 6/1/2013; Add $1.60/hr on 6/1/2014. Premium Increase(s): Add $.10/hr for topman, air tool operator, vibrator or tamper operator (mechanical hand operated), chain saw operator and demolition burning torch laborer; Add $.15/hr for bituminous worker (raker and luteman), formsetter (curb, sidewalk and pavement) and strike off man; Add $.20/hr for blaster and powderman; Add $.25/hr for bottomman; Add $.35/hr for line and grade specialist; Add $.45/hr for pipelayer. / DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	27.20	13.45	40.65
302	Asbestos Abatement Worker	23.96	12.88	36.84
303	Landscaper Future Increase(s): Add $1.60/hr on 6/1/12; Add $1.70/hr on 6/1/13; Add $1.60/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	27.20	13.45	40.65
304	Flagperson or Traffic Control Person Future Increase(s): Add $1.60/hr on 6/1/2012; Add $1.70/hr on 6/1/2013; Add $1.60/hr on 6/1/2014. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	23.55	13.45	37.00

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

HEAVY EQUIPMENT OPERATORS
AIRPORT PAVEMENT OR STATE HIGHWAY CONSTRUCTION

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

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

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
534	Belting, Burlap, Texturing Machine; Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Environmental Burner; Farm or Industrial Type Tractor; Fireman (Asphalt Plant, Pile Driver & Derrick NOT Performing Work on the Great Lakes); Forklift; Greaser; Hoist (Tugger, Automatic); Jeep Digger; Joint Sawer (Multiple Blade); Launch (NOT Performing Work on the Great Lakes); Lift Slab Machine; Mechanical Float; Mulcher; Power Subgrader; Robotic Tool Carrier (With or Without Attachments); Roller (Rubber Tire, 5 Ton or Under); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Telehandler; Tining or Curing Machine. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	32.96	18.90	51.86
535	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Augers (Vertical & Horizontal); Automatic Belt Conveyor & Surge Bin; Boiler (Temporary Heat); Concrete Proportioning Plant; Crusher, Screening or Wash Plant; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Mudjack; Oiler; Prestress Machine; Pug Mill; Pump (3 Inch or Over) or Well Points; Rock, Stone Breaker; Screed (Milling Machine); Stump Chipper; Tank Car Heaters; Vibratory Hammer or Extractor, Power Pack. Future Increase(s): Add $2/hr on 6/1/12; Add $2/hr on 6/1/13; Add $1.75/hr on 6/1/14. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.25/hr for work on projects involving temporary traffic control setup, for lane and shoulder closures, when work under artificial illumination conditions is necessary as required by the project provisions (including prep time prior to and/or cleanup after such time period).	32.67	18.90	51.57
536	Fiber Optic Cable Equipment.	22.00	7.27	29.27
537	Work Performed on the Great Lakes Including Diver; Wet Tender or Hydraulic Dredge Engineer.	36.20	18.81	55.01

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
538	Work Performed on the Great Lakes Including 70 Ton & Over Tug Operator; Assistant Hydraulic Dredge Engineer; Crane or Backhoe Operator; Hydraulic Dredge Leverman or Diver's Tender; Mechanic or Welder.	36.20	18.81	55.01
539	Work Performed on the Great Lakes Including Deck Equipment Operator or Machineryman (Maintains Cranes Over 50 Tons or Backhoes 115,000 Lbs. or More); Tug, Launch or Loader, Dozer or Like Equipment When Operated on a Barge, Breakwater Wall, Slip, Dock or Scow, Deck Machinery.	26.80	18.52	45.32
540	Work Performed on the Great Lakes Including Deck Equipment Operator, Machineryman or Fireman (Operates 4 Units or More or Maintains Cranes 50 Tons or Under or Backhoes 115,000 Lbs. or Under); Deck Hand, Deck Engineer or Assistant Tug Operator; Off Road Trucks-Great Lakes ONLY.	26.80	18.52	45.32

LOCAL STREET OR MISCELLANEOUS PAVING CONSTRUCTION

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

SKILLED TRADES

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
103	Bricklayer, Blocklayer or Stonemason	32.66	16.20	48.86
105	Carpenter	29.06	15.16	44.22
107	Cement Finisher Future Increase(s): Add $1.86 on 6/1/12; Add $1.87 on 6/1/13; Add $1.87 on 6/1/14; Add $1.87 on 6/1/15; Add $1.75 on 6/1/16. Premium Increase(s): DOT PREMIUMS: 1) Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day. 2) Add $1.40/hr when the Wisconsin Department of Transportation or responsible governing agency requires that work be performed at night under artificial illumination with traffic control and the work is completed after sunset and before sunrise.	30.68	15.68	46.36
109	Electrician Future Increase(s): Add $.50/hr. effective 06/04/2012. Premium Increase(s): DOT PREMIUM: Pay two times the hourly basic rate on Sunday, New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day & Christmas Day.	28.74	17.86	46.60
111	Fence Erector	25.50	0.26	25.76
116	Ironworker	30.90	19.11	50.01
118	Line Constructor (Electrical)	35.97	18.08	54.05
124	Painter	25.65	14.11	39.76
125	Pavement Marking Operator	26.00	0.00	26.00
126	Piledriver	29.56	15.16	44.72
133	Roofer or Waterproofer	28.06	0.00	28.06
137	Teledata Technician or Installer	21.26	6.99	28.25
143	Tuckpointer, Caulker or Cleaner	22.00	9.75	31.75
144	Underwater Diver (Except on Great Lakes)	36.20	18.81	55.01
150	Heavy Equipment Operator - ELECTRICAL LINE CONSTRUCTION ONLY	35.42	12.90	48.32

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

TRUCK DRIVERS

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

LABORERS

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

HEAVY EQUIPMENT OPERATORS
CONCRETE PAVEMENT OR BRIDGE WORK

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

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

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

HEAVY EQUIPMENT OPERATORS
ASPHALT PAVEMENT OR OTHER WORK

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

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

RESIDENTIAL OR AGRICULTURAL CONSTRUCTION

Includes single family houses or apartment buildings of no more than four (4) stories in height and all buildings, structures or facilities that are primarily used for agricultural or farming purposes, excluding commercial buildings. For classification purposes, the exterior height of a residential building, in terms of stories, is the primary consideration. All incidental items such as site work, driveways, parking lots, private sidewalks, private septic systems or sewer and water laterals connected to a public system and swimming pools are included within this definition. Residential buildings of five (5) stories and above are NOT included within this definition.

SKILLED TRADES

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
101	Acoustic Ceiling Tile Installer	27.00	2.47	29.47
102	Boilermaker	31.09	23.75	54.84
103	Bricklayer, Blocklayer or Stonemason	32.00	3.00	35.00
104	Cabinet Installer	22.00	2.74	24.74
105	Carpenter	27.00	3.46	30.46
106	Carpet Layer or Soft Floor Coverer	23.95	2.78	26.73
107	Cement Finisher	21.33	4.25	25.58
108	Drywall Taper or Finisher	23.80	1.55	25.35
109	Electrician	22.00	9.18	31.18
110	Elevator Constructor	43.79	25.48	69.27
111	Fence Erector	17.64	4.33	21.97
112	Fire Sprinkler Fitter	36.39	16.97	53.36
113	Glazier	36.23	11.22	47.45
114	Heat or Frost Insulator	29.04	19.73	48.77
115	Insulator (Batt or Blown)	18.95	1.70	20.65
116	Ironworker	30.90	19.11	50.01
117	Lather	28.15	15.14	43.29
119	Marble Finisher	31.16	16.27	47.43
120	Marble Mason	32.66	16.20	48.86
121	Metal Building Erector	17.50	2.80	20.30
123	Overhead Door Installer	17.00	0.00	17.00
124	Painter	25.65	6.33	31.98
125	Pavement Marking Operator	26.00	0.00	26.00

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
129	Plasterer	19.00	0.29	19.29
130	Plumber	30.00	10.34	40.34
132	Refrigeration Mechanic	30.96	0.00	30.96
133	Roofer or Waterproofer	29.85	1.55	31.40
134	Sheet Metal Worker	21.03	3.40	24.43
135	Steamfitter	32.59	11.05	43.64
137	Teledata Technician or Installer	19.23	5.32	24.55
138	Temperature Control Installer	22.45	4.11	26.56
139	Terrazzo Finisher	18.00	5.35	23.35
140	Terrazzo Mechanic	31.16	16.27	47.43
141	Tile Finisher	23.96	13.36	37.32
142	Tile Setter	21.00	0.00	21.00
143	Tuckpointer, Caulker or Cleaner	23.96	12.88	36.84
146	Well Driller or Pump Installer	15.10	12.38	27.48
147	Siding Installer	18.80	1.42	20.22

TRUCK DRIVERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
201	Single Axle or Two Axle	19.86	2.54	22.40
203	Three or More Axle	19.50	14.27	33.77
205	Pavement Marking Vehicle	19.25	10.84	30.09
207	Truck Mechanic	19.00	1.75	20.75

LABORERS

CODE	Fringe Benefits Must Be Paid On All Hours Worked TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
301	General Laborer	16.09	7.18	23.27
302	Asbestos Abatement Worker	17.00	2.21	19.21
303	Landscaper	25.00	0.54	25.54

311	Fiber Optic Laborer (Outside, Other Than Concrete Encased)	16.51	0.00	16.51

HEAVY EQUIPMENT OPERATORS
RESIDENTIAL OR AGRICULTURAL CONSTRUCTION

Fringe Benefits Must Be Paid On All Hours Worked

CODE	TRADE OR OCCUPATION	HOURLY BASIC RATE OF PAY $	HOURLY FRINGE BENEFITS $	TOTAL $
557	Asphalt Heater, Planer & Scarifier; Asphalt Milling Machine; Asphalt Screed; Backhoe (Track Type); Backhoe (Mini, 15,000 Lbs. & Under); Bituminous (Asphalt) Plant & Paver, Screed; Boring Machine (Directional, Horizontal or Vertical); Bulldozer or Endloader; Concrete Breaker (Large, Auto, Vibratory/Sonic, Manual or Remote); Concrete Bump Cutter, Grinder, Planing or Grooving Machine; Concrete Conveyor System; Concrete Laser/Screed; Concrete Paver (Slipform); Concrete Pump, Concrete Conveyor (Rotec or Bidwell Type); Concrete Slipform Placer Curb & Gutter Machine; Concrete Spreader & Distributor; Crane (Carry Deck, Mini) or Truck Mounted Hydraulic Crane (10 Tons or Under); Crane With a Lifting Capacity of 25 Tons or Under; Crane, Shovel, Dragline, Clamshells; Forestry Equipment, Timbco, Tree Shear, Tub Grinder, Processor; Grader or Motor Patrol; Grout Pump; Hydro-Blaster (10,000 PSI or Over); Loading Machine (Conveyor); Manhoist; Material or Stack Hoist; Mechanic or Welder; Milling Machine; Roller (Over 5 Ton); Scraper (Self Propelled or Tractor Drawn) 5 cu yds or More Capacity; Shoulder Widener; Skid Rig; Stabilizing or Concrete Mixer (Self-Propelled or 14S or Over); Tractor (Scraper, Dozer, Pusher, Loader); Tractor or Truck Mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane (10 Tons or Under); Trencher (Wheel Type or Chain Type); Winches & A-Frames.	29.45	15.37	44.82
558	Air Compressor (&/or 400 CFM or Over); Air, Electric or Hydraulic Jacking System; Backfiller; Belting, Burlap, Texturing Machine; Boiler (Temporary Heat); Broom or Sweeper; Compactor (Self-Propelled or Tractor Mounted, Towed & Light Equipment); Concrete Finishing Machine (Road Type); Farm or Industrial Type Tractor; Forklift; Generator (&/or 150 KW or Over); Heaters (Mechanical); High Pressure Utility Locating Machine (Daylighting Machine); Jeep Digger; Lift Slab Machine; Mulcher; Oiler; Post Hole Digger or Driver; Power Subgrader; Pump (3 Inch or Over) or Well Points; Robotic Tool Carrier (With or Without Attachments); Rock, Stone Breaker; Roller (Rubber Tire, 5 Tons or Under); Screed (Milling Machine); Self Propelled Chip Spreader; Shouldering Machine; Skid Steer Loader (With or Without Attachments); Stump Chipper; Telehandler; Vibratory Hammer or Extractor, Power Pack.	26.45	14.35	40.80

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