SECTION 15590

1. SCOPE

1.1 Work Included:

2. GENERAL

2.1 In general, this division of the work includes a complete comfort heating boiler system replacement including equipment appurtenances and accessories necessary to complete all work under all of the sections listed hereunder as hereinafter specified and shown on the drawings. See drawings for base bid and alternates.

A. Section 15590 General Provisions

B. Section 15591 Basic Materials and Methods

C. Section 15592 Mechanical Systems Insulation

D. Section 15593 Comfort Heating Boilers and Pumps

2.2 Furnish and install a complete comfort heating boiler system replacement in accordance with drawings, specifications and the intent of the design. Qualified workmen shall install system in the approved manner. See drawings for base bid and alternates.

2.3 Owner shall purchase all pumps and boilers…but thru the H.V.A.C. Contractor. This contractor shall include the cost of all pumps and boilers within their bids keeping in mind that the owner is a tax free entity.

2.4 This contractor shall also be responsible for mounting the new boiler control panel (furnished by the unit mfr) and completing any/all interconnected wiring.

2.5 The owne shall be responsible for final integration of the new boilers into the existing building automated control system (Delta), as well as all programming of boiler control sequences (lead/lag, run equalization, etc.), o.a. reset schedules, and rotating pumps/boilers to ensure run-time equalization on a weekly basis.

2.6 The owner shall be responsible for rebalancing the existing o.a. intake on the large basement air handling unit to 18% (6000 cfm) maximum.

2.7 Bid shall be submitted using only those manufactured items specifically scheduled. Alternate "approved equals" may be provided as a voluntary alternate. If an alternate boiler or pump is offered the manufacturer, model number, and 'deduct amount' to be subtracted from the base bid must be included on the bid form.

2.8 Where materials are specified without specific mention to one or more manufacturers, they shall be regarded as "standard to the trade" items not requiring approval.

2.9 Submittal of This Contractor's bid will indicate he has examined the drawings and specifications of other trades whose work is related with his so as to avoid any extras, and has examined his own drawings and has included all required allowances in his bid.

2.10 No allowance will be made for any error resulting from This Contractor's failure to thoroughly familiarize himself with all conditions.

3. CODES, PERMITS AND TAXES

3.1 This system shall be installed in compliance with all National, State and Local Codes and Regulations in force at the building location.

3.2 This Contractor shall secure and pay for all permits, licenses and certificates of inspection applicable to this work.

3.3 This Contractor shall pay for all taxes applicable to this work.

3.4 Furnish one copy of all required permits, etc., to the Owners Representative.

3.5 The Contractor shall notify the State of Wisconsin of the Boiler installation on the current D.I.L.H.R. form.

4. SHOP DRAWINGS

4.1 Submit four (4) copies of manufacturer's certified drawings to the engineer for all equipment.

4.2 Drawings to include details dimensions, capacities, gauges, arrangement and operating clearances.

4.3 Incomplete submittals will be disapproved and Contractor will be held responsible for correction of work not having final approval.

4.4 Approval of certified drawings does not relieve Contractor of responsibility of furnishing and installing all system components, as per plans and specifications for proper system operation with particular respect to BTU outputs and water flow capacities, minimum noise requirements and space limitations.

4.5 This Contractor shall thoroughly check all shop drawings prepared by sub-contractors and materials or equipment suppliers as regards to measurements, size of members, materials and details to satisfy himself that they conform to the intent of the Engineer's specifications and plans, and each drawing shall have the date of approval and signature of the checker.

4.6 The Owners Representative's review of shop drawings shall not relieve the Contractor from responsibility for deviations from the contract documents, unless approval of such deviations has been requested in writing and specifically approved by the Engineer. Neither does the Owners Representative's review relieve the Contractor from responsibility for error or omissions of any sort in shop drawings. The Engineer assumes no responsibility for figured dimensions or exact quantities of materials on shop drawings.

4.7 Furnish approved shop drawings to all other Sub-Contractors whose work is affected.

5. TERMINATION

5.1 If the contractor refuses or fails to prosecute the work, or any separable part thereof, with such diligence as will insure its completion within the time and quality as specified in this contract, the Owner may by written notice to the Contractor, terminate his right to proceed with the work or such part of the work in question. In such event the Owner may take over the work and prosecute the same to completion, by contract or otherwise, and may take possession of and utilize in completing the work such materials, appliances, and plant as may be on the site of the work and necessary therefore. Whether or not the Contractor's right to proceed with the work is terminated, he and his sureties shall be liable for any damage to the owner resulting from his refusal or failure to complete the work within the confines of the contract.

6. CHANGES IN THE WORK

6.1 No changes shall be made or extra work done except on written order from the Owner's Representative. Upon request, the contractor shall submit to the Owner's Representative an itemized proposal for any changes in the work that may be considered. No claim for extra cost will be allowed unless ordered in writing before the execution of the work involved.

7. PAYMENTS

7.1 Payments shall be made as provided in the contract. Payments otherwise due may be withheld on account of defective work not remedied, liens filed, damage to others not adjusted by contractor, or failure to make payments properly to sub-contractors or for material or labor.

7.2 The final payment shall not be due until the contractor has delivered to the Owner's Representative, waiver of lien satisfactory to the Owner's Representative indemnifying it against any lien.

8. PROTECTION

8.1 Each Contractor as required shall:

A. Provide, erect and maintain barricades, warning signs and guards as necessary for protection of material storage adjoining property, public building. Use caution at all times to protect persons against injury resulting from job operations, movement of materials and standing equipment.

B. Weather Protection: Provide protection against rain, wind, storms or heat so as to maintain work materials, apparatus and fixtures free from injury or damage. At end of day's work cover new work likely to be damaged.

C. Water Protection: Protect building from damage at all times from rain water, ground water, backing up of drains or sewers and other water. Provide pumps, equipment and enclosures to provide this protection.

D. Protection of Finished Floors: No wheeling of loads over finished floor with or without plank for protection will be permitted in anything except rubber tired wheelbarrows, buggies, trucks, dollies. Applies to finished floors and to concrete floors which are not to be covered with applied surfacing.

E. Protect adequately, surrounding areas and materials including glass when welding, flame cutting or other operations requiring the use of flame, arcs or sparking devices that are necessary in the course of the work.

F. Use only flameproof type tarpaulins.

8.2 Fire Retardant Plastic Sheeting:

A. The contractor shall furnish one standard roll of anti-static plastic sheeting, for emergency protection. Roll to be kept on location, so as to be accessible to Owner or contractor's representative at all times.

9. CLEANING UP

9.1 The Contractor shall keep the building and premise free from the accumulation of waste material and rubbish. Such material shall be gathered and disposed of in a satisfactory manner.

10. SUPERVISION OF WORK

10.1 The Heating Contractor shall furnish the services of an experienced Engineer or Superintendent.

10.2 He shall be constantly in charge of the installation of the work together with all sub-contractors, skilled workmen, helpers and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.

10.3 He shall be thoroughly acquainted with and be responsible for the various sub-contractors work so that it is properly coordinated and supervised to the satisfaction of the Owners Representative.

10.4 Upon written notice to the Contractor of the lack of such coordination and supervision, the Owners Representative may perform such services as may be required and deduct the cost of this service at an hourly rate of $70.00 per hour per man from the contract for the work under this division.

11. COORDINATION AND COOPERATION

11.1 This Contractor shall give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

11.2 Where the work of This Contractor will be installed in close proximity to the work of other trades or where there is evidence that the work of This Contractor shall interfere with the work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment.

11.3 If this Contractor installs his work before coordinating it with other trades or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the condition without extra charge.

12. RECORD DRAWINGS

12.1 This Contractor (including all his sub-contractors) is to convey any information on changes made from the drawings to the Owners Representative on the job.

12.2 The Contractor's Superintendent will mark up a set of the Owners Representative's blue-line prints from the above data.

12.3 Changes made from the plan are to be reported immediately and records are to be made on the set of blue-line prints as the job progresses.

12.4 All Contractors shall post all changes for their particular work each day as the changes occur.

13. SLEEVES, OPENINGS, CUTTING AND PATCHING

13.1 The Heating Contractor must cut all openings in concrete.

13.2 By Heating Contractor:

A. Cooperate with other trades and adjust with them (subject to the Owners Representative's approval) all questions of interference, right-of-way for piping, etc.

B. Arrange for entering all equipment into building and arranging it at locations indicated.

C. Accurately locate all openings and provide and set all sleeves in cooperation with Contractors whose work is affected thereby.

D. Make good, repair and pay for without additional cost above contract agreement price, all damage caused by this Contractor's operations to work and equipment in manner approved by the Owners Representative.

14. PLUMBING

14.1 Any necessary plumbing work associated with the comfort heating boiler replacement will be the responsibility of this contractor. All piping associated with the domestic hot water heater installation is by others.

15. ELECTRICAL WORK (See Alternate #2 on drawings)

15.1 By Heating Contractor **(see alternate #2 on drawings):**

A. To furnish all equipment to suit voltage available and furnish Electrical Contractor all necessary wiring diagrams and installation instructions.

15.2 By Electrical Contractor **(see alternate #2 on drawings):**

A. To furnish and install any/all necessary starting equipment.

B. To furnish and install all line voltage wiring (110 volts and greater) complete from panelboard to motors or junction boxes in factory assembled units except line and low voltage temperature control wiring.

C. To furnish and install all disconnect switches.

D. To wire all equipment motors.

15.3 Motor Requirements:

A. Provide motors and electric heating equipment having proper voltage characteristics and indicated on the drawings and as verified by the Electrical Contractor. Notify the Owner of any discrepancies before ordering these particular motors and controls. All motors to be high efficiency, NEMA rated for 40°C. rise with a service factor of 1.15; unless otherwise noted, all motors shall have drip proof general purpose enclosure. All fractional horsepower motors to be permanent split capacitor type.

15.4 Starting Equipment:

A. Provide all starters as required. All starters for service above 115 volts shall have 115 volt control circuits with built-in transformers. Minimum starter size of "0".

B. Starters to be Allen Bradley or Square D.

16. LUBRICATION

16.1 All equipment must be lubricated in accordance with manufacturer's instructions, before equipment is turned over to the Owners Representative.

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

16.3 Furnish the Owners Representative with a list of equipment to be lubricated stating type of lubrication and interval between lubrication required and date last lubricated.

17. IDENTIFICATION

17.1 Piping:

A. Based on product by Seton Nameplate Corporation.

1. Provide for each piping system "Setmark" markers. Markers to be semi-rigid plastic designed to fit over piping and snap-on tight. Markers to be color coded as per ANSI Specifications.
2. This contractor shall apply markers to all new or newly insulated exposed piping of this contract as follows:
   a. As necessary to provide satisfactory identification of the pipe line.
   b. In boiler rooms, at each change of direction of piping 10 foot or longer.
   c. All identification shall be positioned on the piping for ease of reading from a standing position on the floor.

O.D. of PIPE or COVERING	HEIGHT OF LETTERS
2 inch and under	1 inch
2-1/2 inch and over	1-1/4 inch

B. If stenciled identification is used, coordinate pipe identification with Painting Contractor for piping in equipment rooms.

18. OPERATING AND MAINTENANCE INSTRUCTIONS

18.1 The HVAC Contractor shall furnish to the Owners Representative upon completion of the work but before final acceptance of the system, two (2) bound copies of typewritten instructions covering complete set of drawings marked to show any and all deviations from original layout. This Contractor shall instruct the Owners Representative on the care and operation of all parts of the system.

18.2 Maintenance instructions shall include manufacturer's literature on all system equipment components. All maintenance instructions shall be explicit concerning time intervals for all servicing and preventative maintenance, types and grades of oil and/or grease, packing materials, normal and abnormal clearance, methods of equipment adjustments and complete description of replacement parts and materials for wearing items, electrical diagrams, control diagrams, complete parts list, which list by OEM part number and suppliers name, address and telephone number.

18.3 Instructions and Manuals

A. Instruct the Owners Representative in the proper operating techniques of all mechanical systems, and inform of the instruction time and equipment demonstration to arrange for attendance. Instruction and demonstration shall consist of two 2 hr. periods approximately a month apart.

B. Prepare and submit to the Owners Representative's office two (2) operating and maintenance manuals. Include the following information:

1. Name, address and phone number of installing contractor and person to be called for repairs.
2. Index of the mechanical sections, with tabs dividing the sections.
3. List of equipment with name of manufacturer, local distributor and phone number.
4. Parts list to the major pieces of mechanical equipment including a list of recommended spare parts.
5. Outline description of operation of the various mechanical systems.

19. GUARANTEE

19.1 All work, materials, equipment and controls to be guaranteed for one (1) year from final acceptance of installation and kept in repair for said period, unless defects are the result of bad management.

20. VIBRATION AND NOISE CONTROL

20.1 The prime contractor for this contract shall provide Consolidated Kinetics, Korfund or Mason Industries vibration isolators and bases for all equipment furnished under this contract.

20.2 Pipe Hangers: All piping located throughout equipment rooms, wherever individual equipment is set upon vibration isolators, shall be isolated from the structure by using hangers containing a spring and neoprene element in series similar to Consolidated Kinetics, Ind., Type SFH. Each spring shall have a minimum deflection of 1".

20.3 Springs: All springs shall employ unhoused standing springs with a horizontal to vertical spring stiffness ratio of approximately one. Snubbers to limit extreme horizontal deflections during start and stops shall be used. All spring mounts shall be provided with ribbed or waffled neoprene pads at least 1/4" thick to prevent transmission of high frequency vibrations to the building.

20.4 General Vibration Isolation Details: No rigid connections shall be made between spring mounted equipment and the structure.

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

20.6 The Heating Contractor will be solely responsible for the quality and type of isolators used for the entire project.

21. TESTING AND BALANCING

21.1 The Heating Contractor shall provide an independent, certified Testing and Balancing Firm. The firm shall provide complete testing and balancing services and submit 2 copies of final report to the Owners Representative.

21.2 The Heating Contractor shall assume the responsibility for the following:

A. Purchase and installation of any replacement components of equipment drive assemblies as directed.

B. Equipment lubrication.

C. Adjustment of vibration isolation devices.

D. Equipment conformity to sound level requirements.

E. Removal, cleaning or replacement of hydronic system strainers.

F. Draining, filling and venting of hydronic systems.

G. Installation of all pressure/temperature taps, wells and devices as shown or specified.

H. Water treatment, if specified, system cleaning and general equipment housekeeping.

I. Leak testing of piping.

J. Instructions and training to Owner's personnel on system operation, adjustments and maintenance.

K. Furnishing of ladders and/or scaffolding, if requested by the testing and balancing firm.

L. Correct problems identified by the testing and balancing firm.

22. FINAL REQUIREMENTS

22.1 By Heating Contractor:

A. Provide all replacement of any parts that may be necessary for adjustment of speeds to obtain required water quantities without cost to the Owner.

B. All motors on all equipment shall be properly lubricated before putting into service.

C. Equipment shall be cleaned inside and out.

D. All debris resulting from or caused by this installation shall be removed from the site, or make necessary arrangements with General Contractor to have this done.

22.2 Hydrostatic Test (By Heating Contractor):

A. Of 100 lb. per sq. in.

B. Apply to entire new piping system.

C. Maintain for six (6) hours without drop.

D. Replace defective pipe and fittings with new materials.

E. Caulking, plugging or rusting not permitted.

22.3 Cleaning: After system has been hydrostatically tested and made tight, this Contractor shall chemically clean the internal surfaces of the newly installed boiler system including all new interconnected piping and equipment. The Owners Representative shall supervise the cleaning.

23. BOILER CONTROL SYSTEM

23.1 GENERAL:

A. It is the resposibilty of the OWNER to integrate control of the new boilers into the existing building's automated control system.

23.2 SEQUENCE OF OPERATION:

A. The boilers and boiler pumps B-1 and B-2 shall be controlled via the P.C.

B. Below 65 degrees F outside air temperature - The lead boiler and its' associated pump shall be allowed to energize. The boiler supply water temperature shall reset with O.A. temperature. A preliminary reset schedule is as follows:

O.A. Temp	**HWS Temp**
Above 65 degrees	Boiler off
61-65 degrees	100 degrees
51-60 degrees	110 degrees
46-50 degrees	120 degrees
41-45 degrees	130 degrees
36-40 degrees	140 degrees
31-35 degrees	150 degrees
26-30 degrees	160 degrees
21-25 degrees	165 degrees

Note: HWS temperatures are based on a 20 degree temperature drop between entering and leaving water conditions.

C. When the outdoor air temperature drops to 20 degrees F – both boilers shall be allowed to operate together to maintain desired indoor air temperatures. A preliminary reset schedule for these conditions follows below:

O.A. Temp	**HWS Temp**
11-20 degrees	170 degrees
0-10 degrees	175 degrees
below 0 degrees	180 degrees

Note: HWS temperatures are based on a 20 degree temperature drop between entering and leaving water conditions.

D. Note: If the control software determines that it would be more efficient to operate both boilers in conjunction to meet building heating loads in lieu of operating just one boiler at a time when outdoor air temperatures are greater than 20 degrees than this shall be allowed. If this is the case, both boilers shall follow the temperature reset schedule listed above.

E. Unoccupied Cycle: A (7) degree F night set-back (space temperature) shall be programmed into the building temperature control. The boilers shall follow the same conditions as listed in items "B" thru "D" above to determine which boiler will be maintaining unoccupied building temperatures. Note: During the building's unoccupied hours no boiler shall be allowed to be energized until outside air temperature drops below 45 degrees F.

F. On a failure of the lead boiler/pump - The lag boiler/pump shall automatically start, after a 30 sec. time delay. Indicate pump or boiler failure on the alarm printer. Once the lag boiler/pump starts, it shall remain the lead boiler/pump until the alarm condition is reset from the P.C.

23.3 MASTER CONTROL:

A. Lead boiler shall be determined by rotating lead and lag boilers weekly to equalize run time.

B. Indicator lamps shall show which boilers are in operation.

C. The master control shall further control the burner firing rate motors directly to provide modulated firing proportional to the controlled medium variation from the desired operating point. All burners shall modulate in unison when on the line.

D. As the demand decreases, the burners shall be turned off by the master controller in the reverse order of starting.

23.4 HOT WATER SUPPLY (GENERAL)

A. The Hot Water Supply System consists of:

1) Two (2) high efficiency, fully condensing, sealed combustion boilers. A primary pump is provided for each boiler.

2) There are (2) secondary circulating pumps (in stand-by arrangement) that supply water to existing terminal devices. Each pump is constant flow.

23.5 SECONDARY HOT WATER CIRCULATING PUMP CONTROL

A. The secondary hot water circulating pump H-1 shall be energized whenever the outdoor air temperature is below 65 degrees F. occupied, or 45 degrees F. unoccupied .

B. On a failure of the secondary hot water circulating pump the stand-by pump H-2 shall automatically start (after 30 second time delay). Indicate pump failure on the alarm printer. Once the existing stand-by pump starts, it shall remain the lead pump until the alarm condition is reset from the P.C.

24. USE OF SYSTEM

24.1 The putting of new work or any part thereof into use, even though with the Owner or the Owners Representative's consent, shall not be construed to be an acceptance of the work on the part of the Owner or the Representative, nor shall it be construed to obligate him in any way to accept improper work or defective materials.

END OF SECTION 15590