William Paterson University

Wayne, NJ

Bid Solicitation and Specification

FOR

PURCHASE, DELIVERY and INSTALLATION OF

Two (2) AERCO Benchmark High Efficiency Condensing Hot Water Boilers model BMK-2.0 GWB

PURPOSE AND INTENT

The William Paterson University of New Jersey, hereinafter referred to as “WPUNJ”, is soliciting proposals from qualified companies for the purchase & delivery of mechanical equipment.

Overview

William Paterson University is soliciting bids for the purchase, delivery and installation of the following equipment:

- Two (2) AERCO Benchmark High Efficiency Condensing Hot Water Boilers model BMK-2.0 GWB(or Equivalent)

The University will be the final authority as to whether or not substitute/alternate equipment is acceptable. Substitute/alternate equipment must include an equivalent specification sheet for each item substituted to include a written analysis of any difference from the product specified in this bid package. Requests for substitutions must be made prior to the last day for questions. Failure to provide the required documentation may result in your bid being declared non-responsive and therefore rejected.

A basis of design specification is contained in the bid for reference.

Scope of Work

The bid price shall include all associated costs for the following items:

- Purchase, delivery and installation of the complete boilers as specified.. Equipment shall be installed in accordance with manufacturer’s specifications. Provide typical installation detail.

- All integral controls to operate the boilers including an interface to provide communication with the existing Building Management System at the facility. Provide point list.
- Removal and disposal of existing units. Replace insulation to all piping removed during the removal of existing unit. Provide demo plan.
- Complete operational test at the factory; witnessing of the testing is an option that may be exercised by the owner at the owner's discretion. Owner assumes all travel costs associated with testing verification.
- All shipping transportation to William Paterson University. A predetermined location will provided for the delivery of each unit. The proposal shall include all costs associated with the placement and staging of the units, including all labor and rigging equipment. Contractor is responsible for multiple deliveries, if necessary, at no additional cost to WPUNJ.

AERCO Benchmark High Efficiency Condensing Hot Water Boilers model BMK-2.0 GWB

Part 1 — General

1.1 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled, gas-fired, fire-tube condensing boilers, trim and accessories for generating hot water.

1.2 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.

1. Engineered calculations and drawings must be submitted to Architect/Engineer to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted boiler.

B. Efficiency Curves: At a minimum, submit efficiency curves for 100%, 60%, and 5% input firing rates at incoming water temperatures ranging from 60°F to 160°F. Test protocols shall conform to AERCO's AE-1 standards.

C. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of boiler

1. If submitted material is different from that of the design basis, boiler manufacture shall incur all costs associated with reselection of necessary pumps. Possible differences include, but are not limited to, the pump type, pump pad size, electrical characteristics and piping changes.

D. Shop Drawings: For boilers, boiler trim and accessories, include:

1. Plans, elevations, sections, details and attachments to other work
2. Wiring Diagrams for power, signal and control wiring
3. Shop drawings shall be delivered to the Owner within 20 calendars after the Notice of Award has been issued.

E. Source Quality Control Test Reports: Reports shall be included in submittals.

F. Operation and Maintenance Data: Data to be included in boiler emergency, operation and maintenance manuals.

G. Warranty: Standard warranty specified in this Section

H. Other Informational Submittals:

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Boilers must be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. I=B=R Performance Compliance: Condensing boilers must be rated in accordance with applicable federal testing methods and verified by AHRI as capable of achieving the energy efficiency and performance ratings as tested within prescribed tolerances.

C. ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV “Heating Boilers”.

D. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

E. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers."

F. UL Compliance: Boilers must be tested for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

G. NOx Emission Standards: When installed and operated in accordance with manufacturer's instructions, condensing boilers shall comply with the NOx emission standards outlined in South Coast Air Quality Management District (SCAQMD), Rule 1146.2; and the Texas Commission on Environmental Quality (TCEQ), Title 30, Chapter 117, Rule 117.465.

1.5 WARRANTY

A. Standard Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Fire-Tube Condensing Boilers

a. The pressure vessel/heat exchanger shall carry a 10-year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.

b. Manufacturer labeled control panels are unconditionally warranted against failure for (2) two years from shipment.

c. All other components, with the exception of the igniter and flame detector, are conditionally guaranteed against any failure for 18 months from shipment

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide AERCO International, BMK 2.0 GWB or a comparable product by one of the following:

1. AERCO International

2.2 CONSTRUCTION

A. Description: Boiler shall be natural gas fired, fully condensing, fire tube design. Power burner shall have full modulation (the minimum firing rate shall not exceed 100,000 BTU/HR input. Boilers that have an input greater than 100,000 BTU/Hr at minimum fire will not be considered) and discharge into a positive pressure vent. Boiler efficiency shall increase with decreasing load (output),

while maintaining setpoint. Boiler shall be factory-fabricated, factory-assembled and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure-tight, built on a steel base, including insulated jacket, flue-gas vent, combustion-air intake connections, water supply, return and condensate drain connections, and controls.

B. Heat Exchanger: The heat exchanger shall be constructed of 316L stainless steel fire tubes and tubesheets, with a one-pass combustion gas flow design. The fire tubes shall be 5/8” OD, with no less than 0.065” wall thickness. The upper and lower stainless steel tubesheet shall be no less than 0.375” thick. The pressure vessel/heat exchanger shall be welded construction. The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig. Access to the tubesheets and heat exchanger shall be available by burner and exhaust manifold removal. Minimum access opening shall be no less than 10-inch diameter

C. Pressure Vessel. The pressure vessel shall have a maximum water volume of 24 gallons. The boiler water pressure drop shall not exceed 1.7 psig at 170 gpm. The boiler water connections shall be 4-inch flanged 150-pound, ANSI rated. The pressure vessel shall be constructed of SA53 carbon steel, with a 0.25-inch thick wall and 0.50-inch thick upper head. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The boiler shall be designed so that the thermal efficiency increases as the boiler firing rate decreases.

D. Modulating Air/Fuel Valve and Burner. The boiler burner shall be capable of a 20-to-1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall produce less than 30 ppm of NOx corrected to 3% excess oxygen. The unit shall be certified by the South Coast Air Quality Management District (SCAQMD) as compliant with Rule 1146.2 for boilers and water heaters less than or equal to 2 MBTUs, and the Texas Commission on Environmental Quality (TCEQ) as being compliant with Section 117.465 for boilers and water heaters less than or equal to 2 MBTUs. The burner shall be metal-fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. The modulating motor must be linked to both the gas valve body and air valve body with a single linkage. The linkage shall not require any field adjustment. A variable frequency drive (VFD), controlled cast aluminum pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

E. Minimum boiler efficiencies shall be as follows at a 20 degree delta-T:

EWT	100% Fire	40% Fire	5% Fire

160 °F	85.3%	85.7%	86.3%
120 °F	86.6%	87.8%	90.2%
60 °F	94.2%	96.9%	99%

F. Exhaust Manifold: The exhaust manifold shall be of corrosion resistant cast aluminum with an 8-inch diameter flue connection. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.

G. Blower: The boiler shall include a variable-speed, DC centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.

1. Motors: Blower motors shall comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

   a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require a motor to operate in the service factor range above 1.0.

H. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and electronic flame supervision.

2.3 CONTROLS

A. The boiler control system shall be segregated into three components: “C-More” Control Panel, Power Box and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.

B. The control panel shall consist of six individual circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:

1. A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation
2. A CPU board housing all control functions
3. An electric low-water cutoff board with test and manual reset functions
4. A power supply board
5. An ignition /stepper board incorporating flame safeguard control
6. A connector board

Each board shall be individually field replaceable.

C. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

D. The control panel hardware shall support both RS-232 and RS-485 remote communications.

E. The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate a minimum of eight separate status messages and 34 separate fault messages.

F. The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:

1. Setpoint high limit: Allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum boiler outlet temperature.
2. Setpoint Low Limit: Allows for a selectable minimum operating temperature.
3. Failsafe Mode: Failsafe mode allows the boiler to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.

G. The boiler control system shall incorporate the following additional features for enhanced external system interface:

1. System start temperature feature
2. Pump delay timer
3. Auxiliary start delay timer
4. Auxiliary temperature sensor
5. Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
6. Remote interlock circuit
7. Delayed interlock circuit
8. Fault relay for remote fault alarm

H. Each boiler shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.

Boiler Management System (BMS): The Boiler Manufacturer shall supply as part of the boiler package a completely integrated Boiler Management System Programmer to control all operation and energy input of the multiple boiler heating plant. The Boiler Management System shall be comprised of a

microprocessor based control utilizing the MODBUS protocol to communicate with the Boilers via the RS-485 port.

The controller shall have the ability to vary the firing rate and energy input of each individual boiler throughout its full modulating range to maximize the condensing capability and thermal efficiency output of the entire heating plant. The BMS shall control the boiler outlet header temperature within +2ºF. The controller shall be a PID type controller and uses Ramp Up/Ramp Down control algorithm for accurate temperature control with excellent variable load response. The BMS controller shall provide contact closure for auxiliary equipment such as system pumps and combustion air inlet dampers based upon outdoor air temperature.

When set on Internal Setpoint Mode, temperature control setpoint on the BMS shall be fully field adjustable from 50ºF to 190ºF in operation. When set on Indoor/Outdoor Reset Mode, the BMS will operate on an adjustable inverse ratio in response to outdoor temperature to control the main header temperature. Reset ratio shall be fully field adjustable from 0.3 to 3.0 in operation. When set on 4ma to 20ma Temperature Control Mode, the BMS will operate the plant to vary header temperature setpoint linearly as an externally applied 4-20 ma signal is supplied.

When set on MODBUS Temperature Control Mode, the BMS will operate the plant to vary header temperature setpoint as an external communication utilizing the MODBUS protocol is supplied via the RS-232 port. The BMS controller shall have a vacuum fluorescent display for monitoring of all sensors and interlocks. Non-volatile memory backup of all control parameters shall be internally provided as standard. The controller will automatically balance the sequence of operating time on each boiler by a first-on first-off mode and provide for setback and remote alarm contacts. Connection between central BMS system and individual boilers shall be twisted pair low voltage wiring, with the boilers ‘daisy-chained’ for ease of installation.

2.4 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the boiler.

B. Electrical Characteristics:

1. Voltage: 460 V
2. Phase: Three
3. Frequency: 60 Hz
4. Full-Load Current 9.0 Amps

2.5 VENTING

A. The exhaust vent must be UL Listed for use with Category III and IV appliances and compatible with operating temperatures up to 480°F, positive pressure, condensing flue gas service. UL-listed vents of Al 29-4C stainless steel must be used with boilers.

B. The minimum exhaust vent duct size for each boiler is eight-inch diameter.

C. The minimum sealed combustion air duct size for each boiler is eight-inch diameter.

2.6 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.

B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

   1. If boilers are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.

C. Allow Owner access to source quality-control testing of boilers. Notify Owner fourteen days in advance of testing.

BERGEN COUNTY
RT. 287 AND RT. 208
ENTRY 6
WEST OVERLOOK AVE.
LOT 6
UNIVERSITY DRIVE
WAYNE
NORTH HALEDON
VALLEY ROAD EXTENSION
TO 1600 VALLEY ROAD #46
(APPROX. 1.5 MILES)
ENTRY 5
POWER AVE.
UNIVERSITY DRIVE
MILLS DRIVE
NORTH
LOT 5
HAMBURG TURNPIKE
ST. JOSEPH'S WAYNE HOSPITAL
TO RT. 23, RT. 46, RT. 80 AND THE GARDEN STATE PARKWAY
RATZER ROAD
WEST ROAD
ENTRY 4
UNIVERSITY COMMONS
PIONEER GARAGE
LOT 2
LOT 1
BELMONT AVENUE
LOT 4
LOT 3
LOT 8
ENTRY 3
ENTRY 2
VISITOR PARKING
ENTRY 1
POMPTON ROAD
TO PATERSON
HARMON PLACE
Academic
Administrative
Athletics
Residential
Student Life
Entries
1. SHEA CENTER FOR PERFORMING ARTS
2. HOBART MANOR
3. HOBART HALL
4. MATELSON HALL
5. WHITE HALL
7. WIGHTMAN GYM
8. HUNZIKER HALL
9. BEN SHAHN CENTER FOR THE VISUAL ARTS
10. DAVID AND LORRAINE CHENG LIBRARY
11. MORRISON HALL
12. POOL
13. RAUBINGER HALL
14. HUNZIKER WING
15. NEW ACADEMIC BUILDING
16. SPEERT HALL
17. SCIENCE HALL EAST/WEST
18. MACHUGA STUDENT CENTER
19. PIONEER HALL
20. HERITAGE HALL
21. PIONEER GARAGE
22. WATER TOWER
23. WAREHOUSE
24. WIGHTMAN FIELD COMPLEX
26. TENNIS COURTS
27. ATHLETIC LOCKER FACILITY
28. THE PAVILION
29. REC CENTER
30. ATHLETIC FIELDS
31. CAMPUS POLICE BUILDING
32. PHYSICAL PLANT AND MAIL PROCESSING CENTER
34. GREENHOUSE
35. COLLEGE HALL
36. HILLSIDE HALL
37. PRINT SHOP
38. CONCESSION STAND
40. CATHOLIC CAMPUS MINISTRY
41. GAEDES HALL
42. ATRIUM
43. POWER ART CENTER
44. CENTURY HALL
45. ALLAN AND MICHELE GORAB ALUMNI HOUSE
46. 1600 VALLEY ROAD
47. HIGH MOUNTAIN WEST
48. HIGH MOUNTAIN EAST
49. BALLROOM
50. OVERLOOK NORTH
51. OVERLOOK SOUTH
SHUTTLE BUS CIRCLES PERIMETER OF CAMPUS EVERY 20 MINUTES. SIGNS INDICATE SHUTTLE BUS STOPS.
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