



# DELAWARE STATE UNIVERSITY

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OFFICE OF PLANNING & CONSTRUCTION

1200 N. DuPont Highway  
Dover, Delaware 19901-2277

## Addendum # 2

Date: May 22, 2017  
Project: Price Building Boiler Room Renovations  
Contract: PC-16-049

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The work herein shall be considered part of the bid documents for the referenced project and carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Acknowledge receipt of addendum on the bid form as indicated.

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### Revisions / Clarifications: None

### Changes to Specifications:

1. *Specification 23 52 33.18 - CONDENSING HEATING BOILERS* – See attached, revised specification:
  - a. Add Camus “Advantus” Model boilers to list of approved manufacturers.
  - b. Revise 2.05, paragraph F to the following “Each boiler shall be provided with a “Fully Modulating” firing control system whereby the firing rate is infinitely proportional at any firing rate between 4% and 100% as determined by the pulse-width modulation input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage.”

### Changes to Drawings: None

### General Information:

1. **Bids are due Friday, May 26, 2017 at the DSU Facilities Building Office 101.**

### Attachments:

1. Specification 23 52 33.18 - CONDENSING HEATING BOILERS

END

**SECTION 23 52 33.18**  
**CONDENSING HEATING BOILERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Boilers.
- B. Controls and boiler trim.
- C. Hot water connections.
- D. Fuel connection.
- E. Collector, draft hood, and chimney connection.

**1.02 RELATED SECTIONS**

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 23 21 14 - Hydronic Specialties.
- C. Section 23 51 00 - Breechings, Chimneys, and Stacks.
- D. Section 23 09 13 - Instrumentation and Control Devices for HVAC.
- E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCES**

- A. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2004 (addendum 2005).
- B. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2004.
- C. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2004.
- D. HI BTS - Testing and Rating Standard for Commercial Boilers; The Hydronics Institute; 2000.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.
- F. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2006.
- G. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2006.
- H. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association; 2004.
- I. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.
- J. UL 726 - Oil-Fired Boiler Assemblies; Underwriters Laboratories Inc.; 1995.
- K. UL (HCVCE) - Heating, Cooling, Ventilating and Cooking Equipment Directory; Underwriters Laboratories Inc.; current edition.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Performance rating shall be in accordance with Hydronics Institute Testing and Rating Standard for Commercial Boilers.
- B. Rating: As scheduled.

**1.05 SUBMITTALS**

- A. See Section Gilbane Project Manual for requirements.
- B. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

- C. Manufacturer's Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in City of Providence's name and registered with manufacturer.

#### **1.06 QUALITY ASSURANCE**

- A. The boiler manufacturer shall coordinate with the Owner-designated controls contractor to ensure that all required interface equipment, controllers, sensors, actuators, relays, etc. are accounted for (both devices and installation thereof) prior to bid submission.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 5 years of documented experience.

#### **1.07 REGULATORY REQUIREMENTS**

- A. Conform to applicable code or NFPA 70 code for internal wiring of factory wired equipment.
- B. Conform to ASME (BPV IV) and (BPV VIII, 1) and UL 726 for boiler construction.
- C. Units: AGA certified.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

#### **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

#### **1.09 WARRANTY**

- A. Provide 10 year warranty on for heat exchanger and fuel burner.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Veissmann: [www.veissmann-us.com](http://www.veissmann-us.com).
- B. Lochinvar (CREST): [www.lochinvar.com](http://www.lochinvar.com).
- C. Fulton: [www.fulton.com](http://www.fulton.com).
- D. Camus (Advantus): [www.camus-hydraulics.com](http://www.camus-hydraulics.com).
- E. Substitutions: Not Permitted.

#### **2.02 MANUFACTURED UNITS**

- A. Hot Water Boilers: Factory packaged low pressure condensing hot water boilers of the size and efficiency indicated, complete with all components, accessories, and appurtenances necessary for a complete and operable boiler as specified and designated on the drawings. Each unit shall be factory assembled with required wiring and piping as a self-contained unit.
- B. Each factory packaged boiler, including pressure vessel, trim, valve trains, burner, control system, and all related components, appurtenances, and accessories as specified shall be assembled and furnished by the manufacturer. The manufacturer shall provide unit responsibility for the engineering, coordination, workmanship, performance, warranties, and all field services for each factory package boiler specified herein. The boiler manufacturer shall bear full responsibilities for all components assembled and furnished by him whether or not they are of his own manufacture.

- C. All units shall be factory fire-tested under simulated operating conditions. A run-test report, including air and fuel settings, shall be permanently affixed to the boiler prior to shipping to the site.

### **2.03 FABRICATION**

- A. Assembly: Horizontal, cast aluminum or stainless steel heat exchanger complete with trim, valve trains, burner, and boiler control system. Manufacturer shall full coordinate the boiler as to the interaction of its elements with the burner and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.
- B. Each boiler heat exchanger shall be cast aluminum or stainless steel, counter flow design for maximum heat transfer.
- C. Contractor must verify that that PH level is maintained between 6.0 and 8.5 when filling the system.
- D. All boiler pressure parts shall be constructed in accordance with the latest revision of the ASME Boiler and Pressure Vessel Code, Section IV, and shall be so stamped. Entire assembly shall be fabricated to meet the local CSD-1 code requirements for the State of Delaware, City of Seaford.
- E. Boiler heat exchanger headers shall be fabricated steel and be completely removable for inspection. Seals shall be EPDM, rated for 400 degree F service. Push nipples or section gaskets are not acceptable.
- F. Boilers shall be enclosed with a single wall outer casing. It shall be fabricated from a minimum 16 gage carbon steel. The complete outer casing shall be powder-coated inside and out. The composite structure of the boiler combustion chamber, insulating air gap and outer casing shall be of such thickness and materials to assure and outer casing temperature of not more than 50 degrees F above ambient temperature when the boiler is operating at full load.
- G. An observation port shall be located on the boiler to observe flame condition.
- H. Flue gas outlet shall be located at the rear of the boiler and be certified for installation with Category IV venting as defined by NFPA 54 (ANSI Z221), latest edition.

### **2.04 HOT WATER BOILER TRIM**

- A. ASME rated pressure relief valve, 50 psig.
- B. Combination water pressure and temperature gage.
- C. Low water cut-off to prevent burner operation when boiler water falls below safe level (probe type with manual reset).
- D. Operating temperature controller with outdoor reset to control the sequential operation of the burner.
- E. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.
- F. Separate inlet and outlet water temperature sensors capable of monitoring flow.
- G. Exhaust temperature sensor.

### **2.05 FUEL BURNING SYSTEM**

- A. The manufacturer shall furnish each boiler with an integral, power type, straight gas, fully automatic fuel burner. The fuel burner shall be an assembly of gas burner, combustion air blower, valve train, and ignition system. The burner manufacturer shall fully coordinate the burner as to the interaction of its elements the boiler heat exchanger and boiler control system to provide the required capacities, efficiencies, and performance as specified.
- B. Each burner shall be provided with an integral gas firing combustion head.

- C. Each burner shall provide adequate turbulence and mixing to achieve proper combustion without producing smoke or producing combustibles in the flue gasses.
- D. Each boiler shall be provided with an integral variable speed power blower to premix combustion air and fuel with the blower. The combustion air blower shall have sufficient capacity at the rated firing rate to provide air for stoichiometric combustion plus the necessary excess air. The static and total pressure capability shall comply with the requirements of the boiler. The blower shall be designed and constructed for exposure to temperatures normal to its location on the boiler and shall operate without undue vibration and noise. The operating fan will be tachometer sensed and capable of being displayed on the LED display.
- E. Each boiler shall be of the radial-fired (down-fired) type and constructed of steel with a stainless steel inner and stainless steel mesh outer screen.
- F. Each boiler shall be provided with a "Fully Modulating" firing control system whereby the firing rate is infinitely proportional at any firing rate between 4% and 100% as determined by the pulse-width modulation input control signal. Both fuel input and air input must be sequenced in unison to the appropriate firing rate without the use of mechanical linkage.
- G. Ignition shall be spark-ignition type. No pilots are allowed.
- H. The Micro Processor shall use a Proportional Integral Algorithm to determine the firing rate. The controls shall include:
  - 1. Maintain single set point
  - 2. Outdoor air temp reset of setpoint
  - 3. Boiler shutdown based on outdoor air temp
  - 4. Internal dual setpoint program with an external switchover (night setback, etc.
    - a. from external source)
      - 1) Alarm relay for any manual reset alarm function.
      - 2) Programmable Low Fire Delay to prevent short-cycling base on time and (a) temperature factor for release to modulation.
      - 3) LED Display showing current supply an return temps, current setpoints, and (a) differential setpoints. Display shall also list any fault-codes whether auto or manual reset in nature.
      - 4) Local manual operation.
      - 5) Remote control system (BAS/sequencer) interface – The boiler control shall be (a) capable of accepting a 0-10vdc remote external analog signal to control the firing rate.
      - 6) Computer interface for programming and monitoring all functions.

## **2.06 MAIN GAS VALVE TRAIN**

- A. Each boiler shall be provided with an integral main gas valve train. The main gas valve trains shall be factory assembled, piped, and wired. Each gas valve train shall include at least the following:
  - 1. Two (2) manual shutoff valves
  - 2. Two (2) safety shutoff valves equipped with dual solenoids that can independently energize for leak testing.
  - 3. Air-gas ratio control (maximum inlet pressure of 14 WC)
  - 4. One (1) low-gas pressure switch (manual reset).
  - 5. One (1) high-gas pressure switch (manual reset).
  - 6. Two (2) pressure test ports.

## **2.07 COMBUSTION AIR CONTROL SYSTEM**

- A. Each boiler shall be provided with an integral combustion air control system. The combustion air control system shall be factory assembled. Each combustion air control system shall include at least the following:

1. The primary control shall vary the speed of the blower based on the load demand. The blower shall apply a varying negative pressure on the gas valve which will open or close to maintain zero pressure at the valve orifice, thereby increasing or decreasing the firing rate. Both the air and the gas shall be premixed in the blower.
2. One (1) low airflow differential pressure switch to insure that the combustion air is supplied.
3. High exhaust back-pressure switch.

## **2.08 BURNER CONTROL SYSTEM**

- A. The Burner Control System shall be supplied with a 24 VAC transformer (120/1/60 primary). The 120/1/60 power supply to each boiler shall be protected by a 15 Amp circuit breaker located in the Motor Control Center.
- B. The boiler shall include a spark ignition system. Main flame shall be monitored and controlled by flame rod (rectification) system.
- C. Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.
- D. Each boiler control system shall provide timed sequence pre-ignition air purge of boiler combustion chamber. The combustion airflow sensor shall monitor and prove the airflow purge.

## **2.09 BOILER CONTROL PANEL**

- A. The boiler manufacturer shall provide each boiler with an integral factory prewired control panel. The control panel shall contain at least the following components, all prewired to a numbered terminal strip:
  1. One (1) burner on/off switch.
  2. One (1) electronic combination temperature control, flame safeguard, and system control.
    - 1) Control circuit breaker
    - 2) All necessary control switches, pushbuttons, relays, timers, terminal strips, etc. to
      - (a) complete functionality of the control system.
    - 3) LED display panel to show adjusting setpoints and control parameters. Display
      - (a) shall indicate burner sequence, all service codes, fan speed, boiler set point, and all sensor values.
- B. Inconnection communication controller to link multiple boilers for sequenced firing coordination (Patterson Kelley ENVI, Heat-Timer Multi-Mod system or equal) capable of:
  1. Controlling multiple boilers in all stages for efficient sequencing of the boiler system.
  2. Receiving input from the building automation system for engagement of the heating system.
  3. Receiving input from the building automation system for outdoor air reset scheduling.
  4. Internal clock-based scheduling for operational control.

## **2.10 ADDITIONAL INSTALLATION ITEMS**

- A. The contractor shall provide and install the following items during the boiler installation process:
  1. Manufacturer's recommended water treatment chemical additive to maintain heating and dual-temperature water pH between 6.0 and 8.5. Utilize the existing pot-feeder system for injection.
  2. Manufacturer's required acid-neutralization system to treat condensation prior to release from the boiler room.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in full accordance with manufacturer's instructions.
- B. Install boiler on concrete housekeeping base, sized minimum 4 inches larger than boiler base.
- C. Provide connection of natural gas service in accordance with requirements of NFPA 54 and all applicable State and Local codes.
- D. Provide piping connections and accessories as indicated on drawings and in specifications; refer to Section 23 21 14.
- E. Pipe relief valves to nearest floor drain.
- F. Install circulator and diaphragm expansion tank on boiler.
- G. Provide for connection to electrical service. Refer to Section 26 27 17.
- H. Contractor must, when filling the system, verify that the pH is maintained between 6.0 and 8.5.
- I. Provide and install acid-neutralization tank at each unit per manufacturer's instructions. Pipe discharge to nearest floor drain.

#### **3.02 MANUFACTURER'S FIELD SERVICES**

- A. Instruct operating personnel in operation and maintenance of units.

#### **3.03 SCHEDULES**

- A. See Drawings

**END OF SECTION**