

**ORANGE COUNTY, NEW YORK**

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**RFB: BOILER AND WATER HEATER REPLACEMENT, 30 HARRIMAN DRIVE, GOSHEN, NY**

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8. Contractor will be fully knowledgeable of all requirements of the Contract and will make themselves aware of all job site conditions that will affect their work.
9. Contractor will confirm all given information and advise the Owner, prior to bid, of any conflicts that will affect their cost proposal.
10. Any Contractor who intends to submit a bid using a different Boiler other than the approved manufacture must submit a cut sheet on proposed Boiler from the manufacturer with detailed information on all of its features and temperature control for fan speed. Information on alternate Boiler must be submitted ten (10) days prior to the bid. Any Contractor who fails to submit all information as requested will be subject to rejection. Bids stating "as per specs" will be unacceptable.

**B. EQUIPMENT DESCRIPTIONS**

Provide and install the boilers, pumps, and hydronic specialties, or approved equals, as listed below:

1. Three (3) Aerco Benchmark Platinum High Efficiency Gas Boilers, model BMK-1500;
2. One (1) Lot Heat Fab AL29-4C stainless steel breeching for condensing boilers;
3. a. Two (2) Armstrong End Suction Design Envelope Pump with Integral VFD, model 4280-0205-002.0, include suction guides, flo-trex valves, and flexible pump connectors;  
b. Two (2) Armstrong Vertical Inline Design Envelope Pump with Integral VFD, model 4380-1505-001.5, include flo-trex valves and flexible pump connectors;
4. a. One (1) Armstrong Bladder Style Expansion Tank, model A400-L;  
b. One (1) Armstrong 4" Vortex Air Separator with Strainer, model VAS-4, include automatic air vent;
5. One (1) AO Smith model DRE-80-18kW electric domestic water heater.

**C. WARRANTIES**

1. Boilers: Manufacturer's warranty to be 15-years non-prorated for the heat exchanger, 5-years for the burner, 3-years for the controller, and 2-years for all other non-consumable parts. Consumable parts include the ignitor and flame rod. All warranties to commence 18 months from shipment or 12 months from startup, whichever occurs first.
2. Breeching: 15-year limited warranty from date of shipment.
3. Pumps, Air Separator, and Expansion Tank: Equipment to be warranted for 12-months from date of installation or 18-months from shipment, whichever occurs first, due to failure due to defects in material or workmanship.

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4. Electric Commercial Water Heater: 3-year limited tank warranty and 1-year limited warranty for parts, both commencing on date of installation.
5. Labor and Workmanship: Installation of all equipment, materials and the slab for the new heating boiler plant and hot water heater to be warranted for 1-year from the date of Substantial Completion.

**D. TECHNICAL SPECIFICATIONS FOR EQUIPMENT****1. Condensing Boilers Specification**

- a. Furnish and install three (3) Aerco Benchmark Platinum Series hot water condensing boilers model BMK-1500 or approved equal.
- b. Factory packaged and assembled boiler to include the following:
  - i. burner capable at minimum of 20 to 1 turndown;
  - ii. full modulation of gas train (boiler input range 1,500 mbh down to 75 mbh with infinite points in between);
  - iii. 439 stainless steel firetube heat exchanger;
  - iv. 160psi maximum allowable working pressure;
  - v. oxygen monitoring and trim system;
  - vi. electric type low water level cutoff with test;
  - vii. manual reset and dual over-temperature protection;
  - viii. remote fault alarm contact;
  - ix. FM gas train for natural gas capable of full capacity with gas supply 4.0" to 14.0" w.c.;
  - x. variable speed DC centrifugal blower;
  - xi. integral boiler controller capable of individual boiler control or sequencing a plant of up to 16 boilers;
  - xii. integral boiler controller to be capable of communicating to a centralized BMS via BACnet protocol;
  - xiii. electrical service required is 120 volt, single phase, 16FLA.
- c. Field installed accessories, one per boiler:
  - i. boiler automatic isolation valve with power control;
  - ii. proof-of-operation provided by the boiler via a harness and plug connection to the boiler control;
  - iii. ASME pressure relief valve;
  - iv. pressure/temperature compound gauge on boiler outlet;
  - v. condensate trap, float type, manufactured from only non-corrosive materials;
  - vi. condensate neutralizing kit each suitable for no less than 12 months continuous operation at full condensing.
- d. Field installed control components:

Outside air sensor and header temperature sensor, both wired directly to the master boiler.
- e. Applicable standards:
  - i. AHRI performance compliance - data sheet must be available from AHRI showing both thermal and combustion efficiency;
  - ii. UL listed to standard UL 795; ASHRAE 90.1 compliance;

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- iii. Constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers"; NO<sub>x</sub> emissions < 9 ppm corrected to 3% oxygen.
  
- f. Heat exchanger must be constructed of stainless steel. Boiler designs utilizing water-tube, secondary heat exchangers or multiple heat exchangers within a single cabinet or non-stainless steel materials are unacceptable.
  
- g. O<sub>2</sub> Sensor
  - i. The boiler will utilize an automotive grade O<sub>2</sub> sensor that measures and controls the oxygen content in the exhaust gases.
  - ii. The O<sub>2</sub> sensor will be located in the dry combustion chamber.
  - iii. Alternate systems that locate the sensor where they will be exposed to wet corrosive exhaust will be provided with five (5) spare sensors per boiler (one per year per burner for the burner warranty period).
  - iv. Oxygen monitoring and trim systems to maintain dewpoint at 122°F or higher, and to dynamically optimize combustion efficiency. The O<sub>2</sub> system will measure the oxygen content of the exhaust gasses in real-time and make combustion adjustments as necessary.
  - v. If an external oxygen monitoring system is required, acceptable manufacturers and models will be Hays-Cleveland Series A-10050 or Preferred Instruments ZP series.
  - vi. For any system requiring annual replacement, the replacement oxygen sensors will be covered under the first five (5) years of the manufacturer's warranty for each boiler.
  - vii. Boilers without an equivalent O<sub>2</sub> trim will be deemed unacceptable.
  - viii. Due to the moisture content of flue gasses from condensing boilers, placing the O<sub>2</sub> sensor in the exhaust manifold or stack will be deemed unacceptable.

**2. Breaching and Combustion Air Duct Specification**

- a. Boilers will be individually vented using Heat Fab model CI Plus double-wall pipe.
- b. Boiler breaching will be factory prefabricated, laboratory tested and UL listed as suitable for 15" WC positive pressure.
- c. The exhaust system will be for use with building heating and equipment burning gas.
- d. Products furnished under this section will conform to the requirements of NFPA 54 and NFPA 211, and will comply with UL 1738, ULC S636 Standard for Venting Systems for Category II, III, and IV Gas-Burning Appliances.
- e. The chimney must maintain airtight integrity for flue gas temperatures up to 570°F.
- f. Breaching will be constructed of an AL29-4C inner shell and a 430 stainless steel outer jacket.
- g. Inner shell and outer jacket are to be separated by at least 1-inch airspace, with positive sealing joints.
- h. Mating parts will be sealed by an integral silicone gasket.
- i. Single source supplier required from boiler connection to stack termination.
- j. Combustion air will be directly connected to each boiler using either metal or PVC duct.
- d. Boiler manufacturer to confirm suitable sizing of both breaching and combustion air ducts.

**3. Hyronic Pumps**

- a. Furnish and install two (2) Armstrong end suction and two vertical inline pumps models 4280-0205-002.0 and 4380-1505-001.5, respectively, or approved equals.



b. End Suction Pumps

- i. Single stage, single suction type, end-suction horizontal design with integrated variable speed control.
- ii. Casing will be made of ductile iron ASTM A536 Grade 65-45-12. Casing wetted surfaces will be e-coated to prevent seizing of impeller to casing after periods of inactivity. Ensure casing is radially split to allow for removal of rotating element without disturbing pipe connections. Drill and tap casing for gauge ports on both suction and discharge connections. Drain port, drill and tapped, at the lowest point of the casing. ANSI Class 150 flanged connections to the piping system.
- iii. Impeller to be ASTM A743 CF8M, 316 stainless steel, fully enclosed and dynamically balanced to ANSI G6.3 and fitted to shaft with key. Use two-plane balancing when installed impeller diameter is less than 6 times impeller width.
- iv. Pump shaft: Type 316 stainless steel to ASTM A479.
- v. Flush line: 3/8 inch braided stainless steel complete with air vent.
- vi. Casing O-ring: EPDM
- vii. Mechanical seal, type AB2 outside balanced and rated to 300°F maximum. Rotating face to be resin bonded carbon and stationary seat to be sintered silicon carbide. Secondary seal elastomer made of Viton. Spring and rotating hardware to be stainless steel.
- viii. Integral vibration isolators: Pump to include four (4) springs secured directly to the pump feet and installed on the ground support. Springs will be free-standing type, laterally stable without any housing, and complete with molded with non-skid neoprene acoustical cup. Bolting to the concrete pad not necessary. Protective plastic shrouds will be supplied to house the springs.
- ix. Motor: Provide a permanent magnet motor to IE5 efficiency standards. Motor losses to be reduced by 36% over NEMA Premium Efficiency Table 12.12. Motor horsepower not to exceed 2.0. Field verify motor power supply requirements.
- x. Pump control: Integrated variable speed control with UL type 12 minimum enclosure rating. Harmonic suppression equivalent 5% impedance AC line reactor to mitigate harmonics to support IEEE 519 system requirements. Control to be capable to variable speed pump control without the need for external sensors or signal. System control curve will be a programmable function that is field adjustable for both balancing and operation of the heating system. Control to provide the following motor protections: phase to phase, phase to ground fault, loss of supply phase, over voltage, under voltage, motor over temperature, inverter overload, over current.
- xi. End Suction Pump Accessories:
  - A. Suction guides: End-suction pumps to be provided with cast iron suction guides that include ANSI 150 flange connection to pump. System connection to be either ANSI 150 flanged or

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grooved pipe connection. To include an integral stainless steel strainer for operation and a mesh bronze start-up strainer. Start-up strainer to be removed after system flushing.

- B. Triple duty valve: Cast or ductile iron valve body with tight shut-off, spring-closure type silent non-slam check valve with effective throttling design capability. Stainless steel valve stem with flat surfaces for adjustment with open-end wrench.
- C. Stainless steel braided connectors: Fabricated from stainless steel corrugated hose with heavy duty woven wire braid.

c. Vertical Inline Pump

- i. Single stage, single suction type, vertical inline design with integrated variable speed control. Casing will be made of ductile iron ASTM A536 Grade 65-45-12.
- ii. Casing wetted surfaces will be e-coated to prevent seizing of impeller to casing after periods of inactivity. Ensure casing is radially split to allow for removal of rotating element without disturbing pipe connections. Drill and tap casing for gauge ports on both suction and discharge connections. Drain port, drill and tapped, at the lowest point of the casing. ANSI Class 150 flanged connections to the piping system.
- iii. Impeller to be ASTM A743 CF8M, 316 stainless steel, fully enclosed and dynamically balanced to ANSI G6.3 and fitted to shaft with key. Use two-plane balancing when installed impeller diameter is less than 6 times impeller width.
- iv. Pump shaft: Steel motor shaft with stub shaft made of ASTM A276, type 316 stainless steel.
- v. Flush line: 3/8 inch braided stainless steel complete with air vent.
- vi. Casing O-ring: EPDM, Mechanical seal, type AB2 outside balanced and rated to 300°F maximum. Rotating face to be resin bonded carbon and stationary seat to be sintered silicon carbide. Secondary seal elastomer made of Viton. Spring and rotating hardware to be stainless steel.
- vii. Integral vibration isolators: pump to include four (4) springs secured directly to the pump feet and installed on the ground support. Springs will be free-standing type, laterally stable without any housing, and complete with molded with non-skid neoprene acoustical cup. Bolting to the concrete pad not necessary. Protective plastic shrouds will be supplied to house the springs.
- viii. Motor: Provide a permanent magnet motor to IE5 efficiency standards. Motor losses to be reduced by 36% over NEMA Premium Efficiency Table 12.12. Motor horsepower not to exceed 2.0. Field verify motor power supply requirements.
- ix. Pump control: Integrated variable speed control with UL type 12 minimum enclosure rating. Harmonic suppression equivalent 5% impedance AC line reactor to mitigate harmonics to support IEEE 519 system requirements. Control to be capable to variable speed pump control without the need for external sensors or signal. System control curve will be a programmable function that is field adjustable for both balancing and operation of the heating system. Control to provide the

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following motor protections: phase to phase, phase to ground fault, loss of supply phase, over voltage, under voltage, motor over temperature, inverter overload, over current.

x. End Suction Pump Accessories:

- A. Triple duty valve: Cast or ductile iron valve body with tight shut-off, spring-closure type silent non-slam check valve with effective throttling design capability. Stainless steel valve stem with flat surfaces for adjustment with open-end wrench.
- B. Stainless steel braided connectors: Fabricated from stainless steel corrugated hose with heavy duty woven wire braid.

#### 4. Expansion Tank and Air Separator

Furnish and install one (1) vertically mounted bladder type expansion tank Armstrong model A400-L and one (1) Vortex style air separator model VAS-4 with integral strainer, or approved equals.

a. Bladder type expansion tank:

- i. Tank to be constructed of a carbon steel shell and a heavy-duty replaceable butyl bladder.
- ii. Supply a tank that includes ring base, lifting rings, and NPT system connection.
- iii. Air charging valve connections (standard valve) will be provided to facilitate adjusting pre-charged pressure to meet actual system conditions.
- iv. Tank to be rated for 125-psig working pressure and 375°F maximum operating temperature.
- v. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- vi. Tanks to be shipped with a 12-psig pre-charge.
- vii. Installation to include adjustment of charge pressure to meet system operating pressure.

b. Vortex air separator:

- i. The Vortex air separator will be designed and constructed in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.
- ii. The unit will be fitted with NPT vent connection (for connection to expansion tank and/or air vent). An additional NPT tapping will be provided on the bottom of the air separator to facilitate blow-down.
- iii. The unit will operate with a maximum working temperature of 375°F and a maximum working pressure of 160-psig.
- iv. Body to be cast iron with ANSI-150 flanged connections.
- v. Include an integral stainless steel strainer with free area of not less than four (4) times the cross-sectional area of the connecting piping. Strainer will be removable for cleaning. Air separators will be supplied with a ¾" automatic air vent.
- vi. Air vent to have a brass body rated for 150-psig working pressure.

#### 5. Electric Domestic Water Heater

Furnish and install one (1) commercial electric water heater AO Smith model DRE-80-18kW or approved equal.



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- a. Glass-lined steel 80-gallon tank rated for 150-psig working pressure. Tank to have foam insulation and jacket. Tank to include two anode rods for maximum corrosion protection. Wetted surfaced must comply with NSF 61 barrier materials for potable-water tank lining, including extending finish into tank fittings and outlets. Heavy-duty medium watt density elements with incoloy sheathing to protect against oxidation and scaling.
- b. Cumulative element capacity must be 18 kW or greater, capable of producing 80 gallons per hour of heated domestic water at a 90°F temperature rise.
- c. Include an ASME rated temperature and pressure relief valve rated for the heating capacity of the water heater. Surface mounted temperature control adjustable range 120°F to 181°F and manual reset high temperature cut-off per element.
- d. Thermostat step control may be achieved by varying settings on individual temperature controls. Controls to be located behind a hinged control compartment door.
- e. Integral fusing protects all elements, thermostats, and internal wiring circuits against excess current flow. Meets National Electrical Code requirements that non-ASME tanks must have internal fusing when current draw exceeds 48 amps.
- f. Available electrical voltage to be verified by Contractor.

**E. REMOVAL AND INSTALLATION OF BOILER, WATER HEATER AND CHILLER (IF CHILLER ALTERNATE IS AWARDED), PROVISION OF TEMPORARY HEAT PLANT SOURCE**

**1. General**

- a. Comply with the manufacture's published instructions for the installation of the boilers, pumps and water heater.
- b. It will be Contractor's responsibility to ascertain quantities of materials required to complete the Project.
- c. Neither the facility nor the Owner is responsible for Contractor's need for tools and supplies to complete work.
- d. Contractor is to perform work during normal working hours.

**2. Removal of Existing Boiler, Pumps, Water Heater and Chiller (if Chiller Alternate is awarded)**

- a. Disconnect all piping, electric, and any other utilities from existing equipment.
- b. Remove any mounting brackets or supports from existing equipment.
- c. Contractor is responsible for removal of existing boiler, pumps, expansion tank, hot water heater and inoperable chiller (if chiller Alternate is awarded) including all equipment, machinery, piping, electrical and all other associated items to clear the old systems components to install completely new systems.

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- d. Contractor will supply any and all tools, equipment and rigging as needed for the removal of this equipment and associated infrastructure and accessories.
- e. Contractor is responsible for all safety requirements to protect the staff, and general public, including but not limited to all added safety precautions necessary if a crane or lift equipment is used for any portion of this project.
- f. Contractor will be responsible for the legal disposal of the old Boiler, including, but not limited to, any hazardous materials, along with any and all miscellaneous debris generated from this project.

**3. Installation of New Boilers, Pumps and Water Heater**

- a. Install all new electrical wiring, conduit, breakers, sub panels, control panels, disconnects, shut off and bypass valves for the new equipment including all code compliant labeling.
- b. Connect all utilities to boilers, pumps and water heater including infrastructure for same.
- c. After installation is completed, Contractor will start up unit.
- d. Once Contractor has performed initial startup of the boilers, pumps and water heater Contractor will fully commission each unit by making all adjustments and settings according to the manufacturer's recommendations for peak operating efficiency and by thoroughly testing the boilers, pumps and water heater to confirm optimum results.

**4. Provision of Temporary Heat Plant Source**

- a. Should Contractor not have the new boilers, pumps and water heater operational and fully commissioned by October 1, 2021, Contractor will be responsible for providing, connecting, commissioning, maintaining (includes refueling), disconnecting and decommissioning, a temporary heat plant source using the existing water loop at the facility until the new boilers, pumps and water heater are operational and fully commissioned.
- b. All costs for the temporary heat plant source including all labor, equipment (including but not limited to equipment rental costs), materials, supplies, permits, etc. must be included in the Base Bid price.

**5. Equipment Delivery, Storage and Handling**

- a. Deliver materials to the job site in the manufacturer's original, unopened containers or wrappings with the manufacture's name, brand name and installation instructions intact and legible.
- b. Comply with all the manufacture's written instructions for proper storage.
- c. All equipment and materials will be stored off the ground and protected from damage.
- d. Any equipment or materials found to be damaged should be removed and replaced at the Contractor's expense.