PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

1.02 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. AHRI 1500 - Performance Rating of Commercial Space Heating Boilers; 2015.

C. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2012.

D. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2013, Including All Addenda.

E. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2007, Including All Amendments.

F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.

G. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); current edition at www.nationalboard.org.

H. NFPA 31 - Standard for the Installation of Oil Burning Equipment; 2011.

I. NFPA 54 - National Fuel Gas Code; 2015.

J. NFPA 58 - Liquefied Petroleum Gas Code; 2014.

K. SCAQMD 1146.1 - South Coast Air Quality Management District Rule No.1146.1; current edition.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of the Contract and Division 1 Specification Sections.

B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories; and installation and startup instructions. For boilers with factory-mounted starters, provide short circuit current rating.

C. Shop drawings detailing fabrication and installation of equipment assemblies. Indicate dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.
2. AGA design certificates, for information.

D. Manufacturer's field reports, indicating work supervised and performed and related observations, for information.

1. Indicate compliance with specified performance and efficiency.
2. Provide results of the following combustion tests:

a) Boiler firing rate.
b) Over fire draft.
c) Gas flow rate.
d) Heat input.
e) Burner manifold gas pressure.
f) Percent carbon monoxide.
g) Percent oxides of nitrogen.
h) Percent oxygen.
i) Percent excess air.
j) Flue gas temperature at outlet.
k) Ambient temperature.
l) Net stack temperature.
m) Percent stack loss.
n) Percent combustion efficiency.
o) Heat output.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

G. Software: Copy of software provided under this section.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Comply with NFPA 70 "National Electrical Code" for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. AGA Compliance: Design certified by AGA, tests and ratings according to AGA requirements.

E. ASME Compliance: Fabricate and stamp boilers according to ASME Boiler and Pressure Vessel Code, Section IV, "Heating Boilers." Provide control and safety devices in compliance with locally adopted edition of ASME CSD-1.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.07 WARRANTY

A. Refer to Division 01 for additional warranty requirements.

B. Provide a five year warranty to include coverage for heat exchanger.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Variable Primary Flow System Condensing Boilers.

1. Aerco.
2. Camus Hydronics.
3. Cleaver Brooks
4. Fulton.
5. Lochinvar.
6. Raypak
7. RBI.
8. Viessmann.

2.02 MANUFACTURED UNITS

A. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

B. Unit: Metal membrane wall, water or fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, boiler trim, insulation, and removable jacket, suitable for indoor application.

C. Performance Characteristics: Refer to the schedule on the drawings for capacity, efficiency and electrical characteristics.

2.03 BOILER CONSTRUCTION

A. Conform to the minimum requirements of ASME BPVC-IV and ANSI Z21.13 for construction of boilers.

B. Assembly to bear the ASME "H" stamp and comply with the efficiency requirements of the latest edition of ASHRAE Std 90.1.

C. Required Directory Listings:

1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.
2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); current edition at www.nationalboard.org.

D. Heat Exchanger: Construct with materials that are impervious to corrosion where subject to contact with corrosive condensables.

E. Provide adequate tappings, observation ports, removable panels, and access doors for entry, cleaning, and inspection.

F. Insulate casing with insulation material, protected and covered by heavy-gage metal jacket.

G. Factory apply boiler base and other components, that are subject to corrosion, with durable, acrylic, powder coated or painted.

2.04 BOILER TRIM

A. ASME rated pressure relief valve.

B. Flow switch.

C. Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

D. Temperature and pressure gage.

E. Pressure Switches:

1. High gas pressure.
2. Low gas pressure.
3. Air pressure.

F. Manual reset high limit.

2.05 FUEL BURNING SYSTEM

A. Provide forced draft automatic burner or pulse combustion, integral to boiler, designed to burn natural gas and maintain fuel-air ratios automatically.

1. Blower Design: Statically and dynamically balanced to supply combustion air; direct connected to motor.
2. Forced Draft Design: Mixes combustion air and gas to achieve minimum 90 percent combustion efficiency.
3. Pulse Combustion Design: Self-aspirating, not requiring blower for combustion.
4. Combustion Air Filter: Protects fuel burning system from debris.

B. Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.

C. Emission of Oxides of Nitrogen Requirements: Comply with local authorities having jurisdiction requirements for nitrous oxide emissions for natural gas fired systems, as applicable.

D. Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe

2.06 FACTORY INSTALLED CONTROLS

A. Option for internal or external (0-10) VDC control.

B. Temperature Controls:

1. Automatic reset type to control fuel burning system on-off and firing rate to maintain temperature.
2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls

E. Controller: Provide a master firing control processor. Processor shall be capable of all boiler operation and efficient staging. The master firing control shall be equipped with open protocol communication according to the drawings and specifications. The processor shall be compatible with the existing or specified control system.

F. Boiler pump time delay.

2.07 SOURCE QUALITY CONTROL

A. Test and inspect boilers according to ASME Boiler and Pressure Vessel Code, Section IV for low-pressure boilers and Section I for high-pressure boilers.

B. Provide factory tests to check construction, controls, and operation of unit.

C. Manufacturer to conduct boiler inspection prior to shipment; submit copy of inspection report to Architect.

2.08 ACCESSORIES

A. Flow Switch: Furnish field-mounted differential pressure sensor or thermal dispersion flow switch (paddle-type flow switch not allowed).

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate layout and installation of boilers with related work.

B. Furnish copy of manufacturer's wiring diagram submittal to electrical Installer.

C. Coordinate size and location of concrete housekeeping pads.

3.02 INSTALLATION

A. Install boilers level and plumb, according to manufacturer's written instructions, rough-in drawings, and referenced standards.

B. Install according to NFPA 54

C. Support boilers on concrete pad constructed in accordance with Division 23 section “Common Work Results for HVAC”. Cast anchor bolt inserts into pad.

D. Provide spring vibration isolation mounts where recommended by manufacturer for pulse combustion boilers.

E. Assemble units and parts shipped loose or disassembled.

F. Install electrical devices furnished with boiler but not specified to be factory mounted.

3.03 CONNECTIONS

A. Install piping adjacent to boiler to allow service and maintenance.

B. Connect air intake and exhaust piping to boiler, size as recommended by manufacturer. Provide intake piping material per manufacturer’s recommendations unless otherwise noted on the drawings. Refer to Division 23 Section “Breechings, Chimneys, and Stacks” for flue exhaust piping. Pitch toward boiler minimum of 2 percent or as indicated. Provide termination as indicated.

C. Connect gas piping to boiler according to requirements of Division 22 Section "Natural Gas Systems." Provide union with sufficient clearance for burner removal and service.

1. Install pressure relief lines from the gas train devices to discharge outside of the building. Relief lines shall be black steel pipe with malleable iron fittings one pipe size larger than the relief outlet of the device. Provide turn down with 40 mesh insect screen at discharge. Provide individual relief lines for each gas train device.

D. Connect hot water piping to supply and return boiler tappings, according to requirements of Division 23 section "Hydronic Piping." Provide shutoff valve and union or flange at each connection.

E. Connect condensate piping to boiler connection and/or flue stack according to manufacturer’s requirements. Install Schedule 40 CPVC pipe and fittings from boiler to nearest floor drain or as indicated with PH neutralizer. Provide clear plastic tubing between boiler module connection and manifold connection.

F. Pipe relief valves to nearest floor drain.

3.04 CLEANING AND TOUCH-UP PAINTING

A. Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.

B. Just prior to substantial completion clean unit’s exposed surfaces.

C. Retouch any marred or scratched surfaces of factory-finished surfaces, using finish materials furnished by manufacturer.

3.05 STARTUP

A. Arrange with National Board of Boiler and Pressure Vessel Inspectors and/or local authority having jurisdiction for inspection of boiler piping and for certification of completed boiler units.

B. Provide services of a factory-authorized service representative to provide startup service.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements of Division 26 Sections. Do not proceed with boiler startup until wiring installation is acceptable to equipment installer.

D. Start boilers according to manufacturer's instructions.

E. Adjust burner for maximum burning efficiency.

F. Operate and adjust controls and safeties.

G. Retouch any marred or scratched surfaces of factory-finished surfaces, using finish materials furnished by manufacturer.

3.06 DEMONSTRATION

A. Provide services of a factory-authorized service representative to demonstrate the operation of the boiler, burner and controls.

B. Operate boiler, including accessories and controls, to demonstrate compliance with requirements.

3.07 TRAINING

A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of four hours on the operation and maintenance of the equipment provided under this section. The contractor shall account for all shifts.

B. Content: Training shall include but not be limited to:

1. Overview of the system and/or equipment as it relates to the facility as a whole.
2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner's designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner's representative indicating agreement that the training has been provided.

D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION

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