

# Thermal Solutions EVS Indoor Boiler Specification

## PART 1 GENERAL

Note: Equipment options are indicated [\[in blue\]](#).

### 1.1 SUMMARY

#### A. Section Includes:

1. Copper tube boilers.

### 1.2 REFERENCES

#### A. Underwriters Laboratories:

1. UL 795 Commercial-Industrial Gas Heating Equipment.

#### B. American Society of Mechanical Engineers:

1. ASME Section IV - Boiler and Pressure Vessel Code - Heating Boilers
2. ASME CSD-1 – Controls and Safety Devices for Automatically Fired Boilers

#### C. Hydronics Institute:

1. HI - Testing and Rating Standard for Heating Boilers.

#### D. National Fire Protection Association:

1. NFPA 54 - National Fuel Gas Code.

### 1.3 SUBMITTALS

#### A. In accordance with Contract Documents.

#### B. Product Data: Submit capacities and accessories included with boiler. Include general layout, dimensions, size and location of water, fuel, electric, air inlet and vent connections, electrical characteristics, weight and mounting loads. Provide wiring diagrams that are specific to this project.

#### C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

### 1.4 CLOSEOUT SUBMITTALS

#### A. In accordance with Contract Documents.

#### B. Provide one additional set of final filters (one 99% efficient filter per boiler specified).

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### 1.5 QUALITY ASSURANCE

#### A. Boiler

1. Construction shall conform to ASME Section IV and UL 795. The boiler shall bear the ASME "H" stamp and be National Board Listed for 160 psi working pressure and 250°F.
2. Gas Train and Safety Controls: Conform to requirements of UL 795 and CSD-1.

#### B. Provide services of manufacturer's authorized and factory-trained representative to perform the following functions:

1. Inspect and verify installation.
2. Checkout and startup/supervision. Submit startup report.

### 1.6 QUALIFICATIONS

#### A. Manufacturer: Company specializing in manufacturing products specified in this section.

#### B. Installer: Company specializing in performing work of this section.

### 1.7 DELIVERY, STORAGE, AND HANDLING

#### A. In accordance with Contract Documents.

#### B. Accept equipment and accessories on site in factory shipping packaging. Inspect for damage.

#### C. Protect equipment from damage by leaving packing in place until installation.

#### D. Equipment must be protected from inclement weather, flooding, electrical surges, etc.

### 1.8 WARRANTY

#### A. Boiler shall have the following warranties;

1. The heat exchanger shall carry a 5-year limited warranty, and a 20-year warranty against thermal shock.
2. The burner shall carry a 10-year limited warranty.
3. All other parts shall have a 1-year limited warranty.

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### 1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to installation.

### 1.10 START-UP OF EQUIPMENT

- A. Operating and Maintenance Instructions are to be furnished with each unit.
- B. The boiler shall be factory assembled and fire tested requiring only connections to the water circulating system (supply & return), fuel, electrical power, exhaust vent and air inlet (as specified/shown in contract drawings).
- C. Factory-authorized representatives shall perform start-up service on each unit.

### 1.11 MAINTENANCE SERVICE

- A. Furnish service and maintenance of boiler for one (1) year from start-up, not to exceed eighteen (18) months from shipment.
- B. Maintenance service shall be performed by qualified personnel under supervision of or trained by the manufacturer's representative.

## PART 2 PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Thermal Solutions Boiler, Evolution Model EVS [500, 750, 1000, 1500, 2000, 2000S, 2500, 3000]. Refer to the Equipment Schedule in the Contract Drawings for the specific criteria.
- B. Approved Equal

### 2.2 GENERAL REQUIREMENTS

- A. Boiler
  1. Factory-packaged unit, complete with jacket, gas manifold, burner and controls mounted and wired, as specified in this Section.
  2. The complete boiler shall be factory fire tested by the manufacturer and a copy of the firetest report shall be supplied with the unit.
  3. Heat exchangers shall be constructed in accordance with Section IV of the ASME code, with straight, integral copper-finned tube construction and a gasketless header at top and bottom.
  4. The heat exchanger design must allow for individual access and replacement of each tube.

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5. The wall thickness of the primary heat exchanger tubes shall be no less than 0.072" with fin spacing of no less than 7 fins per inch.
6. The heat exchanger shall encompass the entire burner and be enclosed in stainless steel with a fully water-backed tube sheet.
7. Each boiler shall be contained in a minimum 16-gauge negative pressure steel jacket protected with a powder-coated finish. The unit shall be able to operate with any jacket panels removed during inspection or maintenance periods.
8. The total heat exchanger surface shall be no less than 6.6 square foot per BHP.

### C. Fuel Burning System

1. Radiant non-corroding ceramic burner, with no moving parts. Double-meshed screen, fiber-metal mats, aluminized or stainless steel construction of the burner will not be accepted.
2. Burner operation shall be Full Modulation with minimum 3:1 turn down utilizing a VFD and air-fuel ratio valve for dependable, repeatable modulation. Dampers, linkages or a one-speed fan are not acceptable.
3. Interrupted-type mixed fuel/air pilot system with electric spark-to-pilot ignition that utilizes a UV scanner to prove pilot before main gas valves open. Hot surface ignition systems are not acceptable.
4. The entire firing control sequence shall be monitored by a UL approved, commercial-type microprocessor flame safeguard programmer with first out fault annunciation and diagnostic indicator lights. Furnish pre-purge and post-purge timing. Shut down burner in the event of ignition pilot and/or main flame failure with manual reset. [It shall also recognize the Proof of Closure switches on the gas valves \(if DB&B w/POC\).](#)
5. Full frontal access port shall be provided for the control area.
6. The boiler will be equipped with a non-sparking blower manufactured with a cast aluminum housing.
7. Combustion air pressure switch shall be provided.
8. The blower shall be equipped with a replaceable combustion air filter, 99% efficient to one micron. The unit will have the capability of sealed, direct, or conventional venting. Air inlet dampers and vacuum relief dampers are not required for proper operation.
9. The sound level for a single boiler shall be no more than 60 dB.

### D. Gas Train

1. Gas train shall be UL/FM/CSD-1 compliant.

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2. The gas train shall be certified to take a maximum of 5 psi Natural Gas [2 psi Propane (LP)]. Additional step-down regulators are not allowed and can cause nuisance shutdowns of the unit.
3. Pilot and main gas pressure regulator.
4. Automatic main and redundant gas valves.
  - a. Motorized automatic main and redundant gas valves and a normally open vent valve in between (if DB&B).
  - b. Motorized automatic main and redundant gas valves w/ Proof of Closure contacts and a normally open vent valve in between (if DB&B w/POC).
5. Leak test valves downstream of each gas valve.
6. High and low gas pressure switches.
7. Manual shut off valve upstream of burner and downstream of last gas valve.

### E. Controls

1. Boiler shall utilize a control system featuring a 2-line, 16-character back-lit display to monitor boiler inlet and outlet temperature, system temperature, outside air temperature, firing rate set point, modulating percent, and mixing valve demand. Additionally, it displays boiler sequence messages, hold and lockout messages, last 10 alarm messages, and boiler inlet temperature history
2. The boiler shall include inlet and outlet temperature sensors to monitor boiler temperatures and control boiler modulation to precisely match boiler output to system demand. The control provides pump control, outdoor reset, warm weather shut down, and domestic hot water priority.
3. The boiler control shall be able to control a single boiler installation or can control the lead/lag sequence and modulation of up to 8 boilers by simply interconnecting the boilers with a standard phone cord.
4. The boiler shall be able to facilitate integration with existing controls or to a building management system.

### F. Electrical Input

1. Electrical input to each boiler shall be [120v/1ph (Not available on EVS-2500 or 3000), 208v/1ph, 230v/1ph, 208v/3ph, 230v/3ph, 480v/3ph] /60hz. [The manufacturer will mount the control transformer and fuses inside the unit before it leaves the factory (include if not 120v/1ph)]. Single-point electrical hook-up on every unit is required; separate power wiring and control wiring is not acceptable.

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2. The boilers must utilize a commercial quality 120v/1ph control system. A residential type 24v control system is not acceptable.

### G. Water Trim and Controls

1. ASME rated pressure relief valve set at 125 [30 (Not available on EVS-2500 or 3000), 50, 60, 75, 100, 150] psig.
2. Combination water pressure and temperature gage. Furnish graduated pressure gauge scale from 1-1/2 to 3 times of pressure relief valve setting.
3. A water flow switch to prevent burner operation during low water flow conditions.
4. An adjustable high limit temperature controller with manual reset to prevent water temperature from exceeding a safe system temperature.
5. An adjustable operating temperature controller.

### H. Venting

1. It shall be AL 29-4C, positive pressure type vent material. Single wall vent is acceptable where allowed by local code.
2. Barometric dampers are not allowed unless multiple boilers are combined into the same common vent.

### I. Air Intake Piping

1. It can be PVC or galvanized smoke pipe that is sealed and pressure tight. Pipe must be at least the same size as the connection on the unit.
2. Intake dampers and vacuum relief dampers are not required for sealed combustion/direct venting. Vacuum relief dampers can violate the intent of sealed combustion/direct vent applications.

## 2.2 PERFORMANCE

- A. The boiler shall have a minimum of 88% thermal efficiency as listed in the Equipment Schedule of the Contract Documents.
- B. The standards listed in Section 1.2 of this document shall be used to determine the required efficiency.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install the boiler in accordance with manufacturer's printed instructions.

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- B. Install skid plumb and level, to plus or minus 1/16 inch over base.
- C. Maintain manufacturer's recommended clearances around and over equipment, and as required by local Code.
- D. Arrange all electrical conduit, piping, exhaust vent, and air intake with clearances for burner removal and service of all equipment.
- E. Connect exhaust vent to boiler vent connection, full size of outlet.
- F. If shown in Contract Drawings, connect full sized air inlet vent to flanged connector on boiler.
- G. Connect fuel piping in accordance with NFPA 54.
- H. Connect fuel piping to unit, full size, at gas train inlet.
- I. Use full size (minimum) pipe/tubing on all gas vent connections.
- J. Connect water piping, full size, to supply and return connections.
- K. Install all piping accessories per the details on the contract drawings.
- L. Install discharge piping from relief valves and drain valves to nearest floor drain.
- M. Connect appropriate electrical power to the boiler.
- N. A dedicated disconnect shall be provided for each individual piece of equipment.

### 3.2 FIELD QUALITY CONTROL

- A. Provide services of manufacturer's authorized representative as specified in this Section.
- B. Perform combustion test including boiler firing rate, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide, percent oxygen, percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output. Perform test at minimum, mid-range, and high fire.

### 3.3 CLEANING

- A. MUST isolate boiler when any cleaning or testing of system piping is being preformed.
- B. Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.

### 3.4 DEMONSTRATION

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- A. Demonstrate operation and maintenance procedures for a time period of 8 hours.
- B. Furnish services for manufacturer's technical representative, as specified.

END OF SECTION