METROLINX

Capital Projects Group

# Near Condensing Hot Water Boilers Specification

Specification 23 52 23

Revision 1
Date: September 2018

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Publication Date: September, 2018


an Agency of the Government of Ontario

## Amendment Record Sheet

| Amendment in Clause No. | Date of Amendment | Description of Changes |
|---|---|---|
| Various | Sept. 20, 2018 | Condensing Hot Water Boilers |
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## LIST OF CONTENT

## 1. GENERAL

### 1.1. SCOPE OF WORK

1.1.1. Provide near condensing hot water boilers for snow melting applications, as detailed on drawings and as specified herein.

### 1.2. DESIGN REQUIREMENTS

1.2.1. Near condensing hot water boilers with performance requirements as follows:

a) design requirements based on Part 2 specified requirements of products.

### 1.3. RELATED WORKS

1.3.1. Section 20 05 05 - Mechanical Work General Instructions.

1.3.2. Section 20 05 10 - Basic Mechanical Materials and Methods.

1.3.3. Section 20 05 40 – Mechanical Work Commissioning.

1.3.4. Section 23 21 18 – Glycol Solution Snow Melting System.

### 1.4. REFERENCE STANDARDS

1.4.1. Standards and codes to be latest editions adopted by and enforced by local governing authorities.

1.4.2. Applicable Provincial Codes and Standards.

1.4.3. ANSI Z21.13/CSA 4.9 - Gas-Fired Low Pressure Steam and Hot Water Boilers.

1.4.4. CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

1.4.5. CAN/CSA B149.1, Natural Gas and Propane Installation Codes.

1.4.6. CAN1-3.1, Industrial and Commercial Gas-Fired Package Boilers.

### 1.5. TRAINING

1.5.1. Training is to be a full review of all components including but not limited to a full boiler internal inspection, construction details, burner operation, maintenance, flame characteristics, and adjustments, gas train maintenance, boiler normal operation, abnormal events, normal shut-down, emergency shut-down, and setting up controls.

1.5.2. Include for 3 training sessions of maximum 7 hours duration per session for 10 Metrolinx people per session.

1.5.3. Refer to Section 20 05 05 for additional general requirements.

## 1.6. WARRANTY

1.6.1. Products to be guaranteed by manufacturer, after acceptance by Metrolinx as follows:

a) Boiler shall carry a minimum 10 year warranty from project substantial completion, against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship. All boiler components including but not limited to burner, gastrain control, jacket and accessories shall have minimum 10 years parts and labor warranty which shall be submitted on boiler manufacturer letterhead with shop drawings for review and approval;

b) boiler Manufacturer shall submit written confirmation of minimum 10 years complete parts and labor warranty as in boiler shop drawings, Shop drawings will be rejected without confirmation letter on warranty;

c) warrant the Positive Pressure Vent System against defects in material and workmanship for a period of 15 years from the date of original installation. Any portion of the vent repaired or replaced under the warranty shall be warranted for the remainder of the original warranty period.

c) Minimum 2 years for other product and labor requirements

## 1.7. DELIVERY, STORAGE AND HANDLING

1.7.1. Handle and store products in accordance with manufacturer's instructions, in locations approved by Metrolinx. Include one copy of these instructions with product at time of shipment.

## 1.8. SUBMITTALS

1.8.1. Refer to submittal requirements in Section 20 05 05.

1.8.2. Submit shop drawings/product data sheets for boilers, including accessories, and all required wiring schematics.

1.8.3. Submit with delivery of boiler(s) a copy of factory inspection and test report for each boiler, and include a copy of each report with O & M Manual project close-out data.

1.8.4. Submit a site inspection and boiler start-up report from boiler manufacturer's representative as specified in Part 3 of this Section.

1.8.5. 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.

1.8.6. Product Data

a) Submit manufacturer's Product data indicating:

1) technical data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items, and parts lists;

2) performance criteria, compliance with appropriate reference standards, characteristics, limitations, and troubleshooting protocol;

3) product transportation, storage, handling, and installation requirements;

4) product identification in accordance with Metrolinx requirements.

1.8.7. Shop Drawings

a) Submit shop drawings including:

1) capacity and ratings;

2) dimensions;

3) mounting details to suit locations shown, indicating methods and hardware to be used;

4) control components and control wiring schematic.

1.8.8. Commissioning Package

a) Submit the following in accordance with Sections 20 05 05 and 20 05 40:

1) Commissioning Plan;

2) Commissioning Procedures;

3) Certificate of Readiness;

4) complete test sheets specified in Section 20 05 40 and attach them to the Certificate of Readiness;

5) Source Quality Control inspection and test results and attach to the Certificate of Readiness.

1.8.9. Commissioning Closeout Package

a) Submit the following in accordance with Section 20 05 05:

1) Deficiency Report;

2) Commissioning Closeout Report;

3) submit the following for each Product for incorporation into the Operation and Maintenance Manuals in accordance with Section 20 05 05:

   i) Identification: manufacturer's name, type, year, serial number, number of units, capacity, and identification to related systems;

   ii) functional description detailing operation and control of components;

   iii) performance criteria and maintenance data;

   iv) safety precautions;

   v) operating instructions and precautions;

   vi) component parts availability, including names and addresses of spare part suppliers;

   vii) maintenance and troubleshooting guidelines/protocol;

   viii) product storage, preparation, handling, and installation requirements;

   ix) Commissioning Report.

## 1.9. QUALITY ASSURANCE

1.9.1. Manufacturers Qualifications

a) Manufacturer shall be ISO 9000, 9001 or 9002 certified. Manufacturer of product shall have produced similar product for a minimum period of five years. When requested by Consultant, an acceptable list of installations with similar product shall be provided demonstrating compliance with this requirement.

b) Manufacturer shall have a facility in Ontario with qualified manufacturing/ combustion technicians and spare parts readily available within GTA region.

c) Manufacturers are to be current members of Air-Conditioning, Heating and Refrigeration Institute (AHRI), ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

d) 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.

e) ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".

1.9.2. Installers Qualifications

a) Installers for work to be performed by or work under licensed Mechanical Contractor.

b) Installers of equipment, systems and associated work are to be fully qualified and experienced installers of respective products and work in which they are installing.

c) Boiler installation tradesmen are to be journeyman tradesmen licensed to install boiler equipment.

d) Where manufacturers provide training sessions to installers and certificates upon successful completion, installers to have obtained such certificates and submit copies with shop drawings.

1.9.3. Regulatory Requirements

a) Products and work to comply with applicable local governing authority regulations, bylaws and directives.

b) Include for required inspections and certificate of approvals of installation work from local governing authorities.

## 2. PRODUCTS

### 2.1. NEAR CONDENSING HOT WATER BOILERS

2.1.1. General

a) Boilers approved to ANSI Z21.13 CSA 4.9 standards with minimum efficiency of 85.2%. Efficiency shall be up to 88.5% with 125$^{O}$F supply water. Boilers shall have no limit on inlet water temperatures

b) Boilers shall be constructed of eutectic cast iron sections manufactured in accordance with ASME requirements for low-pressure boilers and each section shall be permanently marked with the ASME symbol and the maximum allowable working pressures. The eutectic cast iron shall have a modulus of elasticity of 30% greater than other cast iron. The warranty on boilers should not be affected if flue gas condensation is allowed within the boiler.

c) Boilers and burners shall be listed as a package, site approval not acceptable. Boiler and burner package must have proven field verified track record for a period of 3 years minimum.

d) The boilers shall be capable of operating at 125$^{O}$F fluid outlet temperature, with no lower limit on inlet fluid temperature.

e) The boiler warranty shall not be affected if flue gas condensation enters inside the boiler sectional elements.

f) The boiler manufacturer shall have a facility in Ontario; qualified manufacturing/combustion technicians and spare parts shall be readily available within the GTA region.

g) Capacity, performance and power supply: as indicated in the equipment schedules.

2.1.2. Boiler Construction

a) Boilers shall be of a three pass wet base, wetbacks design with optimized fins and cast iron turbulators to permit greater heat transfer. The forced draft burner shall be capable of firing the boilers pressurized combustion chamber assuring proper draft and positive ventilation. The burner shall be mounted to swing open either left or right on hinged mounting plate.

b) Boiler sections shall be assembled with precision-machined bi-spherical push nipples pressed into mating machinery nipple port in the section. A gas tight seal with the use of a siliconed thermocord sandwiched between sections prevents leakage of flue gases. The boiler shall be complete with a drain tapping and drain valve. Boilers shall be complete with full-swing doors that give access to all flue ways and combustion areas for easy maintenance and cleaning without burner removal.

c) The complete boiler including the bottom shall be insulated with a minimum thickness of four inches of reinforced fiberglass wool insulation, and shall be encased in a heavy gauge steel boiler jacket. This jacket shall be installed after system piping has been connected to the boiler section assembly. Jacket will have removable panels to allow access to the boiler as required.

d) Water boiler trim shall include pressure gauge, temperature gauge, low water cut-off high limit control operating control, high fire control, and drain valve. An ASME approved pressure relief valve shall be furnished sized to exceed the boiler gross output capacity and shall be factory set to relieve pressure at 125 PSI.

e) The boiler/burner shall be pre-wired to provide the following operation:

1) Local - Remote switch on burner.

2) In Remote position burner shall be capable of being controlled from the digital control system.

3) In Local position burner shall operate from supplied controls.

f) All control circuits shall be 120V/60Hz/1Ph. with all switches in the ungrounded leg. Fuse protection for the control circuit shall be provided.

g) Boiler controls shall be housed in a factory pre-wired control cabinet. The cabinet shall house combustion Safeguard Control to provide pre-purge, post- purge and burner sequencing, complete with flame rod.

h) Panel shall include the following:

1) All panel wiring with color-coded wire.

2) Motor starters with overload protection for blower motor.

3) On/off switch.

4) Low/auto switch.

5) Step down transformer for 120-volt output with circuit fuse if power supply is 3 phase.

6) Individual pilot lights with nameplated to indicate: "Power On".

7) "Main Fuel Valve On", and "Flame Failure".

i) Electronic safety combustion controls shall be supplied to monitor pilot and main flame. Detection will be means of a flame rod. The programming control shall be by Honeywell and will provide pre and post purge, trial for ignition, energize main fuel circuit, interrupted tupe pilot and sequence operation.

j) Manual restart of each burner shall be necessary in the event of a shutdown due to flame failure.

2.1.3. Burner Construction

a) The fully modulating linkage-less burner shall be provided by the boiler manufacturer and selected to match the boiler capacity indicated on the equipment schedule. Burner shall include squirrel cage 3,450 rpm motor, shall be factory tested and incorporated all necessary devices and controls to make a complete fuel burning system and bear the listing label of CSA.

b) The burner shall be designed for natural gas and be of the forced-draft pressure- atomizing type with no CO present in the products of combustion. The burner shall be furnished with an integral motor-driven blower, stainless steel flame retention type combustion head and observation port, and a primary control which utilizes a UV scanner.

c) Burner modulation must be done by linkage-less means by use of independent actuation of the fuel valve and air damper (no mechanical linkages shall be used). Linkage-less control system by Honeywell.

2.1.4. Gas Train

a) Main gas pressure regulator, (vented to outside atmosphere, in accordance with local codes), approved automatically operated motorized safety gas shutoff valve, with proof of closure interlock switch, second automatically operated gas safety valve, manually operated gas shutoff valve located downstream of both automatic gas valves (to permit leakage testing of valves), test pressure tappings upstream and downstream of each valve and regulator, air damper with linkage-less modulating control. A separate pilot gas cock, gas pressure regulator, solenoid valve shall be provided. The pilot will be spark ignited.

2.1.5. Control

a) Boiler/Burner Controls shall be housed in a factory pre-wired control cabinet. The cabinet shall house combustion Safeguard Control to provide pre-purge, post-purge and burner sequencing, complete with flame rod. Panel shall include the following:

1) All panel wiring with color-coded wire.

2) Motor starters with overload protection for blower motor.

3) On/off switch.

4) Low/auto switch.

5) Step down transformer for 120-volt output. With circuit fuse if power supply is 3 phase.

6) Individual pilot lights with name-plated to indicate: "Power On", "Main Fuel Valve On", and "Flame Failure".

7) Electronic safety combustion controls shall be supplied to monitor pilot and main flame. Detection will be means of a flame rod. The programming control shall be a Fireye, model MC120 and will provide pre and post purge, trial for ignition, energize main fuel circuit, interrupted tube pilot and sequence operation.

8) Manual restart of each burner shall be necessary in the event of a shutdown due to flame failure.

2.1.6. Standard of quality of acceptance manufacturers are:

a) De Dietrich GT series

b) Viessmann

c) Or approval equivalent.

## 3. EXECUTION

### 3.1. INSTALLATION OF BOILERS

3.1.1. Install boilers level and plumb on concrete pad. For vibration isolation, refer to Section Basic Mechanical Materials and Methods.

3.1.2. Arrange piping as to provide adequate clearance for service and operation. In particular, ensure that the gas train assembly does not interfere with the clearances required for boiler and burner maintenance work. Pipe safety relief valves and drain valves to floor drain. Install thermometers and pressure gauges on supply and return piping no higher than 1800 mm above floor. Install temperature and pressure sensors in accordance with the manufacturer's recommendations, to ensure correct readings.

3.1.3. Install relief valve sized to suit boiler input and located upstream of any shut-off valve. Conform to manufacturer's installation instructions and piping schematic on drawings. Extend each gas pressure relief (full size) through roof and terminate with gooseneck and screen.

3.1.4. Upon notification of completion of the installation, boiler manufacturer shall furnish the services of a field technician, to:

a) Start-up and adjust the boiler

b) Start-up and adjust the burner

c) Provide combustion tests over the operating range.

d) Issue report to the Consultant indicating system acceptance as installed.

3.1.5. The manufacturer's qualified representatives shall inspect the venting system and shall supply/install draft control devices, if so required by the local configuration of the building. There will be no additional charge to the Owner for this operation.

3.1.6. Contractor shall provide all wiring, disconnects, relays and other devices as required to provide power to the burners and boiler controls.

**END OF SECTION**