

Capital Projects Group

Near Condensing Hot Water Boilers Specification

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Amendment Record Sheet

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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) boiler shall not have no limit on inlet water temperatures, tempering of return water temperature of use of any internal device to mix return water and supply water is strictly prohibited;
 - b) boilers shall be operating at 60% of the snow melting heating capacity per DRM requirement. Both boilers will operate and modulate simultaneously to meet the heating load.
- 1.2.2. Main gas pressure regulator shall be vented to outside atmosphere.
- 1.2.3. Automatically operated motorized safety gas shutoff valve, with proof of closure interlock switches and second automatically operated gas safety.
- 1.2.4. Manually operated gas shutoff valve located downstream of both automatic gas valves (to permit leakage testing of valves).
- 1.2.5. Test pressure tappings upstream and downstream of each valve and regulator.
- 1.2.6. Air damper with linkage-less modulating control.
- 1.2.7. Venting lines for gastrain components.
- 1.2.8. Pressure relief valve shall be provided sized to exceed the boiler gross output capacity and shall be factory set to relieve pressure at 90 PSI.
- 1.2.9. Design requirements are 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.

1.4. 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 stainless steel heat exchanger 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, gas train 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 5 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.

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. Boiler efficiency Curves: At a minimum, submit efficiency curves for 100 %, 80 %, 50 %, and 20 % input firing rates at incoming water temperatures ranging from 60 °F to 160 °F.
- 1.8.4. Boiler pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of boiler.
- 1.8.5. 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.
- 1.8.6. Submit a site inspection and boiler start-up report from boiler manufacturer's representative as specified in Part 3 of this Section.
- 1.8.7. Submit signed copies of a manufacturer's non-prorated 10 year extended warranty for stainless steel heat exchanger against corrosion, thermal stress, mechanical defects, and workmanship, and 2 year extended warranty for all other boiler components.
- 1.8.8. 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.
- 1.8.9. 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.
- 1.8.10. 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.

1.8.11. 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.

1.8.12. 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. De Dietrich Products GT Series, Near Condensing, Eutectic Cast Sectional hot water boilers in accordance with drawing schedule and with performance requirements as follows:

- a) boiler shall not have no limit on inlet water temperatures, tempering of return water temperature of use of any internal device to mix return water and supply water is strictly prohibited;
- b) boilers shall be operating at 60 % of the snow melting heating capacity per DRM requirement. Both boilers will operate and modulate simultaneously to meet the heating load;
- c) boilers approved to ANSI Z21.13/CSA 4.9;
- d) standards with minimum THERMAL efficiency of 86 %.

2.1.2. Boilers shall be complete with following construction features:

- a) 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 standard cast iron. Boilers and burners shall be ULC listed as a package.
- b) boilers shall be of a (3) pass scotch type wet base, wet backs 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.

- c) boiler sections shall be surface ground to ensure smooth positive mating surfaces. 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;
- d) the complete boiler including the bottom shall be insulated with a minimum thickness of four inches of reinforced fibreglass 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;
- e) water boiler trim shall include pressure gauge, temperature gauge, low water cut-off high limit control operating control, high fire control, and drain valve;
- f) an ASME approved pressure relief valve shall be provided sized to exceed the boiler gross output capacity and shall be factory set to relieve pressure at 90 PSI;
- g) factory supplied and certified seismic restraint anchor points.

2.1.3. Boiler trim includes following:

- a) low water cut-off control supplied loose for site installation, which, when installed and wired to burner control circuit will prevent burner operation if boiler water falls below a safe level, an auxiliary low water cut-off as above, and a McDonnell & Miller Model TC-4 "Test-N-Check" valve above and below both low water cut-offs;
- b) ASME rated factory sized and set relief valve, shipped loose for site installation.

2.1.4. The Boiler/Burner shall be pre-wired equipped with following components:

- a) Local - Remote Switch on Burner;
- b) in "Remote" position burner shall be capable of being controlled from BAS (building automation system) - refer to control drawings for requirements;
- c) in "Local" position burner shall operate independently from supplied controls;
- d) all control circuits shall be 120V, 60 Hz, 1 Ph. With all switches in the ungrounded leg. Fuse protection for the control circuit shall be provided. Burner shall be supplied by stepdown transformer for controls on burner;

- e) the burner shall be fully modulating, sealed combustion, with squirrel cage 3,450 rpm motor, and 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;
- f) the burner shall be designed for natural gas, sealed combustion, and be of the forced-draft pressure-atomizing type with min CO present in the products of combustion. The burner shall be provided with an integral motor-driven blower, stainless steel flame retention type combustion head and observation port, and a primary spark ignition assembly, and primary control. Burner shall come with pilot line;
- g) burner modulation must be done by Linkage-Less means by use of independent actuation of fuel valve and air damper. Linkage burner is not acceptable;
- h) main gas pressure regulator shall be vented to outside atmosphere, in accordance with local codes, approved automatically operated motorized safety gas shutoff valve, with proof of closure interlock switches, second automatically operated gas safety, manually operated gas shutoff valve located downstream of both automatic gas valves (to permit leakage testing of valves), test pressure tapings 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. Contractor is responsible to install venting lines on gas train if necessary even if those lines are not shown on drawings;
- i) contractor shall supply and install venting lines for gas train components even if those lines are not shown on mechanical drawings;
- j) 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 UV scanner. Panel shall include, but not limited to, the following:
 - 1) all panel wiring with colour-coded wire;
 - 2) motor starter with overload protection for blower motor;
 - 3) On/Off Switch;
 - 4) Low/Auto switch;
 - 5) stepdown Transformer for 120V output, with circuit fuse if power supply is 3 phase;
 - 6) individual pilot lights with name plate to indicate: "Power ON", "Main Fuel Valve ON" and "Flame Failure".

- k) electronic safety combustion controls shall be supplied to monitor pilot and main flame. Detection will be means of a flame rod. The flame safeguard control shall provide pre and post purge, trial for ignition, energize main fuel circuit, interrupted type pilot and sequence operation.
 - l) Manual Reset of each burner shall be necessary in the event of shutdown due to flame failure.
- 2.1.5. Double wall stainless steel AL29-4C stainless steel flue gas vent for each boiler with a type 304 outer casing and AL29-4C inner flue supplied by boiler manufacturer. Each boiler is to operate under Category IV positive vent pressure conditions for room air dependent operation. Venting is to feature condensate disposal and have 50 mm (2 ") clearance to combustibles.
- 2.1.6. Equal to JJM Boiler Works or Condensate Neutralizer condensate acid neutralizing PVC tube sized to suit the boiler condensate discharge, supplied with boiler, filled with 12 mm (½ ") and 20 mm (¾ ") aggregate calcium carbonate and complete with floor mounting galvanized steel strut clamps, threaded PVC inlet and outlet fittings, and a spare charge of calcium silicate.
- 2.1.7. Standard of quality assurance manufacturers are:
 - a) De Dietrich Products;
 - b) Viessmann Manufacturing Co.;
 - c) Or Approval equivalents.

3. EXECUTION

3.1. INSTALLATION OF BOILERS

- 3.1.1. Provide Near condensing hot water boilers, fully compatible to operate with Glycol solution for all temperature ranges and concentration. In accordance with specified codes and standards with specific reference to TSSA O. Reg. 220/01 in design, construction, maintenance, use, operation, repair and service of boilers, pressure vessels and piping.
- 3.1.2. Cast Sectional boiler shall be assembled and wired inside mechanical room on the pad by factory crew.
- 3.1.3. Where required, anchor each boiler and concrete base in accordance with local governing codes requirements for seismic control and restraint. Provide flexible connections in piping connections to each boiler.
- 3.1.4. Connect each boiler with piping and flue.
- 3.1.5. Connect boilers gas pressure regulation valve and station (PRS) tray next to each boiler to adjust the gas pressure to boilers operation pressure.

- 3.1.6. Install condensate acid neutralizers adjacent to boilers and connect with piping from boilers to neutralizers and from neutralizers to drain in accordance with manufacturer's directions and drawing requirements.
- 3.1.7. Install control components shipped loose for each boiler, including low water cut-offs, relief valve, and flow switch. Unless otherwise instructed, follow manufacturer's installation instructions. Provide pressure gauges and thermometers in boiler water supply and return piping connections.
- 3.1.8. Wall mount boiler control panel where shown but confirm exact location prior to installation, and connect to BAS.
- 3.1.9. Commissioning of boilers plant sequence of operation to ensure appropriate safeties and communications between boilers are achieved.
- 3.1.10. Perform required control wiring in conduit to connect control components. Follow boiler manufacturer's control wiring schematics and conduit and conductor installation requirements specified as part of electrical work.
- 3.1.11. When boiler plant installation is substantially complete, but prior to start-up, and prior to flushing and cleaning heating piping system as specified in Section entitled HVAC Water Treatment, inspect each boiler and remove visible dirt, oil and debris, then cooperate with the boiler boil-out chemical supplier to ensure proper boil-out procedures are followed.
- 3.1.12. Refer to Section 20 05 10 for equipment/system manufacturer certification requirements.
- 3.1.13. Refer to Section 20 05 10 for equipment/system start-up requirements.

END OF SECTION