

1 GENERAL

- 1.1 The work of this section includes the provision of all design, labour, materials, equipment and services required to fabricate and install heat generating systems as required for a complete project. The work includes, but is not necessarily limited to, the items referenced herein:
- 1.1.1 Boilers
 - 1.1.2 Auxiliary Equipment
- 1.2 Reference Standards
- 1.2.1 All products must be treated in accordance with the ASME Codes and must be in the required ASME plate and ASME stampings.
 - 1.2.2 Pumps: in accordance with the latest API 610, ANSI, ASME, EEMAC, NEMA and IEEE standards.
 - 1.2.3 Insulation: in accordance with *[NFPA 90A – 1996]*, *[NFPA 255 – 1996]* and *[ULC-S102 - M88]*.
- 1.3 Regulations: All products must meet the requirements of ASME, ANSI and local codes having jurisdiction.
- 1.4 Materials: All associated products must be the supply of one manufacturer.
- 1.5 Commissioning
- 1.5.1 Hot Water Generators:
 - 1.5.1.1 After the hot water generator has been in operation for two weeks, experienced and qualified boiler, burner and combustion control system manufacturer representatives shall demonstrate the operating capability of the boiler.
 - 1.5.1.2 Provide training and instructions to the Owner operator including Burner Safeguard and Management System, and Combustion Controls Training.
 - 1.5.1.3 Prior to completion of control commissioning, test the boiler for capacity and efficiency as per ASME standard short form.
 - 1.5.1.4 The stipulated efficiencies shall be demonstrated at the 50% and 100% hot water load. The Operating Engineer shall operate the boiler with automatic combustion controls in the manual mode. Fuel, water, chemicals, power and heat load supplied by the Owner.

2 DESIGN

- 2.1 Boilers

- 2.1.1 Hot Water Generators:
 - 2.1.1.1 Provide multiple-staged, packaged hot water generating units complete with equipment, material and appurtenances meeting provincial standards, ASME, ASTM, ANSI, CSA, CGA and listed with Canadian Registry.
 - 2.1.1.2 The lead hot water generator shall be a high efficiency, gas-fired condensing boiler sized for 50% of the total building heating load.
 - 2.1.1.3 The remaining hot water generators may be of cast iron or water tube design, with flue gas passes separated with water wall tubes. Boilers shall come complete with on-board efficiency maximization package, which actively adjusts fuel/air ratio throughout burner range.
 - 2.1.1.4 It is intended that one boiler unit will remain on-line during the summer and shoulder seasons for domestic water heating and residual space heating requirements.
 - 2.1.1.5 The installation will satisfactorily handle the building's heating demand with a disabled boiler unit.
 - 2.1.1.6 The heating system shall be designed such that the supply water temperature is set to avoid condensation in non-condensing boilers. The maximum design return water temperature shall be 57°C to allow maximum efficiency in condensing boiler(s).
 - 2.1.1.7 Acceptable materials (Non-condensing): *[Bryan, H.B. Smith, Weil McLain, Cleaver Brooks, Ajax, Viessman, RBI]*.
 - 2.1.1.8 Acceptable materials (Condensing): *[Viessman, RBI]*.
- 2.1.2 Piping and Fittings
 - 2.1.2.1 Provide gas piping, isolation valves, etc. from the point of service connection to the generator.
 - 2.1.2.2 Sizing of all piping should be designed to handle the maximum required flow and the designed pressure losses of the system.
- 2.1.3 Primary / secondary hot water pumping system
 - 2.1.3.1 Acceptable materials: *[S.A. Armstrong, PACO, Grundfos, Taco, Bell & Gossett]*.
- 2.1.4 Primary Boiler Circulating Pumps:
 - 2.1.4.1 Provide dedicated pumps to circulate water from the common hot water return pipe through each of the boilers and into the common hot water supply pipe.

- 2.1.4.2 Each pump when operating will run continuously to provide a constant flow of water to the boiler it serves. Pumps and associated boiler units will be sequenced in response to demand. The system will enable selection of lead / lag unit sequences.
- 2.1.5 Secondary System Distribution Pumps:
 - 2.1.5.1 Provide system distribution pumps to pump hot water from the hot water supply pipe through the hot water distribution system and back to the hot water return pipe.
 - 2.1.5.2 Provide two pumps at 100% duty variable speed pumping units.
 - 2.1.5.3 Pumps speed will be controlled by distribution system pressure requirements.
 - 2.1.5.4 Pumps are to operate along the system head curve. Therefore, the best efficiency curve is one, which is parallel to the system head curve.
 - 2.1.5.5 Provide motors suitable for being driven by variable frequency drive with NEMA design B and class F insulation.
 - 2.1.5.6 Provide Variable Frequency Drive (VFD) suitable for this application and for use in normal indoor non-hazardous industrial environments. The VFD shall provide variable speed control of a squirrel cage induction motor designed to meet the requirements of *[NEMA MG 1 Part 31]* Definite-Purpose Inverter-fed Motors and controlled by Building Automation System (BAS).
 - 2.1.5.6.1 Acceptable materials: *[Graham; Toshiba; Siemens]*.
 - 2.1.5.7 Provide control and monitoring from BAS for VFD's, indoor/outdoor air temperature reset sequencing, domestic hot water control, protection of non-condensing boilers against damage from low return water temperatures, status, alarms, enable/disable.

2.2 Auxiliary Equipment

- 2.2.1 Breeching and Chimneys:
 - 2.2.1.1 Provide prefabricated stainless steel positive pressure venting as per boiler manufacturers' recommendations.
 - 2.2.1.2 Venting to be insulated as required to maintain safe surface temperatures.

3 MATERIALS

3.1 Boilers

3.1.1 Piping and Fittings

3.1.1.1 Piping and fittings shall be A53 Grade B or A106 Grade B.

3.1.1.2 Valves and fittings shall be rated for the pressure of the service in which they are used.

3.2 Insulation:

3.2.1 All components of insulation system shall meet latest *[ANSI/NFPA 90A]* standard and maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with the latest *[ANSI/NFPA 255]* and *[CAN/ULC-S102-M88]* standards.

3.2.2 Provide adhesives, sealers, vapour coating, mastics, laggings and bedding compounds with materials to which they are applied. Material shall not soften, corrode or deteriorate in either wet or dry state and shall only be of type recommended by insulation manufacturer as suitable for proposed application.

4 INSTALLATION

4.1 Install all equipment following manufacturers instructions. Equipment to be installed on 100 mm high housekeeping pads which extend beyond the greatest dimensions of the equipment by at least 100 mm.

End of Section