STEAM BOILER AUXILIARY EQUIPMENT

1. GENERAL

1.1 Scope

.1 Boiler feed tank and pumps.

.2 Blowdown tanks.

.3 Water Softener System

1.2 Quality Assurance

.1 All equipment, controls and accessories to be compatible with system design, and matched to the steam boiler(s) by the boiler Manufacturer.

.2 All components and packages to be factory assembled and piped where called for.

.3 All connections, sizes and capacities to comply with all current applicable codes.

.4 Comply with Provincial Regulations and have CSA approval.

.5 Construct to ASME Section VIII, Rules for Construction of Pressure Vessels.

.6 Obtain all required inspection certificates from Provincial Authorities.

1.3 Shipping

.1 Factory assembled units to be shipped intact unless restricted by transport regulations.

1.4 Shop Drawings

.1 Detailed shop drawings to be submitted for review for all equipment and accessories in this session prior to ordering, indicating physical dimensions, capacities, curves and weights.

2. PRODUCTS

2.1 Blowdown Tanks

.1 Refer to Section 15630 – Packaged Vertical Watertube Boilers.

2.2 Boiler Feed Tank and Pumps

.1 Tank: Supply and Install feed water tank with necessary connections, gauge glass, gauge cocks, thermometer, internal baffle. Support tank on welded structural steel stand assembly. Tank must be elevated to create positive head on feed water pumps.

.2 Standard of Acceptance: Bryan HFS-15-50-100-D.

.3 Make-up Water Assembly: Float operated make-up water feeder, Y strainer with bypass assembly.

.4 Boiler Feed Pumps: One pump shall provide 100% capacity. Motors shall be non overloading, TEFC. Supply and install a multi staged centrifugal type pump sized to suit boiler and for use with 108^{o}C water. The material construction of pump must be stainless steel and having mechanical seals. Minimum NPSH: 1.8 m (6 ft). Control panel shall include the above recommended feed water pump motor control circuit, and overload protection as standard.

.5 Standard of Acceptance: Goulds

.6 Control Panel: Dust proof control panel containing motor starters, selector switch, indicator lights, circuit breakers, pump alternating controls, alarm lights and horn. Provide automatic pump alternating after each cycle.

2.3 Water Softener System

.1 Process Description & Control Philosophy

.1 Influent water will be under pressure to the water softener system.

.2 Softening will be achieved using a duplex system consisting of two softeners. The system will comprise of an alternating duplex softener system. At any one time, only one softener in the duplex system will be in operation. The other softener in the duplex system will be regenerating or will be in standby.

.3 A brine tank will provide brine to each of the two softeners during the regeneration process.

.4 The flow of water through the softening plant will vary, depending on the demand of the downstream processes. The flow through the softener will be controlled by a modulating valve which will be located downstream of the softening plant.

.5 The flow of water to each softener will be measured and totalized. When the required totalized water flow (operator adjustable) has passed through the duty softener, the flow will be automatically diverted to the standby softener and the regeneration process started.

.6 Regeneration will be an automatic process comprising back washing, regeneration and rinsing. Once the regeneration has been completed on the duplex system the softener will remain idle until the duty softener requires regeneration.

.7 An interlock will prevent more than one softener from being regenerated at any one time.

.2 Performance Requirements

.1 Design capacity (treated water): 782 l/hr (3.44 USgpm)

.2 Maximum daily flow (treated water): 1,900 l/d (500 USgpd)

.3 Maximum total head loss at design capacity: 276 kPa (40 psig)

.4 Average treated water hardness: 0.1 mg/L (as CaCO3)

.5 Maximum treated water hardness: 0.2 mg/L (as CaCO3)

.6 Peak treated water hardness: 2.0 mg/L (as CaCO3)

.7 Minimum time between regeneration for each of the duplex softeners: 12 hours (at design capacity)

.8 Performance based on achieving treated water hardness of 0 grains of hardness per gallon is not acceptable.

.3 Influent Water Characteristics

.1 Pressure of influent water: 415 kPa (60 psig)

.2 Maximum total iron: 0.3 mg/L

.3 Minimum influent water temperature: 1°C (34 ^{o}F)

.4 Maximum influent water temperature: 25°C (77 ^{o}F)

.5 Maximum influent water hardness: 200 mg/L (as $CaCO_3$)

.4 General Design Considerations

.1 Softener system to include two softeners operating in alternating duplex mode. System to include a brine tank.

.2 Flow to each softener to be monitored and the totalized flow used to determine when regeneration is required.

.3 Locate the softening plant in the area shown on the drawings.

.4 Design the softener plant to prevent excessive flow and head loss through the system.

.5 Design the softener to ensure that the flow is above the minimum flow that causes channeling within the resin bed. Identify the minimum flow that causes channeling within the bed.

.6 Electrical characteristics are 120 volts, 1 phase, 60 Hz.

.5 Softener Vessels

.1 Supply and Install two softener vessels.

.2 Softener vessels to be constructed from carbon steel or fiber wound fiberglass reinforced plastic (FRP). Steel vessels to be designed for a working pressure of 690 kPa (100 psig). Fiberglass tanks to be designed for a working pressure of 1035 kPa (150 psig) and to be NSF approved.

.3 Each vessel to be equipped with a resin loading port, a drain/resin removal port and an access hatch. Supply and Install a vacuum breaker for each softener vessel. Supply and Install a pressure relief valve for each softener.

.4 Provide sufficient freeboard above the resin to allow expansion of bed during back washing.

.5 Supply and Install water distribution system to prevent channeling in the bed. Include gravel or equivalent system.

.6 Main multi-port valves and manifold piping to be factory assembled and shipped with each vessels for ease of installation and start-up.

.7 Design the system to prevent loss of resin beads during back washing.

.8 Material used in the construction of the vessels to be chemically inert so as not to react with the water, media, water-borne contaminants, acids, caustic soda and chemicals.

.9 Supply and Install internal and external coatings to metal vessels to prevent corrosion and deterioration of the vessels.

.6 Resin

.1 Supply and Install sodium zeolite resin.

.2 Resin to be high capacity with good resistance to bead fracture. The resin to be solid, with particle size of 20-50 mesh. Resin to contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener.

.3 Supply resin with the following minimum requirements.

.1	Construction	High capacity, gel type beads
.2	Minimum bed depth in the softener	800 mm
.3	Regeneration method	NaCl
.4	Stable pH range	0 to 14

.5	Stable temperature range	-10 to 100°C
.6	Maximum number of rinses	5
.7	Minimum exchange capacity	2.0 eq/L
.8	Minimum uncracked resin beads	95%

.7 Brine Tank

.1 Provide sufficient brine tank capacity so that salt does not need to be fed to the tank more than once per 24 hours.

.2 The tank to be constructed from corrosion free fiberglass reinforced plastic, polyethylene or polypropylene.

.3 22.7 kg (50 lb.) bags of sodium chloride will be used for manual loading into the brine tank.

.4 Supply and Install all interconnecting pipes and valves.

.5 Supply and Install drain port and valve per tank.

.6 Identify the salt rate (lb./ft^3) used for the duplex system under the various operating scenarios.

.8 Regeneration

.1 Supply and Install a fully automatic system for regeneration of the resin, capable of providing back washing, regeneration and rinse cycles.

.9 Valve Actuators

.1 Supply and Install all valve actuators.

.2 Valve actuators to be electric.

.10 Piping

.1 Supply and Install all interconnecting pipes and isolation valves for the softening plant.

.2 Supply and Install easily accessible sample collection valves for sampling of influent water, treated water and wastewater.

.11 Pressure Gauges

.1 Supply and Install pressure gauges together with gauge cocks on the inlet and outlet of each softener.

.12 Controls

.1 Provide a fully integrated control system capable of full automatic control of the softener system.

.2 Provide single control panel for the system, or one control panel for each softener, as appropriate.

.3 Provide manual over-ride of the control system to enable operatives to manually control the plant.

.4 Provide facility to enable manual initiation of the automatic regeneration sequence.

.5 Provide instantaneous flow indication and totalized flow indication, complete with reset facility.

.6 Interlock to be provided to prevent more than one unit being regenerated at any one time.

.7 The controller(s) to be housed in enclosures constructed to NEMA 4 standards.

.8 Provide visible lights to indicate whether softener is on-line, off-line (regeneration or standby) or in alarm.

3. EXECUTION

3.1 General

.1 Vent condensate receivers and boiler feed tanks to outdoors.

.2 Flush and clean condensate tanks and boiler feed tanks prior to delivery to site and keep sealed during construction.

.3 Elevate boiler feed tank to create a positive head on boiler feed water pumps.

.4 Supply and Install suction and discharge valve and a check valve for each boiler feed pump.

.5 When boiler feed tanks are higher than boiler water line, supply and install a spring loaded check valve to prevent boiler from flooding after shutdown.

.6 Supply and Install water meter on make-up water lines.

.7 Supply and Install drain valves on all strainers.

.8 Install steam exhaust heads on blow-off tank vents. Pipe exhaust head drains through roof to sanitary sewer.

3.2 Performance

.1 Refer to Equipment Schedules.

END OF SECTION