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BuildingName
The Description of the Project
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SPECIFICATION DIVISION 23

NUMBER SECTION DESCRIPTION

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 235300 - HEATING BOILER FEEDWATER AND BLOW-DOWN EQUIPMENT

END OF CONTENTS TABLE

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)
SECTION 235300 - HEATING BOILER FEEDWATER AND BLOW-DOWN EQUIPMENT

REVISIONS:
NOV.9,2004: NEW SECTION CREATED FOR THE MASTER SPECIFICATIONS.
MAR.11,2005: LAST REVISION.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

INCLUDE PARAGRAPH 1.1.A AND B IN EVERY SPECIFICATION SECTION. EDIT RELATED SECTIONS 1.1.B TO MAKE IT PROJECT SPECIFIC.

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

1.2 SCOPE OF WORK:

A. Provide packaged boiler feed water preheat system, packaged boiler feed water system (no preheat), Deaerator system, blowdown tank and accessories as specified and scheduled.

1.3 QUALITY ASSURANCE:

SPEC EDITOR: DELETE ITEMS NOT IN THE PROJECT

A. Codes and Standards:

1. UL Compliance: The complete Deaerator, boiler feed water unit, unit shall be approved and labeled as a unit by Underwriters Laboratories.
2. ASME Compliance: Construct Deaerator, boiler feed water unit, blow down tank in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".
3. UL and NEMA Compliance: Provide all ancillary electrical components which have been listed and labeled by UL and comply with NEMA standards.
4. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).
5. NEC compliance: Provide control panels and assembly and wiring of all devices in accordance with requirements of latest edition of NEC. All control panels shall have a label indicating listing by a nationally recognized testing agency such as UL, ETL or MET.

B. Pressure Vessel Warranty:

1. If, within fifteen (15) years the tank fails under normal use and service, the manufacturer shall replace tank and the part or component as required for proper operation of the unit.

C. Complete Package Warranty:

1. The complete package shall be warranted for a period of 12 months from the date of acceptance of the installation by the University.

1.4 ACCEPTABLE MANUFACTURERS:

SPEC EDITOR: ALWAYS SPECIFY ELEVATED TANK AND 212 F PUMPS GOOD 2' NPSH

A. Subject to compliance with requirements, provide boiler feed-water system by one of the following manufacturers:

1. ITT Domestic Model CMED
2. Industrial Steam
3. Skidmore

B. Subject to compliance with requirements, provide blow-down separator by one of the following manufacturers:

1. PENN
2. Industrial Steam
3. Wilson
4. Johnston Boiler
5. Cemline

C. Subject to compliance with requirements, provide Deaerator by one of the following manufacturers:

1. Sellers Engineering
2. Industrial Steam
3. *add another vendor*

PART 2 - PRODUCTS

2.1 BOILER FEED WATER UNIT (WITHOUT PREHEAT):

SPEC EDITOR: REVISE THE NUMBER OF PUMPS FOR EACH PROJECT. BOILER FEED WATER UNIT WITH NO PREHEAT USED IN ALL LOW PRESSURE BOILERS.

A. Furnish and install according to drawings and manufacturers' requirements single compartment boiler feed unit as shown on drawings. It shall consist of the following: (1) single compartment steel receiver with (3) three boiler feed pumps, electrical controls and accessories.

B. The boiler feed receivers shall be of welded ¼ inch steel construction single compartment design, elevated to meet the 2' NPSH requirements of the pumps. The unit shall be factory equipped with the following

1. Make up water assembly consisting of externally adjustable float switch and solenoid valve sized equal to one of the boiler feed pumps
2. Make up valve strainer
3. Three valve bypass for make-up valve
4. Make up valve pressure gauge

5. Manhole for inspection and repairs and Inspection port hand hole
6. Chemical injection quill
7. One gauge glass assembly with shut off valves
8. One dial thermometer
9. One set of lifting eyes
10. Three pumps suction, discharge, strainers, check valves and pressure gauge etc.
11. One low level pump cut off switch and low water level alarm switch.
12. Cast iron basket strainer with bronze screen on condensate inlet location
13. Sampling valve.

C. A magnesium anode shall be mounted in the receiver compartment.

D. The pumps shall be 2' NPSH close coupled vertical design with axial flow impeller that builds positive suction pressure of 5 psig. Provide a cast bronze impeller that is bronze fitted to the cast iron pump housing with a bronze sleeve. The mechanical seal shall be rated for 250F service. Provide isolation valves, check valve and strainers as shown in plans for each pump.

E. The unit manufacturer shall mount and wire a separate NEMA 1 control cabinet with hinged door and grounding lug and include the following:

1. Combination magnetic starters with overload relays and circuit breakers or fused disconnects for each pump.
2. Door interlock.
3. Momentary contact test buttons for each pump.
4. Numbered terminal strip.
5. H-O-A switch with indicating light for each pump.
6. Contacts for ON-OFF signals from boiler control panel. (The pump to run only when the corresponding boiler is operational).
7. Low level alarm.
8. Low water cutoff.
9. Control transformer with secondary fused 115 volts single phase control circuit.
10. Single point power connection.
11. Totalizing run hour meter for each pump.
12. Alarms to be audible and visual with silencing push button. Provide indicating light for each alarm. All indicating lights shall be push to test type.
13. All electrically operated valves shall be powered from the control cabinet.
14. Single point power connection.

F. Control Sequence: Under normal operation the three boiler feed pumps are left in auto mode. The boiler level controllers cycle the respective boiler feed water pump.

2.2 PREHEATING TYPE BOILER FEED WATER UNIT:

SPEC EDITOR: REVISE THE NUMBER OF PUMPS FOR EACH PROJECT. PREHEATING TYPE BOILER FEED WATER UNIT IS REQUIRED ONLY FOR HIGH PRESSURE BOILERS.

A. Furnish and install according to drawings and manufacturers' requirements single compartment preheat boiler feed unit as shown on drawings. It shall consist of the following: (1) single compartment steel receiver with (3) three boiler feed pumps, (1) direct injection steam heating assembly, electrical controls and accessories.

B. The boiler feed receivers shall be of welded ¼ inch steel construction single compartment design, elevated to meet the NPSH requirements of the pumps. The unit shall be factory equipped with the following

1. Steam heater as described below.
2. Make up water assembly consisting of externally adjustable float switch and solenoid valve sized equal to one of the boiler feed pumps
3. Make up valve strainer
4. Three valve bypass for make-up valve
5. Make up valve pressure gauge
6. Inspection port hand hole
7. Chemical injection quill
8. One gauge glass assembly with shut off valves
9. One dial thermometer
10. One set of lifting eyes
11. Three pumps suction, discharge and pressure relief valves, strainers, check valves and pressure gauge etc.
12. Three valve bypass with strainer, steam regulating valve, upstream and downstream pressure gauges.
13. One low level pump cut off switch and alarm
14. Cast iron basket strainer with bronze screen on condensate inlet location
15. Sampling valve

C. A magnesium anode shall be mounted in each receiver compartment.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

D. An injection steam heating assembly shall consist of a double flange mounted injection stainless steel tube, Spence or Hoffman pressure and temperature regulator, wye strainer and pressure gauge. Capacity to heat 5 gpm from 50F to 200F, 9 psig steam at the inlet valve.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

E. The pumps shall be 2’ NPSH close coupled vertical design with axial flow impeller that builds positive suction pressure of 5 psig. Provide a cast bronze impeller that is bronze fitted to the cast iron pump housing with a bronze sleeve. The mechanical seal shall be rated for 250F service. Provide isolation valves, check valve and strainers as shown in plans for each pump.

F. The unit manufacturer shall mount and wire a separate NEMA 2 control cabinet with hinged door and grounding lug and include the following:

1. Combination magnetic starters with overload relays and circuit breakers or fused disconnects for each pump.

2. Door interlock.
3. Momentary contact test buttons for each pump.
4. Numbered terminal strip.
5. H-O-A switch with indicating light for each pump.
6. Contacts for ON-OFF signals from boiler control panel. (The pumps to run only when anyone of the two boilers are operational).
7. Low level alarm.
8. Low water cutoff.
9. Control transformer with secondary fused 115 volts single phase control circuit.
10. Single point power connection.
11. Totalizing run hour meter for each pump.
12. Alarms to be audible and visual with silencing push button. Provide indicating light for each alarm. All indicating lights shall be push to test type.
13. All electrically operated valves shall be powered from the control cabinet.
14. Single point power connection.

G. Control Sequence: Under normal operation the three boiler feed pumps are left in auto mode. The boiler level controllers cycle the respective boiler feed water pump.

SPEC EDITOR: THE FOLLOWING IS A COPY OF THE DEAERATOR SPECIFICATIONS USED FOR G G BROWN BOILER REPLACEMENT PROJECT. VERIFY WITH OUTLYING BOILER GROUP WHETHER TRAY AND SPRAY TYPE IS REQUIRED INSTEAD OF THIS.

2.3 DEAERATING TYPE BOILER FEED WATER UNIT:

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

A. Furnish and install according to drawings and manufacturers' requirements single compartment pressurized De-aerating boiler feed unit as shown on drawings. The unit shall be nominally rated for 35,000 lbs/hr guaranteed to remove oxygen in the condensate to a level of not more than 0.005 cc/liter. It shall consist of the following: (1) single compartment steel receiver with (3) three boiler feed pumps, (1) direct injection steam heating assembly, (1) de-aerating spray and tray section, electrical controls and accessories. The receiver shall be constructed in accordance with ASME code and 50 psig stamped.

B. The boiler feed receivers shall be of welded carbon steel construction single compartment design, elevated to meet the NPSH requirements of the pumps. The de-aerator shall be factory equipped with the following

1. Steam heater as described below.
2. Spray manifold
3. Chemical injection quill
4. One gauge glass assembly
5. One receiver pressure gauge
6. One relief valve
7. One throttling vent valve with orifice plate
8. One overflow drainer
9. One dial thermometer

10. One set of lifting eyes
11. Three pump suction, discharge and automatic (balancing) flow control valves, strainers, check valves and pressure gauge etc.
12. One steam, strainer, pressure gauge, isolation valves etc.
13. One low water level switch, low water level auto off and alarm, & high level alarm.
14. One electric make up valve and make up valve modulating controller.
15. Manhole.
16. Plasite 7156 epoxy lining
17. Internal overflow loop with anti-siphoning orifice
18. Sampling valve.
19. One makeup water strainer and pressure gauge
20. One manual 3 valve bypass for makeup valve.
21. All of the above (except for the accumulator tank) factory assembled, pre-piped and pre-wired on a floor mounted structural steel base.

C. A stainless steel de-aerating section with integral stainless stell cascade trays containing a vent condensing spray manifold with stainless steel spray nozzles shall be integral to condensate receiver. A dial thermometer and pressure gauge shall be integral part of the manifold assembly.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

D. The capacity of the make-up valve shall be 20 gpm, at a 20 psig supply pressure.

E. A magnesium anode shall be mounted in the receiver compartment.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

F. A direct injection steam heating assembly shall consist of a double flange mounted injection tube, electric steam control valve and temperature regulator, wye strainer and pressure gauge. Capacity to heat 70 gpm from 140F to 227F, 9 psig steam at the regulator. Provide a three valve bypass.

G. The centrifugal boiler feed pumps shall be flange mounted on the receiver suction piping. The pumps shall be 2-stage close coupled vertical design. The first stage shall be a stainless steel axial flow impeller discharging through a stainless steel diffuser to the second stage. The second stage shall be a cast bronze impeller that is bronze fitted to the cast iron pump housing with a renewable bronze wearing ring. The mechanical seal shall be rated for 250F service. Provide isolation valves, check valve and strainers as shown in plans for each pump. Each pump shall be of 2' NPSH design.

H. The unit manufacturer shall mount and wire a separate NEMA 2 control cabinet for the de-aerator. Cabinet shall have hinged door and grounding lug and include the following:

1. De-aerator
2. Combination magnetic starters with overload relays and circuit breakers for each pump.
3. Door interlock.
4. Momentary contact test buttons for each pump.

5. Numbered terminal strip.
6. H-O-A switch with indicating light for each pump.
7. Contacts for ON-OFF signals from boiler control panel. (Each pump to run only when the respective boiler level controller calls for it).
8. Low level and high level alarms.
9. Low water cutoff.
10. Control circuit disconnect switch
11. Power on light
12. Control transformer with secondary fused 115 volts, single phase control circuit.
13. Alarms to be audible and visual with silencing push button. Provide indicating light for each alarm. All indicating lights shall be push to test type.
14. All electrically operated valves shall be powered from the control cabinet.
15. Single point power connection.

I. Control Sequence: The boiler to be run is selected manually and run. While selecting the boiler the corresponding the boiler feed water pump is set in auto mode. The boiler level controller cycles the respective boiler feed water pump. The built in level controller in the de-aerator unit modulates the make-up valve.

J. The entire unit shall be factory assembled and wired on a 48" high structural steel support. The unit shall be started up and operating personnel trained by a factory authorized field representative.

2.4 BLOW DOWN SEPARATOR:

A. Furnish and install as shown on the drawings a boiler blowdown separator with stainless steel striking plate, minimum 3/8" thickness, at point of inlet impingement.

B. Separator shall be designed in accordance with ASME code, shall comply with Michigan regulations and shall handle blowdown from the following boilers operating at 60 psig. For sizing purposes assume only two boilers will blow down at any given time. Minimum size as shown in the schedule. If the minimum size shown is inadequate, advise the U of M project engineer.

SPEC EDITOR: REVISE AS REQUIRED FOR EACH PROJECT

1. Boiler No. LP-1 125 HP
2. Boiler No. LP-2 125 HP
3. Boiler No. LP-3 70 HP

C. Separator shall include the following accessories:

1. Pressure gauge.
2. After cooler with automatic temperature regulating valve, strainer and bimetal thermometer.
3. Three angle legs for floor mounting or wall brackets for wall mounting. See plans for requirements.

2.5 ELECTRICAL CONTROL PANEL LABELING:

A. All control panels provided with burner, boiler feed water unit shall bear a label from UL, ETL or MET. All wiring including the control wiring shall be installed in a NEC compliant conduit system.

2.6 VALVES, MOTORS AND OTHER ITEMS SPECIFIED ELSEWHERE:

A. All motors shall meet requirements of Section 220513.

B. All valves shall meet requirements of Section 220523.

C. All piping shall meet requirements of Sections 221113 and 232216.

D. Thermometers and gauges shall meet requirements of Section 220519.

E. Unit to be field insulated per section 220719.

PART 3 - EXECUTION

3.1 START UP SERVICE:

A. After the boiler feed water/ Deaerator unit installation is completed, a factory trained representative shall supervise starting, boil out and adjusting the pump flow rates, schooling for the operators in the care and handling of the equipment and provide warranty service after initial firing.

3.2 MECHANICAL SPACE AND INSTALLATION:

A. The equipment shall be installed where shown on the drawings and in accordance with the manufacturer's written instructions.

B. Field installation of the boiler feed unit shall be done under the supervision of a trained representative of the unit manufacturer.

C. Provide for connection to electrical service, steam outlet, condensate inlet, vents, etc., for a complete and operating system.

D. Pipe relief valves, drains, blow downs, etc., to nearest floor drain.

E. Installation shall be performed by a firm certified by the State of Michigan to install equipment specified.

F. The installer shall construct a level concrete housekeeping pad for equipment foundation according to unit manufacturer's erecting instructions and as shown in the plans.

G. Clean the system per manufacturer’s instructions; flush the system to remove all trash and dirt; and refill the system, including inhibitor as specified.

H. All equipment, piping, valves and other components shipped loose shall be installed per manufacturer's instruction, whether indicated or not, in these plans and specifications.

END OF SECTION 235300