

SECTION 15710

HEAT EXCHANGERS FOR HVAC

PART 1 –GENERAL

1.1 SUMMARY

- A. Section includes shell and tube type heat exchangers, plate type heat exchangers, accessories and trim.

1.2 REFERENCES

- A. ASME (ANSI/American Society of Mechanical Engineers) - Boilers and Pressure Vessels Code.

1.3 SUBMITTALS

- A. Section 01330 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate dimensions, locations, and size of taps, support frame.
- C. Product Data: Submit performance data.
- D. Test Reports: Indicate shop test reports of tube bundle pressure tests.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01770 - Execution Requirements: Closeout submittals.
- B. Operation and Maintenance Data: Submit start-up and shut down instructions, assembly drawings, and spare parts lists.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with applicable codes and laws as well as the Stanford Facilities Design Guidelines and all Stanford University Contract documents.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by the Project Manager.

1.7 PRE-INSTALLATION MEETING

- A. Section 01330 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect equipment.
- B. Accept heat exchangers on site in factory protective packaging. Inspect for damage.
- C. Protect entry of foreign material into openings with temporary caps.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Section 01770 - Execution Requirements: Product warranties and product bonds.
- B. Provide five year manufacturer warranty for heat exchangers.

1.11 EXTRA MATERIALS

- A. Section 01770 - Execution Requirements: Spare parts and maintenance products.
- B. Supply two sets of replacement gaskets.

PART 2 –PRODUCTS

2.1 STEAM-TO-HOT WATER HEAT EXCHANGERS:

- A. Steam from the CEF is most often utilized at its entry to the building in a steam-to-hot water exchanger.

2.2 SHELL AND TUBE TYPE HEAT EXCHANGERS

- A. Heat exchanger: Multi-pass, U-tube; steel shell, 125 psi w.s.p.; ASME Stamp label steam in shell, water in the tubes; copper tube 5/8 inch outer diameter or larger, 125 psi w.p.; removable tube bundle; cast iron divided head with matching flange and with non-asbestos gaskets. Attached metal name plate stating pressure rating and size of exchanger.
- B. Shell of Heat Exchanger: The shell of the heat exchanger will have a 3/4 inch NPT vacuum breaker installed in the designated connection
- C. Tubes: number of tubes per pass, number of passes and total exchange surface.
- D. Capacity and Computations: Do not select the unit from manufacturer's catalog ratings. Calculate the required size of the unit to produce the output shown after deducting for scale formation of tube surfaces, using a fouling factor of 0.0005.
- E. Temperature range: The temperature range for operation will be a maximum of 180 degrees F. Applications that allow for a sliding temperature scale will be 180 degrees at 32 degrees outside air temperature and 120 degrees F at 65 degrees F outside air. These systems will also shut off at temperature about 65 degrees F outside air. The circulation pumps on these systems will run for a minimum of 10 minutes after the steam has been shut down to eliminate the possibility the temperature of the exchanger exceeding the 180 degrees F.
- F. Additional Requirements:
 - 1. Condensate Pump: Duplex.
 - 2. Expansion Tank: Bladder Type.
 - 3. Steam Control Valve: Preferred pneumatic over electric. Valves shall be normally closed. Systems that require 2 valves with lead/lag configuration, pilot positioners are required. Electronic control valves: low voltage is preferred.
 - 4. Triple Duty Valve: At pump discharge.
 - 5. Suction Diffuser: Required.
 - 6. Strainer: On pump inlet with capped ball valve blowdown.
 - 7. Pressure Gauges: Bourden tube type, liquid filled with 3/8 inch piping across the pumps with isolation valves.
 - 8. Hot Water Pumps: Single gauge with valves on both the inlet and outlet of the pump allowing a single gauge to read both inlet and outlet pressure placed beyond the vibration isolators. Each pump will have a dedicated gauge. Pumps shall be redundant.
 - 9. Make-up Water: Gauges will be used on the inlet and outlet with isolation valves on each.
 - 10. Steam: Gauges showing the pressure before and after the PRV. Gage shall

be three inch minimum and placed in such a manner that they are easily visible from the service area.

11. Thermometers: Bimetal type gage with a three inch face and place in such a manner that they are easily visible from the service area. Thermometer shall show the entering and exiting water temperature of the exchanger as well as the circulation loops.
12. Temperature Sensor: Sensor must have outside air reset which controls the heating hot water to building. Sensor will be mounted on the North side of the building, away from any heat source, in a perforated stainless steel box.
13. Automatic Air Vent: Will be piped to drain.
14. Air Separator: No strainer for two inch and larger. Under two inch will be an inline type.
15. Flex Connection: Flex connector shall be on the inlet and discharge of pump(s), stainless steel hose & braid with carbon steel fittings.
16. Structural Steel Frame: Frame for support of the heat exchanger and associated equipment will be built in such a manner as to not interfere with the service of the equipment and be structurally sound. Steel will be galvanized or painted to protect it from corrosion.
17. Chemical Pot Feeder: The chemical pot feeder shall be sized to allow service on a once per month schedule.
18. Steam Trap: All Steam traps shall be piped with unions to allow removal and installation in such a manner to allow ease of removal.
19. Check Valve: All check valves shall be piped with unions to allow removal and installation in such a manner to allow ease of removal.
20. Shut-Off Valves: All valves shall be installed so that the valve stem is greater than 10 degrees about the horizontal plane and accessible from the service area. All valves shall be labeled with a brass tag that corresponds to the as-built schematic drawing.
21. Hot Water: All shut-off and isolation valves shall be ball valves.
22. Steam: All shut-off and isolation valves shall be gate valves.
23. Relief Valves:
 - a. Steam: Steam relief valves at 125 PSI, size of the heat exchanger with the vents piped to the outside of the building above the roof line away from over-hangs and air intakes.
 - b. Hot Water: Hot water relief will 75 PSI, size of the heat exchanger and piped to a sanitary drain.

G. Electrical:

1. NEMA-1 UL Approved Control Panel with:
 - a. Main circuit breaker disconnect switch
 - b. Magnetic Starters for each pump
 - c. Each pump shall have a disconnect at the pump regardless if there is a panel in the room. Disconnect shall be placed to allow the service technician to disconnect the power to the pumps while

- working on the pumps.
 - d. Any low voltage control circuit transformer will be fuse protected.
 - e. H-O-A select switch for each pump
 - 2. Electronic controls:
 - a. Temperature controller will have provision for outdoor sensor and water temperature reset feature.
 - b. Temperature transmitter will provide a 4-20 mA output signal.
 - c. Electronic steam control valve will have provision for the connection to the building EMCS energy system for remote on/off control
 - 3. Variable Frequency Drives (VFD): The system pressure shall be controlled by a VFD on the circulating pump(s). The VFD controls shall not be located on the exchanger skid or near any high heat area. The VFD will have remote send and receive controls. When possible fresh filtered air shall be provided to the VFD location for cooling. Final location shall be approved by Stanford's Project Manager.
- H. Expansion Tank:
- 1. Expansion tank will be replaceable bladder type only
 - 2. Horizontal cylindrical
 - 3. Welded steel construction
 - 4. Testing and stamp per ASTM Code for Unified Pressure Vessels
 - 5. Gage glass
 - 6. Drain valve
 - 7. Isolation valve, drain tee, and union
- I. Air Vent Fitting:
- 1. Manual air vent
 - 2. Vent tube extended into tank are least 3/4 of the tank diameter.
 - 3. Fitting shall manually control air volume in tank by bleeding air into tank for draining.
- J. Insulation: All piping, valves, tanks, exchanger and other heat producing surfaces shall be insulated by a minimum of one inch of fiberglass insulation with backing. Elbows, valve bodies and other in-line devices shall be insulated with molded fittings only. The insulation shall not impair the operation of any part of the exchanger or the ability to shut valve or service the equipment
- K. Drain Pans: Exchanger shall be placed in a drain pan large enough to contain a moderate leak. The drain pan shall be piped to a drain or connected to a drain within the pan. The drain pan outlet location shall allow service and not be located under equipment or away from service area. No standing water shall be allowed in the pan. The equipment "skids" shall be elevated a minimum of one quarter inch above the pan. Material used to elevate the equipment shall not corrode or degrade when in contact with moisture. If the pan is concrete it must

be sealed with a material that will not degrade when exposed to steam or water. Any penetrations in the pan must be sealed with a material that will not degrade when exposed to steam or water. Penetration must be kept to a minimum. Pan formed out of metal shall be stainless steel with re-enforced and supported edges. Pan will extend under all wet side equipment. Only distribution piping will extend beyond the pan area.

- L. Inertia Bases: If the exchanger is not on grade an inertia pad shall be included. The pad shall minimize the vibration and noise from the exchanger. Pad and support shall be made of material that will not be adversely affected by steam or moisture.
- M. Tags and Schematic Drawing: All equipment, including but not limited to, valves, pumps, gages, controls and other identifiable pieces shall be tagged listing the item number that corresponds with a schematic and a description of the item. The corresponding schematic shall not be less than 11 X 17 inches framed with glass and located in an approved unobstructed area of the mechanical room. The Stanford Project Manager will give the approval of the schematic location. Drawing shall be done by a CAD system conforming to the Stanford Cad Design Standard format. Electronic copies shall be given to the project manager with the as built drawings.
 - 1. Tag Schedule: will be provided to identify all valves on the heat exchanger and piping. This will include existing valves that are listed to be reused. If the valves are part of the exchanger system they will be tagged.
- N. Bypass Chemical Feeder:
 - 1. Steel tank shell
 - 2. Steel tank head
 - 3. Cast iron cap Buna N "O" ring
 - 4. Steel Leg extensions
 - 5. Full Bottom drain

2.3 MATERIALS:

- A. Tubes: U-tube type with $\frac{3}{4}$ inch OD minimum seamless copper tubes, suitable for 125 psig working pressure.
- B. Shell: Steel with threaded or flanged piping connections and necessary taps, steel saddle and attaching U-bolts, prime coated, thermometer wells, and drain taps.
- C. Heads: Cast iron with steel tube sheets, threaded or flanged for piping connections.

- D. Water Chamber and Tube Bundle: Removable for inspection and cleaning.
- E. Design: Heating fluid in shell and heated fluid in tubes.

2.4 PLATE TYPE HEAT EXCHANGERS

- A. Frames: Carbon steel with baked epoxy enamel paint, stainless steel side bolts and shroud.
- B. Plates: Stainless steel Type 316.
- C. Gaskets: Nitrile rubber, Ethylene propylene diene monomer (EPDM), Neoprene, or Resin-cured butyl rubber.
- D. Nozzles: 150psig ASA rubber rated flange type.

PART 3 –EXECUTION

3.1 INSTALLATION

- A. Install work in accordance with applicable codes and laws as well as the Stanford Facilities Design Guidelines and all Stanford University Contract documents.
- B. Install with clearance to permit removal of tube bundle or plates with no disturbance to installed equipment and piping.
- C. Support heat exchangers on welded steel pipe and angle floor stand.
- D. Pitch shell to completely drain condensate.
- E. Pipe relief and drain valves to nearest floor drain.
- F. Provide steam to water heat exchanger with trim as follows:
 - 1. Shell: Pressure gage tapping with pigtail siphon and vacuum breaker.
 - 2. Water Inlet: Thermometer well, pressure gage tap and drain with valve.
 - 3. Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve, thermometer well and pressure gauge tap.
- G. Provide water to water heat exchanger with trim as follows:
 - 1. Water Inlets and Outlets: Thermometer wells and pressure gage taps
 - 2. Heated Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve and drain with valve.

END OF SECTION