



# THERMALINE™

## SHELL AND TUBE HEAT EXCHANGER INSTALLATION AND OPERATION INSTRUCTIONS

### INSTALLATION:

1. Provide sufficient clearance as follows:
  - a.) U-tube type units need clearance at the head of the unit to allow removal of the tube bundle from the shell.
  - b.) To conform to 3-A Sanitary Standards, the following is required:
    - 1.) Horizontal sanitary heat exchangers shall be mounted with a minimum clearance of 6" between the floor and the lowest part of the unit.
2. Vertical heat exchangers shall be mounted with a minimum of 4" of clearance between a wall or column and the outside of the heat exchanger.
3. Provide valves and bypasses in the piping system so the heat exchanger may be bypassed to allow removal (if applicable) for inspection, cleaning and repair.
4. Provide thermometer wells and pressure gauge connections in all piping, locating them close to the exchanger inlet and outlet.
5. Provide air vent cocks in unit piping to allow purging of non-condensable gases.
6. Foundations must be adequate so the exchanger will not settle and strain piping.
7. If Thermaline has provided the mounting support feet, one foot support should be installed that will allow for thermal expansion. The bolting for this foot should only be torqued to approximately 1 to 5 ft./lbs. If the customer is providing the supports, a thermal growth support design should be used.
8. Install the unit in a manner that will prevent the forcing of piping connections and that will allow the proper draining of the unit.
9. Inspect all openings in the exchanger for foreign material. Do not expose the unit to the elements with the covers removed from nozzles since rain water may enter the unit and cause severe damage if allowed to freeze.
10. Ensure the entire system is clean before starting operation to prevent plugging tubes with any foreign matter.
11. Gauge glasses should be installed in all vapor or gas environments to indicate potential flooding of these areas. These areas will flood if the condensate piping becomes clogged, the steam trap fails, or if the steam trap is inadequately sized.

## OPERATION:

1. When placing a unit in operation, open the vent connections and start to circulate the cold medium only. Be sure the passages in the exchanger are filled with the cold fluid before closing the vents. The hot medium should then be introduced gradually until all passages are filled with liquid. In the case of steam, start the flow slowly while the cold medium comes up to temperature slowly.
2. Start operation gradually. Do not introduce hot medium into the unit suddenly when empty or cold. Do not shock the unit with cold fluid when the unit is hot.
3. When shutting down a unit, the flow of any hot medium should be shut off first. If, for any reason, it is necessary to stop circulation of a cooling medium, the circulation of any hot medium should also be stopped by by-passing or other suitable means.
4. Do not operate equipment under conditions in excess of those specified on the unit nameplate.
5. When shutting down a unit, drain all Fluids to eliminate the possibility of freezing and/or corrosion. To guard against water hammer, all condensate should be drained from steam heaters and similar apparatuses at the time of start-up and shut-down.

## MAINTENANCE;

1. Provide a means for frequent cleaning of heat exchangers as suggested below:
  - a.) Some commercial cleaning compounds may be used to remove sludge or coke if hot wash, oil or water washing does not give satisfactory results.
  - b.) If the above described method is not effective for the removal of hard scale, a mechanical means of cleaning may be used.
2. At regular intervals, inspect the interior and exterior condition of all tubes and keep them clean. Failure to keep all tubes clean may, in time, result in termination of flow through some tubes. Such termination of flow leads to tube leaks and rupture.
3. Do not attempt to clean tubes by blowing steam through individual tubes. This will cause over stressing of these tubes and possible failure, especially in a TEMA type BEM unit constructed with straight tubes. TEMA type BEU bundles should be moved about on cradles or skids.
4. Exchangers subjected to fouling should be cleaned periodically. A marked increase in pressure drop and/or reduction in thermal performance usually indicates that cleaning is necessary. Frequent cleanings are recommended since the greater the build up of scale, the more difficult it is to remove.
5. In cleaning a tube bundle, tubes should not be hammered on with any metallic tool. If it is necessary to use scrapers, care should be exercised that the scraper is not sharp enough to cut the metal of the tubes.
6. When removing a tube bundle from an exchanger for inspection or cleaning care should be exercised so that it is not damaged by improper handling. Tubes are small and constructed of relatively thin material. Once removed, tube bundles should be properly supported with cradles located under baffles.