



YORK HEAT EXCHANGER TUBE DESIGN

TECHNICAL DATA

Supersedes: 160.00-TD1 (1295)

Form 160.00-TD1 (805)

YORK Millennium chillers utilize the latest, state-of-the-art tube surfaces, heat exchanger designs and materials to attain new levels of thermal transfer in a compact shell. Enhancements in water-side and refrigerant-side design minimize energy consumption, water pressure drop and tube fouling.

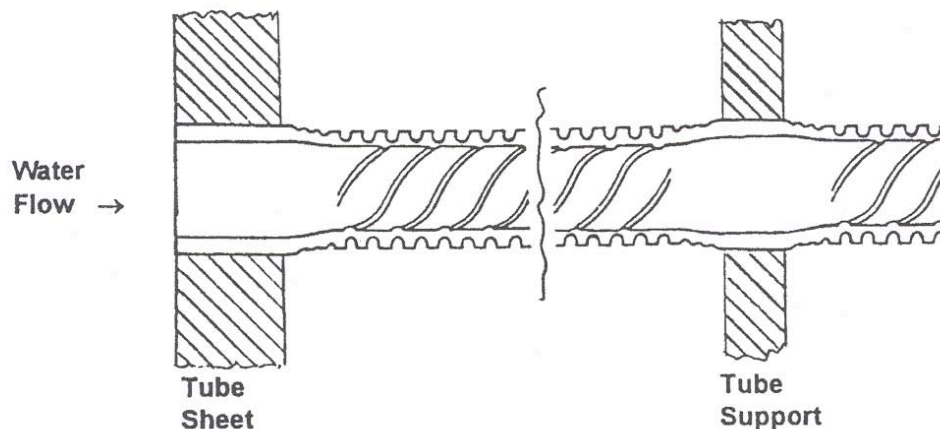
In addition, the heat exchanger tubes have been designed to provide the most reliable long term operation possible. All YORK tubes have plain copper lands (without internal and external enhancements) at the tube sheets and at all intermediate tube supports. This provides a double thickness of copper at these critical support portions of the tube.

All heat exchanger designs are evaluated for tube vibration. The predominant cause of vibration in an evaporator is the violent boiling action of the refrigerant. In the condenser, the source of vibration is from outside mechanical sources (pumps, compressor, etc.). Tube vibration problems are eliminated with 1/2" thick intermediate tube supports and/or rolling the tubes into the intermediate tube supports. This conservative design philosophy ensures maximum life from the heat exchangers.

The enhanced portion of tubes are not suitable for support due to the work hardening process in manufacturing the enhancements. Work hardened material is more brittle than the soft annealed copper lands. Tubes having continuous internal and external enhancement at the tube supports short change the tube and heat exchanger longevity in favor of a lower first cost product.

The common term, wall thickness or gage, refers to the minimum wall thickness of the tube. This would occur at the enhanced portion of the tube. Wall thickness is measured from the root of the outer enhanced surface to the root of the internal ribbed surface.

A cross section of the tube is shown in the diagram; and the actual wall thickness is tabulated for various tubes.



TUBE GAGE	ACTUAL TUBE THICKNESS	
	ENHANCED SECTION	PLAIN SECTION
23	0.025"	0.050-0.053"
22	0.028"	0.053-0.056"
20	0.035"	0.059-0.063"

The minimum wall thickness used in a particular product is a function of the maximum temperature and pressure to which the tube will be subjected. For chiller applications, wall temperatures are under 150°F allowing 0.025" wall copper tubes. Pressures are dictated by the refrigerant employed and design working pressure (DWP) of the heat exchangers. R-123 (15PSIG DWP) and R-134a (18OPSIG DWP) can utilize 0.025" wall copper tubes. For R-22 (265-300PSIG DWP) the ASME Code generally requires 0.028" copper tubes.

Good engineering practice also dictates the use of plain tube lands at the intermediate tube supports for all tube wall thicknesses. In the absence of plain tube lands, a minimum wall thickness of 0.035" should be specified to handle the tube support function.

Thicker wall tubes are sometimes specified in order to extend the life of the heat exchanger. As discussed above, the critical area is at the intermediate tube supports. A skipped fin 0.025" wall tube provides more thickness at the tube supports than a non-skipped 0.035" tube. For these applications the customer must specify skipped finned tubes to assure that extended life.

