

TECHNICAL UPDATE - TU-6001

SUBJECT: T316 or T304 STAINLESS STEEL TUBING IN UNITHERM TRACED BUNDLES

We are often asked why we specify AISI Type 316 stainless steel tubing in our Preinsulated and Heat Traced Tubing bundles instead of AISI Type 304 stainless steel. Type 316 is specified for two reasons: 1) increased corrosion resistance over Type 304, and 2) slight increased pressure capabilities over Type 304.

The higher nickel content of Type 316 stainless steel improves the resistance to a variety of corrodants seen in the chemical processing industry. The table below shows the chemical makeup of the two materials.

Type 316 stainless steel is also less susceptible to stress corrosion cracking than Type 304. Stress corrosion cracking (SCC) occurs when a tube is stressed and subjected to an electrolyte such as sea water. SCC results in localized cracks and leaks in the tube and can occur at very low stresses and in environments where general corrosion is negligible.

Accelerated crack testing has shown that Type 316 stainless steel tubes are two to four times more resistant to SCC than Type 304 stainless steel tubes.

The difference in pressure rating on these two materials is usually slight, but sometimes significant to the customer. The standard working pressure rating for a ½"OD x .049" wall seamless Type 316 stainless steel tube at 400°F is 4103 psig. The rating for the same tube in Type 304 stainless steel is 4% less, or 3976 psig. The spread in working pressures increases as the temperature increases.

Chemistry of Type 304 and Type 316 Austenitic Stainless Steels

Element (%)	Carbon	Manganese	Phosphorus	Sulfur	Silicon	Nickel	Chrome	Molybdenum
Type 304	.08 Max	2.00 Max	.045 Max	.03 Max	1.00	8.0-11.0	18.0-20.0	--
Type 316	.08 Max	2.00 Max	.045 Max	.03 Max	1.00	10.0-14.0	16.0-18.0	2.0-3.0

Balance of chemistry is iron for both Types.