

Protection Tube/Sheath Material Data

Material	Approximate Composition	Recommended Max. Temp.	Description	
			Applications	Remarks
Cast Iron	Fe	1600°F (870°C)	Molten Aluminum Die Castings	Needs daily application of white wash solution.
Carbon Steel	Sae 1018 or Sae 1020	1000°F (540°C)	Petroleum Tinning Galvanizing	Non-corrosive gases and liquids. Scales quickly at higher temperatures.
304 Stainless Steel	19% Cr 9% Ni 2% Mn 1% Si Balance Fe	1650°F (900°C)	Petroleum Products Mild Acids Steam Lines Food Processing	Good resistance to corrosion. Embrittles in the 900 to 1475°F range.
310 Stainless Steel	25% Cr 20% Ni 2% Mn 1.5% Si Balance Fe	2100°F (1150°C)	Chemical Applications Petroleum Products Kiln	High mechanical and creep strength at elevated temperatures. Very good corrosion resistance.
316 Stainless Steel	17% Cr 12% Ni 2% Mn 1% Si 2% Mo, Balance Fe	1700°F (930°C)	Chemical Applications Food Products Steam Lines	Higher corrosion resistance than 304. Resists pitting in sulphuric and phosphoric acids.
446 Stainless Steel	25%Cr 1.5% Mn 1% Si Balance Fe	2100°F (1150°C)	Neutral Salt Baths Some Molten Metals Furnaces	Highly resistant to Sulphur attack. General-purpose alloy.
Inconel®	60% Ni 23% Cr 14% Fe	2100°F (1150°C)	Heat Treating Furnaces Kilns	Generally used for high temperature. Good resistance to scaling to 2100°F. Should not be used where sulphur is present.
Monel®	66% Ni 31% Cu 1% Fe	1000°F (540°C)	Marine Conditions Chemical Applications Food Processing	Combines high strength and ductility. Withstands many corrosives.
HR-160®	37% Ni 29% Co 28% Cr 2.5% Si, 2% Fe	2200°F (1200°C)	Boilers & furnaces. Municipal, industrial, and hazardous waste incinerators	Excellent resistance to sulfidation and chloride attack.
Hastelloy® C-276	57% Ni 16% Mo 16% Cr 5.5% Fe	1000°F (540°C)	Marine Conditions Chemical Applications	Has excellent resistance to a wide variety of chemical process environments.
Titanium	Ti	1000°F (540°C)	Power generation Chemical processing Desalination plants	Excellent corrosion resistance, especially in the presence oxidizing acids and chlorides.
Molybdenum	99% Mo Desilicized	3100°F (1700°C)	Inert & Vacuum Atmosphere ONLY.	Very sensitive to oxidation above 925° F.
Tantalum	99% Ta Chromalized	4200°F (2300°C)	Inert & Vacuum Atmosphere ONLY.	Very sensitive to traces of Oxygen above 500° F.
Metal-Ceramic (LT-1)	77% Cr 23% Al Oxide	2500°F (1370°C)	High Temperature Applications.	Better resistance to mechanical and thermal shock than plain ceramics
Mullite	63% Al ₂ O ₃ 34% SiO ₂ Other Traces	3100°F (1700°C)	General High Temperature Applications	Good thermal shock resistance. Low rate of thermal expansion. Possibility of Platinum contamination above 2400° F.
Alumina	99% + Al ₂ O ₃	3400°F (1870°C)	High Temperature Applications	Fair thermal shock resistance. Resistance to gases at high temperatures. Less prone to Platinum contamination at high temperatures.
Silicon Carbide	90% Silicone-Nitrate 9% Si-Dioxide	3000°F (1650°C)	Secondary protection for Mullite or Alumina Tubes	Resistant to flame impingement. Fair thermal shock resistance.
Refrax	Silicon-Nitrite bonded Si-Carbide	3150°F (1730°C)	Secondary protection for Mullite or Alumina Tubes	Better resistance to mechanical and thermal shock. Not wetted by molten aluminum.

Common Pipe Sizes / Schedules

NPS PIPE SIZE	SCHEDULE	OUTSIDE DIAMETER	WALL THICKNESS	INSIDE DIAMETER
1/8"	10	.405"	.049"	.307"
	40	.405"	.068"	.269"
	80	.405"	.095"	.215"
1/4"	10	.540"	.065"	.410"
	40	.540"	.088"	.364"
	80	.540"	.119"	.302"
3/8"	10	.675"	.065"	.545"
	40	.675"	.091"	.493"
	80	.675"	.126"	.423"
1/2"	10	.840"	.083"	.674"
	40	.840"	.109"	.622"
	80	.840"	.147"	.546"
3/4"	10	1.050"	.083"	.884"
	40	1.050"	.113"	.824"
	80	1.050"	.154"	.742"
1"	10	1.315"	.109"	1.097"
	40	1.315"	.133"	1.049"
	80	1.315"	.179"	.957"
1-1/4"	10	1.660"	.109"	1.422"
	40	1.660"	.140"	1.380"
	80	1.660"	.191"	1.278"
1-1/2"	10	1.900"	.109"	1.682"
	40	1.900"	.145"	1.610"
	80	1.900"	.200"	1.500"