LIGHTING EQUIPMENT MATERIALS – TYPES 316 AND 316L STAINLESS STEEL

DESCRIPTION

Type 316 (UNS S 31600) is an austenitic chromium-nickel stainless and heat resistant steel with superior corrosion resistance to other chromium-nickel steels when exposed to many types of chemical corrosives, as well as marine atmospheres. It also has superior creep strength at elevated temperatures. In the lower carbon 316L material, carbide precipitation, as a result of welding, will be minimized, resulting in less susceptibility to intergranular corrosion.

PRODUCT FORMS

- Ingots
- Slabs
- Hot bands
- Sheet
- Strip

TYPICAL APPLICATIONS

- Chemical screens, storage and transportation tanks, tubing.
- Food processing equipment, steam-cooking kettles.
- Oil refining equipment.
- Paper digesters, evaporators, handling equipment.
- Pharmaceutical processing equipment.
- Scrubbers for environmental control.
- Soap and photographic handling equipment.
- Textile industry.

PROCESSING

Annealing

Cool rapidly from 1950- 2050°F The object of this treatment is to take the carbides into solution and keep them in solution by cooling rapidly (usually in water).

Hardening

These grades can be hardened only by cold working. See table of Typical Mechanical Properties.

Stress Relieving

The recommended temperature range for stress relieving is 400-750°F.

Hot Working

- Preheating temperature — 1500-1600°F for large sections.
- Forging and pressing temperature — 2100-2300°F.
- Finishing temperature — 1700°F (the reductions below 1800° should be light).

FORMING

Types 316 and 316L can be formed into most shapes. However, as they will work harden, material should be in the annealed condition before each severe cold forming operation. It is also recommended that after severe cold forming operations, material be stress relieved as a final step.

WELDING

Types 316 and 316L possess excellent welding characteristics. These grades can be welded by the electric arc, gas fusion or electric resistance processes. Welds in these alloys possess toughness, structural stability and high strength. Types 316 or 316Cb filler metal or electrodes may be used.

CORROSION

Type 316 stainless has excellent resistance to most organic acids. e.g., acetic, benzoic, lactic. It is superior to the regular chromium nickel stainless grades in sea water and is less susceptible to pitting attack.

OXIDATION

In ordinary atmosphere, Type 316 has good scaling resistance up to 1650°F in continuous service, 1500°F in intermittent service.

CHEMICAL COMPOSITION

Carbon	Manganese	Silicon	Chromium	Nickel	Moly.
T316. 0.08 max.	2.00	1.00	16.00	10.00	2.00
T316L 0.03 max.	max.	max.	18.00	14.00	3.00

TYPICAL MECHANICAL PROPERTIES

Finish/ Condition	Yield Strength psi	Tensile Strength psi	Elongation in 2 in., %	Hardness Rockwell B
No. 1/2D Finish, annealed	40,000	84,000	52	79
No. 2/2B Finish, skin passed	45,000	84,000	50	83

PHYSICAL PROPERTIES

Density lb./cu.in.	Modulus of Elasticity in Tension x 10^6, psi	Specific Heat Btu/°F/lb.	Thermal Conductivity Btu/hr/ft²/ft	
		32-212°F	°F	
0.29	28.0	0.12	212	932
			9.4	12.4

Mean Coeficient of Thermal Expansion per °F (x10^6)				Melting Point Range	Electrical Resistivity microhm-cm
°F				°F	@ 70°F
32-212	32-600	32-1000	32-1200	2550	74
8.9	9.0	9.7	10.3	2550	

ELEVATED TEMPERATURE STRENGTH

Creep Strength, load for 1% elong. 10,000 hr. psi	Temperature			
	1000°F	1100°F	1200°F	1300°F
	25,000	18,200	12,700	7900

GUTH®
LIGHTING FOR DEMANDING ENVIRONMENTS

LIGHTING EQUIPMENT MATERIALS – TYPES 304 AND 304L STAINLESS STEEL

DESCRIPTION

Type 304 (UNS S 30400) is the most widely used of the austenitic chromium-nickel stainless steels. Its carbon content is lower and its corrosion resistance somewhat higher than Type 302. In the annealed condition, Type 304 is essentially non-magnetic and becomes slightly magnetic when cold worked. In the lower carbon Type 304L material, carbide precipitation as a result of welding will be minimized, resulting in less susceptibility to intergranular corrosion.

PRODUCT FORMS

- Ingots
- Slabs
- Hot bands
- Sheet
- Strip

TYPICAL APPLICATIONS

- Beer barrels
- Chemical equipment
- Coal hopper linings
- Cooling coils
- Cryogenic vessels and components
- Dairy equipment
- Evaporators
- Feedwater tubing
- Food handling equipment
- Hypodermic needles
- Milking machines
- Nuclear vessels and components
- Oil well filter screens
- Pressure vessels
- Sanitary fittings and valves
- Shipping drums
- Still tubes
- Textile dyeing equipment

PROCESSING

Annealing

Heat to 1850-2050°F and cool rapidly — light gauge sheets may be air cooled. Heavier sections should be water- quenched. Maximum corrosion resistance is obtained when final anneal is above 1950 °F.

Hardening

These grades can be hardened only by cold work. They will work harden less than Types 301 and 302 and are used where multiple drawing operations are necessary without intermediate anneals. See table of Typical Mechanical properties.

Stress Relieving

The recommended temperature range for stress relieving is 400-750°F.

Hot Working

- Initial forging and pressing temperature — 2100-2300°F.
- Finishing temperature — 1600 °F
- Reductions under 1800°F should be light.

FORMING

These grades can be formed into most shapes. In many cases, more than one forming operation may be conducted before a re-anneal is necessary.

WELDING

Type 304 lends itself exceptionally well to fabrication by welding. The welds are as strong and ductile as the parent metal since the material is non-air hardening. The material may be welded by the electric arc, gas fusion or electrical resistance welding processes. For gas or electric arc welding, Type 308 filler metal and electrodes are used.

CORROSION

Like Type 302, Type 304 in the fully annealed condition is highly resistant to the corrosive atmospheres of city, rural and seaside locations. Type 304 is also quite resistant to most organic acids. Because of its lower carbon content, Type 304 is less prone to carbide precipitation and may be used as welded in many applications.

OXIDATION

Type 304 has excellent resistance to oxidation when used up to 1650°F in continuous service, and up to 1500°F in intermittent service.

CHEMICAL COMPOSITION

Carbon	Manganese	Silicon	Chromium	Nickel
T304 0.08 max.	2.00	1.00	18.00	8.00
T304L 0.03 max.	max.	max.	20.00	10.50

TYPICAL MECHANICAL PROPERTIES

Finish/ Condition	Yield Strength psi	Tensile Strength psi	Elongation in 2 in., %	Hardness Rockwell B
No. 1/2D Finish, annealed	39,000	87,000	56	82
No. 2/2B Finish, skin passed	46,000	89,000	55	86

PHYSICAL PROPERTIES

Density lb./cu.in.	Modulus of Elasticity in Tension x 10^6, psi	Specific Heat Btu/°F/lb. 32-212°F	Thermal Conductivity Btu/hr/ft^2/ft °F	
0.29	28.0	0.12	212	932
			9.4	12.4

Mean Coeficient of Thermal Expansion °F (x10^{-6})				Melting Point Range	Electrical Resistivity microhm-cm
°F					
32-212	32-600	32-1000	32-1200	2550	72
9.6	9.9	10.2	10.4	2650	

ELEVATED TEMPERATURE STRENGTH

Creep Strength, load for 1% elong. 10,000 hr. psi	Temperature			
	1000°F	1100°F	1200°F	1300°F
	17,000	12,000	7000	4000

LIGHTING EQUIPMENT MATERIALS – STAINLESS STEEL CORROSION RESISTANCE DATA

The following table presents information as to the relative corrosion resistance of representative types of stainless steels, namely Types 316, 304. This data is based on laboratory tests and should be considered only as an indication of service life to be anticipated.

Under service operating conditions, many variations are encountered such as fluctuations in temperature, impurities in materials being processed, and local variations in concentrations. etc. Fabrication problems such as welding, brazing and heat treating must also be considered In the selection of the right type of stainless. The design factor must be studied as it, too, enters into the selection. It is important that sufficient access be made to equipment that it might be properly cleaned. Crevices and sharp corners should be avoided, welds should be ground smooth, etc.

In view of the above, it is recommended that, wherever possible, samples of stainless steel should be subjected to actual operating conditions for evaluation before application to production.

CHEMICAL MEDIA	TEMP °F	316L	304L
Acetic Acid			
5 to 20%	70°	●	●
50%	70°	●	●
80%	70°	●	●
100%	70°	●	●
50%	Boiling	●	
80%	Boiling	●	■
100%	Boiling	●	
Acetic Anhydride			
90%	70°	●	●
90%	Boiling	●	●
Acetic Vapors			
30%	Hot	●	
100%	Hot		■
Acetone			
	70°	●	●
	Boiling	●	●
Acetylene	70°	●	●
Alcohol, Ethyl			
	70°	●	●
	Boiling	●	●
Alcohol, Methyl			
	70°	●	●
	150°	●	
Aluminum	Molten	■	■
Aluminum Acetate			
Saturated	70°	●	●
Saturated	Boiling	●	■
Aluminum Chloride			
25%	70°		■
Saturated	70°	—	■
Aluminum Fluoride	70°		■
Aluminum Hydroxide			
Saturated	70%	●	●
Aluminum Potassium Sulphate			
2% and 10%	70°	●	●*
2% and 10%	Boiling	●	●*
Saturated	Boiling	●	●*
Aluminum Sulphate			
10%	70°	●	●*
Saturated	70°	●	●*
10%	Boiling	●*	●*
Saturated	Boiling	●*	●*
Ammonia (Dry or Moist)			
All concentrations			
	70° and Hot	●	●
Anhydrous	70°	●	●
Anhydrous	Hot	■	■
Ammonium Bicarbonate	70° and Hot	●	●
Ammonium Carbonate			
1% and 5%	70°	●	●
Aerated or agitated	70°	●	●
Ammonium Chloride			
1%	70°	●	●*
10-28-50%	Boiling	●*	●*
Ammonium Nitrate			
All concentrations	70°	●	●
Saturated	Boiling	●	●
Ammonium Oxalate, (5%)	70°	●	●
Ammonium Persulphate, (5%)	70°	●	●
Ammonium Perchlorate			
10%	Boiling	●	●

CHEMICAL MEDIA	TEMP °F	316L	304L
Ammonium Phosphate			
5%	70°	●	●
	70°	●	●
Saturated	70°	●	●
Ammonium Sulphate			
1% and 5%	70°	●	●
10%	Boiling	●*	●*
Saturated	Boiling	●*	●*
Ammonium Sulphate	70° and Boiling	●	●
Aniline			
3%	70°	●	●
Concentrated crude	70°	●	●
Aniline Hydrochloride	70°	■	■
Anlimony	Molten	■	■
Anlimony Trichloride	70°	■	■
Amyl Acetate (Conc.)	70°	●	●
Amyl Chloride	70°	●	●
Arsenic Acid	150°	●	●
Barium Carbonate	70°	●	●
Barium Chloride			
5%	70°	●	*
Saturated	70°	●	●*
Aqueous Solution	Hot	●*	●*
Barium Sulphate	70°	●	●
Barium Sulphide			
Saturated solution	70°	●	●
Beer	70°	●	●
Barley (Malt and Hops)	70°	●	●
Alcohol (3 1/2 to 4 1/2%)	160°	●	●
Benzene	70°	●	●
Benzoic Acid	70°	●	●
Benzol	70°	●	●
Blood (Meat Juices)	Cold	●	●*
Borax (5%)	Hot	●	●
Boric Acid			
5%	Hot	●	●
Saturated solution	Boiling	●*	●*
Bromine	70°	■	■
Buttermilk	70°	●	●
Bulryic Acid			
5%	70°	●	●
5%	150°	●	●
Aqueous Sol Sp.G. 964	Boiling	●	●
Calcium Carbonate	70°	●	●
Calcium Chlorate			
Dilute Solution	70°	●	●
Dilute Solution	Hot	●	●
Calcium Chloride			
Dilute Solution	70°	●*	●*
Conc. Solution	70°	●*	●*
Calcium Hydroxide			
10%	Boiling	●	●
20%	Boiling	●	●
50%	Boiling	●	^
Calcium Hypochlorite (2%)	70°	●*	●*
Calcium Sulphate			
Saturated	70°	●	●
Carbolic Acid			
CP	70°	●	●
CP	Hot	●	●
Carbonated Water			
(Carbonic Acid)	Cold and Hot	●	●
Carbon Bisulphide	70°	●	●

CHEMICAL MEDIA	TEMP °F	316L	304L
Carbon Monoxide Gas	1400°	●	●
	1600°	●	●
Carbon Tetrachloride			
CP (Dry)	70°	●	●
CP (Dry)	Boiling	●	●
Aqueous solution (10%)	70°	●*	*
Chinosol			
Antiseptic solution 10-500	70°	●	●
Chloracetic Acid	70°	*	■
Chlorbenzol			
Pure, Dry	70°	●	●
Chloric Acid	70°	■	■
Chlorinated Water			
Saturated	70°	^	■
Chlorine Gas			
Dry gas	70°	^	^
Moist gas	70°	■	■
Chloroform (Dry)	70°	●	●
Chromic Acid			
CP 10%	70°	●	●
CP 10%	Boiling	●	*
CP 50%	Boiling	^	*
Chromic Acid			
50% commercial (Cont. SO_3)	70°	●	●
50% commercial (Cont. SO_3)	Boiling	■	■
Chromium Plating Bath	70°	●	●
Cider	70°	●	●
Citric Acid			
10%	70°	●	●
25%	70°	●	●
50%	70°	●	●
10%	Boiling	●	●
25%	Boiling	●	■
50%	Boiling	●	■
Coca-Cola Syrup (Pure)	70°	●	●
Coffee	Boiling	●	●
Copper Acetate			
Saturated	70°	●	●
Copper Carbonate			
Sat. sol. in 50% NH_4OH	70°	●	●
Copper Chloride			
1% aerated	70°	●*	●*
5% aerated	70°	^	■
Copper Cyanide			
Saturated	Boiling	●	●
Copper Nitrate			
5%	70°	●	●
50%	Boiling	●	●
Copper Sulphate			
5% aerated	70°	●	●
Saturated	Boiling	●	●
Creosote (Coal Tar)	Hot	●	●
Cyanogen Gas	70°	●	●
Dichloroethane	Boiling	●	●
Dinitrochlorobenzene			
Melted and solidiified	70%	●	●
Dyewood Liquor	70°	●	●**
Epsom Salt			
Magnesium sulphate	Cold and Hot	●*	●*
Ether	70°	●	●
Ethyl Alcohol, (10% to 100%)	70°	●	●

CHEMICAL MEDIA	TEMP °F	316L	304L
Ethyl Chloride (Dry)	70°	●	●
Dthylene Glycol (Conc.)	70°	●	●
Ferric Chloride			
All concentrations	70°	■	■
Ferric Hydroxide	70°	●	●
Ferric Nitrate			
All concentrations	70°	●	●
Ferrous Chloride			
Saturated	70°	^	■
Ferrous Sulphate			
10%	70°	●	●*
10%	Boiling	●	●
Fluorine (Gas)	70°		
Formalin			
(Formaldehyde, 40%)	70°	●	●*
Formic Acid			
5%	70°	●	●
10%	70°	●	●
50%	70°	●	●
100%	70°	●	●
10%	Boiling	●	●
50%	Boiling	●	●
100%	Boiling	●	●
Fruit Juices	70°	●	●
Fuel Oil	Hot	●	●
Furfural	70°	●	●
Gallic Acid			
5%	70°	●	●
5%	150°	●	●
Saturated, 212°F	Boiling	●	●
Gasoline	70°	●	●
Gelatine	70°	●	●
Glue			
Dry	70°	●	●
Solution Acid	70° and 140°	●*	**
Glycerine	70°	●	●
Hydrobromic Acid		■	■
Hydrochloric Acid			
All concentratons	70°	■	■
Hydrocyanic Acid		●	●
Hydrofluoric Acid			
All concentration	70° and Hot	■	■
Hydrofluosilici Acid	70°	■	■
Hydrogen Peroxide	70°	●	●
	Boiling	●	●
Hydrogen Sulphide			
Dry	70°	●	●
Wet	70°	●**	●**
Iodine	70°	■	■
Iodoform	70°	●	●
Kerosene	70°	●	●
Ketchup	70°	●	●*
Lactic Acid			
1%, 5% and 10%	70°	●	●
1%	Boiling	●	●
5%	Boiling	●	^
10%	Boiling	●	*
Lard	70°	●	●
Lead (Molten)	1000°F	^	^
Lead Acetate (5%)	Boiling	●	●
Linseed Oil	70°	●	●
Lysol	70°	●	●
Magnesium Carbonate			
All concentrations	70°	●	●

* Pitting occurs under some conditions.

**Attack may occur if sulphuric acid is present.

Symbols indicate recommendation:

- • Recommended
- ^ Light attack —use with caution
- ■ Chemically attacked - not recommended
- – Not tested

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LIGHTING FOR DEMANDING ENVIRONMENTS

LIGHTING EQUIPMENT MATERIALS – STAINLESS STEEL CORROSION RESISTANCE DATA (CONT.)

CHEMICAL MEDIA	TEMP °F	316L	304L
Magnesium Chloride			
1% and 5%	70°	●*	●*
	Hot	●*	*
Magnesium Hydroxide	70°	●	●
Magnesium Nitrate			
All concentrations	70°	●	●
Malic Acid	Cold and Hot	●	●
Mayonnaise	70°	●	●*
Mercunc Chloride			
(Dil. Sol.)	70°	■	■
Mercury		●	●
Methanol (See Methyl Alcohol)			
Milk (Fresh or Sour)	Cold or Hot	●	●
Mixed Acids			
50% H_2SO_4	Cold	●	●
50% HNO3	200°	●	●
	Boilng	■	■
15% H_2SO+5%			
HNO_3 +80% water	200°	●	●
	Boiling	●	●
Molasses		●	●
Molybdic Acid (5%)	70°	●	●
Mustard	70°	●*	●*
Munatic Acid	70°	■	■
Naphtha (Pure)	70°	●	●
Naphtha (Crude)	70°	●	●
Nickel Chloride Solution	70°	●*	●*
Nickel Sulphate Solution	70°	●*	●*
Niter Cake	Fused	●	●
Nitric Acid			
Allconcentrations	70°	●	●
5%	Boiling	●	●
20%, 40% and 65%	Boiling	●	●
Concentrated	Boiling	●	●
Fuming conc.	70°	●	●
Fuming conc.	Boiling	■	■
Nitrous Acid (5%)	70°	●	●
Oils (Crude)	Cold and Hot	●**	●**
Oils			
(Vegetabel and Mineral)	Cold and Hot	●**	●**
Oleic Acid	70°	●	●
	300°	●	●
	400°	●	^
Oxalic Acid			
5%	70°	●	●
10%	Boiling	●	●
10%	70°	^	■
25%	Boiling	^	■
50%	Boiling	^	■
Paraffin	Cold and Hot	●	●
Petroleum Ether			
Phenol (See Carbolic Acid)			
Phenolic Resins	Cold and Hot	●	●
Phosphoric Acid			
1% and 5%	70° and Boiling	●	●
10% Still	70°	●	●
10%	Boiling	●	^
50%	Boiling	●	*
Picnc Acid	Boiling	●	●
Pine Tar Oil	Cold and Hot	●	●
Potassium Bichromate			
25%	70°	●	●
25%	Boiling	●	●

CHEMICAL MEDIA	TEMP °F	316L	304L
Potassium Bromide	70°	●*	●*
Potassium Carbonate			
Solution	70° and Boiling	●	●
Potassium Chlorate			
Saturated	Boiling	●	●
Potassium Chloride			
1% and 5%	70°	●*	●*
1% and 5%	Boiling	●*	●*
Potassium Dichromate			
All concentrations	Cold and Hot	●	●
Potassium Ferricyanide			
5%	70°	●	●
5% and 25%	Boiling	●	●
Potassium Ferrocyanide	70°	●	●
Potassium Hydroxide			
5%	70°	●	●
27% and 50%	Boiling	●	●
Potassium Iodide			
All concentrations	Cold and Hot	●	●
Potassium Nitrate			
50%	70°	●	●
50%	Boiling	●	●
Potassium Oxalate			
Potassium Permanganate			
5%	70°	●	●
5%	Boiling	●	●
Potassium Sulphate			
1%	70°	●	●
5%	70°	●	●
5%	Hot	●	●
Potassium Sulphate			
1%	70°	●	●
5%	70°	●	●
5%	Hot	●	●
Potassium Sulphide Solution	Hot	●	●
Pyrogalic Acid			
Quinine Bisulphate (Dry)		●	●
Quinine Sulphate (Dry)		●	●
Rosin	Moltin	●	●
Sauerkraut Brine	70°	●	■
Sea Water	70°	●	●*
Sewage		●**	●**
Silver Bromide		●*	●*
Silver Chloride		■	■
Silver Nitrate		●	●
10%	70°	●	●
10%	Boiling	●	●
Soaps	70°	●	●
Sodium Acetate (Moist)		●	●*
Sodium Bicarbonate			
All concentrations	70°	●	●
5%	150°	●	●
Sodium Bichromate			
Sodium Bisulphate			
10%	70°	●	●
10%	Boiling	●	●
Sodium borate			
All concentrations	Cold and Hot	●	●
Sodium Carbonate			
5%	Boiling	●	●
50%	Boiling	●	●
Molten	1650°		

CHEMICAL MEDIA	TEMP °F	316L	304L
Sodium Chlorate			
25%	Cold and Hot	●	●
Sodium Chloride			
All concentrations	70°	●*	●*
Saturated	70° and Boiling	●	●*
Sodium Citrate			
All concentrations	Cold and Hot	●	●
Sodium Fluoride			
5%		●*	●*
Sodium Hydroxide			
20% and 30%	70°	●	●
20%	Boiling	●	●
30%	Boiling	●	●
Molten	650°	●	●
Sodium Hypochlorite (5%)	70°	●*	^*
Sodium Hyposulphite	70°	●	●
Sodium Nitrate			
All concentrations	Cold and Hot	●	●
Sodium Perchlorate			
10%	70°	●	●
10%	Boiling	●	●
Sodium Peroxide (10%)	70°	●	●
	Boiling	●	●
Sodium Phosphate			
5%	Cold and Hot	●	●
Sodium Sulphate			
5%	70°	●	●
Saturated	Boiling	●	●
Sodium Sulphide			
5%	70°	●	●*
50%	Boiling	●	●*
Sodium Sulphite			
5%	70°	●	●
25% and 50%	Boiling	●	●
Sodium Thiosulphate			
25%	70°	●**	●**
Saturated	70° and Boiling	●**	●**
Acid fixing bath (Hypo)	70°	●	●
Stannic Chloride			
Sp. Gr. 1.21	70°		■
Sp. Gr. 1.21	Boiling	■	■
Stannous Chloride			
Saturated	120°	●	^
Saturated	Boiling	—	■
Steam		●	●
Stearic Acid	70°	●	●
Strontium Hydroxide			
Strontium Nitrate Solution	Hot	●	●
Sugar Juice	Hot	●	●
Sulphur			
Fused	265°	●	●
Boiling	830°	■	■
Sulphur Chloride	Cold and Hot	■	■
Sulphpur Dioxide Gas			
Dry	575°	●	●
Moist	70°	●	●

CHEMICAL MEDIA	TEMP °F	316L	304L
Sulphur Monochloride	70°	●	^
Suphuric Acid			
5%	70°	●	^
10%	70°	●	*
50%	70°	^	■
Concentrated	70°	●	●
Fuming	70°	●	^
5%	Boiling	^	■
10%	Boiling	^	■
50%	Boiling	■	■
Concentrated	Boiling	^	^
Suphurous Acid			
Saturated	70°	●*	^*
150- pressure	375°	●*	^*
Tannic Acid			
10%	70°	●	●
50%	70°	●	●
10%	Boiling	●	●
50%	Boiling	●	●
Tanning Liquor	70°	●	●
Tar		●	●
Tartaric Acid			
10%	70°	●	●
50%	70°	●	●
10%	Boiling	●	●
50%	Boiling	●	●
Tin	Molten	■	■
Trichloracetic Acid	70°	■	■
Trichlorethylene (Dry)	70°	●*	●*
Tung Oil	Cold and Hot	●	●
Uric Acid	70°	●	●
Varnish	70°	●	●
	Hot	●	●
Vegetable Juices		●	●
Vinegar	70°	●	●
	Hot	●	●
Whiskey		●	●
Wort		●	●
Zinc	Molten	■	■
Zinc Chloride			
5%	70°	●	●
20%	70°	●	●
70%	70°	●	●
5%	Boiling	●*	●*
20%	Boiling	●	●
70%	Boiling	●	■
Zinc Cyanide (Moist)	70°	●	●
Zinc Nitrate Solution	Hot	●	●
Zinc Sulphate			
5%	70°	●	●
Saturated	70°	●	●
25%	Boiling	●	●

* Pitting occurs under some conditions.
**Attack may occur if sulphuric acid is present.

Symbols indicate recommendation:

- • Recommended
- ^ Light attack —use with caution
- ■ Chemically attacked - not recommended
- – Not tested