RUBBER ELASTOMERS

The chart below shows the general characteristics of some of the common rubber compounds. Elastomers are mixed with various chemicals to provide a wide range of physical properties for specific service needs.

ASTM DESIGNATION	COMMON NAME	COMPOSITION	GENERAL PROPERTIES
CR	Neoprene	Chloroprene	• Good abrasion resistance • Good weathering resistance • Good oil resistance • Flame retarding
NBR	Nitrile (Buna-N)	Acrylonitrile-butadiene	• Excellent oil resistance • Moderate resistance to aromatics
IIR	Butyl	Isobutene-isoprene	• Excellent weathering resistance • Good resistance to fire resistant fluids • Good heat resistance • Low permeability to air • Poor resistance to petroleum fluids
CIIR	Chlorinated Butyl	Chloro-isobutene isoprene	• Similar to butyl
SBR	SBR	Styrene-butadiene	• Good abrasion resistance • Poor resistance to petroleum fluids
EPDM	EPDM	Ethylene-propylene diene terpolymer	• Excellent ozone resistance • Good chemical resistance • Good temperature resistance • Poor petroleum characteristics
ECO	Epichlorohydrin Copolymer	Ethylene oxide Chloromethyl oxirane	• Excellent oil resistance • Excellent ozone resistance • Good low temperature properties • Low permeability to air • Fair flame resistance
XLPE	Cross-Linked Polyethylene	Polyethylene and cross linking agents	• Excellent chemical resistance
PA	Nylon	Polyamide	• Good abrasion resistance • Good chemical resistance • Low coefficeint of friction
CSM	Hypalon	Chloro-sulfonated Polyethylene	• Excellent ozone resistance • Good abrasion resistance • Good heat resistance • Fair petroleum qualities
NR	Natural Rubber	Isoprene rubber (Natural)	• Excellent abrasion resistance • Acid resistance • Not oil resistant
AFMU	Teflon	Tetrafluro ethylene	• Excellent high temperature resistance • Excellent chemical resistance
V-NBR	Vinyl Nitrite	PVC/NBR	• Good ozone resistance • Good resistance to animal fats and oils • Good petroleum resistance

CHEMICAL RESISTANCE DATA—Chemical Resistance of Polymers

Because of variations in compounding of the polymers used in RAGCO hose, maximum temperature recommendations will vary with the type and concentrations of the chemicals handled. Consult RAGCO for specific recommendations. This table is abstracted from the RMA Hose Handbook. The code used to indicate the type of service to be expected from each polymer is as follows:

G — Good service. Suitable for continuous use.
F — Fair service. Usually suitable for continuous service and suitable for intermittent service.
C — Conditional service. Suitable if exposure is limited or infrequent.
X — Not recommended.
Blank — Insufficient information at time of publication.

Maximum temperature 100°F (38°C) unless otherwise specified.

Chemical	Natural Rubber	SBR	Neoprene (CR)	Nitrile (NBR)	Butyl (IIR)	Hypalon* (CSM)	EPDM	Viton* (FPM)	Polyethylene (XLPE)
Acetic acid, dilute, 10%	F	C	C	C	G	C	G	X	G
Acetic acid, glacial	C	X	X	X	F	C	F	X	G
Acetic anhydride	C	C	F	F	F	G	X	G	
Acetone	G	G	F	X	G	F	G	X	G
Acetylene	G	G	F	G	G	F	G	G	
Air 150°F (65°C)	G	G	G	G	G	G	G	G	
Aluminum chloride 150°F (65°C)	G	G	G	G	G	G	G	G	G
Aluminum fluoride 150°F (65°C)	G	G	G	G	G	G	G		
Aluminum sulfate 150°F (65°C)	G	G	G	G	G	G	G	G	
Alums 150°F (65°C)	G	G	G	G	G	G	G	G	
Ammonia gas	G	G	G	G	G	G	G	X	G
Ammonium chloride	G	G	G	G	G	G	G	G	
Ammonium hydroxide	C	F	F	F	G	G	G	G	G
Ammonium nitrate	G	G	G	G	G	G	G	G	
Ammonium phosphate, monobasic	G	G	G	G	G	G	G	G	
Ammonium phosphate, dibasic	G	G	G	G	G	G	G	G	
Ammonium phosphate, tribasic	G	G	G	G	G	G	G	G	
Ammonium sulfate	G	G	G	G	G	G	G	G	
Amyl acetate	F	X	X	X	F	X	G	X	G
Amyl alcohol	G	G	G	G	G	G	G	G	G
Aniline, Aniline Oil	X	X	C	X	G	X	C	G	G
Aniline dyes	F	F	F	F	G	F	C		
Animal fats	X	X	F	G	X	F	F	G	G
Animal oils	X	X	X	G	F	X	G	G	
Asphalt	X	X	F	F	X	F	X	G	X
Barium chloride	G	G	G	G	G	G	G	G	
Barium hydroxide	G	G	G	G	G	G	G	G	
Barium sulfide	G	G	G	G	G	G	G	G	
Beer	G	G	G	G	G	G	G	G	
Beet sugar liquors	G	G	G	G	G	G	G	G	
Benzene (Benzol)	X	X	X	C	X	X	X	G	G
Benzine, petroleum ether	X	X	C	F	X	F	X	G	
Benzine, petroleum naphtha	X	X	C	F	X	F	X	G	
Black sulfate liquor	G	G	G	G	G	G	G	G	
Blast furnace gas	C	C	G	C	C	C	C	G	
Borax	G	G	G	G	G	G	G	G	
Boric acid	G	G	G	G	G	G	G	G	
Brine	G	G	G	G	G	G	G	G	
Bromine	X	X	X	X	X	C	X	G	F
Butane	X	X	F	G	X	G	X	G	
Butyl acetate	C	X	X	X	F	X	F	X	G
Butyl alcohol (butanol)	G	G	G	G	G	G	G	G	G
Calcium bisulfate	C	C	G	G	F	G	F	G	
Calcium chloride	G	G	G	G	G	G	G	G	
Calcium hydroxide	G	G	G	G	G	G	G	G	

DuPont trademarks. Note: Teflon, while not listed, will generally handle satisfactorily all the chemicals listed.*

CHEMICAL RESISTANCE DATA—Chemical Resistance of Polymers

Maximum temperature 100°F (38°C) unless otherwise specified.

Chemical	Natural Rubber	SBR	Neoprene (CR)	Nitrile (NBR)	Butyl (IIR)	Hypalon* (CSM)	EPDM	Viton* (FPM)	Poly-ethylene (XLPE)
Calcium hypochlorite	X	X	X	X	G	F	G	F	
Caliche liquors	G	G	G	G	G	G	G	G	
Cane sugar liquors	G	G	G	G	G	G	G	G	
Carbolic acid (Phenol)	C	C	C	C	C	C	G	G	
Carbon dioxide, wet or dry	G	G	G	G	G	G	G	G	
Carbon disulfide	X	X	X	X	X	X	X	G	C
Carbon monoxide 150°F (65°C)	C	C	C	C	C	F	C	G	
Carbon tetrachloride	X	X	X	C	X	X	X	G	G
Castor oil	G	G	G	G	G	G	G	G	
Cellusolve acetate	F	F	X	X	G	G	C	G	
China wood oil (Tung oil)	X	X	F	G	G	F	G	C	G
Chlorine, wet or dry	X	X	X	X	X	X	X	G	F
Chlorinated solvents	X	X	X	X	X	X	X	G	
Chloroacetic acid	X	C	C	C	X	G	X	G	
Chlorosulfonic acid	X	X	C	C	X	X	X	X	F
Chromic acid	X	X	X	X	C	G	F		
Citric acid	G	G	G	F	G	G	G	G	
Coke oven gas	C	C	C	C	C	G	X	C	
Copper chloride 150°F (65°C)	C	G	F	G	G	F	G	G	
Copper sulfate 150°F (65°C)	C	G	G	G	F	G	G	G	
Corn oil	X	C	F	G	G	F	C	C	
Cottonseed oil	X	C	F	G	G	F	C	G	G
Creosols (Cresylic acid)	C	X	X	C	C	F	X	G	
Creosote, coal tar	X	X	F	G	X	F	X	F	G
Creosote, wood	X	X	F	G	X	F	X	F	G
Ethers	C	C	C	C	C	F	X	X	G
Ethyl acetate	F	X	X	X	F	X	F	X	G
Ethyl alcohol (Ethanol)	G	G	G	G	G	G	G	G	G
Ethyl cellulose	F	F	F	F	F	F	G		
Ethyl chloride	G	F	F	X	G	F	G	F	F
Ethylene glycol	G	G	G	G	G	G	G	G	G
Ferric chloride 150°F (65°C)	G	G	G	G	G	G	G	G	
Ferric sulfate 150°F (65°C)	G	G	G	G	G	G	G	G	
Formaldehyde	G	G	C	G	G	G	G	G	G
Formic acid	G	G	C	F	G	G	G	X	F
Freon #12, liquid	X	X	G	F	F	F	G		
Fuel Oil	X	X	F	G	X	F	X	G	
Furfural	X	C	C	X	G	F	C	X	G
Gasoline, unleaded	X	X	X	G	X	X	X	G	F
Gasoline, regular, leaded	X	X	X	C	X	X	X	G	F
Gasoline, hi-test, leaded	X	X	X	G	X	X	X	G	F
Gelatin	G	G	G	G	G	G	G	G	
Glucose	G	G	G	G	G	G	G	G	
Glue	F	F	G	G	F	G	G	G	
Glycerine (Glycerol)	G	G	G	G	G	G	G	G	G
Green sulfate liquor	G	G	G	G	G	G	G	G	
Hydraulic fluids,									
petroleum	X	X	G	G	X	F	X		
phosphate ester alkyl	X	X	C	X	G	X	G		
phosphate ester aryl	X	X	X	X	C	X	C		
Hydraulic fluids,									
phosphate ester blends	X	X	X	X	X	X	C		
silicate ester	X	X	C	C	X	C	X		
water-glycol	G	G	G	G	G	G	G		
Hydrobromic acid	C	X	C	C	G	G	G		

**DuPont trademarks. Note: Teflon*, while not listed, will generally handle satisfactorily all the chemicals listed.*

CHEMICAL RESISTANCE DATA—Chemical Resistance of Polymers

Maximum temperature 100°F (38°C) unless otherwise specified.

Chemical	Natural Rubber	SBR	Neoprene (CR)	Nitrile (NBR)	Butyl (IIR)	Hypalon* (CSM)	EPDM	Viton* (FPM)	Poly-ethylene (XLPE)
Hydrochloric acid	G	X	X	X	C	C	C	G	G
Hydrocyanic acid	F	F	C	F	C	G	C	G	
Hydrofluoric acid	X	X	X	X	C	G	C	G	G
Hydrofluosilicic acid	G	F	F	F	G	G			
Hydrogen gas	F	F	G	G	G	G	G		
Hydrogen peroxide	X	X	C	C	C	C	C	G	
Hydrogen sulfide, dry	C	C	F	X	G	G	G		
Hydrogen sulfide, wet	C	C	F	C	G	G	G	G	
Jet fuels	X	X	F	G	X	C	X	G	G
Kerosene	X	X	F	G	X	C	X	G	G
Lacquers	X	X	X	X	C	X	X	F	
Lacquer solvents	X	X	X	X	C	X	X	X	F
Lactic acid	C	C	C	C	C	G	C	G	
Linseed oil	C	X	F	G	G	G	G	G	G
Lubricating oils, crude	X	X	F	G	X	C	X	G	G
Lubricating oils, refined	X	X	F	G	X	C	X	G	
Magnesium chloride 150°F (65°C)	G	G	G	G	G	G	G	G	
Magnesium hydroxide 150°F (65°C)	G	F	F	F	G	G	G	G	
Magnesium sulfate 150°F (65°C)	G	G	G	G	G	G	G	G	
Mercuric chloride	F	F	C	F	G	G	G	G	
Mercury	G	G	G	G	G	G	G	G	
Methyl alcohol (Methanol)	G	G	G	G	G	G	G	C	G
Methyl chloride	C	C	C	C	C	X	C	F	
Methyl ethyl ketone	X	X	X	X	F	C	G	X	G
Methyl isopropyl ketone	X	X	X	X	F	C	C	X	G
Milk	C	C	F	F	G	G	G	G	
Mineral oils	X	C	F	G	X	F	X	G	
Natural gas	C	C	G	G	C	G	X	G	
Nickel chloride 150°F (65°C)	G	G	G	G	G	G	G	G	G
Nickel sulfate 150°F (65°C)	G	G	G	G	G	G	G	G	
Nitric acid, concentrated, 70%	X	X	X	X	C	C	X	C	F
Nitric acid, diluted, 10%	X	X	C	X	C	G	C	C	
Nitric acid, crude	X	X	X	X	C	C	X		
Nitrobenzene	X	X	X	X	X	X	F	G	
Oleic acid	X	F	C	F	F	X	F	G	
Oleum spirits	X	C	C	C	F	C			
Oxalic acid	F	C	F	F	G	G	G	G	
Oxygen	F	C	G	C	G	G	G		
Palmitic acid	X	F	G	G	F	F	F	G	
Perchloroethylene	X	X	X	C	X	X	X	G	G
Petroleum, crude 200°F (95°C)	X	X	F	G	X	C	X	G	
Petroleum oils 200°F (95°C)	X	X	F	C	C	G	C	G	
Phosphoric acid, crude	G	C	C	C	C	G	C	G	
Phosphoric acid, pure, 45%	G	C	C	C	C	C	G	G	
Picric acid, molten	C	C	C	C	G	G			
Picric acid, water solution	G	C	F	F	G	G			
Potassium chloride	G	G	G	G	G	G	G	G	
Potassium cyanide	G	G	G	G	G	G	G	G	
Potassium hydroxide	F	F	C	C	G	G	G	G	
Potassium sulfate	G	G	G	G	G	G	G	G	
Propane	X	X	F	G	X	F	X	G	
Sea water	G	G	G	G	G	G	F	G	G
Sewage	C	C	F	G	C	G	C	G	
Soap solutions	G	G	F	G	G	G	G	G	
Soda ash (sodium carbonate)	G	G	G	G	G	G	G	G	

**DuPont trademarks. Note: Teflon*, while not listed, will generally handle satisfactorily all the chemicals listed.*

CHEMICAL RESISTANCE DATA—Chemical Resistance of Polymers

Maximum temperature 100°F (38°C) unless otherwise specified.

Chemical	Natural Rubber	SBR	Neoprene (CR)	Nitrile (NBR)	Butyl (IIR)	Hypalon* (CSM)	EPDM	Viton* (FPM)	Poly-ethylene (XLPE)
Sodium bicarbonate (Baking soda)	G	G	G	G	G	G	G	G	
Sodium bisulfate	G	G	G	G	G	G	G	G	
Sodium chloride	G	G	G	G	G	G	G	G	
Sodium cyanide	G	G	G	G	G	G	G	G	
Sodium hydroxide (Caustic soda)	F	F	C	C	G	C	G	G	G
Sodium hypochlorite	X	X	X	X	G	F	G	G	
Sodium metaphosphate	G	G	C	G	G	F	G	G	
Sodium nitrate	C	C	C	C	G	G	G	G	
Sodium perborate	C	C	C	C	G	G	G	G	
Sodium peroxide	C	C	C	C	G	G	G	G	
Sodium phosphate, monobasic	G	F	C	F	G	G	G	G	
Sodium phosphate, dibasic	G	F	C	F	G	G	G	G	
Sodium phosphate, tribasic	G	F	C	F	G	G	G	G	
Sodium silicate	G	G	G	G	G	G	G	G	
Sodium sulfate	G	G	G	G	G	G	G	G	
Sodium sulfide	G	G	G	G	G	G	G	G	
Sodium thiosulfate (Hypo)	G	G	G	G	G	G	G	G	
Soybean oil	X	C	F	G	G	G	G	G	G
Stannic chloride	G	G	G	G	F	G	F	G	
Steam 450°F (230°C)	C	C	C	C	C	C	F	X	
Stearic acid	X	X	C	F	F	C	F	G	
Sulfur	F	F	G	F	G	G	G	C	
Sulfur chloride	X	X	C	C	X	G	X	G	
Sulfur dioxide, dry	C	C	C	C	C	G	C		
Sulfur trioxide, dry	X	C	C	C	C	F	C		
Sulfuric acid, 10%	G	G	G	G	G	G	G	G	G
Sulfuric acid, 11-75%	C	C	C	C	F	G	C	G	
Sulfuric acid, 76-95%	X	X	X	X	C	G	X	G	G
Sulfuric acid, fuming	X	X	X	X	X	X	X	G	X
Sulfurous acid	C	C	C	C	C	G	C	G	
Tannic acid	G	C	G	C	G	G	G	G	
Tar	X	X	C	C	X	C	X	X	
Tartaric acid	G	C	C	C	F	G	F	G	
Toluene (Toluol)	X	X	X	C	X	X	X	G	G
Trichloroethylene	X	X	X	X	X	X	X	G	G
Turpentine	X	X	X	F	X	X	X	G	G
Vegetable oil, non-edible	X	X	F	F	G	G			
Vinegar	C	C	C	C	G	G	G	T	
Water, acid mine	G	G	C	G	G	G	G	G	G
Water, distilled	G	G	C	G	G	G	G	G	
Water, fresh	G	G	C	G	G	G	G	G	
Water, sea	G	G	G	G	G	G	F	G	G
Whiskey and Wines	G	G	G	C	G	G	G	G	
Xylene (Xylol)	X	X	X	C	X	X	X	G	G
Zinc	C	C	C	C	G	G	G	G	
Zinc sulfate	G	G	G	G	G	G	G	G	

**DuPont trademarks. Note: Teflon*, while not listed, will generally handle satisfactorily all the chemicals listed.*

HOSE—Teflon Chemical Resistance Data

Material Compatibility Key: 1. Excellent 2. Acceptable 3. Not Recommended 4. No Information. Test Before Using.

Chemical	Fitting Material					Effusion
	Teflon	CS	304SS	316SS	Brass	
Acetaldehyde	1	1	1	1	1	B
Acetic Acid, Glacial	1	0	2	2	0	
Acetic Acid, 30%	1	3	2	2	3	
Acetic Anhydride	1	3	2	2	3	
Acetone	1	1	1	1	1	
Acetylene	1	0	1	1	2	C
Acrylonitrile	1	1	1	1	0	
Alum, Ammonium or Potassium	1	3	2	2	3	
Aluminum Acetate	1	0	1	1	3	
Aluminum Bromide	1	3	2	2	3	
Aluminum Chloride	1	3	2	2	3	
Aluminum Fluoride	1	3	2	2	3	
Aluminum Hydroxide	1	0	1	1	1	
Aluminum Nitrate	1	3	1	1	9	
Aluminum Salts	1	0	2	2	0	
Aluminum Sulfate	1	3	3	2	3	
Ammonia, Anhydrous	1	1	1	1	0	
Ammonia, Aqueous	1	0	1	1	3	
Ammonium Carbonate	0	1	1	1	0	
Ammonium Chloride	1	0	2	2	3	
Ammonium Hydroxide	1	2	1	1	3	
Ammonium Metaphosphate	1	1	1	1	0	
Ammonium Nitrate	1	1	1	1	3	
Ammonium Nitrate	0	0	1	1	0	
Ammonium Persulfate	0	0	1	1	0	
Ammonium Phosphate	1	3	2	1	0	
Ammonium Sulfate	1	1	1	1	3	
Ammonium Thiocyanate	1	1	1	1	0	
Amyl Acetate	1	3	1	1	1	
Amyl Alcohol	1	1	1	1	1	
Amyl Chloride	1	0	1	1	0	
Amyl Chloronaphthalene	1	0	1	1	0	
Amyl Naphthalene	1	0	1	1	0	
Aniline	1	2	1	1	3	
Aniline Dyes	1	3	1	1	0	
Aniline Hydrochloride	1	0	3	3	3	
Animal Fats	1	1	1	1	0	
Aqua Regia	1	0	3	3	0	
Arsenic Acid	1	2	0	1	0	
Askarel	0	1	1	1	1	
Asphalt	1	1	1	1	2	
Barium Carbonate	1	2	1	1	1	
Barium Chloride	1	3	1	1	2	
Barium Hydroxide	1	2	1	1	0	
Barium Sulfate	1	1	1	1	2	
Barium Sulfide	1	3	1	1	3	
Beer	1	2	1	1	1	
Beet Sugar Liquors	1	1	1	1	0	
Benzene	1	1	1	1	1	
Benzenesulfonic Acid	0	3	0	2	0	
Benzaldehyde	1	1	0	0	0	
Benzine	1	1	1	1	1	B
Benzyl Alcohol	1	1	1	1	0	
Benzyle Benzoate	1	1	1	1	0	
Benzyl Chloride	1	1	0	0	0	
Bismuth Carbonate	1	1	1	1	0	
Black Sulfate Liquor	1	1	1	1	0	
Blast Surface Gas	1	1	1	1	1	C
Borax	1	2	1	1	2	
Bordeaux Mixture	1	0	1	1	0	

Chemical	Fitting Material					Effusion
	Teflon	CS	304SS	316SS	Brass	
Boric Acid	1	3	2	1	3	
Bunker Oil	1	1	1	1	1	
Butadiene	1	0	1	1	1	
Butane	1	1	1	1	1	C
Butter Oil	1	1	1	1	1	
Butyric Acid	1	3	1	1	2	
Butyl Acetate	1	2	1	1	1	
Butyl Alchohol	1	1	1	1	1	
Butyl Amine	0	1	1	1	1	
Butyl Carbitol	1	1	1	1	1	
Butyl Stearate	1	1	1	1	1	
Butyl Mercaptan	1	0	1	1	0	
Butyraldehyde	1	0	0	0	1	
Calcium Acetate	1	1	1	1	1	
Calcium Bisulfate	1	0	2	1	3	
Calcium Bisulfite	1	0	1	1	0	
Calcium Carbonate	1	1	1	1	1	
Calcium Chlorate	1	0	2	1	0	
Calcium Chloride	1	3	2	1	2	
Calcium Hydroxide	1	3	3	1	2	
Calcium Hypochlorite	1	0	3	2	3	
Calcium Nitrate	1	1	1	1	1	
Calcium Silicate	1	1	1	1	1	B
Calcium Sulfate	1	1	1	1	1	
Calcium Sulfide	1	1	1	1	0	
Cane Sugar Liquors	1	1	1	1	2	
Carbolic Acid	1	3	1	1	3	
Carbon Dioxide	1	1	1	1	1	A
Carbon Disulfide	0	2	1	1	2	
Carbonic Acid	1	3	1	1	3	
Carbon Monoxide	1	1	1	1	1	C
Carbon Tetrachloride	1	3	2	2	2	
Castor Oil	1	1	1	1	1	
Caustic Soda	1	2	1	1	3	
Cellosolve, Acetate	1	1	1	1	0	
Cellosolve, Butyl	1	1	1	1	0	
Cellulube	1	1	1	1	1	
Chlorine, Gaseous, Dry*	*	2	3	3	2	C
Chlorine, Gaseous, Wet*	*	3	3	3	3	B
Chlorine Trifluoride	0	3	0	0	0	C
Chloroacetic Acid	1	3	3	3	2	
Chlorobenzene	1	1	1	1	1	
Chlorobromomethane	1	1	1	1	1	
Chloroform	1	1	1	1	1	
0-Chloronaphthalene	1	1	1	1	1	
Chlorotoluene	1	1	1	1	1	
Chromic Acid	1	3	3	2	3	
Citric Acid	1	3	3	1	3	
Cod Liver Oil	1	1	1	1	1	
Coke Oven Gas	1	1	1	1	0	C
Copper Chloride	1	3	3	1	3	
Copper Cyanide	1	0	1	1	3	
Copper Sulfate	1	3	1	1	3	
Corn Oil	1	1	1	1	1	
Corn Syrup	1	1	1	1	0	
Cottonseed Oil	1	1	1	1	1	
Creosote	1	2	1	1	3	
Cresol	1	2	1	1	0	
Crude Wax	1	1	1	1	1	
Cutting Oil	1	1	1	1	1	

HOSE—Teflon Chemical Resistance Data

Material Compatibility Key: 1. Excellent 2. Acceptable 3. Not Recommended 4. No Information. Test Before Using.

Chemical	Teflon	Fitting Material				Effusion
		CS	304SS	316SS	Brass	
Cyclohexane	1	1	1	1	1	
Cyclohexanone	1	0	1	1	0	
Cymene	1	0	0	0	1	
Decalin	1	0	0	0	1	
Denatured Alcohol	1	1	1	1	1	
Diacetone	1	1	1	1	1	
Diacetone Alcohol	1	1	1	1	1	
Dibenzyl Ether	1	1	1	1	1	
Dibutyl Ether	1	1	1	1	1	
Dibutyl Phthalate	1	1	1	1	1	
Dibutyl Sebacate	1	0	0	0	1	
Dichlorobenzene	1	0	1	1	1	
Diesel Oil	1	1	1	1	1	
Diethylamine	1	3	0	2	3	
Diethyl Ether	1	1	1	1	1	B
Diethylene Glycol	1	1	1	1	1	
Diethyl Phthalate	1	0	1	1	1	
Diethyl Sebacate	1	0	1	1	1	
Di-Isobutylene	0	0	1	1	1	
Di-Isopropyl Ketone	1	0	1	1	1	
Dimethyl Aniline	1	0	0	0	1	
Dimethyl Formamide	0	1	1	1	0	
Dimethyl Phthalate	1	0	0	0	1	
Dioctyl Phthalate	1	1	1	1	1	
Dioxane	1	1	1	1	1	
Dipentene	1	1	1	1	1	
Ethanolamine	1	1	1	1	1	
Ethyl Acetate	1	1	1	1	1	
Ethyl Acetoacetate	1	1	1	1	1	
Ethyl Acrylate	0	1	1	1	0	
Ethyl Alcohol	1	1	1	1	2	
Ethyl Benzene	1	1	1	1	1	
Ethyl Cellulose	1	1	1	1	1	
Ethyl Chloride	1	2	1	1	2	C
Ethyl Ether	1	2	1	1	1	
Ethyl Mercaptan	1	2	0	0	0	B
Ethyl Pentochlorobenzene	1	2	1	1	1	
Ethyl Silicate	1	1	1	1	1	
Ethylene Chloride	1	2	1	1	2	
Ethyhlene Chlorohydrin	1	0	0	0	0	
Ethylene Diamine	1	0	0	0	1	
Ethylene Glycol	1	2	1	1	1	
Fatty Acids	1	0	1	1	0	
Ferric Chloride	1	3	3	3	3	
Ferric Nitrate	1	3	1	1	0	
Ferric Sulfate	1	3	1	1	3	
Ferrous Chloride	1	3	1	2	2	
Ferrous Nitrate	1	0	1	1	0	
Ferrous Sulfate	1	3	1	1	2	
Fluoroboric Acid	1	0	1	1	0	
Formaldehyde	1	0	1	1	1	
Formic Acid	1	3	2	1	2	
Freon 12	2	3	1	1	0	A
Freon 114	2	3	1	1	0	A
Fuel Oil	1	2	2	2	1	
Fumaric Acid	0	0	1	1	0	
Furan Furfuran	1	1	1	1	1	
Furfural	1	2	1	1	1	
Gallic Acid	1	3	1	1	0	
Gasoline	1	2	1	1	1	

Chemical	Teflon	Fitting Material				Effusion
		CS	304SS	316SS	Brass	
Glauber's Salt	0	1	1	1	0	
Glucose	1	1	1	1	1	
Glue	1	2	1	1	3	
Glycerin	1	2	1	1	1	
Glycols	1	1	1	1	1	
Green Sulfate Liquor	1	1	1	1	0	
n-Hexaldehyde	1	1	1	1	1	
Hexane	1	1	1	1	1	
Hexene	1	1	1	1	1	
Hexyl Alcohol	1	1	1	1	2	
Hydraulic Oil, Petroleum	1	1	1	1	1	
Hydrochloric Acid, 15%	1	3	3	3	3	B
Hydrochloric Acid, 37%	1	3	3	3	3	B
Hydrocarbon Acid	1	3	1	1	3	C
Hydrofluoric Acid, Concentrated	1	3	3	3	3	
Hydrofluosilicic Acid	1	0	3	3	3	
Hydrogen, Gaseous	*	1	1	1	1	C
Hydrogen Peroxide, 70%	1	3	2	1	3	
Hydrogen Sulfide, Gaseous	1	3	2	1	3	C
Hydroquinone	0	0	1	1	0	
Isobutyl Alcohol	1	1	1	1	2	
Iso Octane	1	1	1	1	1	
Isopropyl Acetate	1	1	1	1	1	
Isopropyl Alcohol	1	1	1	1	2	
Isopropyl Ether	1	1	1	1	1	
Kerosene	1	1	1	1	1	
Lacquers	1	3	3	1	1	
Lacquer Solvents	1	3	3	1	1	B
Lactic Acid	1	3	2	1	2	
Lard	1	1	1	1	3	
Lead Acetate	1	2	1	1	1	
Lead Nitrate	0	1	1	1	0	
Lime Bleach	0	3	2	1	0	
Linoleic Acid	1	0	0	0	0	
Linseed Oil	1	2	1	1	2	
Lubricating Oils, Petroleum	1	1	1	1	1	
Magnesium Chloride	1	3	2	1	2	
Magnesium Hydroxide	1	1	1	1	0	
Magnesium Sulfate	1	2	1	1	1	
Malic Acid	1	2	2	1	0	
Mercuric Chloride	1	31	1	3		
Mercury	1	1	1	1	3	
Mesityl Oxide	1	1	1	1	1	
Methyl Acetate	1	1	1	1	1	
Methyl Acrylate	0	1	1	1	1	
Methyl Alcohol	1	1	1	1	2	
Methyl Bromide	1	1	1	1	1	B
Methyl Butyl Ketone	0	1	1	1	1	
Methyl Chloride	1	1	1	1	1	B
Methylene Chloride	1	1	1	1	1	
Methyl Ethyl Ketone (MEK)	1	1	1	1	1	
Methyl Formate	1	1	1	1	1	B
Methyl Isobutyl Ketone	1	1	1	1	1	
Methyl Methacrylate	1	1	1	1	0	
Methyl Salicylate	1	1	1	1	1	
Milk	1	3	1	1	3	
Mineral Oil	1	1	1	1	1	
Monochlorobenzene	1	1	1	1	1	
Monoethanolamine	0	1	1	1	1	1
Naphtha	1	2	1	1	1	

*Caution: explosive; consult Titeflex engineering.

HOSE—Teflon Chemical Resistance Data

Material Compatibility Key: 1. Excellent 2. Acceptable 3. Not Recommended 4. No Information. Test Before Using.

Chemical	Teflon	Fitting Material				Effusion
		CS	304SS	316SS	Brass	
Naphthalene	1	0	1	1	0	
Naphthenic Acid	1	0	2	1	0	
Natural Gas	1	1	1	1	2	C
Nickel Acetate	1	1	1	1	1	
Nickel Chloride	1	3	2	2	3	
Nickel Sulfate	1	0	2	1	3	
Niter Cake	0	3	2	1	0	
Nitric Acid, All Concentrations	1	3	2	2	3	
Nitric Acid, Red Fuming	1	3	2	2	3	
Nitrobenzene	1	1	1	1	1	
Nitroehtane	1	0	1	1	1	
Nitrogen, Gaseous	1	1	1	1	1	A
Nitrogen Tetroxide	0	0	0	2	0	
n-Octane	0	1	1	1	1	
Octyl Alcohol	1	1	1	1	2	
Oil, SAE	1	1	1	1	1	
Oleic Acid	1	2	2	1	2	
Olive Oil	1	2	2	1	2	
Oxalic Acid	1	3	2	1	3	
Oxygen, Gaseous	1	1	1	1	1	A
Ozone	1	1	1	1	1	
Paint	1	0	1	1	1	
Palmitic Acid	1	1	2	1	3	
Peanut Oil	1	1	1	1	1	
Perchloric Acid	1	0	2	1	0	
Perchloroethylene	1	1	1	1	1	
Petroleum	1	1	1	1	1	
Phenol	1	3	1	1	3	
Phorone	1	1	1	1	1	
Picric Acid	1	3	1	1	3	
Pinene	1	1	1	1	1	
Pine Oil	1	1	1	1	0	
Plating Solution, Chrone	1	0	3	3	0	
Potassium Acetate	1	0	1	1	0	
Potassium Chloride	1	2	2	1	3	
Potassium Cyanide	1	2	1	1	3	
Potassium Dichromate	1	0	1	1	0	
Potassium Hydroxide, 30%	1	3	1	1	3	
Potassium Nitrate	1	3	1	1	2	
Potassium Sulfate	1	2	1	1	2	
Propane	1	1	1	1	1	A
Propyl Acetate	0	1	1	1	1	
Propyl Alcohol	1	1	1	1	2	
Pyridine, 50%	1	0	1	1	1	
Red Oil	1	2	2	1	2	
Salicylic Acid	0	0	1	1	0	
Salt Water	1	2	1	1	3	
Sewage	1	3	1	1	1	
Silicone Greases	0	1	1	1	1	
Silicone Oils	0	1	1	1	1	
Silver Nitrate	1	2	1	1	2	
Skydrol 500 and 7000	1	1	1	1	0	
Soap Solutions	1	1	1	1	1	
Soda Ash	0	1	1	1	2	
Sodium Acetate	1	1	1	1	1	
Sodium Bicarbonate	1	2	1	1	2	
Sodium Bisulfite	1	1	1	1	0	
Sodium Borate	1	1	1	1	0	
Sodium Chloride	1	2	2	1	3	

Chemical	Teflon	Fitting Material				Effusion
		CS	304SS	316SS	Brass	
Sodium Cyanide	1	2	1	1	3	
Sodium Hydroxide, 40%	1	2	1	1	3	
Sodium Hypochlorite	1	3	3	2	3	
Sodium Metaphosphate	1	3	1	1	3	
Sodium Nitrate	1	1	2	2	2	
Sodium Perborate	1	3	1	1	3	
Sodium Peroxide	1	3	1	1	3	
Sodium Phosphate	1	0	1	1	3	
Sodium Thiosulfite	1	3	1	1	3	
Soybean Oil	1	1	1	1	0	
Stannic Chloride	1	3	0	0	3	
Steam	1	1	1	1	2	A
Stearic Acid	1	3	2	1	3	
Stoddard Solvent	1	2	1	1	1	
Styrene	1	2	0	2	2	
Sucrose Solution	1	1	1	1	0	
Sulfur, 200°F	1	2	2	1	3	
Sulfur Chloride	1	3	3	2	3	
Sulfur Dioxide	1	2	1	1	1	C
Sulfur Trioxide	1	2	2	2	0	B
Sulfuric Acid, 10%	1	3	3	2	3	
Sulfuric Acid, 98%	1	2	3	2	3	
Sulfuric Acid, Fuming	1	2	0	1	3	
Sulfurous Acid, 10%	1	3	2	1	3	
Sulfurous Acid, 75%	1	3	3	2	3	
Tannic Acid, 10%	1	2	1	1	3	
Tar, Bituminous	1	1	1	1	2	
Tartaric Acid	1	0	2	2	0	
Terpineol	1	0	0	0	0	
Titanium Tetrachloride	0	1	2	2	3	
Toluene	1	1	1	1	1	
Toluene Diisocyanate	0	0	0	0	0	
Transformer Oil	1	1	1	1	1	
Transmission Fluid, Type A	1	1	1	1	1	
Tributoxyethyl Phosphate	1	1	0	0	0	
Tributyl Phosphate	1	1	0	0	0	
Trichloroethylene	1	3	0	1	1	
Tricresyl Phosphate	1	1	0	2	0	
Tung Oil	1	1	1	1	1	
Turpentine	1	0	1	1	2	
Urea Solution, 50%	1	1	1	1	0	
Varnish	0	2	1	1	2	
Vegetable Oils	1	1	1	1	0	
Versilube	1	1	1	1	1	
Vinegar	1	3	2	1	3	
Vinegar Chloride	1	2	1	1	3	C
Water	1	2	1	1	1	
Whiskey, Wines	1	3	2	1	3	
Xylene	1	2	2	2	0	
Zinc Acetate	1	1	1	1	1	
Zinc Chloride	1	3	2	1	3	
Zinc Sulfate	1	3	2	1	3	

Metal Hose Corrosion Evaluation Data

This information may be used as a guide for the selection of flexible metal hose and of fitting material suitable for conveying the substances listed. However, this data should not be construed as advice to use or not use without further testing or investigation since variations in service conditions can influence resistance to corrosion.

The corrosion resistance of tin-lead solder, brass brazing and silver brazing alloys used to attach end fittings to metal hose may be considered equal to bronze in the table. Joints produced by welding end fittings to steel, stainless steel and Monel hose may be considered equivalent to the corrosion resistance of the component parts.

Interpretation of Corrosion Data

Class 1 Resistant ..... Less than .00035 inch penetration per month
Class 2 Partially Resistant ..... .00035 to .0035 inch penetration per month
Class 3 Non-Resistant ..... Greater than .0035 inch penetration per month

* Subject to decomposition (forming HCl) in presence of moisture
† Subject to pitting at air line or when allowed to dry
◊ Subject to attack in presence of H_2SO_4

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Acetic Acid 5%-20% Agitated						
or Aerated	70°	1	1	3	3	2
50%	70°	1	1	3	3	3
50%-80%	Boiling	3	2	3	3	3
80%	70°	1	1	3	3	1
100%	70°	1	1	3	3	1
100%	Boiling	3	2	3	3	2
100%-150 lbs. pressure	400°	3	3	3	3	2
Acetic Anhydride	70°	1	1	3	3	2
	Boiling	1	1	3	3	2
Acetic Acid Vapors, 30%	Hot	3	2	3	3	3
100%	Hot	3	3	3	3	2
Acetone	Boiling	1	1	3	1	1
Acetyl Chloride	Cold	2	2	3	2	1
	Boiling	2	2	3	2	3
Acetylene Concentrated	70°	1	1	1	3	1
Commerciallly Pure	70°	1	1	1	3	1
Acid Salt Mixture 10% H_7SO_4Sp, G, 1.07+ 10% $CuSO_4 \cdot 5H_2O$	Boiling	1	1	3	3	3
Alcohol, Ethyl, 70% & Boiling	70°	1	1	1	1	1
Alcohol, Methyl	70° (150°)	1	1	1	1	1
	Boiling	3†	2	3	1	1
Aluminum, Molten	1400°	3	3	3	3	3
Aluminm Acetate, Saturated	70° & Boiling	1	1	3	3	1
Aluminum Chloride						
10% Quiescent	70°	3	3	3	3	2
25% Quiescent	70°	1	1	3	3	2
Aluminum Fluoride	70°	3	3	3	3	2
Aluminum Hydroxide, Saturated	70°	1†	1	1†	1	1

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Aluminum Sulphate, 5%	150°	1†	1	3	3	1
10%	70°	1†	1	3	3	1
10%	Boiling	2†	1	3	3	1
Saturated	70°	1†	1	3	3	1
Saturated	Boiling	2†	1	3	3	1
Aluminum Potassium Sulphate						
(Alum) 2%-10%	70°	1	1	3	2	2
10%	Boiling	2	1	3	3	2
Saturated	Boiling	3	2	3	3	2
Ammonia (Anhydrous)						
All Concentrations	70°	1	1	1	1	1
Gas	Hot	3	3	3	3	–
Ammonia Liquor	70°	1	1	3	3	3
	Boiling	1	1	3	3	3
Ammonium Bicarbonate	70°	1	1	3	3	2
	Hot	1	1	3	3	2
Ammonium Bromide	70°	2	1	3	3	2
Ammonium Carbonate 1 & 5%	70°	1	1	1	3	3
Ammonium Chloride 1%	70°	1	1	2	3	1
10%	Boiling	1†	1†	–	3	2
28%	Boiling	2†	1†	–	3	2
50%	Boiling	2†	1†	–	3	2
Ammonium Hydroxide						
All Concentrations	70°	1	1	2	3	3
Ammonium Monophosphate	70°	1	1	2	3	2
Ammonium Nitrate						
All Concentrate Agitated	70°	1	1	3	3	2
All Concentrate Aerated	70°	1	1	3	3	2
All Concentrate Saturated	Boiling	1	1	3	3	2
Ammonium Oxalate 5%	70°	1	1	2	3	–
Ammonium Perchlorate 10%	Boiling	1	1	2	3	–
Ammonium Persulphate 5%	70°	1	1	–	3	3
Ammonium Phosphate 5%	70°	1	1	2	3	3

Metal Hose Corrosion Evaluation Data

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Ammonium Sulphate						
1% Aerated or Agitated	70°	1	1	3	3	2
10% Saturated	Boiling	2†	1†	3	3	2
Ammonium Sulphite	70° & Boiling	1	1	3	3	3
Amyl Acetate Concentrate	70°	1	1	2	1	1
Amyl Chloride	70°	1	1	3	2	2
Aniline, 3%	70°	1	1	2	3	2
Concentrated Crude	70°	1	1	1	3	2
Aniline Hydrochloride	70°	3	3	–	3	3
Antimony Trichloride	70°	3	3	3	3	3
Barium Carbonate	70°	1	1	2	1	2
Barium Chloride						
5% & Saturated	70°	1	1	3	2	2
Barium Hydroxide						
Aqueous Solution	Hot	1	1	2	–	–
Barium Nitrate						
Aqueous Solution	Hot	1	1	2	–	–
Barium Sulphate						
(Barytes-Blanc Fixe)	70°	1	1	–	1	2
Barium Sulfide						
Saturated Solution	70°	1	1	3	3	–
Benzene (Benzol)	70° or Hot	1	1	2	1	2
Benzoic Acid	70°	1	1	1	1	–
Blood (Meat Juices)	Cold	1†	1	3	–	2
Borax 5%	Hot or Cold	1	1	–	–	–
Boric Acid						
5% Solution, 70° or Hot	70°	1	1	3	1	2
5% Solution	Boiling	1	1†	3	1	2
Saturated Solution	70°	1†	1†	3	2	2
Saturated Solution	Boiling	1†	1†	3	3	2
Bromine, Bromine Water	70°	3	3	3	3	3
Buttermilk	70°	1	1	3	3	2
Butyl Acetate	–	1	1	2	–	2
Butyric Acid 5%	70-150°	1	1	3	2	2
Aqueous Soln Sp. G. .964	Boiling	1	1	3	3	2
Calcium Carbonate	70°	1	1	1	–	1
Calcium Chlorate	70° or					
Dilute Solution	Hot	1	1	2	–	2
Calcium Chloride						
Dilute or Concen. Solution	70°	2†	1†	3	2	3

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Calcium Chlorohypochlorite						
(Bleaching Powder) 1%	70°	3	3	3	2	3
5%	70°	3	3	3	2	3
Calcium Hypochlorite, 2%	70°	2†	1†	3	2	3
Calcium Hydroxide, 10-20%	Boiling	1	1	3	1	1
Calcium Sulphate, Saturated	70°	1	1	3	1	2
Carbonic Acid Saturated Soln.	70°	1	1	3	1	3
Carbolic Acid C.P.	70° or Boiling	1	1	3	2	1
Carbonated Water	–	1	1	3	2	3
Carbon Bisulfide	70°	1	1	2	2	2
Carbon Monoxide Gas	1400°					
	1600°	1	1	1	3	1
Carbon Tetrachloride						
C.P.	70°	1	1	2	1	1
Dry C.P.	Boiling	1	1	2	1	2
Commercial + 1% Water		–	3†	2†	3	
Carnallite – Cold Saturated Soln						
$KCl \cdot MgCl_2 \cdot 6H_2O$	Boiling	3	1†	–	–	–
Cellulose	–	1	1	–	–	1
Chloracetic Acid	70°	3	3	3	2	2
Chlorbenzol Conc. Pure Dry	70°	1	1	2	2	2
Chloric Acid	70°	3	3	3	3	3
Chlorine Gas (Dry)	70°	3	2	2	1	2
(Moist)	70°	3	3	3	3	3
Chlorinator Water, Saturated		–	3†	2†	3	
Chloroform	70°	1	1	1	1	1
Chromic Acid						
5% C.P.	70°	1	1	3	3	3
10%	70°	3	2	3	3	3
Chromic Acid						
10% C.P.	Boiling	3	2	3	3	3
50% C.P.	70°	3	2	3	3	3
50% C.P.	Boiling	3	3	3	3	3
Commercial 50% (Cont. SO_3)	70°	3	3	3	3	3
Commercial 50% (Cont. SO_3)	Boiling	3	3	3	3	3
Chromium Plating Bath	70°	1	1	2	–	3
Citric Acid, 5% Still	70-150°	1	1	3	1	2
15% Still	70°	1	1	3	2	2
15% or Concentrated	Boiling	2	1	3	2	3
Coffee	Boiling	1	1	3	1	1
Copper Acetate						
(Saturated Solution)	70°	1	1	3	–	2

* Subject to decomposition (forming HCl) in presence of moisture
◊ Subject to attack in presence of H_2SO_4

† Subject to pitting at air line or when allowed to dry
• Mild steel severely stressed subject to caustic embrittlement

Metal Hose Corrosion Evaluation Data

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Copper Chloride 1% Agitated	70°	2†	1†	3	3	3
1% Agitated	158°	3	3	3	3	3
1% Aerated	70°	2†	1†	3	3	3
5% Agitated	70°	3†	2†	3	3	3
5% Aerated	70°	3†	3†	3	3	3
Copper Cyanide (Sat. Sol.)	Boiling	1	1	–	3	2
Copper Nitrate						
1% Still, Agitated & Aerated	70°	1	1	3	3	3
5% Still, Agitated or Aerated	70°	1	1	3	3	3
50% Aqueous Solution	Hot	1	1	3	3	3
Copper Sulphate						
5% Agitated, Still or Aerated	70°	1	1	3	2	3
Saturated Solution	Boiling	1	1	3	2	3
Creosote (Coal Tar)	Hot	1	1	2	1	2
Creosote Oil	Hot	1	1	2	2	2
Cyanogen Gas	70°	1	1	–	–	–
Dichloroethane (Dry)	Boiling	1	1	3	3	2
Dinitrochlorobenzene						
Melted and Solidified	70°	1	1	3	–	–
Dyewood Liquor	70°	1◊	1	3	–	2
Epsom Salt (Magnesium Sulfate)	Hot & Cold	1	1	3	1	2
Ethers	70°	1	1	2	1	2
Ethyl Acetate (Conc. Solution)	70°	1	1	2	1	2
Ethyl Chloride	70°	1	1	2	2	1
Ethylene Chloride	70°	1	1	2	2	1
Ethylene Glycol	70°	1	1	2	1	1
Ferric Chloride, 1% Solution Still	70°	2†	1†	3	3	3
1% Solution	Boiling	3	3	3	3	3
5% Solution, Agitated, Aerated	70°	3	3	3	3	3
Ferric Hydroxide						
(Hydrated Iron Oxide)	70°	1	1	3	–	2
Ferric Nitrate						
1%-5% Quiescent or Agitated	70°	1	1	3	3	3
1%-5% Aerated	70°	1	1	3	3	3
Ferric Sulphate						
1%-5% Quiescent or Agitated	70°	1†	1	3	3	3
1%-5% Aerated	70°	1†	1	3	3	
10%	Boiling	1†	1	3	3	3
Ferrous Chloride						
Saturated Solution	70°	3	1	3	2	–
Ferrous Sulphate, Dilute Solution	70°	1	1	3	2	3
Fluorine (Gas) Moist	70°	3	3	3	3	3
Formaldehyde, 40% Solution	–	1†	1†	2	1	1

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Formic Acid, 5% Still	70°	2	1	3	2	2
5% Still	150°	2	1	3	2	3
Fuel Oil	Hot	1	1	2	1	2
Containing Sulfuric Acid	–	3	2	–	3	2
Furfural	70°	1	1	2	1	2
Gallic Acid, 5%	70-150°	1	1	3	–	2
Saturated	212°	1	1	3	–	2
Gasoline	70°	1	1	2	1	1
Gelatin	–	1	1	3	1	1
Glue Dry	70°	1	1	1	2	2
Solution – Acid	70-140°	2†	1	2	3	2
Glycerine	70°	1	1	2	1	1
Hydrochloric Acid						
All Concentrations	70°	3	3	3	3	3
Hydrocyanic Acid	70°	1	1	3	3	2
Hydrofluoric Acid	70°	3	3	3	3	1
Hydrofluosilic Acid	70°	3	3	3	2	2
Hydrogen Peroxide	70°	1◊	1	3	3	2
	Boiling	2◊	1	3	3	2
Hydrogen Sulphide (Dry)	70°	1	1	2	1	3
(Wet)	70°	2◊	1◊	3	3	3
Hyposulfite Soda (Hypo)	–	1	1	–	–	–
Ink	70°	2◊	1	3	3	31
Iodine	70°	3	3	3	3	3
Iodoform	70°	1	1	3	–	2
Kerosene	70°	1	1	2	1	2
Lactic Acid, 1%	70°	1	1	3	2	2
1%	Boiling	1	1	3	3	2
5%	70°	1	1	3	2	2
5%	150°					
Boiling		3	2	3	3	2
Concentrated	70°	2	1	3	2	2
Concentrated	Boiling	3	2	3	3	2
Lead (Molten)	750°	2	2	–	3	3
Lead Acetate 5%	Boiling	1	1	3	–	2
Linseed Oil	70°	1	1	2	2	1
Plus 3% H_2SO_4	390°	2	1	3	3	1

* Subject to decomposition (forming HCl) in presence of moisture
◊ Subject to attack in presence of H_2SO_4

† Subject to pitting at air line or when allowed to dry
• Mild steel severely stressed subject to caustic embrittlement

Metal Hose Corrosion Evaluation Data

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Magnesium Chloride						
1% Quiescent	70°	1†	1	3	2	1
1% Quiescent	Hot	3	2†	3	2	1
5% Quiescent	70°	1†	1	3	2	1
5% Quiescent	Hot	3	2†	3	2	1
Magnesium Oxychloride	70°	3	2†	3	–	–
Magnesium Sulphate	Hot & Cold	1	1	3	1	1
Malac Acid	Hot & Cold	2	1	3	–	2
Mash	Hot	1	1	–	–	2
Mayonnaise	70°	1†	1	3	–	2
Mercury	–	1	1	1	3	3
Mercuric Chloride, Dilute Solution	70°	3	3	3	3	3
Methanol (Methyl Alcohol)	–	1	1	2	1	1
Milk, Fresh or Sour	–	1	1	3	1	2
Mixed Acids						
53% H_2SO_4 + 45% HNO_1	Cold	1	1	3	3	3
Molasses	–	1	1	2	1	1
Muriatic Acid	70°	3	3	3	3	2
Mustard	70°	1†	1†	3	–	1
Naphtha, Crude	70°	1	1	2	2	1
Naphtha, Pure	70°	1	1	2	2	1
Naphthalene Sulfonic Acid	70°	1	1	3	–	1
Nickel Chloride Solution	70°	1†	1†	3	2	2
Nitrating Solutions	Cold & Hot	1	1	3	1	1
Niter Cake	Fused	2	1	3	–	2
Nitric Acid, 5%-50%-70%	Boiling	1	1	3	3	3
65%	70°	1	1	3	3	3
65%	Boiling	2	2	3	3	3
Concentrated	70°	1	1	3	3	3
Concentrated	Boiling	3	3	3	3	3
Fuming Concentrated	70-110°	1	1	3	3	3
Fuming Concentrated	Boiling	3	3	3	3	3
Nitrous Acid 5%	70°	1	1	3	3	3
Oils, Crude	Cold & Hot	1◊	1◊	A	2	1
Oleic Acid	70-400°	1†	1	2	2	2
Oxalic Acid						
5%-10%	70° & Boiling	1	1	3	2	2
10%	Boiling	3	3	3	2	2
25%-50%	Boiling	3	3	3	2	1
Paraffine	Cold & Hot	1	1	2	1	1
Phenol (See Carbolic Acid)						
Petroleum Ether	–	1	1	2	–	2
Phosphoric Acid						
1%	70°	1*	1*	3	3	2
1%	Boiling	1	1	3	3	2
1% – 45 lbs. Pressure	284°	1	1	3	3	2
5% Quiescent or Agitated	70°	1	1	3	3	2
5% Aerated	70°	1	1	3	3	2
10% Quiescent	70°	3	1	3	3	2
10% Agitated or Aerated	70°	3	2	3	3	2
10%-50%	Boiling	1	1	3	3	3
80%	70°	3	3	3	3	2
80%	230°	3	3	3	3	3
85%	Boiling	3	3	3	3	3
Pictic Acid	70°	1	1	3	3	3
Potassium Bichromate, 25%	70°	1	1	–	3	2
25%	Boiling	1	1	–	3	2
Potassium Bromide	70°	2†	1†	3	2	2
Potassium Carbonate 1%	70°	1	1	2	2	1
Potassium Carbonate	Hot	1	1	2	3	1
Potassium Chlorate						
Sat. at 212°	Boiling	1	1	2	3	3
Potassium Chloride						
1% Quiescent	70°	1†	1†	3	2	1
1% Agitated or Aerated	70°	1	1	3	2	1
5% Quiescent	70°	1†	1†	3	2	1
5% Agitated or Aerated	70°	1	1	3	2	1
5%	Boiling	1	1	3	2	1
Potassium Chromium Sulfate						
5%	70°	1†	1	3	2	–
Sp. G. 1.6	Boiling	3	3	3	3	–
Potassium Cyanide	70°	1	1	2	3	2

* Subject to decomposition (forming HCl) in presence of moisture
◊ Subject to attack in presence of H_2SO_4

† Subject to pitting at air line or when allowed to dry
• Mild steel severely stressed subject to caustic embrittlement

Metal Hose Corrosion Evaluation Data

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Potassium Ferricyanide, 5%-25%	70°	1	1	3	–	2
25%	Boiling	1	1	3	–	2
Potassium Ferrocyanide, 5%	70°	1	1	3	–	2
Potassium Hydroxide, 5%	70°	1	1	2•	2	1
27%	Boiling	1	1	2•	2	1
50%	Boiling	2	1	3	2	1
Potassium Hypochlorite	70°	2	2	3	3	3
Potassium Nitrate						
1%-5% Still or Agitated	70°	1	1	3	2	1
1%-5% Aerated	70°	1	1	3	2	1
50%	70°	1	1	3	1	1
Molten	1022°	1	1	3	–	–
Potassium Oxalate	–	1	1	–	–	–
Potassium Permanganate, 5%	70°	1	1	2	–	3
Potassium Sulphate						
1%-5% Still or Agitated	70°	1	1	2	1	2
1%-5% Aerated	70°	1	1	2	1	2
	Hot	1	1	3	1	2
Potassium Sulphide (Salt)	–	1	1	3	–	–
Pyrogallic Acid	–	1	1	2	–	–
Quinine Bisulfate (Dry)	–	2	2	2	–	–
Quinine Sulphate (Dry)	–	1	1	3	2	2
Sea Water	70°	1†	1†	3	2	1
Sewage	–	1◊	1◊	–	1	1
Silver Bromide	–	2†	1†	3	3	–
Silver Chloride	–	3	3	3	3	3
Silver Nitrate	–	1	1	3	3	3
Soap	70°	1	1	2	1	1
Sodium Acetate (Moist)	–	1†	1	3	–	2
Sodium Bicarbonate						
All concentrations	70°	1	1	3	2	1
5% Still	150°	1	1	3	2	1
Sodium Bisulfate, Solution	70°	1◊	1◊	3	2	2
Saturated Solution	70°	3	3	3	2	2
2g + 1g H_2SO_4 liter	68°	3	1◊	3	2	2
Sodium Chloride, 5% Still	70-150°	1†	1	3	2	1
20% Aerated	70°	1†	1	3	2	1
Saturated	70°	1†	1	3	2	1
Saturated	Boiling	2†	1	3	2	1

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Sodium Cyanide	70°	1	1	2	3	–
Sodium Fluoride, 5% Solution	70°	2†	1†	3	1	1
Sodium Hydroxide	70°	1	1	2	2	1
Sodium Hypochlorite, 5% Still	–	2†	1†	3	2	3
Sodium Hyposulfite	70°	1◊	1	3	–	1
Sodium Nitrate	Fused	1	1	2	1	2
Sodium Perchlorate, 10%	70°	1	1	–	–	–
	Boiling	1	1	–	–	–
Sodium Phosphate	70°	1	1	2	2	2
Sodium Sulphate, 5% Still	70°	1	1	3	1	1
All Concentrations	70°	1	1	3	1	1
Sodium Sulphide, Saturated	–	2†	1	3	3	2
Sodium Sulphite, 5%	70°	1	1	3	2	2
10%	150°	1	1	3	2	2
Sodium Thiosulfate						
Saturated Solution	70°	1	1◊	3	3	1
Acid Fixing Bath (Hypo)	70°	1	1	3	3	2
25% Solution	70° & Boiling	1	1◊	3	3	2
Stannic Chloride Solution	70° *					
Sp. G. 1.21	Boiling	3	3	3	3	3
Stannous Chloride, Saturated	–	3	1	3	–	3
Steam	–	1	1	3	1	1
Stearic Acid	70°	1	1	3	2	2
Starch, Aqueous Solution	–	1	1	–	–	2
Strontium Hydroxide	–	1	1	–	–	–
Strontium Nitrate Solution	Hot	1	1	3	–	2
Sulphur, Moist	70°	2†	1†	3	3	2
Molten	266°	1	1	3	3	1
Molten	833°	3	3	3	3	3
Sulphur Chloride (Dry)	–	3	3	3	1	2
Sulphur Dioxide Gas (Moist)	70°	2	1	3	2	3
Gas (Dry)	575°	1	1	3	1	2

* Subject to decomposition (forming HCl) in presence of moisture
◊ Subject to attack in presence of H_2SO_4

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• Mild steel severely stressed subject to caustic embrittlement

Metal Hose Corrosion Evaluation Data

Chemical	Temp. °F	304 SS/321 SS	316L SS	Carbon Steel	Bronze	Monel
Sulfuric Acid						
5%-10%	70°	3	2	3	2	3
5%-10%	Boiling	3	3	3	3	3
50%	70°	3	3	3	3	3
50%	Boiling	3	3	3	3	3
Concentrated	70°	1	1	3	2	3
Concentrated	Boiling	3	3	3	2	3
Concentrated	300°	3	3	3	2	3
Fuming	70°	3	2	3	2	3
Sulphurous Acid, Saturated	70°	3	2	3	2	3
Saturated – 60 lb. Pressure	250°	3	2	3	2	3
Saturated – 70-125 lb. Pressure	310°	3	2	3	2	3
150 lbs. Pressure	375°	3	2	3	2	3
Sulphurous Spray	70°	3	3	3	3	3
Tannic Acid	70°	1	1	3	1	3
	150°	1	1	–	1	3
Tanning Liquor	70°	1	1	–	–	1
Tar	–	1	1	2	1	2
Tartaric Acid	–	1	1	3	1	2
Tin	Molten	3	3	3	3	–
Trichloracetic Acid	70°	3	3	3	2	3
Trichlorethylene (Dry)	70°	1†	1	3	1	1
(Moist)	–	–	–	–	2	–
Varnish	70°	1	1	2	1	1
Water	–	1	1	2	1	1
Yeast	–	1	1	–	3	1
Zinc	Molten	3	3	3	3	3
Zinc Chloride, 5% Still	70°	1†	1†	3	3	2
	Boiling	2†	2†	3	3	2
Zinc Cyanide, Moist	70°	1	1	3	–	–
Zinc Nitrate, Solution	Hot	1	1	3	–	–
Zinc Sulphate	–	1	1	3	2	2

Consult factory for corrosion evaluation data for other materials of construction.

Hose Terminology

Adhesion. The bonding or adherence of two material surfaces to one another. In fire hose, the bond between the cured rubber and the jacket.

Backing. A layer of rubber material used to provide the adhesion between the tube and jacket.

Burst Test. To break open with internal pressure. In fire hose, a test designed to determine the ultimate breaking strength of a short sample.

Construction. The type of fiber used, tensile strength of the fiber, number of ends, and number of picks per inch in a fire hose jacket.

Crimp. The waviness of the yarn in a woven jacket. The difference in distance between two points on a yarn as it lies in a fabric and the same two points when the yarn has been removed and straightened.

Cure. The act of vulcanization. In fire hose, the vulcanization of the tube to the jacket.

Dacron®. A synthetic polyester fiber. The first manmade fiber ever used in fire hose. High strength, low stretch material ideally suited for fire hose.

Denier. A unit of weight. Used to express the yarn number of polyester and other continuous filament fibers.

Elongation. The increase in length caused by applied force. It may be measured at any specified load and is expressed as a percentage of the original length.

End. One thread of the warp, either before weaving or in the jacket.

Expansion. The increase in diameter under hydrostatic pressure.

Extrusion. The formation of a desired shape by ejecting through a shaped opening.

Filament. A single continuous strand of indefinite length, such as manmade polyester. Compared to staple fibers such as cotton, a filament possesses extreme length and often may be measured in thousands of yards without a break.

Filler. The yarn which interfaces with the warp yarn to produce a woven jacket.

Fully Backed. The process by which the tube is bonded 360° around the jacket.

Hypalon®. A synthetic rubber with excellent ozone, weathering and acid resistance—good abrasion and heat resistance. Widely used in fore hose to retard abrasion.

Impregnate. To infuse a substance with particles of another substance. In fire hose, a process in which a dye or chemical is forced into the yarns to mildew treat or coat the jacket for various reasons.

Jacket. A seamless, tubular, woven fabric.

Lined Hose. A jacket which has a tube of rubber inside designed not to leak under hydrostatic pressure.

Liner. The innermost continuous rubber element of the fire hose.

Loose-at-Fold. The process by which a tube is not bonded 360° around by the jacket.

Mildew. Growth of organic matter produced by fungi. It will discolor and cause deterioration of the woven fabric.

Mildew Resistant. Designed to withstand the growth of mildew and mold, without any deteriorating effect of the fabric.

Neoprene®. A synthetic rubber. Excellent resistance to many chemicals, weathering, ozone, heat, cold and abrasion. Ideally suited for fire hose liners where prolonged storage is a factor.

Nylon. A synthetic fiber, named by E.I. DuPont, used in wearing apparel, and other commercial and industrial applications where elongation is not a factor.

Oxygen Bomb. A chamber capable of holding oxygen at an elevated pressure which can be heated to an elevated temperature. Used for accelerated aging tests of the rubber liner.

Pick. Circular yarn woven between longitudinal warp ends forms a pick on one turn of the finished jacket.

Polyester. A synthetic material either spun or filament. Can be used in both the warp and filler yarn in fire hose.

Spun Yarn (Polyester). Cut lengths of synthetic yarn (approximately 4-1/2") twisted into a pile warp yarn.

Staple (Cotton). The length by measurement of a selected portion of the fibers. It is assigned by custom to a sample or bale as a whole. Directly relates to quality and strength of cotton yarn.

Shore Hardness. An arbitrary numerical value which measures the hardness or stiffness or a rubber sample.

Tensile Strength. The measure of the ability of yarn or rubber to resist breaking by tension.

Tube. (See Liner.)

Unlined Hose. A woven hose which does not incorporate a tube. Designed to "seep." Manufactured of line yarn. Normally used as emergency hose.

Warp. The amount of deviation from a straight line when the hose is hydrostatically tested. Usually expressed in inches.

Twist. The turns about its axis of a length of hose subjected to hydrostatic pressure usually expressed in turns per length or degrees per foot.

Yarn Number (Cotton). A conventional relative measure of fineness as applied to yarns. Coarse yarns have low numbers and the fine have high numbers.

GENERAL INFORMATION

COUPLING THREAD DATA

SYSTEM NAME	ABBREVIATION	SEAL METHOD	COMPATIBILITY THREAD
Iron Pipe Thread	IPT	Generic Name For All Pipe Thread	
American Standard Taper Pipe Thread	NPT	Thread Fit	Male NPT—Female NPSM, NPSH Female NPT—Male NPT, NPTF
American Standard Dryseal Pipe Thread	NPTF	Thread Fit	Male NPTF—Female NPSM, NPTF Female NPTF—Male NPTF, NPT
American Standard Straight Pipe Thread	NPSM	Washer Seal	Male NPSM—Female NPSM Female NPSM—Male NPSM, NPT, NPTF
		Mechanical Seal	Male NPSM—Female NPSM Female NPSM—Male NPT, NPTF
American Standard Straight Pipe Thread for Garden Hose and Nipples	NPSH	Washer Seal	Male NPSH—Female NPSH Not compatible with other thread types
Garden Hose Thread	GHT (NPSH Type)	Washer Seal	Male GHT—Female GHT Not compatible with other thread types
Fire Hose	NPSH Type	Sealing method, thread pitch, diameters vary for local and municipal regulations, refer to factory	
American Petroleum Institute Standard	API	Thread Fit	Other API Threads only

FLANGE SIZE

Standard Pipe Flanges

125-150 lbs. American Standard Cast Iron, ASA B16.1 or Forged Steel, ASA B16.5

Designated Pipe Size	O.D. of Flange	Thickness of Flange	Bolt Circle	No. Of Bolts	Size Of Bolt	Approx. Wt. —lbs. Forged Steel (Slip-On or Threaded)
1"	4-1/4"	*9/16"	3-1/8"	4	1/2"	2
1-1/4"	4-5/8"	*5/8"	3-1/2"	4	1/2"	3
1-1/2"	5"	*11/16"	3-7/8"	4	1/2"	3
2"	6"	*3/4"	4-3/4"	4	5/8"	5
2-1/2"	7"	**7/8"	5-1/2"	4	5/8"	-7
3	7-1/2"	**15/16"	6"	4	5/8"	8
3-1/2"	8-1/2"	15/16"	7"	8	5/8"	11
4"	9"	15/16"	7-1/2"	8	5/8"	13
4-1/2"	9-1/4"	15/16"	7-3/4"	8	3/4"	14
5"	10"	15/16"	8-1/2"	8	3/4"	15
6"	11"	1"	9-1/2"	8	3/4"	19
7"	12-1/2"	1-1/16"	10-3/4"	8	3/4"	25
8"	13-1/2"	1-1/8"	11-3/4"	8	3/4"	30
9"	15"	1-1/8"	13-1/4"	12	3/4"	36
10"	16"	1-3/16"	14-1/4"	12	7/8"	43
12"	19"	1-1/4"	17"	12	7/8"	64
14"	21"	1-3/8"	18-3/4"	12	1"	85
15"	22-1/4"	1-3/8"	20"	16	1"	89
16"	23-1/2"	1-7/16"	21-1/4"	16	1"	93
28"	25"	1-9/16"	22-3/4"	16	1-1/8"	120
20"	27-1/2"	1-07/8"	29-1/2"	20	1-1/8"	155
24"	32"	1-7/8"	29-1/2"	20	1-1/4"	210

*Cast Iron are 1/8" thinner. Figures above aply to Forged Steel.
**Cast Iron are 3/16" thinner. Figures above apply to Forged Steel.

300 lbs. American Standard

Pipe Size	O.D. of Flange	Thickness of Flange	Bolt Circle	No. Of Bolts	Size Of Bolt	Approx. Wt. —lbs. Forged Steel (Slip-On or Threaded)
1"	4-7/8"	11/16"	3-1/2"	4	5/8"	3
1-1/4"	5-1/4"	3/4"	3-7/8"	4	5/8"	4
1-1/2"	6-1/8"	13/16"	4-1/2'	4	3/4"	6
2"	6-1/2"	7/8"	5"	8	5/8"	7
2-1/2"	7-1/2"	1"	5-7/8"	8	3/4"	10
3	8-1/4"	1-1/8"	6-5/8"	8	3/4"	3
3-1/2"	9"	1-3/16"	7-1/4"	8	3/4"	17
4"	10"	1-1/4"	7-7/8"	8	3/4"	22
4-1/2"	10-1/2"	1-5/16"	8-1/2"	8	3/4"	25
5"	11"	1-3/8"	9-1/4"	8	3/4"	28
6"	12-1/2"	1-7/16"	10-5/8"	12	3/4"	39
7"	14"	1-1/2"	11-7/8"	12	3/4"	48
8"	15"	1-5/8"	3"	12	7/8"	58
9"	16-1/4"	1-3/4"	14"	12"	1"	69
10"	17-1/2"	1-67/8"	15-1/4"	16	1"	81
12"	20-1/2"	2"	17-3/4"	16	1-1/8"	115
14"	23"	2-1/8"	20-1/4"	20	1-1/8"	164
15"	24-1/2"	2-3/16"	21-1/2"	20	1-1/8"	194
16"	25-1/2"	2-1/4"	22-1/2"	20	1-1/4"	220
18"	28"	2-3/8"	24-3/4"	24	1-1/4"	280
20"	30-1/2"	2-1/2"	27"	24	1-1/4"	325
24"	36"	2-3/4"	32"	24	1-1/2"	490