Corrosion Guide Instructions

WARNING:

This guide is the only document to be used in making recommendations for corrosive service for Instrument Division products. Call Customer Service for questions on unlisted chemicals or chemical concetrations.

The information provided here is for general information only. The end user is responsible for choice of product in his own application, based upon his own determination of the materials, chemicals, and corrosion factors involved. THERE ARE NO WARRANTIES (UNLESS SPECIFICALLY STATED IN SELLER'S WARRANTY), EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. SELLER'S LIABILITY SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT OF ANY DEFECTIVE PRODUCTS OR SERVICES, OR REFUND OF AN EQUITABLE PORTION OF THE PURCHASE PRICE, AND THE PARTIES AGREE THAT THIS SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY. SELLER SHALL NOT BE LIABLE, IN ANY EVENT, FOR LOSS OF PROFITS, BUSINESS LOSSES, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Careless use of this table could result in an accident endangering life and property. Most process plants or refineries have chemical or corrosion engineers, who are better able to specify instrument materials, since they are familiar with the details and past history of their own applications. This table should be used only when the company has no such resource. **Consult the Stratford Customer Service Department about chemicals or conditions not covered in the guide: Don't guess!**

The table is intended to serve solely as a general guide in the recommendation of materials for corrosive services and must be regarded as indicative only and not as any guarantee for a specific service. There are many conditions which cannot be covered by a simple tabulation such as this, which is based on uncontaminated chemicals, not mixtures.

Many of the chemicals listed are dangerous or toxic. No material recommendation should be made when there is insufficient information, a high degree of risk, or an extremely dangerous chemical. The end user is responsible for testing materials in his own application, or for securing the services of a qualified engineer to recommend materials.

References:

This Guide was developed for Instrument Division products from manufacturer's literature and standard references such as:

Corrosion Data Survey, Metals Section (1985) or *Non-Metals Section* (1975), available from NACE, (National Association of Corrosion Engineers) P. O. Box 218340, Houston, TX 79231, Phone (713) 492-0535.

Chemical Resistance Guide for Metals and Alloys, and --- *for Elastomers*, both published by Compass Publications, PO Box 2276, LaMesa CA 91943, Phone (619) 589-9636.

Corrosion Resistance Tables 4th ed. 1995 Philip A Schweitzer, published by Marcel Dekker, Inc. New York, NY.

Chemical Resistance vol II *Thermoplastic Elastomers*, *Thermosets and Rubbers* 2nd ed. 1994, PDL, Plastics Design Library, Morris NY 13808.

To quote part of ASME B40.1 - 1991 *Gauges – Pressure Indicating Dial Type – Elastic Element* Available from ASME, New York, NY; paragraphs 4.3.3 and 4.3.4:

> The elastic element is generally a thin walled member, which operates under high stress conditions and must be carefully selected for compatibility with the pressure medium being measured. None of the common element materials are impervious to every type of chemical attack. The potential for corrosive attack is established by many factors, including the concentration, temperature and contamination of the medium.
>
> In addition to the factors discussed above, the capability of the pressure element is influenced by the design, materials and fabrication of the joints between its parts.

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Factory Questions:

The Stratford Engineering or Customer Service Departments will provide assistance when necessary, but the end users engineers should always be consulted first. If Dresser is to be questioned, please be prepared with the following information.

Also, The name and phone number of the facility engineer or technical contact.
Be sure of the chemical name of the corrodant; seemingly minor differences in name can mean entirely different substances. For example, sodium nitrite is quite different from sodium nitrate. Cupric chloride has corrosion properties different from cuprous chloride.

Other Gauge Selection Guidelines:

Since a Bourdon tube is a spring, it may encounter corrosion fatigue. Minimize stresses by selecting a gauge with a pressure range twice the maximum operating pressure. Specify a liquid filled gauge with a throttle plug if there is pulsation or vibration.

To repeat ANSI B40.1 in part:

> 4.3.1 Operating pressure. The pressure gauge selected should have a range such that the operating pressure occurs in the middle half … of the scale. A good rule of thumb is to select a gauge with a full scale pressure two times the intended operating pressure.

Do not use a steel Bourdon tube if the adjacent piping is a more corrosion resistant material; avoid mixing dissimilar metal alloys.

A diaphragm seal made of suitably corrosion resistant materials should be used where there is potential for corrosion of pressure elements; for clogging by solids, or abnormal temperature.

Corrosion Guide Legend Details:

O: An open circle means the material is OK for the service. The uniform corrosion rate is less than .002 per year and there is no tendency for pitting or stress corrosion. A Bourdon tube, bellows, diaphragm or lower housing of this material may be used.

An "O" under the "R" column indicates an "R" gauge system (carbon steel socket, 316 SS Bourdon tube) is permissible if the adjacent piping is iron or steel. There may be some rusting.

L: The letter "L" indicates the uniform corrosion rate is less than .020 inches per year and the material is suitable only for a diaphragm seal lower housing. It is **NOT** suitable for a Bourdon tube, bellows or diaphragm.

X: Cross in box: material is not recommended, there is insufficient information, or there are complex restrictions that cannot be addressed in this simple table. The Stratford Engineering Department has access to more detailed corrosion information and may be consulted if there are questions and there is no facility engineer available.

* See special note in left column of this line

Observe the temperature limitations in the table for rubber and plastic components. These may be lower than temperature listed for the corrodant.

Halar is a trade name of Ausimont USA Inc., Kalrez, Teflon and Viton are trademarks of duPont. Kynar is a trademark of Elf Atochem North America, Philadelphia.

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Oxidizing Agent Warning:

Liquid Fill for Gauges and Diaphragm Seals Used With Oxidizing Agents:

HALOCARBON® gauge or diaphragm seal fill is required for use with media which are strong oxidizing agents. Leakage of strong oxidizing agents may cause fires or violent reactions if mixed with glycerin, silicone or oil, instrument fills. To specify Halocarbon®, add variation XGX to the product code for gauges, or variation XCF for diaphragm seals.

Halocarbon is mandatory for use with:

* dry or moist **Chlorine, Oxygen, Ozone, or ETO** (Ethylene Oxide),
* with concentrated **Sulfuric acid, or Nitric acid**
* with concentrated **Sodium Hypochlorite, Sodium Chlorate, Sodium Chlorite, Chlorine Dioxide, or Hydrogen Peroxide.**

Less common chemicals requiring HALOCARBON include aqueous solutions, with over 10% of chemical compounds, whose name ends in any of the following:

(For example, hydrogen peroxide, sodium permanganate, potassium chlorate).

Halocarbon is a trademark for chlorotrifluoroethylene (CTFE) oils and greases made by Halocarbon Products Corporation, River Edge, NJ. Occidental Chemical's Fluorolube®, has the same non-reactive chemical, both carry the CAS number 9002-83-9. CAS (Chemical Abstracts Service) is a division of the American Chemical Society that assigns a unique identifying number for each chemical compound and its structure.

Dilute water solutions (over 90% water) of these chemicals do not normally behave as oxidizing agents. The customer's facility engineer is responsible for deciding whether a solution could be hazardous.

In the following corrosion chart, chemical names with a (Bomb Symbol) are oxidizing agents and Halocarbon fill should be used for solutions with over 10% of the chemical.

If in doubt whether a material is an oxidant, consult the facility engineer, Stratford Engineering, or a reference such as Dangerous Properties of Industrial Materials, N.I. Sax, Van Nostrand Reinhold, or the U. S. Department of Transportation Hazardous Materials Table in 49CFR 172.101 the Merck Index, or other publications.

Corrosion Guide Instructions

Sour Gas/Oil Warning:

NACE Gauges and Pressure Products for Sour Gas or Oil Service:

See product bulletin DU/PI-63 for a more complete discussion of this subject. The term "sour" when used in reference to oil or gas, means Hydrogen Sulfide (H2S) is present as an impurity. Hydrogen sulfide is a foul smelling, deadly poisonous gas which causes many metals to fail by stress corrosion cracking. It occurs naturally in many oil and gas fields. Metallic pressure products for use in sour petroleum service must comply with the National Association of Corrosion Engineers, (NACE) Material Requirement MR-01-75; *Sulfide Stress Cracking Resistant Metallic Materials for Oilfield Equipment.* It is a legal requirement in many states. This document specifies both materials and limiting hardness. Gauges above 600psi for NACE service must be ordered to variation XMA.

Only Monel and some other Nickel alloy Bourdon tube gauges will meet the specification. Some competitors' distributors have offered stainless steel gauges, but none of the major gauge manufacturers will support this claim.

Ashcroft Pressure gauges meeting NACE MR-01-75 are:

> Monel Duragauges, General Service Gauges, and type 1082 Test gauges, ranges 12- 600psi.
>
> All gauges with ranges above 600psi require variation XMA. Type 1082 Test gauges above 4000psi will not meet the specification and are not available. No gauge above 23,000psi is available for NACE MR0175 applications

The gauges listed above are the only ones meeting the requirements of NACE MR-01-75 and must be supplied when customers request a NACE gauge, have an application covered by the standard, or have an application involving hydrogen sulfide as an impurity. A NACE gauge is recommended when a sewage treatment plant has an appreciable concentration of hydrogen sulfide.

The preferred diaphragm seal for sour gas/oil service is a Hastelloy C (C276) diaphragm and lower housing.

While non-metals are not yet covered by NACE standard, Teflon TFE is highly rated. Viton is not recommended and the Kalrez compound 2037 used for Ashcroft diaphragms, has poor resistance to the amine inhibitors frequently to reduce corrosion of metals in sour oil fields.

Dry Chlorine/Titanium Warning

Please note that **Titanium** is **not suitable** when exposed to **dry chlorine** (either vapor or liquid). In the absence of water, Titaniun can burn and possible explode, even at room temperature.

Do not confuse **Tit**anium with **Tan**talum. Tantalum is fully resistant to dry or wet chlorine and is the most frequently used diaphragm material when combined with a Hastelloy C lower housing.

Do not confuse liquid chlorine with "wet" chlorine. Wet means there is water mixed with the chlorine, which can form hydrocloric acid. Chlorine gas liquefies at about 120 psi and is normally shipped as a liquid in pressurized containers.

Chlorine is the highest volume chemical produced in the USA and is used extensively in treating both potable water and sewage treatment.

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Corrodent	Common Names & Formulas	Corrodent Temp. °F MAX	Concentration % in H2O	METALS: 403/410 SS [SE]	Carbon Steel [B]	304 SS [C]	316 SS [S], [SL]	Carp. 20 Cb 3 [D]	Phos. Bronze [A]	Brass [AA]	Monel [P OR M]	Nickel [N]	Inconel 600,718 [W],[WW]	Hastelloy B2 [G]	Hastelloy C276 [H]	Tantalum [U]	Titanium [TI] (<160°F)	"R" Systems	PLASTICS: PVC (-40/140°F) [V]	Kynar (PVDF) (180°F) [KY]	Halar (ECTFE) (250°F) [HH]	Teflon (TFE) (400°F) [T]	ELASTOMERS: Neoprene (CR) (140°F)	Viton (FKM) (300°F) [Y]	Buna "N" (NBR) (150°F)	Kalrez 2037 (200°F) [K]
ACETIC ACID		200	<40	X	X	X	O	O	X	X	X	X	X	X	O	O	O	X	X	O	O	O	X	X	X	O
ACETIC ANHYDRIDE		200	-	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	X	X	X	O	X	X	X	O
ACETONE		150	-	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	O	X	X	X	O
ACETYLENE, DRY (Explosive in Cu)		200	100	O	O	O	O	O	X	X	X	O	O	O	O	O	O	O	X	X	X	O	X	X	X	O
ACROLEIN		200	100	X	X	L	L	L	X	X	L	L	L	L	L	O	O	X	X	X	X	O	X	X	X	O
ALUMINUM CHLORIDE	$AlCl_3$	150	-	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	L	O	O	O	O	O	O	O
ALUMINUM SULFATE	Alum. Al2(SO4)3	150	< 50	X	X	L	L	L	X	X	X	X	X	O	O	O	O	X	L	O	O	O	O	O	O	O
Ammonia Anhydrous (Wet, see Ammonium Hydroxide)	DOT Quality NH_3	300	100	O	O	O	O	O	X	X	X	X	X	L	L	X	X	O	X	X	O	O	X	X	X	O
AMMONIUM CHLORIDE	Sal Ammoniac NH_4Cl	200	<40	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	X	O	O	O	O	O	X	O
AMMONIUM HYDROXIDE (*316SS <70°F)	Ammonia Water NH_3 in Water	200	<30	X	X	L	O*	L	X	X	X	X	X	L	L	X	O	X	O	O	O	O	O	X	O	O
AMMONIUM NITRATE	Norway Saltpeter NH_4NO_3	200	<50	L	X	O	O	O	X	X	X	X	X	X	L	O	O	O	O	O	X	O	O	X	O	O
AMMONIUM SULFATE	$(NH_4)_2SO_4$	200	<60	X	X	X	L	L	X	X	X	L	X	X	L	O	O	X	O	O	O	O	O	X	O	O
AMYL ACETATE		250	-	X	L	O	O	O	X	X	X	X	X	O	O	O	O	O	X	X	X	O	X	X	X	O
ANILINE		200	>99	X	X	O	O	O	X	X	L	L	L	X	X	O	O	X	X	X	X	O	X	X	X	O

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BEER		200	-	X	X	O	O	O	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	X	O	X
BENZENE	C_6H_6	200	<50	L	L	O	O	O	O	L	O	O	O	X	X	O	O	O	X	X	X	O	X	X	X	O
BENZIDINE		200	>99	L	L	L	L	L	L	L	L	L	L	L	L	O	O	X	X	X	X	X	X	X	X	O
BENZOIC ACID		200	<70	L	X	L	L	L	X	X	L	L	X	O	O	O	O	X	X	O	L	O	X	X	X	O
BLACK LIQUOR		200	-	X	X	X	X	L	X	X	X	X	X	X	X	X	X	X	X	X	L	O	X	O	X	X
BORIC ACID	H_3BO_4		<25	X	X	O	O	O	L	L	L	L	L	O	O	O	O	X	O	O	O	O	O	O	O	O
BROMINE, DRY (< 57 PPM H_2O)	Br	200	>99*	X	X	X	X	X	X	X	X	O	O	X	X	O	X	X	X	L	X	X	X	O	X	O
BROMOBENZENE		200	>99	X	X	O	O	O	X	X	L	L	L	L	O	O	O	O	X	X	X	O	X	O	X	O
BUTADIENE		200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O		O	X	O	X	O	X	X	X	O
BUTANE	C_4H_{10}	200	-	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	X	O	O	O
BUTYL ALCOHOL	Butanol	200	-	O	X	O	O	O	O	O	O	O	O	O	O	O	O	X	X	O	O	O	O	O	O	O
BUTYRIC ACID		200	<10	X	X	L	L	L	X	X	X	X	X	O	O	O	O	X	X	O	O	O	X	X	X	O
CALCIUM BISULFITE	$Ca(HSO_3)_2$	250	>90	X	X	X	O	X	X	X	X	X	X	X	X	X	O	X	O	O	O	O	O	O	X	O
CALCIUM CHLORIDE	$CaCl_2$	200	<80	X	X	X	X	X	X	X	X	X	O	O	O	O	O	X	O	O	O	O	O	O	O	O
CALCIUM HYDROXIDE	Slaked Lime $Ca(OH)_2$	200	<50	X	X	X	L	X	X	X	X	X	X	X	O	O	O	X	O	O	O	O	O	O	O	O

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CALCIUM Hypochlorite 💣	$Ca(OCl)_2$	75<	<10	X	X	X	X	O	X	X	X	X	X	X	L	O	O	X	O	O	O	O	X	O	X	O
CARBON DIOXIDE, WET	CO_2	150	>50 ppm	X	X	O	O	O	X	X	O	X	O	O	O	O	O	X	O	O	O	O	X	O	O	O
CARBON MONOXIDE	CO	200	>99	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O	X	O	X	O	O	O	O	O
CHLORINATED WATER (<10ppm Chlorine)		70	<10 ppm	X	X	O	O	O	O	O	O	X	X	L	O	O	O	X	O	O	O	O	X	O	X	O
CHLORINATED WATER (To Saturation)		120	-	X	X	X	X	O	X	X	X	X	X	L	O	O	O	X	X	O	O	X	X	X	X	O
CHLORINE, DRY 💣 (*Consult Eng.) (**See Page 4 in Text)	Cl_2	200	>99	X	X	X	X	L	X	X	*	L	X	X	L	O	**	X	X	L	X	X	X	O	X	O
CHLORINE, MOIST 💣		160	>90	X	X	X	X	X	X	X	X	X	X	X	L	O	X	X	X	L	X	X	X	X	X	X
CHLOROACETIC ACID		150	<30	X	X	X	X	X	X	X	L	X	X	L	L	O	L	X	X	X	O	X	X	X	X	O
CHLOROFORM, DRY	Trichloromethane $CHCl_3$	100	>99	X	X	O	O	O	X	X	O	O	O	X	X	O	O	X	X	O	O	O	X	X	X	O
CHROMIC ACID	Chromium Trioxide H_2CrO_4	200	<30	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	O	O	O	X	O	X	O
CITRIC ACID		200	>10 <50	X	X	L	O	O	X	X	L	L	L	O	O	O	O	X	O	O	O	O	O	O	O	O
COPPER NITRATE 💣	Cupric Nitrate $Cu(NO_3)_2$	200	<10	X	X	O	O	O	X	X	X	X	X	X	X	O	O	X	X	O	O	O	O	O	O	O
COPPER SULFATE	Culpric Sulfate $CuSO_4$	200	<30	X	X	L	L	O	X	X	X	X	X	X	O	O	O	X	O	O	O	O	O	O	O	O
CREOSOTE	Coal-Tar	200	-	X	L	L	L	L	L	L	L	L	L	L	L	O	X	X	X	X	X	O	X	O	X	O

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CRESOL		200	>99	O	X	O	O	O	O	L	O	O	O	O	O	O	L	X	X	O	X	O	X	X	X	O
CRUDE OIL - Sour (See Warning Pg. 4 text)		<200	<5	X	X	X	X	X	X	X	O	X	X	X	O	O	X	X	X	O	O	O	X	X	X	X
CRUDE OIL - Sweet, Low Sulfur		200	-	X	L	O	O	O	X	X	O	O	O	O	O	O	O	O	O	O	O	O	X	O	X	O
CUPRIC CHLORIDE		200	<40	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	O	O	O	O	O	O
DOWTHERM A		300	-	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O	X	X	X	O	X	X	X	O
ETHYL ACETATE		<200	-	X	L	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	O	X	X	X	O
ETHYL ALCOHOL	Ethanol C_2H_5OH	200		O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
ETHYL CHLORIDE, DRY		<200	>99	O	O	X	X	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	X	O	O	O
ETHYLENE GLYCOL	Glycol	200	>40	X	X	O	O	O	L	L	L	L	L	O	O	O	O	X	O	O	O	O	O	O	O	O
ETHYLENE OXIDE	ETO	100	>99	X	O	O	O	O	O	O	O	O	O	X	X	O	X	O	X	O	O	O	X	X	X	O
FERRIC CHLORIDE (*Viton <170°F)	$FeCl_3$	200	<40	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	O	O	O	O	O	O*	O	O
FERRIC SULFATE (*Viton <170°F)	$Fe_2(SO_4)_3$	150	<10	X	X	O	O	O	X	X	X	X	O	X	O	O	O	X	O	O	O	O	O	O*	O	O
FERROUS CHLORIDE (*Viton <170°F)	$FeCl_2$	200	<30	X	X	X	X	X	X	X	X	X	X	X	L	O	O	X	O	O	O	O	X	O*	O	O
FERROUS SULFATE (*Viton <170°F)	$FeSO_4$	200	<50	X	X	X	X	L	X	X	X	X	X	L	L	O	O	X	O	O	O	O	O	O*	O	O
FLUORINE, GAS DRY	F	200	>99	X	X	X	X	X	X	X	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X

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Corrodent	**Common Names & Formulas**	Corrodent Temp. °F MAX	Concentration % in H2O	403/410 SS [SE]	Carbon Steel [B]	304 SS [C]	316 SS [S], [SL]	Carp. 20 Cb 3 [D]	Phos. Bronze [A]	Brass [AA]	Monel [P OR M]	Nickel [N]	Inconel 600,718 [W],[WW]	Hastelloy B2 [G]	Hastelloy C276 [H]	Tantalum [U]	Titanium [TI] (<160°F)	"R" Systems	PVC (-40/140°F) [V]	Kynar (PVDF) (180°F) [KY]	Halar (ECTFE) (250°F) [HH]	Teflon (TFE) (400°F) [T]	Neoprene (CR) (140°F)	Viton (FKM) (300°F) [Y]	Buna "N" (NBR) (150°F)	Kalrez 2037 (200°F) [K]
FLUOROSILICIC ACID	Fluosilicic Acid H_2SiF_6	140	<30	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	X	O	O	O
FORMALDEHYDE (*316SS <90%)		200	-	X	X	X	O*	O	X	X	O	O	O	X	X	O	O	X	X	X	X	O	X	X	X	O
FORMIC ACID		<150	-	X	X	X	X	X	X	X	X	X	X	L	L	O	X	X	X	O	O	O	X	X	X	O
FURFURAL		200	<10	X	X	O	X	O	L	L	L	L	X	L	O	O	L	X	X	X	O	O	X	X	X	O
GASOLINE (*Flowing-Phos Bronze)		200	-	X	X	L	O	X	O*	L	X	X	L	O	O	O	X	X	X	O	O	O	X	O	X	O
GLUCOSE		300	-	X	X	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O
GLYCERINE	Glycerol	200	-	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
HEXANE, DRY		200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	X	O	O	O
HYDRAZINE		100	-	X	X	O	X	X	X	X	X	X	X	X	X	X	X	X	X	O	X	O	X	X	X	O
HYDROBROMIC ACID	HBr	200	-	X	X	X	X	X	X	X	X	X	X	X	X	O	X	X	X	O	O	O	X	O	X	O
HYDROCHLORIC ACID	HCl	100	<35	X	X	X	X	X	X	X	X	X	X	L	X	O	X	X	X	O	O	X	X	O	X	O
HYDROFLUORIC ACID (No Air)	HF	120	<50	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	O	X	X
HYDROFLUOSILIC ACID	Fluosilicic Acid	140	<30	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	X	O	O	O
HYDROGEN	H_2	200	-	X	X	X	O	X	O	O	X	X	X	X	X	X	X	X	X	O	X	X	O	O	O	O
Hydrogen Peroxide (*Neoprene <110°F)	H_2O_2	200	<50	X	X	L	L	X	X	X	X	X	X	X	X	O	X	X	X	O	X	O	O*	X	X	O

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HYDROGEN SULFIDE (See Sour Gas/Oil Warning)	H_2S	140	-	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	X	O	O	X	X	X	X	X
KEROSENE	Kerosine	200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O
LACTIC ACID		<100	<70	X	X	O	O	O	X	X	X	X	X	L	L	O	O	X	X	O	O	O	X	O	X	O
MAGNESIUM CHLORIDE	$MgCl_2$	200	<40	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	O	O	O	O	O	O	O	O
MAGNESIUM SULFATE	Epsom Salts $MgSO_4$	200	<40	X	X	O	O	O	O	O	O	O	X	O	X	O		O	O	O	O	O	O	O	O	O
MERCURIC CHLORIDE	$HgCl_2$	200	<60	X	X	X	X	X	X	X	X	X	X	X	X	O		X	O	O	O	O	X	O	O	O
MERCURY	Quicksilver Hg	200	>99	O	O	O	O	O	X	X	X	O	X	X	O	X		O	O	O	O	O	O	O	O	O
METHANE DRY, NO H_2S	CH_4	200	-	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O
METHYL ETHYL KETONE	M.E.K.	120	>99	X	L	O	O	O	X	X	X	X	X	X	X	X		O	X	X	X	O	X	X	X	O
MILK				X	X	O	O	X	X	X	X	X	O	X	O	X	X	X	O	O	O	O	O	O	O	X
MORPHOLINE		200	>99	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	X	X	X	O	X	X	X	O
NAPHTHA	Benzin	200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O
NAPHTHALENE	Tar Camphor $C_{10}H_8$		>99	O	O	O	O	O	L	L	O	O	O	X	X	L	O	O	X	O	X	O	X	O	X	O
Natural Gas, DOT Quality (*Cu alloy<100PSI.)		150	-	L	L	L	O	X	O*	O*	L	X	X	X	X	O	X	O	X	O	X	O	O	O	O	O
NICKEL CHLORIDE	$NiCl_2$	200	<80	X	X	X	X	X	X	X	X	X	X	O	O	O	O	X	O	O	O	O	O	O	O	O

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NICKEL SULFATE	$NiSO_4$	200	-	X	X	L	O	L	X	X	X	X	X	X	X	X	O	X	L	O	O	O	O	O	O	O
NITRIC ACID	HNO_3	<100	<95	X	X	O	O	O	X	X	X	X	X	X	X	O	X	X	X	O	O	O	X	X	X	X
NITROUS OXIDE	Laughing Gas N_2O	<100	>97	X	O	L	L	L	X	X	X	X	X	X	L	O	X	X	X	X	O	O	X	X	X	O
OLEIC ACID		200	-	X	X	L	L	O	L	L	L	L	O	L	L	O	L	X	X	O	O	O	X	X	X	O
OXALIC ACID		140	<50	X	X	X	X	X	X	X	X	X	X	X	L	O	X	X	L	O	O	O	X	O	X	O
OXYGEN GAS	O_2	120	-	X	X	O	O	O	O	O	O	X	O	O	O	O	X	X	O	O	O	O	O	X	X	X
OZONE	O_3	120	<8	X	X	O	O	O	X	X	X	X	X	X	X	X	X	X	X	O	O	O	X	O	X	O
PALMITIC ACID		160	>99	X	X	O	O	X	X	X	X	X	X	X	O	X	X	X	X	O	O	O	X	O	O	O
PHENOL		120	>90	X	X	O	O	O	X	X	L	O	O	X	O	O	X	X	X	O	X	O	X	O	X	O
PHOSPHORIC ACID	H_3PO_4	100	<60	X	X	O	O	O	X	X	X	X	L	O	O	O	X	X	O	O	O	O	X	O	X	O
PHTHALIC ANHYDRIDE		200	>99	X	O	O	O	O	X	X	O	O	O	O	O	O	X	O	X	X	X	O	X	X	X	O
PICRIC ACID		200	<10	X	X	O	O	X	X	X	X	X	X	X	L	O	X	X	X	X	X	O	X	O	X	O
Potassium Hydroxide	KOH	160	<50	X	L	L	L	L	X	X	O	O	L	L	L	X	X	X	O	X	O	O	O	X	X	O
POTASSIUM NITRATE	Saltpeter KNO_3	200	<50	L	L	L	L	X	L	L	L	L	L	X	L	O	O	X	O	O	O	O	O	O	O	O
POTASSIUM NITRITE	KNO_2	200	<50	L	L	L	L	L	L	L	L	L	L	L	L	X	X	X	O	X	X	O	O	X	X	O

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PROPANE	C_3H_8	200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O
ROSIN		200	-	X	X	L	O	O	L	L	O	O	X	X	O	X		O	X	X	X	O	O	X	O	O
SEA WATER (*Monel not for Diaphragms)	Ocean Water	200	-	X	X	X	X	X	X	X	O*	X	O	X	O	O	O	X	O	O	O	O	O	O	O	O
SEWAGE, RAW		100	-	X	X	L	L	L	L	L	L	X	X	X	O	O	X	X	O	O	O	O	X	O	O	O
SILVER NITRATE (Acid free)	$AgNO_3$	200	<50	L	X	L	L	O	X	X	X	X	X	X	X	O	X	X	O	O	O	O	O	O	X	O
SKYDROL		200	100	X	X	O	O	O	X	X	O	O	O	O	O	O	X	X	X	X	X	O	X	X	X	O
SODIUM BICARBONATE	Baking Soda $NaHCO_3$	<200	<20	O	L	O	O	O	L	L	O	O	O	L	L	X	O	O	O	O	O	O	O	O	O	O
SODIUM BISULFATE	$NaHSO_4$	<200	<30	X	X	X	X	O	L	L	L	L	X	L	L	O	X	X	O	O	O	O	O	O	X	O
SODIUM BISULFITE	$NaHSO_3$	<150	<40	X	X	X	X	L	X	X	L	X	X	L	L	O	O	X	O	O	O	O	O	O	O	O
SODIUM CARBONATE	Soda Ash Na_2CO_3	<200	<40	O	L	O	O	O	L	X	O	O	O	O	O	O	O	X	O	O	O	O	O	O	O	O
SODIUM CHLORIDE	Table Salt NaCl	<200	<30	X	X	X	X	X	X	X	O	L	O	X	O	O	O	X	O	O	O	O	O	O	O	O
SODIUM CHROMATE	Na_2CrO_4	<200	<60	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	X	O	O
SODIUM CYANIDE	NaCN	<140	-	X	O	O	O	O	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O	O
SODIUM DICHROMATE	S. Bichromate $Na_2Cr_2O_7$	<140	<20	O	L	O	O	O	X	X	X	X	X	X	X	X	O	O	O	O	O	O	X	O	X	O
SODIUM HYDROXIDE	CAUSTIC SODA NaOH	<150	<40	X	X	X	O	O	L	L	O	O	O	O	L	X	O	O	O	X	O	O	O	X	X	O

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SODIUM HYDROXIDE	CAUSTIC SODA NaOH	<200	<70	X	X	X	X	O	X	X	O	O	O	O	L	X	X	X	X	X	X	O	X	X	X	O
Sodium Hypochlorite (* Kynar 15% max. conc.)	NaOCl	150	<40	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	O*	X	X	X	X	X	O
SODIUM NITRATE	Chile Saltpeter $NaNO_3$	<200	-	O	L	O	O	O	X	X	X	O	X	X	X	O	O	O	O	O	O	O	X	X	X	O
SODIUM NITRATE	$NaNO_2$	<200	<60	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	O	O	X
SODIUM PEROXIDE	Na_2O_2	<200	<10	O	L	O	O	O	X	X	L	L	L	L	L	X	X	O	L	O	O	O	X	O	X	O
SODIUM PHOSPHATE (TRIBASIC)	TSP Na_3PO_4	<200	<60	O	O	O	O	O	L	O	O	O	O	L	O	O	X	O	X	O	O	O	X	O	X	O
SODIUM SILICATE	Water Glass	<200	-	O	O	O	O	O	X	X	O	O	O	X	L	O	O	O	O	O	O	O	O	O	O	O
SODIUM SULFATE	Na_2SO_4	<200	<30	O	X	O	O	O	L	L	L	L	L	L	L	O	O	O	O	O	O	O	O	O	O	O
SODIUM SULFIDE	Na_2S	<200	<30	X	X	X	L	O	X	X	L	L	L	X	L	O	X	X	O	O	O	O	O	X	O	O
SODIUM SULFITE (*Viton<140°F)	Na_2SO_3	<200	<30	X	X	L	O	O	X	X	X	X	X	X	O	O	O	X	O	O	O	O	O	O*	X	O
SODIUM THIOSULFATE	$Na_2S_2O_3$	<200	-	X	X	L	O	O	X	X	O	L	L	L	L	O	X	X	O	O	O	O	X	O	X	O
SOUR GAS / OIL (See Warning Pg. 4 of Text)		<200	<5	X	X	X	X	X	X	X	O	X	X	X	O	O	X	X	X	O	O	O	X	X	X	X
STANNOUS CHLORIDE	Tin Dichloride $SnCl_2$	<200	<50	X	X	X	X	L	X	X	X	X	X	X	X	O	X	X	X	O	X	O	X	O	O	O
STEAM (WITH SIPHON)		<300	-	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	O	O	X	X	X	X
STEARIC ACID		<200	-	X	X	O	O	O	X	X	X	O	L	X	O	O	X	X	O	O	O	O	X	X	X	O

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STODDARD SOLVENT		<150	-	O	O	O	O	O	O	O	O	O	O	O	O	O		O	X	O	O	O	X	O	O	O
SULFUR	S	250	>95	X	X	X	L	X	X	X	X	X	O	L	O	O	O	X	X	X	X	O	X	O	X	O
SULFUR DIOXIDE, WET	SO_2	140	-	X	X	X	L	X	X	X	X	X	X	X	L	O	O	X	X	L	O	O	X	O	X	O
SULFUR TRIOXIDE, DRY	SO_3	140	>99	X	X	L	L	L	X	X	X	L	L	X	O	X	X	X	O	X	X	O	X	O	X	O
SULFURIC ACID <60%	H_2SO_4	200	<60	X	X	X	X	X	X	X	X	X	X	L	X	O	X	X	X	O	O	O	X	X	X	O
SULFURIC ACID >80%	H_2SO_4	200	>80	X	X	X	X	X	X	X	X	X	X	L	X	O	X	X	X	X	O	O	X	X	X	O
TANNIC ACID	Tannin	<150	-	X	O	L	O	O	X	X	O	X	L	X	X	O	O	O	O	O	O	O	X	O	O	O
TARTARIC ACID		<150	<50	X	X	X	O	X	X	X	O	X	O	X	X	O	X	X	X	O	O	O	O	O	O	O
TIN CHLORIDE (Stannous)	$SnCl_2$	<200	<10	X	X	X	X	O	X	X	X	X	X	X	X	O	X	X	X	O	X	O	X	O	O	O
TOLUENE (TOLUOL)		<200	>99	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X	X	X	O	X	X	X	O
Trichloroacetic Acid		<200	<50	X	X	X	X	X	X	X	L	X	X	L	O	X	X	O	X	X	X	X	X	X	X	O
Trichloroethane 1,1,1, Dry (*Teflon<200°F)		<150	>98	O	O	O	O	O	O	O	O	O	O	O	O	O		O	X	X	X	O*	X	X	X	O
Trichloroethyene, Dry		<200	>99	X	O	O	O	O	X	X	O	O	L	O	O	O	O	O	X	O	X	O	X	X	X	O
TURPENTINE		<200	>98	O	O	O	O	O	O	O	O	O	O	O	O	O		O	X	O	O	O	X	O	X	O
UREA	Carbamide	<200	<50	X	X	O	O	X	X	X	X	X	L	X	X	X	O	X	X	O	O	O	X	X	X	X

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O = OK For Indicated Service
L = OK for Lower Housing Only
X = Unsuitable or Insufficient Information
R = "R" System Permissible with Steel Piping.
= Halocarbon Fill
[ ] = Dresser Material Code
> = Greater Than
< = Less Than

Call Customer Service 203-378-8281 for unlisted chemicals

				METALS															PLASTICS				ELASTOMERS			
Corrodent	**Common Names & Formulas**	Corrodent Temp. °F MAX	Concentration % in H2O	403/410 SS [SE]	Carbon Steel [B]	304 SS [C]	316 SS [S] , [SL]	Carp. 20 Cb 3 [D]	Phos. Bronze [A]	Brass [AA]	Monel [P OR M]	Nickel [N]	Inconel 600,718 [W],[WW]	Hastelloy B2 [G]	Hastelloy C276 [H]	Tantalum [U]	Titanium [TI] (<160°F)	"R" Systems	PVC (-40/140°F) [V]	Kynar (PVDF) (180°F) [KY]	Halar (ECTFE) (250°F) [HH]	Teflon (TFE) (400°F) [T]	Neoprene (CR) (140°F)	Viton (FKM) (300°F) [Y]	Buna "N" (NBR) (150°F)	Kalrez 2037 (200°F) [K]
VINYL CHLORIDE		<100	>99	X	X	X	O	O	X	X	O	X	X	X	O	O	O	X	X	O	X	O	X	X	X	O