



gasket

resources
incorporated

**Technical Handbook &
Fluid Sealing Program for**

Railroad Tank Cars



Superior Manufacturing • Quality Performance

This handbook is a summary of the fluid-sealing program that has been developed by Gasket Resources Inc. with the objective of the elimination of bolted joint related NAR's.

Step One: Gasket Selection

A complete analysis of available gasket materials was conducted and an updated gasket materials specification was completed with the goal to consolidate gasket selection to one or two materials per fleet.

Step Two: Supply Management

Due to the logistics of supply, Gasket Resources Inc. formed an alliance that established authorized DURLON® distributors/cutters strategically located to ensure product availability, authenticity and technical support. This alliance agreement can service all repair facilities both on site and through contract repair facilities.

Step Three: Technical Services

GRI's technical services department has established a database of information related to the bolted joints found within most tank car fleets.

Step Four: Training

GRI is committed to training on proper bolted flange assembly installation procedures. The training covers basic bolted joint design knowledge and the proper installation procedures to ensure a tight and lasting seal.

Step Five: Best Practices

The "Bolted Joint Assembly Procedure" is a part of this document. This is a detailed reference for all flange assembly procedures.

GASKET RESOURCES INC.
DURLON® GASKETING TECHNICAL HANDBOOK
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**DURLON® Products are Manufactured
to ISO 9001:2000 Quality Standards**



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Style	Composition	Description
8500	Aramid-Inorganic/NBR	Our workhorse material, DURLON 8500 is excellent in steam, fuels, oils, natural gas, vegetable oils, glycols, inert gases, molten sulfur, alcohols, tall oil, plus many more chemicals. A high quality general service gasket material for use in a wide range of tank car applications for the chemical, pulp and paper, food, beverage, refinery, gas and general industries. FIRE TESTED: DURLON 8500 passed a modified API 607 fire test.
7900, 7925, 7950 (79XX)	Aramid-Inorganic/NBR	A general service compressed sheet with NBR rubber binder for mild service OEM & railroad applications in steam, hydrocarbons and refrigerants. An economical alternative when service ranges and applications are not severe.

Anti-Stick Properties: Much effort has gone into improving the anti-stick release agents of all compressed DURLON® products. All DURLON® compressed gasket materials have passed the MIL-G-24696B Navy Adhesion Test (366°F/48 hrs).

9000/9000N	Pure PTFE resins with inorganic fillers	DURLON 9000/9000N is used extensively in aggressive chemicals in the railroad tank car industry. It has been tested and approved for liquid chlorine, caustics, liquid oxygen, and high purity applications in the pharmaceutical industry. The fillers in DURLON 9000/9000N are engineered shapes, homogeneously blended with pure PTFE resins and do not wick.
9200W	Pure PTFE resins with barium sulfate filler	Suitable for use in aggressive chemicals. Including caustics, hydrogen peroxide, sodium hypochlorite, nitric acid, liquors. Applications in the chemical, pharmaceutical and plastics industries include butadiene, hydrofluoric acid, vinyl chloride, methyl methacrylates, and styrene. DURLON 9200W is also used extensively in railroad tank car applications.

Independent testing has shown the fillers in the DURLON method to be more homogeneously blended than calendered, or layered filled PTFE gasket materials, giving DURLON filled PTFE's more consistent physical and mechanical properties without voids, separation and chemical compatibility problems found in the layered construction method.

Typical Physical Properties

DURLON® Style	8500	79XX	9000/9000N	9200W
Color:	Green	7900 – Off-White, 7925 – Green, 7950 - Blue	9000 - Blue 9000N- White	Granite White
Style	Compressed Sheet	Compressed Sheet	Filled PTFE	Filled PTFE
Composition	Aramid-Inorganic/NBR	Aramid-Inorganic/NBR	Inorganic/PTFE	Barium Sulfate/PTFE
Fluid Services:	Saturated Steam, Oils, Dilute Acids & Alkalis, Solvents, Fuels, Refrigerants	Steam, Water, Oils, Fuels, Dilute Acids & Alkalis, Refrigerants	Steam, Oils, TiO ₂ , ClO ₂ , Liquid Chlorine ¹ , Acids, Caustics, H ₂ O ₂ , Liquid Oxygen ² , Oleum	Steam, Nitric Acid, TiO ₂ , ClO ₂ , H ₂ O ₂ , Liquors, Sulfur Dioxide, Brown Stock, Phosphoric Acid
Temperature, Range:	-100 to 700°F (-73 to 371°C)	-100 to 700°F (-73 to 371°C)	-350 to 520°F (-212 to 271°C)	-350 to 520°F (-212 to 271°C)
Continuous, max:	548°F (287°C)	400°F (204°C)	500°F (260°C)	500°F (260°C)
Pressure Max:	1500 psig (103 bar)	1000 psig (70 bar)	1500 psig (103 bar)	1500 psig (103 bar)
Density, g/cc (lbs/cu. ft):	1.7 (106)	1.7 (106)	2.2 (138)	2.5 (156)
ASTM F36, Compressibility	8-16%	7-17%	8-16%	8-16%
ASTM F36, Recovery	50%	40%	40%	35%
ASTM F38, Creep Relaxation	20%	20%	30%	30%
ASTM F152, Tensile Strength across grain, psi (MPa)	2,000 (13.8)	1,600 (11.0)	2,000 (13.8)	1920 (13.2)
Fluid Resistance, pH Range (room temperature)	3 to 11	3 to 11	0 to 14	0 to 14
Leakage: DIN 3535	0.03 cc/min	0.05 cc/min	0.01 cc/min	0.01 cc/min
ASTM F104 Line Call-Out	F712120-A9B3E12K5M6	F712120-A9B3E22K5M5	F452111-A9B5E11K6M6	F452111-A9B5E11K6M5
Notes:	Passed modified API 607 Fire Test		1. Pamphlet 95, The Chlorine Institute 2. O2 Certified - BAM 3. Conforms to 21 CFR 177.1550 for food and drug contact	Conforms to 21 CFR 177.1550 for food and drug contact

Note: ASTM and DIN properties based on 1/16" sheet thickness, except ASTM F38 which is based on 1/32" sheet thickness. This is a general guide only and should not be the sole means of accepting or rejecting this material. The data listed here falls within the normal range of product properties, but should not be used to establish specification limits nor used alone as the basis of design.

Warning: These materials should never be recommended when both temperature and pressure are at the maximum listed. Properties and applications shown are typical. No application should be undertaken by anyone without independent study and evaluation for suitability. Never use more than one gasket in one flange joint, and never reuse a gasket. Improper use or gasket selection could cause property damage and/or serious personal injury. Data reported in this brochure is a compilation of field testing, field service reports and/or in-house testing. While the utmost care has gone into publishing the information contained herein, we assume no responsibility for errors. Specifications and information contained in this brochure are subject to change without notice. This edition cancels and obsoletes all previous editions.

Causes of Gasket Failure

- Uneven loading of flanges holding gasket in place
- Gasket load too low
- Bolt strength too low
- Torque loss
- Bolt Relaxation/Stretch (approximately 10% in first 24 hours)
- Gasket creep
- Vibration in the system
- Thermal cycling
- Elastic interaction during bolt tightening
- Improper gasket installation procedures

GRI Recommendations

- *Bolt/nut lubrication- lubrication reduces torque loss caused by friction*
- *Through hardened steel washers (ASTM F-436 or similar) - hardened steel washers will create a more reliable flange assembly, with even load distribution during installation.*

Torque loss is inherent in any bolted joint. The combined effects of bolt relaxation, (can be up to 10% during the first 24 hours after installation), gasket creep, vibration in the system, thermal expansion and elastic interaction during bolt tightening contribute to torque loss. When torque loss reaches an extreme, the internal pressure exceeds the compressive force holding the gasket in place and a leak or blow-out occurs.

A key to reducing these effects is proper gasket installation. By bringing the flanges together slowly and parallel when installing a new gasket and taking a minimum of four bolt tightening passes, following the correct bolt tightening sequence or pattern, there is a payoff in reduced NAR's and maintenance costs while increasing safety.

Even when the installation is ideal, where the bolt stress is uniformly applied to each bolt, and the gasket is properly compressed, problems can still arise. Inherently with time, loosening can occur due to the factors already mentioned. If other factors such as cycling, thermal upsets, or vibration are present, periodic rechecking of the fastener torque might be necessary.

For problem areas, high temperature applications or where there is temperature cycling, or where a flange torque cannot be checked, conical spring washers have been found to be very helpful as an aid to torque retention. They act as a spring and help lessen the effects of torque loss.

Reducing Gasket Failures:

- PROPER GASKET INSTALLATION PRACTICES
- Use the correct components, i.e. bolts/nuts and washers
- Lubricate bolts & nut facings
- Bring the flanges together slowly and parallel
 1. Multiple passes with increasing torque,
 2. Each pass following proper tightening sequence
- Use the thinnest gasket possible
- Periodic checking of fastener torque
- Use the right method of bolt up for the job
 - Order of efficiency from least to greatest:
 1. Wrench and cheater bar or sledge hammer
 2. Air impact gun
 3. Torque wrench
 4. Hydraulic torque wrench
 5. Hydraulic stud tensioners

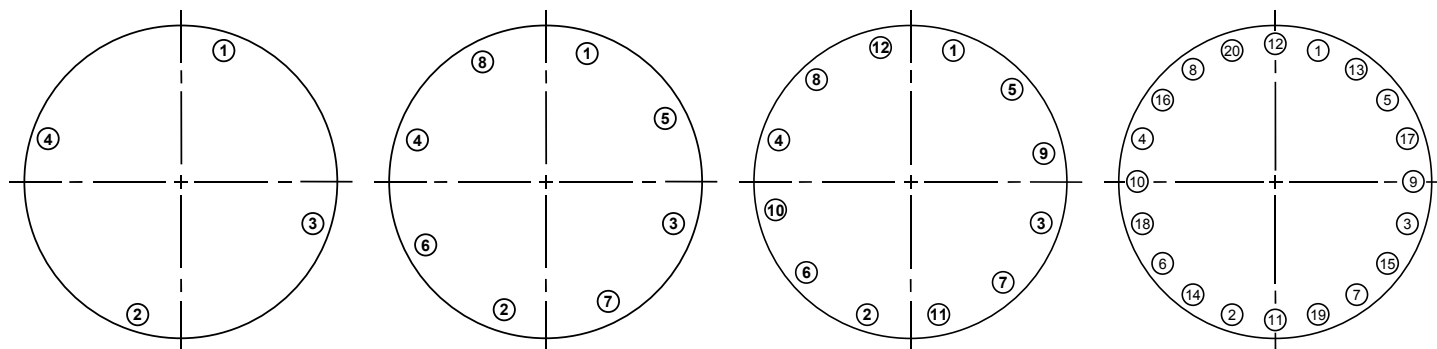
GASKET RESOURCES INC. DURLON® GASKETING - BOLT TIGHTENING WORK SHEET

Location/Identification: _____ Nominal Bolt Size: _____

Gasket Contact Surface Finish on Flange: _____; Lubricant Used: _____

(Initial each step in space provided below.)

- ___ 1. Visually examine and clean flanges, bolts, nuts and washers. Replace components if necessary.
- ___ 2. Install new gasket. **DO NOT USE MULTIPLE GASKETS.**
- ___ 3. **Lubricate bolts, nuts, AND flange surface AROUND BOLT HOLES.**
- ___ 4. Number bolts in cross-pattern sequence according to the appropriate sketch below.
- ___ 5. Install nuts. **HAND TIGHTEN nuts all around until snug. NEXT, using a torque wrench PRE-TIGHTEN BOLTS to 10-20 ft-lbs torque using the cross-pattern tightening sequence below.**
- ___ 6. **Check gap for uniformity.**
- ___ 7. Use the appropriate cross-pattern tightening sequence in the sketch below to hand tighten, pre-tighten and for Rounds 1, 2, and 3. Each tightening sequence in the sketch below constitutes a "Round."



- **Target Torque:** _____ ft-lbs (from torque table)

LUBRICATE, HAND TIGHTEN, PRE-TIGHTEN, then TIGHTEN, bolts in stages using cross pattern sequence

Pre-Tighten - 10-20 ft-lbs

Round 1 - Tighten to _____ ft-lbs (30% of target torque)

Round 2 - Tighten to _____ ft-lbs (60% of target torque)

Round 3 - Tighten to _____ ft-lbs (100% of target torque)

Check gap around the circumference between each of these rounds, measured at every other bolt. If the gap is not reasonably uniform around the circumference, make the appropriate adjustments by selective bolt tightening before proceeding.

- ___ **Rotational Round** – Starting with Bolt No. 1 tighten in a ROTATIONAL, clockwise tightening sequence at 100% of Final Torque (same as Round 3 above), for at least one complete round. If necessary, continue until no further nut rotation occurs at 100% of the Final Torque value for any nut.

TIGHTENING METHOD USED:

Hand Wrench Manual Torque Wrench Hydraulic Torque Wrench
 Impact Wrench Other

Joint Assembler: _____ Date: _____

DURLON® Gaskets; Typical Tank car Torque Values¹

General Purpose Cars

Component	Material	Style	Gasket Material/Dimensions			Bolting	Torque (ft-lbs)	
			Thk.	OD	ID		Dry	Lubricated
Manway Cover	Durlon 9000 (Hard Dimensions)	AAR-1	1/8"	21-5/8"	19-1/2"	1"/A307	250	210
		UTC-1	1/8"	21-1/2"	19-7/16"	1"/A307	250	210
		TRN-1	1/8"	21-11/16"	19-5/8"	7/8"/A449	395	335
	Viton® GF-S (Elastomeric Dimensions)	AAR-1	1/4"	21-11/16"	19-1/2"	1"/A307	85	70
		UTC-1	1/8"	21-1/2"	19-7/16"	1"/A307	85	70
		TRN-1	1/4"	21-1/2"	19-1/4"	7/8"/A449	90	75
Cover Flange	Durlon 9000	-	1/8"	17-1/8"	15"	1"/A193-B7	480	410
		-	1/8"	17"	16"	3/4"/J429 Gr 5	200	170
		-	1/8"	16-1/8"	14"	1"/A193-B7	480	410
Air / Liquid Valves	Durlon 9000	-	1/8"	4-1/8"	2-3/4"	5/8"/A193-B7	120	100
	Durlon 9200W	-	1/8"	4-1/8"	2-3/4"	5/8"/A193-B8M	55	45
	Durlon 9000	-	1/8"	5-3/8"	4-1/8"	5/8"/A193-B7	133	113
	Durlon 9200W	-	1/8"	5-3/8"	4-1/8"	5/8"/A193-B8M	55	45
Gage Device	Durlon 9000	-	1/8"	3-3/8"	2-1/2"	3/4"/A193-B7	90	80
		T/G	1/8"	2-1/4"	1-1/2"	5/8"/A193-B7	45	40
Safety Valve	Durlon 9000	-	1/8"	5-3/8"	4-1/8"	3/4"/A193-B7	155	130
		-	1/8"	5-1/4"	3-5/8"	3/4"/J429 Gr 5	165	140
Bottom Outlet	Viton® GF-S	-	1/8"	7-1/8"	4-1/2"	5/8"/A307	60	50
	Durlon 9000	-	1/8"	8-1/2"	7-1/2"	3/4"/A193-B7	160	135
		T/G	1/8"	8-7/16"	7-9/16"	3/4"/A574	230	200

Pressure Cars

Component	Material	Style	Gasket Material/Dimensions			Bolting	Torque (ft-lbs)	
			Thk.	OD	ID		Dry	Lubricated
Manway / Base (pressure) Plate	Durlon 9000	-	1/8"	20-1/4"	19-1/4"	1-1/8"	717	609
			1/8"	22-1/4"	21-1/4"	1-1/8"	717	609
Angle Valve / Gauging Device	Durlon 9000	-	1/8"	2-1/4"	1-1/2"	3/4"	198 / 218 (C)	168 / 185 (C)
			1/8"	4"	3-1/4"	3/4"	198 / 218 (C)	168 / 185 (C)
Safety	Durlon 9000	-	1/8"	4-3/4"	4"	3/4"	198 / 218 (C)	168 / 185 (C)
		-	1/8"	6-3/4"	6"	7/8"	321 / 353 (C)	273 / 300 (C)
		-	1/8"	2-1/4"	1-1/2"	3/4"	198 / 218 (C)	168 / 185 (C)

¹ Number of bolts, bolt grade and lubrication can vary. A never seize type lubricant used for above examples.

* Special configuration. (C) designates a torque using a crow's foot wrench.

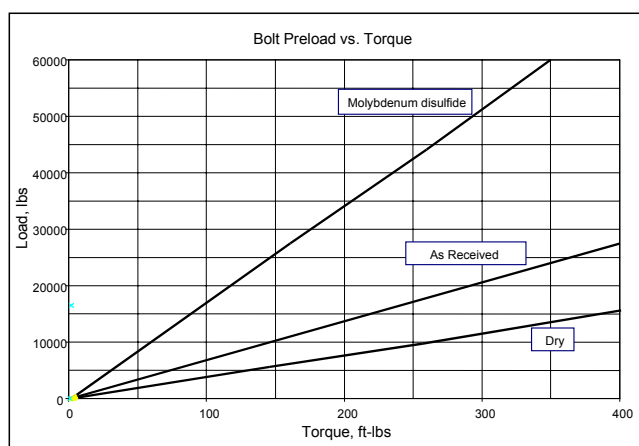
For torque worksheet by car set, contact GRI Technical Services at 713-856-9445 or tech@durlon.com.

The Effect of Bolt Lubrication

Bolt lubrication greatly affects the torque values used when installing gaskets. To achieve the same gasket compression, a much higher torque value is required for a dry bolt versus using an effective lubricant such as molybdenum disulfide.

In a dry bolt up, or where an inefficient lubricant is used, the effort used in tightening is overcome by the frictional forces between the bolts and nuts and to a greater extent between the nuts and nut facings.

This can result in a lower gasket load and inadequate stress on the bolts, which can result in torque loss and eventual leakage in service.



The following information is a general guide only for the selection of a suitable gasket material as there are unlimited combinations of fluid, pressure and temperature conditions

A - Acceptable
 C - Caution - Depends on Conditions
 NS - Not Suitable

FLUID	8500 79XX	9000	9200W
Acetaldehyde	C	A	A
Acetamide	A	A	A
Acetic Acid, 37%	A	A	A
Acetic Acid, Glacial	C	A	A
Acetic Anhydride	C	A	A
Acetone	C	A	A
Acetonitrile	NS	A	A
Acetophenone	-	A	A
Acetyl Chloride	-	A	A
Acetyl Tributyl Citrate	-	A	A
Acrol Flex Polyol Mixture	-	A	A
Acrolein (acrylaldehyde)	C	A	A
Acrylamide	-	A	A
Acrylic Acid	NS	A	A
Acrylic Emulsion	-	A	A
Acrylic Resin Solution	-	A	A
Acryloid Oil Additive	-	A	A
Acryloid Oil Additive (in flammable solvent)	-	A	A
Acryloid Oil Additive (in nonflammable solvent)	-	A	A
Acrylonitrile	NS	A	A
Adipic Acid Solution	C	A	A
Alcohol Bottoms	-	A	A
Alcohol NOS (Not Otherwise Specified)	-	A	A
Alcohol-Beverage	C	A	A
Alkyd Resin	A	A	A
Alkyl Benzene	NS	A	A
Alkyl Benzene Sulfonate (or Sulfonic Acid)	NS	A	A
Alkyl Phenol Ethoxylate	-	A	A
Alkylamine	-	A	A
Alkylbenzene, C10-C16	C	A	A
Alkylsulfonic Acid	NS	A	A
Allyl Alcohol	A	A	A
Allyl Bromide (3-Bromopropene)	-	A	A
Allyl Chloride	-	A	A
Allyl Trichlorosilane	-	A	A
Alpha Methyl Styrene	NS	A	A
Alum	A	A	A
Allumina Trihydrate Slurry (Aluminum Hydroxide)	A	A	A
Aluminum Ammonium Sulfate (Ammonium Alum)	A	A	A
Aluminum Chloride	A	A	A
Aluminum Chloride Solution	A	A	A
Aluminum Fluoride Solution	NS	-	A
Aluminum Sulfate (Alum)	A	A	A
Aluminum Sulfate, Food Grade	A	A	A
Aluminum Triethyl (Triethylaluminum)	-	A	A
Aluminum Trimethyl (Trimethylaluminum)	-	A	A
Amines (Mixed)	NS	A	A
para-Aminodiphenylamine	NS	A	A
Aminoethylethanol Amine (Hydroxyethylethylenediamine)	-	A	A
Aminoethylpiperazine	-	A	A
Aminophenol Solution (Hydroxyaniline)	-	A	A
Aminothiazole (2-Thiazylamine)	-	A	A

FLUID	8500 79XX	9000	9200W
Ammonia Gas, <150°F	A	A	A
Ammonia Contaminated with Benzene (UTLX 83593, ACFX 99228, 83789)	-	A	A
Ammonia, Liquid, Anhydrous	A	A	A
Ammonia-Aqua (Ammonium Hydroxide)	A	A	A
Ammonium Bisulfide	A	A	A
Ammonium Carbonate Solution	A	A	A
Ammonium Hydroxide	A	A	A
Ammonium Nitrate	A	A	A
Ammonium Nitrate Solution	A	A	A
Ammonium Perchlorate	-	A	A
Ammonium Phosphate Solution	A	A	A
Ammonium Sulfamate Solution	-	A	A
Ammonium Sulfate Solution	A	A	A
Ammonium Sulfide	A	A	A
Ammonium Sulfide Solution	A	A	A
Ammonium Sulfite Solution	A	A	A
Ammonium Thiocyanate	C	A	A
Ammonium Thiosulfate	A	A	A
Ammonium Thiosulfate Solution	A	A	A
Amyl Acetate (Banana Oil; Pear Oil)	NS	A	A
Amyl Chloride (1-Chloropentane)	NS	A	A
Amyl Mercaptan	NS	A	A
Amyl Nitrate	NS	A	A
Amyl Nitrite	NS	A	A
Amyl Phenol	NS	A	A
Amyl Trichlorosilane	NS	A	A
Amylene	NS	A	A
Amylene (1-Pentene)	NS	A	A
Aniline (Aminobenzene)	NS	A	A
Animal Feed Solution	A	A	A
Animal Oils (Tallow)	A	A	A
Anthraquinone	NS	A	A
Anitmony Pentachloride (Anitmony Perchloride)	NS	A	A
Argon	A	A	A
Arochlor (Polychlorinated Biphenyl; PCB)	NS	A	A
Aromatic Concentrate	-	A	A
Arsenic Acid (Orthoarsenic Acid)	A	A	A
Asphalt	A	A	A
Atrazine (2-Chloro-4-Ethylamino-6-Isopropylamino-s-Triazine)	NS	A	A
Aviation Gasoline 100 LL	A	A	A
Barium Chlorate Solution	A	A	A
Base Oil	A	A	A
Benzaldehyde (Benzoic Aldehyde)	NS	A	A
Benzene	NS	A	A
Benzeneposphorous Dichloride	NS	A	A
Benzenesulfonic Acid (Phenylsulfonic Acid)	NS	A	A
Benzoic Acid	NS	A	A
Benzophenone (Cyasorb)	NS	A	A
Benzoyle Chloride	NS	A	A
Benzyl Alcohol (Alpha-Hydroxytoluene)	NS	A	A
Benzyl Chloride (Alpha-Chlorotoluene)	NS	A	A
Benzyl Fatty Quaternary Ammonium Chloride	NS	A	A

FLUID	8500 79XX	9000	9200W
Biphenyl (Diphenyl)	NS	A	A
Bisphenol (4,4'-Isopropylidenediphenol)	NS	A	A
Boric Acid Solution	A	A	A
Boron Trichloride (Boron Chloride)	-	A	A
Boron Trifluoride (Boron Fluoride)	-	A	A
Brake Fluid (Hydraulic Fluid Petroleum-Based)	A	A	A
Brine	A	A	A
Bromine	NS	A	A
Bromochloromethane (Halon 1011)	NS	A	A
Bromochloropropane (Trimethylene Chlorobromide)	NS	A	A
Bunker C Oil	A	A	A
Bunker Oil	A	A	A
Butadiene (1,3 Butadiene)	NS	A	A
Butane	A	A	A
Butanediol	C	A	A
Butanol	A	A	A
Butanol Acid	NS	A	A
Butene (Butylene)	A	A	A
Butyl Acetate (n-; sec-; tert- Butyl Acetate)	NS	A	A
Butyl Acrylate (n-Butyl Acrylate)	NS	A	A
Butyl Alcohol (1-Butanol)	A	A	A
Butyl Amine	NS	A	A
Butyl Benzyl Phthalate (BBP)	NS	A	A
Butyl Carbitol (Diethylene Glycol Monobutyl Ether)	NS	A	A
Butyl Cellosolve (Ethylene Glycol Monobutyl Ether)	NS	A	A
Butyl Chloride (Chlorobutane)	NS	A	A
2,4-D, Butyl Ester	NS	A	A
Butyl Ether (n-Dibutyl Ether)	NS	A	A
Butyl Glycol	C	A	A
Butyl Lactate (n-Butyl Lactate)	NS	A	A
Butyl Lithium (n-Butyllithium)	NS	A	A
Butyl Mercaptan (Butanethiol)	NS	A	A
Butyl Methacrylate	NS	A	A
Butyl Oleate	NS	A	A
Butyl Phenol (o-sec-Butylphenol)	C	A	A
Butyl Propionate (n-Butyl Propionate)	NS	A	A
Carbon Black Oil	A	A	A
Carbon Black	A	A	A
Carbon Dioxide	A	A	A
Carbon Disulfide (Carbon Bisulfide)	A	A	A
Carbon Tetrachloride (Tetrachloromethane)	A	A	A
Carbowax Polyethylene Glycol 400	C	A	A
Carboxybenzene (Benzoic Acid Solution)	NS	A	A
Castor Oil	A	A	A
Caustic Soda	C	A	A
50% Caustic	C	A	A
Cayenne Pepper Mash	A	A	A
Cellosolve Acetate	NS	A	A
Cetyl Alcohol (1-Hexadecanol)	NS	A	A
Chloral (Trichloroacetaldehyde)	-	A	A
Chloral Hydrate	-	A	A
Chlordane	NS	A	A

FLUID	8500 79XX	9000	9200W
Chlorinated Paraffin	-	A	A
Chlorinated Phosphate Ester	NS	A	A
Chlorine	NS	A	A
Chloroacetic Acid	-	A	A
Chloroacetyl Chloride	-	A	A
Chloroaniline (o-,p-,Aminochlorobenzene)	-	A	A
Chlorobenzaldehyde	NS	A	A
Chlorobenzene (Monochlorobenzene)	NS	A	A
Chlorobenzenethiol (p-Chlorothiophenol)	NS	A	A
Chlorobenzotrifluoride	NS	A	A
Chlorodifluoroethane	NS	A	A
Chlorodifluoromethane	NS	A	A
Chloroform (Trichloromethane)	NS	A	A
Chloroformate - see Poly Oxybutylene Chloroformate	NS	A	A
Chloro-IPC (Isopropyl-n-(3-Chlorophenyl) Carbamate)	NS	A	A
Chloronaphthalene	NS	A	A
Chloronitrobenzene (Nitrochlorobenzene)	NS	A	A
Chlorophenyl Isocyanate (p-Chlorophenyl Isocyanate)	NS	A	A
Chloropicrin (Trichloronitromethane)	NS	A	A
Chlorosulfonic Acid (Sulfuric Chlorohydrin)	NS	A	A
Chlorotoluene	NS	A	A
Chocolate	A	A	A
Choline Chloride	-	A	A
Chrome Plating Solutions	NS	-	A
Chromic Acid	-	A	A
Citric Acid	A	A	A
Citronella (Citronella Oil)	A	A	A
Clay Slurry	A	A	A
Coal Tar	A	A	A
Coal Tar Light Oil, Ashland	A	A	A
Coal Tar Oil	A	A	A
Coal Tar Pitch	A	A	A
Coconut Fatty Alcohol	A	A	A
Coconut Oil	A	A	A
Cod Liver Oil	A	A	A
Copper (II) Sulphate Solution	A	A	A
Copper Chloride Solution	A	A	A
Corn Gluten Meal	A	A	A
Corn Oil	A	A	A
Corn Syrup	A	A	A
Cotton Seed Oil	A	A	A
Creosote	A	A	A
meta-Cresol	NS	A	A
para-Cresol	NS	A	A
Cresol (Cresylic Acid)	NS	A	A
tert-Butyl-m-Cresol	NS	A	A
meta-Cresylic Acid	NS	A	A
Cresyl Diphenyl Phosphate	NS	A	A
Cresylic Acid	NS	A	A
Crotonaldehyde (2-Butenal)	NS	A	A
Crude Methyl Propanediol	NS	A	A
Crude Oil	A	A	A
Crude Sulfate Turpentine	NS	A	A
Crude Vegetable Oil (See Vegetable Oil)	A	A	A
Cumene (Isopropylbenzene)	NS	A	A
para-Cumylphenol	NS	A	A
Cyclohexane (Hexamethylene)	A	A	A
Cyclohexanol (Hexahydrophenol)	A	A	A
Cyclohexanone (Pimelic Ketone; Ketohexamethylene)	NS	A	A
Cyclohexene (1,2,3,4-Tetrahydrobenzene)	C	A	A

FLUID	8500 79XX	9000	9200W
Cyclohexylamine (Hexahydroaniline)	NS	A	A
cyclopentadiene	NS	A	A
cyclopentane (Pentamethylene)	C	A	A
Cyclopropane Carbonitrile	NS	A	A
Decanol (Decyl Alcohol)	A	A	A
Detergents	A	A	A
Dextrose	A	A	A
Diacetone Alcohol	NS	A	A
Diacid Chloride (IsoPhthaloyl Chloride)	NS	A	A
Diallylamine (di-2-Propenylamine)	NS	A	A
Diaminodiphenylmethane (4,4-Methylenedianiline)	NS	A	A
Diammoniumphosphate Solution	A	A	A
Diamylamine (Di-n-Pentylamine)	NS	A	A
Diamylphenol (1-Hydroxy-2,4-Diamylbenzene)	NS	A	A
Diamylphthalate	NS	A	A
Diazinon	NS	A	A
Dibenzyl Sebacate	NS	A	A
Dibromochloropropane (DBCP)	NS	A	A
Dibutyl Fumarate	NS	A	A
Dibutyl Maleate (DBM)	NS	A	A
Dibutyl Phthalate	NS	A	A
Dibutyl Sebacate	NS	A	A
Dibutylamine	NS	A	A
Dibutylcresol	NS	A	A
Dibutyltin Dilaurate	NS	A	A
Dicapryl Phthalate (DCP)	NS	A	A
Dichloroacetaldehyde	NS	A	A
Dichloroaniline	NS	A	A
Ortho-Dichlorobenzene	NS	A	A
Para-dichlorobenzene	NS	A	A
Dichlorobenzene (Para- or Ortho-Dichlorobenzene)	NS	A	A
Dichlorobenzene Mix	NS	A	A
Dichlorobutane (Tetramethylene Dichloride; DCE)	NS	A	A
Dichlorodifluoromethane (R-12)	NS	A	A
Dichloroethylene (Dichloroacetylene)	NS	A	A
Dichloromethyl Ether	NS	A	A
Dichloromonofluoromethane (R-21)	NS	A	A
Dichlorophenol	NS	A	A
2,4-D (2,4-Dichlorophenoxyacetic Acid)	NS	A	A
Dichloropropane	NS	A	A
Dichloropropionic Acid (Dalapon Herbicide)	NS	A	A
Dichlorotetrafluoroethane (R-114)	NS	A	A
Dicyclohexylamine	NS	A	A
Dicyclopentadiene	NS	A	A
Dicyclopentadiene 75% (DCPD)	NS	A	A
Diesel Fuel (Fuel Oil #2)	A	A	A
Diethanolamine	NS	A	A
Diethyl	NS	A	A
Diethyl Carbonate	NS	A	A
Diethyl Formamide	NS	A	A
Diethyl Phosphite	NS	A	A
Diethyl Phosphorochloridothionate (ETHYL PCT)	NS	A	A
Diethyl Phthalate (DEP)	NS	A	A
Diethyl Sulfate	NS	A	A
Diethyl Sulfide	NS	A	A
Diethylaluminum Chloride (DEAC)	C	A	A
Diethylamine	NS	A	A
Diethylbenzene	NS	A	A
Diethylene Glycol	A	A	A
Diethylene Glycol Diethyl Ether	A	A	A

FLUID	8500 79XX	9000	9200W
Diethylene Glycol Monoethyl Ether	A	A	A
Diethylene Glycol Monoethyl Ether Acetate	A	A	A
Diethylene Glycol Monomethyl Ether	A	A	A
Diethylene Glycol Monopropyl Ether	A	A	A
Diethylenetriamine	NS	A	A
Diethylenetriamine Pentanoic Acid	NS	A	A
Diethylethanolamine (Diethylaminoethanol)	NS	A	A
Diethylketone (Metacetone, Propione)	NS	A	A
Difluoroethane (Ethylidene Fluoride)	NS	A	A
Diisobutyl Carbinol (2,6-Dimethyl-4-Heptanol)	NS	A	A
Diisobutyl Ketone	NS	A	A
Diisobutyl Phenol	NS	A	A
Diisobutyl Phthalate	NS	A	A
Diisobutylene	A	A	A
Diisodecyl Adipate	NS	A	A
Diisodecyl Phthalate	NS	A	A
Diisooctyl Azelate (DIOZ)	NS	A	A
Diisooctyl Phthalate	NS	A	A
Diisopropanolamine	NS	A	A
Diisopropyl Ether	A	A	A
Diisopropylamine	NS	A	A
Dilauryl-3,3'-Thiodipropionate	C	A	A
Dimer Acid	-	A	A
n,n-Dimethyl Acetamide (DMAC)	NS	A	A
n,n-Dimethyl Aniline	NS	A	A
Dimethyl Ether (Methyl Ether)	NS	A	A
Dimethyl Ethyl Ammonium	-	A	A
Dimethyl Formamide	NS	A	A
o,o-Dimethyl Phosphorochloridothioate	-	A	A
Dimethyl Phthalate	NS	A	A
Dimethyl Sebacate	NS	A	A
Dimethyl Sulfate (Methyl Sulfate)	A	A	A
Dimethyl Sulfide (Methyl Sulfide)	NS	A	A
Dimethyl Sulfoxide (DMSO)	NS	A	A
Dimethyl Terephthalate	NS	A	A
Dimethylamine, Anhydrous (DMA)	NS	A	A
Dimethylamine, Aqueous	NS	A	A
Dimethylaminopropylamine	NS	A	A
Dimethylbenzene	NS	A	A
Dimethyldichlorosilane (Dichlorodimethylsilane)	NS	A	A
Dimethylethanolamine (2-Dimethylaminoethanol)	NS	A	A
n,n-Dimethylethanolamine (DMEA)	NS	A	A
Dimethylformamide (n, n-Dimethylformamide, DMF)	NS	A	A
Dimethylhexane	NS	A	A
Dimethylhydrazine (UDMH)	NS	A	A
Dimethylhydroxylamine	NS	A	A
Dimethylol Propionic Acid	NS	A	A
Dinitrobenzene (o-,m-,p-Dinitrobenzene)	NS	A	A
Dinitrochlorobenzene	NS	A	A
Dinitrochlorobenzotrifluoride	NS	A	A
Dinitrophenol (2, 4-Dinitrophenol)	NS	A	A
Dinitrotoluene (2, 4-; 3, 4-; 3, 5-Dinitrotoluene)	NS	A	A
Diocetyl Adipate (Di(2-Ethylhexyl) Adipate)	NS	A	A
Diocetyl Azelate (Di(2-Ethylhexyl) Azelate)	NS	A	A
Diocetyl Maleate	NS	A	A
Diocetyl Phthalate	NS	A	A
Diocetyl Sebacate	NS	A	A
Dioxane (Diethylene Ether)	NS	A	A
Dipentene (Cinene)	A	A	A
Diphenyl	NS	A	A

FLUID	8500 79XX	9000	9200W
Diphenyl Ether	NS	A	A
Diphenyl Oxide	NS	A	A
Diphenylamine (n-Phenylaniline) (DPA)	NS	A	A
Diphenyldichlorosilane	NS	A	A
n-Dipropylamine	NS	A	A
Dipropylene Glyco Monomethyl Ether	A	A	A
Dipropylene Glycol (2,2'-Dihydroxydipropylether)	A	A	A
Dipropylene Glycol Dibenzoate	A	A	A
Disodium EDTA Solutions	A	A	A
Disodium Iminodiacetate	C	A	A
Disodium Phosphate (Sodium Phosphate, Dibasic)	A	A	A
Disulfide Oil	-	A	A
Ditertiary Amyl (Diamyl) Phenol	NS	A	A
Ditertiary Butyl Phenol	NS	A	A
Ditridecyl Phthalate (Plasticizer)	NS	A	A
Ditridecylphthalate (DTDP) (Jayflex)	NS	A	A
Divinylbenzene (Vinylstyrene)	NS	A	A
Dodecanol (Lauryl Alcohol)	A	A	A
Dodecyl Benzene Sulfonate	NS	A	A
Dodecyl Mercaptan (DDM)	-	A	A
Dodecylaniline	NS	A	A
Dodecylbenzene	NS	A	A
Dodecylbenzenesulfonic Acid (DDBSA)	NS	A	A
Dodecyl-Pentadecyl Methacrylate UDM	NS	A	A
Dodecylphenol	NS	A	A
Dodecyltrichlorosilane	NS	A	A
Dowtherm-A	NS	A	A
Dowtherm-E	NS	A	A
Drilling Mud	A	A	A
Emulsifiers	A	A	A
Epichlorohydrin (Chloropropylene Oxide)	NS	A	A
Ethane	A	A	A
Ethanol	A	A	A
Ethanolamine (Monoethanolamine, 2-Aminoethanol)	NS	A	A
Ethoxylated Alcohol	NS	A	A
Ethoxylated Fatty Alcohols	NS	A	A
Ethyl 3-ethoxypropionate	NS	A	A
Ethyl Acetate	NS	A	A
Ethyl Acetoacetate	NS	A	A
Ethyl Acrylate	NS	A	A
Ethyl Alcohol (Ethanol, Grain Alcohol)	A	A	A
Ethyl Amyl Ketone (EAK, 5-Methyl-3-Heptanone)	NS	A	A
Ethyl Bromide (Bromoethane)	NS	A	A
Ethyl Butanol (2-Ethylbutyl Alcohol)	A	A	A
Ethyl Butyl Ketone (3-Heptanone)	NS	A	A
Ethyl Chloride	NS	A	A
Ethyl Dichlorosilane (Dichloroethylarsine)	NS	A	A
Ethyl Dimethyl Propylamine	NS	A	A
Ethyl Ether	NS	A	A
Ethyl Formate	NS	A	A
Ethyl Hexaldehyde (2-Ethylhexanal)	NS	A	A
Ethyl Hexanol	A	A	A
Ethyl Hexoic Acid	NS	A	A
Ethyl Hitec 436 (Same as Petroleum Oil Additives)	A	A	A
Ethyl Isopropyl Ketone	NS	A	A
Ethyl Mercaptan (Ethanethiol)	NS	A	A
Ethyl Methacrylate	NS	C	C
Ethyl Methyl Ether	NS	A	A
Ethyl Morpholine (n-Ethylmorpholine)	NS	A	A
Ethyl Nitrite	NS	A	A
Ethyl Oxalate	NS	A	A
Ethyl Phosphonothiodichloride	NS	A	A
Ethyl Silicate (Tetraethyl Orthosilicate)	A	A	A
Ethyl Trichlorosilane	NS	A	A

FLUID	8500 79XX	9000	9200W
Ethyl Toluidine	NS	A	A
Ethylaluminum Sesquichloride (EASC)	NS	A	A
Ethylamine, Anhydrous (Monoethylamine)	NS	A	A
Ethylamine, Aqueous (Aqueous Monoethylamine)	NS	A	A
Ethylaniline (n-Ethylaniline)	NS	A	A
Ethylbenzene (Phenylethane)	NS	A	A
Ethylene	A	A	A
Ethylene Benzene	NS	A	A
Ethylene Chlorobromide	NS	A	A
Ethylene Chlorohydrin	NS	A	A
Ethylene Dibromide (EDB, 1,2-Dibromoethane)	NS	A	A
Ethylene Dichloride	NS	A	A
Ethylene Glycol (1,2-Ethanediol)	A	A	A
Ethylene Glycol Monobutyl Ether Acetate	NS	A	A
Ethylene Oxide (Oxirane)	NS	A	A
Ethylene Vinyl Acetate Copolymer, <150°F	NS	A	A
Ethylenediamine (1,2-Diaminoethane)	NS	A	A
2-Ethylhexanol	A	A	A
2-Ethylhexoic Acid (Butylethylacetic Acid)	NS	A	A
2-Ethylhexyl Acrylate	NS	A	A
Ethylidene Norbornene (ENB)	NS	A	A
Fatty Acid	A	A	A
Fatty Acid Esters of Coconut Oil	NS	A	A
Fatty Alcohol	A	A	A
Fatty Alcohol, C10-12	A	A	A
Fatty Alcohol, C12-14	NS	A	A
Fatty Alcohol, C14-C18	NS	A	A
Fatty Amine	NS	A	A
Ferric Chloride	A	A	A
Ferric Chloride Solution	A	A	A
Ferrous Chloride Solution	A	A	A
Ferrous Sulfate Solution	A	A	A
Fertilizer Ammoniation Solution with free Ammonia	A	A	A
Fish Oil	A	A	A
Fish Soluables	A	A	A
Fluorophosphoric Acid	NS	NS	C
Fluorosulfonic Acid	-	A	A
Foots (soapstock)	A	A	A
Formaldehyde	A	A	A
Formaldehyde Solution	A	A	A
Formamide	NS	A	A
Formic Acid	NS	A	A
Freon	C	A	A
Freon 11 (Trichlorofluoromethane)	A	A	A
Freon 114 (Dichlorotetrafluoroethane)	A	A	A
Freon 12 (Dichlorodifluoromethane)	A	A	A
Freon 141-B (Dichlorofluoroethane)	A	A	A
Freon 22 (Chlorodifluoromethane)	NS	A	A
Fuel Oil	A	A	A
Fuel Oil (No. 3, 4, 5, 6, & heavy)	A	A	A
Fumaric Acid Solution	A	A	A
Furfural	NS	A	A
Furfuryl Alcohol	NS	A	A
Gasoline	A	A	A
Gasoline Fuel Additives	A	A	A
General Service	A	A	A
Gluconic Acid Solution	NS	A	A
Glucose	A	A	A
Glue	A	A	A
Glutaraldehyde	NS	A	A
Glycerides, Mono & Di	NS	A	A
Glycerin	A	A	A
Glycol	A	A	A
Glycol Ethers	C	A	A

FLUID	8500 79XX	9000	9200W
Glycolonitrile Solution	C	A	A
Glyoxal Solution	-	A	A
Halon 1011 (Bromochloromethane)	NS	A	A
Helium	A	A	A
Heptane	A	A	A
Heptanoic Acid	NS	A	A
3-Heptanol	C	A	A
Hexachlorocyclopentadiene	NS	A	A
Hexadecylidimethylamine	NS	A	A
Hexadecyltrichlorosilane	NS	A	A
Hexamethylene Diamine	NS	A	A
Hexane	A	A	A
Hexanol	C	A	A
Hexene (n-Hexene)	NS	A	A
Hexyl Alcohol	C	A	A
Hexylene Glycol	A	A	A
Hexyltrichlorosilane	NS	A	A
hexynol	-	A	A
Hydrazine	C	A	A
Hydrazine (Aqueous Solution)	C	A	A
Hydroabietyl Alcohol	NS	A	A
Hydrobromic Acid	NS	A	A
Hydrocarbon Gas	A	A	A
Hydrochloric Acid	NS	A	A
Hydrocyanic Acid (Hydrogen Cyanide)	A	A	A
Hydrofluoric Acid, Aqueous	NS	NS	NS
Hydrofluoric Acid (60-80%)	NS	NS	NS
Hydrofluoric Acid Anhydrous	NS	NS	NS
Hydrofluoric Acid, Anhydrous (Hydrogen Fluoride)	NS	NS	NS
Hydrofluosilicic Acid Solution	NS	NS	A
Hydrofluosilicic Acid	NS	NS	A
Hydrogen Chloride	NS	A	A
Hydrogen Chloride (HCl, Anhydrous)	NS	A	A
Hydrogen Fluoride Anhydrous	NS	NS	NS
Hydrogen Peroxide Solution	NS	A	A
Hydrogen Peroxide	NS	A	A
Hydrogen Sulfide	C	A	A
Hydroxyacetic Acid Solution	C	A	A
Hydroxyethyl Piperazine	NS	A	A
Hydroxylamine	NS	A	A
Ink	A	A	A
Isoamyl Acetate	NS	A	A
Isoamyl Alcohol	A	A	A
Isoamylene	NS	A	A
Isobutane (Butane)	A	A	A
Isobutanol	C	A	A
Isobutene (Isobutylene)	A	A	A
Isobutyl Acetate	NS	A	A
Isobutyl Acrylate	NS	A	A
Isobutyl Alcohol	C	A	A
Isobutylamine	NS	A	A
Isobutyl Isobutyrate	NS	A	A
Isobutyl Methacrylate	NS	A	A
Isobutylene (Isobutene, 2-Methylpropene)	A	A	A
Isobutyraldehyde	NS	A	A
Isobutyric Acid	NS	A	A
Isobutyronitrile	NS	A	A
Isocyanate	A	A	A
Isodecanol	C	A	A
Isodecanol Mixed Isomers	C	A	A
Isononanoic Acid	-	A	A
Isononyl Alcohol	-	A	A
Isooctyl Ester 2,4-D,	NS	A	A
Isooctyl Isodecyl Phthalate	NS	A	A

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FLUID	8500 79XX	9000	9200W
Isopentane	A	A	A
Isophorone	NS	A	A
Isoprene	C	A	A
Isopropanol	A	A	A
Isopropanolamine	NS	A	A
Isopropyl Acetate	NS	A	A
Isopropyl Amine (Isopropanol Amine)	NS	A	A
Isopropyl Aniline	NS	A	A
Isopropyl Benzene	NS	A	A
Isopropyl Cellosolve	NS	A	A
Isopropyl Ether	C	A	A
Isopropyl Mercaptan	NS	A	A
Isoquinoline	NS	A	A
Jet Fuel	A	A	A
Kerosene	A	A	A
Kvna Sulfonic Acid/Heptane Solution	-	A	A
Lacquer Thinner (Solvent)	-	A	A
Lacquers, Nitrocellulose	NS	A	A
Lactic Acid	A	A	A
Lanolin	A	A	A
Latex	A	A	A
Lauric Acid	NS	A	A
Lauryl Methacrylate	NS	A	A
Lead Arsenate	A	A	A
Lead Arsenite	A	A	A
Light Fuel Oil	A	A	A
Lignin Liqueur	C	A	A
Lignin Sulfonate	C	A	A
Limestone Slurry	A	A	A
Linseed Oil	A	A	A
Liquefied Petroleum Gas (LPG)	A	A	A
Liquid Corn Oil	A	A	A
Liquid Sugar	A	A	A
L-Lysine Monohydrochloride Liquid	NS	A	A
LPG (Not Propylene or Butadiene)	A	A	A
Lube Oil	A	A	A
Lube Oil Additives	A	A	A
Lubricating Oil	A	A	A
Lubricating Oil Additives	A	A	A
Lysine (monohydrochloride)	NS	A	A
Magnesium Calcium Brine	A	A	A
Magnesium Chloride	A	A	A
Magnesium Hydroxide (Milk of Magnesia)	A	A	A
Magnesium Hydroxide Solution	A	A	A
Magnesium Perchlorate Solution	C	A	A
Magnesium Sulfonate	C	A	A
Maleic Acid	A	A	A
Maleic Anhydride	NS	A	A
Manganese Sulfate Solution	A	A	A
Melamine Formaldehyde	NS	A	A
p-Menthane Hydroperoxide	-	A	A
Mesityl Oxide	NS	A	A
Methacrylic Acid	NS	A	A
Methane	A	A	A
Methanol	A	A	A
Methoxydihydropyran	NS	A	A
Methyl Acetate	NS	A	A
Methyl Aceto Acetate	NS	A	A
Methyl Acetone	NS	A	A
Methyl Acrylate	NS	A	A
Methyl Alcohol (Methanol)	A	A	A
Methyl Aluminum Sesquichloride	-	A	A
Methyl Amyl Acetate	NS	A	A
Methyl Amyl Alcohol (Methyl Isobutyl Carbinol)	NS	A	A
Methyl Amyl Ketone	NS	A	A
Methyl Bromide (Bromomethane)	NS	A	A
Methyl Butene	NS	A	A
Methyl butyl Ketone	NS	A	A
Methyl Butynol	NS	A	A
Methyl 'Cellosolve' (Ethylene glycol monomethyl ether)	NS	A	A
Methyl Chloride (Chloromethane)	NS	A	A
Methyl chloroformate	NS	A	A

FLUID	8500 79XX	9000	9200W
Methyl Cresol	NS	A	A
Methyl Cyclohexylamine	NS	A	A
Methyl Dichlorosilane	NS	A	A
Methyl Diisocyanate	NS	A	A
Methyl Diphenyl Diisocyanate (MDI)	NS	A	A
Methyl Ester	NS	A	A
Methyl Ethyl Ketone	NS	A	A
Methyl Ethyl Pyridine	NS	A	A
n-Methyl Glucamine Aqueous Solution	NS	A	A
n-Methyl Glucamine	NS	A	A
Methyl Isoamyl Ketone	NS	A	A
Methyl Isobutyl Ketone (MIBK)	NS	A	A
Methyl Isocyanate	NS	A	A
Methyl Isopropenyl Ketone	NS	A	A
Methyl Mercaptan (Methanethiol)	NS	A	NS
Methyl Methacrylate	NS	A	A
Methyl Methacrylate Monomer	NS	A	A
Methyl Naphthyl Ketone	NS	A	A
Methyl Oleate	NS	A	A
Methyl Parathion Insecticide	-	A	A
Methyl Pentamethylene Diamine	NS	A	A
3-Methyl Piperidine	NS	A	A
Methyl Propyl Carbinol	NS	A	A
Methyl Styrene (Vinyl Toluene)	NS	A	A
Methyl Tert. Butyl Ether (MTBE)	A	A	A
Methyl Trichlorosilane	NS	A	A
Methyl Vinylpyridine	NS	A	A
Methylaluminum Sesquibromide	-	A	A
Methylamine, Anhydrous (Monomethylamine)	NS	A	A
Methylamine, Aqueous	NS	A	A
Methylaniline	NS	A	A
Methylcyclohexanol	NS	A	A
Methyldiethanolamine	NS	A	A
Methylene Bromide	NS	A	A
Methylene Chloride	NS	A	A
Methylene Diisocyanate	NS	A	A
Methylene Diphenyldiisocyanate (MDI)	NS	A	A
n-Methylformamide	NS	A	A
Methylglutaronitrile	NS	A	A
3-Methylmercaptopropanal	NS	A	A
Methylnaphthalene	NS	A	A
Methylpyrrolidone (n-Methyl-2-Pyrrolidone)	NS	A	A
2-Methylthiopropionaldehyde Oxime	NS	A	A
Mineral Oil	A	A	A
Mineral Spirit	A	A	A
Mixed C4 Hydrocarbons	A	A	A
Molasses	A	A	A
Molten Sulfur	A	A	A
Monochlorodifluoroethane	NS	A	A
Monochlorodifluoromethane (R-22)	NS	A	A
Monochlorotrifluoroethane	NS	A	A
Monoethanolamine	NS	A	A
Monomethyl Ether (Methyl Carbitol)	A	A	A
Monomethylamine	NS	A	A
Monosodium Acid Methanesulfonate(MSMA)	C	A	A
Monosodium Methylarsonate Solution	C	A	A
Morea Pre-Mix	-	A	A
Morpholine	NS	A	A
Motor Fuel Antiknock Comp.	-	A	A
Myristic Acid	-	A	A
N-Methyltaurine	NS	A	A
Naphtha	A	A	A
naphtha, Coal-Tar	A	A	A
Naphtha, Petroleum	A	A	A
Naphthalene	NS	A	A
Naphthalene Disulfonic Acid	NS	A	A
Naphthenic Acid	NS	A	A
Naphthol	NS	A	A
Natural Latex	A	A	A
Natural Gas Liquids	A	A	A
Neatsfoot Oil	A	A	A
Neodecanoic Acid	-	A	A

FLUID	8500 79XX	9000	9200W
Neohexane	A	A	A
Neooctanoic Acid	-	A	A
Neopentanoic Acid (Pivalic Acid, Trimethylacetic Acid)	-	A	A
Neopentyl Glycol	-	A	A
Nitric Acid	NS	A	A
Nitrioltriacetic Acid	NS	A	A
Nitroanilines	NS	A	A
o-Nitroaniline	NS	A	A
Nitrobenzene	NS	A	A
Nitrochlorobenzene (chloronitrobenzene)	NS	A	A
ortho-Nitrochlorobenzene	NS	A	A
para-Nitrochlorobenzene	NS	A	A
Nitrocresol	NS	A	A
Nitroethane	NS	A	A
Nitrogen	A	A	A
Nitrogen Fertilizer Solution (< 40 psia)	C	A	A
Nitrogen Dioxide	NS	A	A
Nitrogen Fertilizer Solution	-	A	A
Nitrogen Solution, 19%	A	A	A
para-Nitrophenetole	NS	A	A
para-Nitrophenol Solution	NS	A	A
2-Nitropropane	NS	A	A
ortho-Nitrotoluene	NS	A	A
ortho-Nitroxylol	NS	A	A
Nonene	A	A	A
t-Nonyl Mercaptan	NS	A	A
para-Nonyl Phenol	NS	A	A
Nonylene	-	A	A
Nonylphenol	NS	A	A
Octadecene	C	A	A
Octadecyltrichlorosilane	NS	A	A
Octane	A	A	A
Octanoic Acid	NS	A	A
Octene	A	A	A
Octyl Alcohol	A	A	A
tert-Octylamine	NS	A	A
Octyl Decyl Phthalage	NS	A	A
Octyl Phenol	NS	A	A
Octyl Trichlorosilane	NS	A	A
Olefins	A	A	A
Oleic Acid	A	A	A
Oleum	NS	A	NS
Orange Juice	A	A	A
Oxygen	-	A	A
Oxygen Gas	-	A	A
Palmitic Acid	A	A	A
Paraffin Oil	A	A	A
Paraffin Wax	A	A	A
Paraldehyde	NS	A	A
Paranitrophenetole	NS	A	A
Parathion	A	A	A
Pelargonic Acid	-	A	A
Penta Erythritol Slurry	NS	A	A
Pentachloroethane	NS	A	A
Pentachlorophenol (solution)	NS	A	A
Pentaerythritol Solution	NS	A	A
Pentane	A	A	A
Pentene	A	A	A
2-Pentenenitrile	NS	A	A
Perchloroethylene	NS	A	A
Perchlorothane	NS	A	A
Petrolatum	A	A	A
Petroleum Oils	A	A	A
Petroleum Gas Oil	A	A	A
Petroleum Oil Additive	A	A	A
p-Phenetidine	NS	A	A
Phenol	NS	A	A
Phenol-Formaldehyde (Phenolic resin)	NS	A	A
Phenolic Resin	NS	A	A
Phenosulfonic Acid	NS	A	A
Phenyl Mercaptan	NS	A	A
Phenyl Methyl Ketone	NS	A	A

GRI/DURLON® Railroad Tank car Chemical Resistance Chart Page 9

FLUID	8500 79XX	9000	9200W
Phenylacetaldehyde	NS	A	A
para-Phenylene Diamines	NS	A	A
Phenylethyl Alcohol	NS	A	A
ortho-Phenylphenol	NS	A	A
Phenyltrichlorosilane	NS	A	A
Phosgene (carbonyl chloride)	NS	A	A
n-Propyl Mercaptan	NS	A	A
Phosphatic Fertilizer Solution	-	A	A
Phospholeum (Super Phos Acid)	NS	A	A
Phosphoric Acid	NS	A	A
Phosphorus	NS	A	A
Phosphorus, White or Yellow	NS	A	A
Phosphorus Chlorides	NS	A	A
Phosphorus Oxychloride	NS	A	A
Phosphorus Pentachloride	NS	A	A
Phosphorus Trichloride	NS	A	A
Phthalate Esters, Mixed	NS	A	A
Phthalic Anhydride	NS	A	A
Picoline	A	A	A
Pine Oil	A	A	A
Pinene	A	A	A
Piperazine	NS	A	A
Piperylene	NS	A	A
Piperylene Concentrate	NS	A	A
Pitch	A	A	A
Pivalic Acid (Neopentanoic Acid)	C	A	A
Plastic, Liquid	A	A	A
Polyalphaolefin	A	A	A
Polyaluminum Hydroxychloride	-	A	A
Polyamine H	NS	A	A
Polybutene	-	A	A
Polycaprolactam Waste Water	-	A	A
Polychlorinated Biphenyl	NS	A	A
Polyester Resin	-	A	A
Polyester Resin Solution in Styrene	NS	A	A
Polyether Triol	NS	A	A
Polyethyl Benzene	NS	A	A
Polyethylene Glycol	A	A	A
Polyglycerol	A	A	A
Polyglycol	A	A	A
Polyisobutylene Amine	NS	A	A
Polyisocyanates	NS	A	A
Polyols	-	A	A
Polyoxybutylene Chloroformate	NS	A	A
Polyoxyethylene Ether	NS	A	A
Polypropylene, Amorphous	-	A	A
Polypropylene Glycol	A	A	A
Polystyrene	-	A	A
Polyvinyl Acetate Solution	-	A	A
Polyvinyl Chloride Emulsion	-	A	A
Polyvinyl Methyl Ether	-	A	A
Positek 8617 Paper Making Aid	NS	A	A
Potash	A	A	A
Potash Alum Solution	A	A	A
Potassium Carbonate Solution	A	A	A
Potassium Cyanide Solution	A	A	A
Potassium Ferrocyanide Solution	A	A	A
Potassium Fluoride Solution	A	A	A
Potassium Hydroxide	C	A	A
Potassium Phenylacetate Solution	NS	A	A
Potassium Phosphate Solution	A	A	A
Potassium Resinate	-	A	A
Potassium Silicate Solution	A	A	A
Propane	A	A	A
Propane Butane Mix	A	A	A
Propanoic Acid (Propionic Acid)	A	A	A
Propargyl Alcohol	-	A	A
beta-Propiolactone	NS	A	A
Propionaldehyde	NS	A	A
Propionic Acid	A	A	A
Propyl Acetate	NS	A	A
Propyl Alcohol	A	A	A
Propyl Mercaptan	NS	A	A
Propylamine	NS	A	A
Propylene	A	A	A

FLUID	8500 79XX	9000	9200W
Propylene (Propene)	NS	A	A
Propylene Dichloride	NS	A	A
1,2-Propylene Glycol	A	A	A
Propylene Glycol Monomethyl Ether	A	A	A
Propylene Glycol Monomethyl Ether	NS	A	A
Propylene Oxide	NS	A	A
Propyltrichlorosilane	NS	A	A
Pyridine	NS	A	A
Pyroxylin Solution	-	A	A
Quinoline	NS	A	A
Rapeseed Oil	A	A	A
Refrigerant Gases	A	A	A
Resins	A	A	A
Resorcinol Formaldehyde Resin, Liquid	NS	A	A
Rosin	A	A	A
Rosin Oil	A	A	A
Rosin Solution	A	A	A
Rosin Esther	NS	A	A
Rubber Solvent	NS	A	A
Rubber Extender Oil	-	A	A
Safflower Oil	A	A	A
Salicylaldehyde	NS	A	A
5-Ethyl-n-Cyclohexyl-n-Ethylthiocarbamate	NS	A	A
Sevin (1-Naphthyl Methyl Carbamate)	NS	A	A
Silicon Tetrachloride	NS	A	A
Silicone Oil	NS	A	A
Sizing	A	A	A
Soap Solutions (skimmings)	A	A	A
Soapstock (Same as Detergents)	A	A	A
Sodium	NS	C	C
Sodium Aluminate	A	A	A
Sodium Benzothiazole	NS	A	A
Sodium Bichromate	A	A	A
Sodium Bisulfate Solution	A	A	A
Sodium Bisulfide (Hydrosulfide)	A	A	A
Sodium Bisulfite Solution	A	A	A
Sodium Bromide	-	A	A
Sodium Carbonate (solution)	A	A	A
Sodium Chlorate (solution)	A	A	A
Sodium Chloride	A	A	A
Sodium Cresylate (solution)	NS	A	A
Sodium Cyanide (solution)	A	A	A
Sodium Dibutylthiocarbamate	NS	A	A
Sodium Dichromate	A	A	A
Sodium Diethylenetriamine Pentaacetate	NS	A	A
Sodium Dimethyl Dithiocarbamate	NS	A	A
Sodium Ferrocyanide Solution	A	A	A
Sodium Formate	NS	A	A
Sodium Formate Solution	NS	A	A
Sodium Hydrosulfide	A	A	A
Sodium Hydroxide (solution)	C	A	A
Sodium Hypochlorite Solution	C	A	A
Sodium Isocyanates	A	A	A
Sodium Lauryl Sulfate	A	A	A
Sodium Lignosulfonate	C	A	A
Sodium Mercaptobenzothiazole (MBT)	NS	A	A
Sodium Methylate	NS	A	A
Sodium n-Methylthio Carbamate Solution (Metam Sodium)	NS	A	A
Sodium Nitrate Liquor	A	A	A
Sodium Nitrate (solution)	A	A	A
Sodium Phenate	NS	A	A
Sodium Poly Acrylate	NS	A	A
Sodium Silicate	A	A	A
Sodium Silicate Solution	A	A	A
Sodium Sulfhydrylate Solution	A	A	A
Sodium Sulfide	A	A	A
Sodium Sulfide Solution	A	A	A
Sodium Sulfite Solution	A	A	A
Sodium Sulfonate	NS	A	A
Sodium Sulfonates	NS	A	A
Sodium Toluene Sulfonate	NS	A	A
Sodium-n-Lauroyl Sarcosinate	A	A	A
Solvents	C	A	A
Sorbitol	A	A	A
Soy Bean Oil	A	A	A

FLUID	8500 79XX	9000	9200W
Spearmint Oil	A	A	A
Spent Caustic	A	A	A
Spent Sulfuric Acid	NS	A	C
Sperm Oil	A	A	A
Steam (350 Degrees Max.)	A	A	A
Stearic Acid	A	A	A
Stearyl Alcohol	NS	A	A
Styrene	NS	A	A
Styrene - Butadiene	NS	A	A
Sucrose Acetate Isobutyrate	NS	A	A
Sugar	A	A	A
Sugar Solution	A	A	A
Sulfate Turpentine	A	A	A
Sulfated Alcohol Ethoxylate	NS	A	A
Sulfur	A	A	A
Sulfur Chloride	NS	A	A
Sulfur Dichloride	NS	A	A
Sulfur Dioxide	NS	A	A
Sulfur, Molten	A	A	A
Sulfur Trioxide	NS	A	A
Sulfuric Acid	NS	A	NS
Sulfuryl Chloride	NS	A	A
Sunflower Oil	A	A	A
Superphosphoric Acid	NS	NS	C
Tall Oil	A	A	A
Tall Oil Brine	A	A	A
Tall Oil Crude	A	A	A
Tall Oil Fatty Acid	A	A	A
Tall Oil Pitch	A	A	A
Tallow	A	A	A
Tallow/Coconut Type Fatty Acid Blends	A	A	A
Ortho-TDA	-	A	-
Terpene	NS	A	A
Terpene Polychlorinates	NS	A	A
tert-Butyl-m-Cresol	NS	A	A
Tert-Dodecyl Mercaptan	NS	A	A
Tetra Chloro Pyridine	NS	A	A
Tetrachlorobenzene	NS	A	A
1,1,2,2-Tetrachloroethane	NS	A	A
1-Tetradecanol	A	A	A
Tetradecene	NS	A	A
Tetraethyl Lead (TEL)	C	A	A
Tetraethylene Glycol	A	A	A
Tetraethylenepentamine	NS	A	A
1,1,1,2-Tetrafluoroethane	NS	A	A
Tetrahydro Benzaldehyde	NS	A	A
Tetrahydrobenzaldehyde	NS	A	A
Tetrahydrofuran (THF)	NS	A	A
Tetrahydrofurfuryl Alcohol	NS	A	A
Tetrahydronaphthalene	NS	A	A
Tetrapotassium Pyrophosphate (60%)	NS	A	A
Tetrasodium EDTA (Sequestrene 38)	A	A	A
Therminol	NS	A	A
Thionyl Chloride	NS	A	A
Thiophosphoryl Chloride	NS	A	A
Tin Tetrachloride (Stannic Chloride)	NS	A	A
Titanium	A	A	A
Titanium Dioxide (Slurry)	A	A	A
Titanium Tetrachloride	NS	A	A
Toluene	NS	A	A
Toluene Diamine	NS	A	A
Toluene Diisocyanate (TDI)	NS	A	A
Toluene/Xylene Mixture	NS	A	A
ortho-Toluidine	NS	A	A
Tomato Paste	A	A	A
Toxaphene	A	A	A
Transformer Oil (petro or mineral base)	A	A	A
Transmission Fluid	A	A	A
Triacetin	A	A	A
Triallate Technical	-	A	A
Triazinyl Stilbene	NS	A	A
Tributoxyethyl Phosphate	NS	A	A
Tributylamine	NS	A	A
Tributyl Phosphate	NS	A	A
1,2,3 -Trichlorobenzene	NS	A	A

FLUID	8500 79XX	9000	9200W
1,2,4-Trichlorobenzene	NS	A	A
1,3,5-Trichlorobenzene	NS	A	A
1,1,1-TRICHLOROETHANE	NS	A	A
Trichloroethylene	NS	A	A
Trichloromonofluoromethane	NS	A	A
Trichlorophenol	NS	A	A
Trichlorosilane	NS	A	A
Trichlorotrifluoroethane	NS	A	A
Tricresyl Phosphate	NS	A	A
Tridecyl Alcohol	A	A	A
Tridecylbenzene	NS	A	A
Triethanolamine	NS	A	A
Triethanolamine Lauryl Sulfate	NS	A	A
Triethyl Citrate	NS	A	A
Triethyl Phosphate	NS	A	A
Triethylamine	NS	A	A
Triethylene Glycol	A	A	A
Triethylene Glycol Dipelargonate	A	A	A
Triethylenetetramine	NS	A	A
Triisobutylene	NS	A	A
Triisopropanolamine	NS	A	A
Trimethylchlorosilane	NS	A	A
Trimethyl Pentanediol	NS	A	A
Trimethyl Pentanediol Mono-Isobutyrate	NS	A	A
Trimethyl Phosphate	NS	A	A
Trimethyl Phosphite	NS	A	A
Trimethylacetic Acid (Neopentanoic Acid, Pivalic Acid)	A	A	A
Trimethylamine, Anhydrous (TMA)	NS	A	A

FLUID	8500 79XX	9000	9200W
Trimethylamine, Aqueous	NS	A	A
TRIMETHYLCHLOROSILANE	NS	A	A
Trimethylol Propane	NS	A	A
Triphenyl Phosphite	NS	A	A
Tripropylene Glycol	A	A	A
Tris-2-chloroethyl Phosphite	NS	A	A
Trisodium Nitrotriacetate Solution	NS	A	A
Tung Oil	A	A	A
Turpentine	A	A	A
Urea	A	A	A
Urea Ammonia	A	A	A
Urea Formaldehyde	A	A	A
Urea Formaldehyde Resin Liquid	A	A	A
Urea Solution	A	A	A
Urea/Ammonium Nitrate	A	A	A
n-Valeraldehyde	NS	A	A
Valeric Acid	NS	A	A
Vanillin Black Liquor	A	A	A
VCM	NS	A	A
Vegetable Oil	A	A	A
Vinyl Acetate	NS	A	A
Vinyl Acrylic Copolymer	NS	A	A
Vinyl Bromide	NS	A	A
Vinyl Butyl Ether	NS	A	A
Vinyl Chloride (VCM)	NS	A	A
Vinyl Ether	NS	A	A
Vinyl Ethyl Ether	NS	A	A
Vinyl Fluoride	NS	A	A

FLUID	8500 79XX	9000	9200W
Vinyl Methyl Ether	NS	A	A
Vinyl Propionate	NS	A	A
Vinyl Resin	-	A	A
Vinyl Toluene (Methyl Styrene)	NS	A	A
Vinyl Trichlorosilane	NS	A	A
Vinylcyclohexene	NS	A	A
Vinylidene Chloride	NS	A	A
Vinylpyridine	NS	A	A
Waste Derived Fuel	A	A	A
Waste Oil	A	A	A
Waste Water	A	A	A
Wax	A	A	A
Whiskey	A	A	A
White Mineral Oil	A	A	A
Wood Sugar Molasses	A	A	A
XUS 15643.001 Experimental Formulated Polyol	-	A	A
XUS 16111.00 Experimental Copolymer Polyol	-	A	A
Xylene	NS	A	A
ortho-Xylene	NS	A	A
meta-Xylene	NS	A	A
para-Xylene	NS	A	A
Xylidine	NS	A	A
Zinc Chlorate Solution	-	A	A
Zinc Chloride Solution	A	A	A
Zinc Dimethyldithiocarbamate	NS	A	A
Zinc Sulfate	A	A	A

* Durlon 9000 is listed in Pamphlet 95 of the Chlorine Institute, as an acceptable gasket material for dry chlorine (liquid & gas) service. Gaskets for chlorine or oxygen service should be cleaned before installation.

This information is a general guide for the selection of a suitable gasket material. The substances listed above are evaluated for their effect on the gasket materials at ambient temperature (-40°F to 100°F, or -40°C to 38°C) unless stated otherwise. For unusual conditions of fluid concentrates, internal pressures or temperature consult your representative. This evaluation is based on laboratory or field tests, or experience; however, no guarantee can be given as to the actual performance experienced by the end user.

There are several fluids used in food which can be sealed by SBR, however due to flavor pickup, we have used "C" caution on these products.

This Chemical Resistance Chart supersedes and obsoletes all previously issued charts.

Please go to our website for additional chemical listings.

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GASKET RESOURCES INC.

Our Company

We are market-driven and technology-based, serving customers throughout the *world* with innovative fluid sealing products.

Our People

GRI regards people as its most important resource. We foster leadership, individual accountability, and teamwork. Our employees are professionals whose entrepreneurial behavior is result-oriented and guided by personal integrity. In return, our employees can count on opportunities for individual and professional development in an empowering working environment.

Our Sealing Products

Durlon® sealing products have the widest possible range of service applications, therefore, the number of different types of gaskets required to be inventoried can be greatly reduced. This impacts process safety because limiting the number of gasket styles reduces the chance of installing the wrong gasket in the wrong service.

For these reasons, more and more original equipment manufacturers and industrial consumers are specifying Durlon® gasket materials for their needs.

Durlon® products are used in virtually every industrialized corner of the world. Our gasket materials are manufactured to ISO 9001 quality standards and are subjected to continuous testing and rigid quality control. And, our cutting and fabrication facility is ISO 9002 certified. This ensures unvarying performance on the job.

Our state-of-the-art research and development facility is geared to meet the ever-changing demands required in today's variety of service conditions. Since their inception, DURLON® gasket materials have undergone many enhancements, each incorporating the latest technology to better meet the wide variety of industry's changing needs.

Gasket Resources Inc. recognizes that today more emphasis is being placed on fugitive emissions via the Clean Air Act in the U.S., and various regulations in other countries. Therefore one of our prime design objectives is to maximize the sealability of our gasket materials to meet fugitive emissions requirements.

INNOVATIVE DURLON® FABRICATION ADVANTAGES

Welded Durlon

Our innovative welding process enables GRI to manufacture large diameter gaskets with single piece construction.

- All of our 9000 series Filled PTFE products can be welded
- Gasket OD sizes 60" and above
- Cost Effective Alternative to Conventional Die Cutting
- Retains the same physical properties as a die cut gasket
- Conforms to FDA regulations

Lathe Cut Durlon

All Filled PTFE Durlon® products can be provided lathe cut

- Cost Effective alternative to conventional die cutting
- Eliminates Costly Center Waste
- Cost Effective Large Diameter Gaskets
- Small cross sectional parts that cannot be die cut

Gasket Cutting Division

While GRI's distributors all have cutting capabilities, Gasket Resources compliments our distributors with a modern, ISO 9002 certified, cutting facility and world class workmanship that can only come from experience. GRI is proud of our dedicated workforce that averages over 20 years of fabrication experience.

Our fabrication plant, located at our headquarters in Exton, PA, includes equipment not found at the most progressive fabrication facilities. These amenities include PTFE welding for large diameter gaskets over 60", Durlon® PTFE lathe cutting, computerized high speed die cutting equipment, all steel interchangeable ID/OD tooling for close tolerance ring gaskets and many more proprietary and innovative production related customer service assets.

If your Durlon® gasketing product is fabricated by Gasket Resources or our factory trained and dedicated distribution partners you are assured that you are receiving the very best value in the fluid sealing industry.



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