Technical Index

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Technical

Revision 2

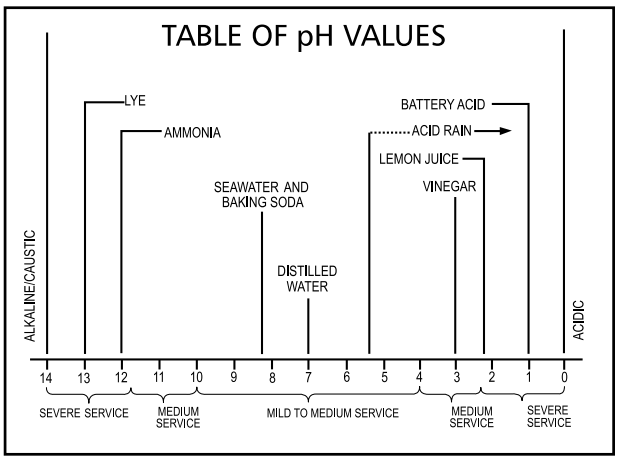
Knife Gate Valve Packing

The purpose of packing in knife gate valves is to provide a seal around the gate where it passes through the valve body. The ability to maintain a seal is dependent upon many factors including:

1. **Smoothness of the gate and consistency of gate section.** A rough gate surface carries away particles of the packing with each valve cycle. This reduction in packing volume results in a loss of packing pressure against the gate, reducing sealing ability. Variation in gate section can also produce a reduction in packing pressure, resulting in reduced sealing ability.

2. **Range of chemical compatibility.** Packing consists of two components. A fiber which is woven to give the packing form, and a filler/lubricant which fills the voids between the fibers and provides lubricity. Cored packing also contain a third component, an elastomer core, which provides resiliency and improved sealing ability. All components must be resistant to the materials being handled.

Chemical compatibility of packing is expressed in terms of the pH of the material being handled. pH is a measure of the presence of hydrogen ions. It is a scientific shorthand for measuring the level of acidity or alkalinity of a substance. The scale is logarithmic, making Lye at 13, ten times as alkaline as Ammonia at 12.



Strong Oxidizing Agents

Oxidizers act as a catalyst and cause the carbon to combine with oxygen and cause a breakdown of the fiber.

(a) Fluorine, which is used as an oxidizer or rocket fuel.
(b) Sulfur Trioxide, which is used to make sulfuric acid.
(c) Aqua Regia (nitric and hydrochloric acid), which is used to dissolve metals.
(d) Sodium Peroxide, which is used in dyeing, paper bleaching, and oxygen generation.
(e) Oleum (fuming sulfuric), which is used in detergent and explosive manufacturing.
(f) Perchloric Acid, which is used in the manufacturing of explosives, esters, and medicine.
(g) Sulfuric Acid greater than 75% and over 250°F (121°C), which is the most widely used industrial chemical.
(h) Chloric Acid greater than 10% and over 200°F (93°C), which ignites organic materials on contact.
(i) Ferric Chloride greater than 50% and over 200°F (93°C), which is used for sewage treatment, photography, medicine, etching, feed additives, and oxidizing disinfectant.
(j) Nitric Acid greater than 20% and over 250°F (121°C), which is used in fertilizer, etching, medicine, dyeing, drugs, and explosives.
(k) Chlorous Acid greater than 10% and over 200°F.
(l) Iodine greater than 5% and over 200°F (93°C), which is used in soaps, medicine, some lubricants, dyes and salt.
(m) Hydrofluoric Acid greater than 40% and over 200°F (93°C), which is used for pickling, purification, dissolving ores, cleaning castings, etching, cleaning stone and brick, and fermentation.
(n) Sodium Hypochlorite greater than 5%, which is used in textiles, water purification, and bleaching pulp and paper.
(o) Sodium Chlorate greater than 5%, which is used as a bleach for paper pulp, medicine, and leather tanning textiles.
(p) Calcium Chlorate greater than 5%, which is used in pyrotechnics and photography.

3. **Abrasion caused by service conditions.** Since materials that are soft and move around under load make good sealing materials, most good sealing materials are not very abrasion resistant, particularly when materials are pulled through the packing as in the case of a knife gate valve. Synthetic packing such as Kevlar® fiber does an excellent job in abrasive service, and can be used in combination with a softer packing to take advantage of the best features of each. For example, PTFE packing, when used in conjunction with a bottom row of Kevlar® provides a good seal with the PTFE while allowing the Kevlar® to clean the gate and retain the PTFE.

   Kevlar® is a registered trademark of DuPont

4. **Thermal Cycling.** The function of the packing is dependent upon maintaining a load against a sealing surface. Thermal cycling causes expansion and contraction of the valve body, gate, and packing components, which alters the sealing load. Live loading the packing hardware will improve packing performance in thermal cycling applications.

5. **Cycling Requirements.** Packing wear occurs each time the gate passes through the packing. Packing adjustments are made to compensate for wear. Live loading the packing hardware reduces adjustment requirements to an absolute minimum.

Technical

Revision 2

Braided Packing Specifications

Braided Packing Name	pH Range	Maximum Temp.	Description	Characteristics
Acrylic/PTFE	3-11	500°F (260°C)	Acrylic yarns impregnated with PTFE and a break-in lubricant	Excellent resistance to chemicals due to PTFE dispersion
Acrylic/PTFE/ Silicone core	3-11	500°F (260°C)	Acrylic yarns impregnated with PTFE and a break-in lubricant, with a Silicone rubber core	Excellent resistance to chemicals due to PTFE dispersion, with improved sealing over Acrylic/ PTFE
PTFE/ Graphite	0-14	550°F (288°C)	Gore GFO® yarn impregnated with PTFE	Excellent chemical resistance and good sealing
PTFE/Graphite/ Viton® core	0-14	550°F (288°C)	Gore GFO® yarn impregnated with PTFE, with a Viton® rubber core	Excellent chemical resistance, with improved sealing over PTFE/Graphite
PTFE	0-14	500°F (260°C)	PTFE yarn impregnated with a break-in lubricant	Excellent chemical resistance and good sealing
FDA PTFE	0-14	500°F (260°C)	Virgin PTFE yarn impregnated with an FDA approved break-in lubricant	FDA approved
FDA PTFE/ Silicone core	0-14	500°F (260°C)	Virgin PTFE yarn impregnated with an FDA approved break-in lubricant, with a Silicone rubber core	FDA approved, with improved sealing capability over FDA PTFE
Carbon Yarn	0-14	650°F (1) 1200°F (2)	High temperature core with outer jacket of carbon yarn and Inconel® wire	Excellent for high temperature and pressure steam service
Graphite Filament (not for use with fuming nitric acid, oleum or fluorine)	0-14	800°F (427°C) in oxidizing atmosphere 1200°F (649°C) in steam 1600°F (871°C) non-oxidizing	Purest of graphite filament yarns impregnated with graphite particles	Excellent for high temperature, with a very low coefficient of friction
PTFE/Graphite/ Kevlar®	3-11	500°F (260°C)	Gore GFO® yarn (PTFE/Graphite) with Kevlar® corners and a break-in lubricant	Characteristics of PTFE/Graphite packing, plus resistant to extrusion
Kevlar®	3-11	500°F (260°C)	Kevlar® yarns impregnated with PTFE and a break-in lubricant	Excellent abrasion resistance due to great tensile strength of yarn
Kevlar®/ Viton® core	3-11	500°F (260°C)	Kevlar® yarns impregnated with PTFE and a break-in lubricant, with a Viton® rubber core	Excellent abrasion resistance due to great tensile strength of yarn, with improved sealing capability over Kevlar®
Copper	N/A	1200°F (649°C)	Square braided copper filaments	Used as a scraper

Gore GFO® is a registered trademark of W. L. Gore & Assoc. Inc.
Viton® is a registered trademark of DuPont Dow Corporation
Inconel® is a registered trademark of Inco Alloys International

(1) Oxidizing
(2) Non-Oxidizing

Technical

Revision 2

Low Pressure Operation

Knife gate valves standards, MSS SP-81 specifically, require a seat test at 40 psi (2.8 bar). In addition, Fabri-Valve tests the seat at the maximum rated CWP. Due to the relatively large surface area of the gate, when pressure in metal seated valves falls below 40 psi (2.8 bar) seat sealing may degrade somewhat. Conversely, when pressure exceeds the 40 psi (2.8 bar) standard test pressure, sealing generally shows improvement. Low-pressure seat sealing can be improved by employing chest buttons and/or centerline buttons, which serve the same purpose as higher pressure by keeping the gate in close alignment with the seat.

Pressure/Temperature Ratings

Most knife gate valve applications are limited by the temperature limit or the chemical compatibility of the seat and/or packing material. When checking pressure/ temperature ratings, be sure to check the temperature rating and chemical compatibility of the packing material, and the seat material if it is other than the integral metal seat.

Reverse Pressure Rating

Single seated knife gate valves are considered uni-directional with regard to sealing. That is, they are designed to have the line pressure assist sealing by pushing the gate against the seat. All single seated Fabri-Valve knife gate valves, except the Figure 100, are rated for full reverse pressure in the fully closed position. Though leakage in reverse pressure may exceed standard leakage rates, damage to the valve or gross leakage will not occur. Installation where line pressure pushes the gate away from the seat during cycling could result in damage to the valve resulting in gross leakage in either direction. For reverse pressure during cycling, knife gate valves should be equipped with backing rings.

The 1.5" - 24" Figure C67 knife gate valves are bi-directional and are rated for 150 psi (10.3 bar) in both directions, in cycling and non-cycling service. The 30" C67 is rated for 100 psi (6.9 bar) in both directions, in cycling and non-cycling service, and the 36" C67 is rated for 80 psi (5.5 bar) in both directions, in cycling and non-cycling service.

The Figures C100 and F100 knife gate valves are not reverse pressure rated.

Material Standards

Cast valves are supplied in Ductile Iron, Carbon Steel 304 SS, 316 SS, 316L SS and 317L SS. Other alloys such as the cast equivalents of 254SMO®, AL6XN®, Alloy 20®, 304L SS, 904L SS, 309 SS, Hastelloy®, Inconel®, and Monel® are also available. In addition, valves can be fabricated from a wide range of special alloys, economically and on a small run basis. Valves may be fabricated entirely of the special alloy or may be built with just the wetted parts of the special alloy and the remainder of the valve of either a lesser alloy or carbon steel. Fabricated valve materials available include those listed above, plus Titanium. Fabri-Valve has experience with a wide range of alloys, in both cast and fabricated configurations.

NOTE: ITT Engineered Process Solutions reserves the right to substitute comparable materials to achieve equivalent performance.

Maximum temperatures for materials commonly used in the construction of Fabri-Valve valves

	ASTM Specification			
Material	Cast	Plate	Max. Temp.°F	Min. Temp.°F
Cast Iron	A126 B	-	450	-20
Ductile Iron	A536 65-45-12	-	650	-30
Carbon Steel	A216 WCB	A36	650	-30
Carbon Steel	-	A285	850	-30
Carbon Steel	-	A516Gr70	1000	
410 / 13 Cr	A743 CA15	A240	1200	
304 / 18 Cr, 8 Ni	A351 CF8	A240	1700	-100
309 / 22 Cr, 12 Ni	A351 CH20	A240	1800	
310 / 24 Cr, 19 Ni	A351 HK40	A240	1900	
316 / 16 Cr, 10 Ni	A351 CF8M	A240	1700	-100
316L / 16 Cr, 10 Ni	A351 CF3M	A240	850	-100
317L / 18 Cr, 11 Ni	A351 CG3M	A240	850	
Inconel 800HT®	A351 CT15C	B407	2000	
254SMO®	A351 CK3MCUN	A240	1000	
Alloy 20®	A351 CN7M	B463	*	
Hastelloy C276®	A494 CW12MW	B575	*	
Titanium	-	B265 Gr2	*	

* Consult Factory

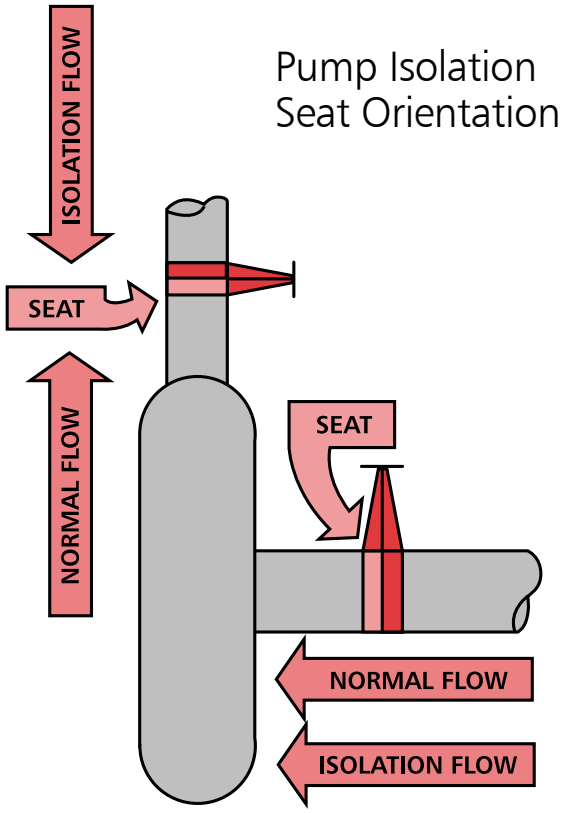
CAUTION:
Ratings are based on the temperature of the valve. Care must be taken to consider service and/or environmental conditions that will adversely affect the valve.

Technical

Revision 2

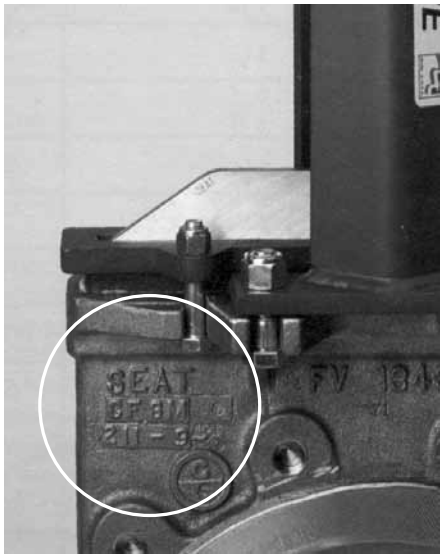
Pump Isolation

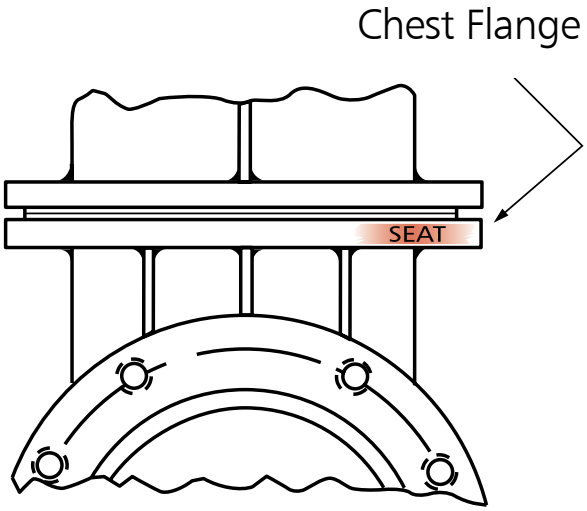
When using a knife gate valve to isolate the suction side of a pump, use the standard knife gate installation (valve's seat on the down stream side). When using knife gate valves to isolate the discharge side of a pump, install the valve **backwards** (seat upstream). Valves used to isolate the discharge side of a pump should be equipped with backing rings.



Pump Isolation
Seat Orientation

Seat Orientation Markings





Bonneted Valves

Technical

Revision 2

Gaskets

Gaskets are required in some Fabri-Valve valves such as bonneted valves, check valves, and valves equipped with replaceable metal seats. Gasket materials available and their specifications/performance ratings are as follows:

Standard Gasket
Aramid Fibers with NBR Synthetic Rubber;
Temperatures to 750°F (399°C), pressures to 900 psi (62 bar).

Corrosive Service
TFE; Temperatures to 500°F (260°C).

High Temperature
Compressed carbon fiber; Temperatures to 900°F (482°C)
Reinforced Graphite; Temperatures to 1600°F (871°C).

Standard Orientation

NOTE: Where position is indicated as upstream or downstream it applies only to single directional shutoff valves.

I. Butterfly Valves:
Looking at the actuator end of shaft, the disc rotates clockwise to close. Clockwise rotation of the handwheel closes the valve.

II. Gate Valves
The handwheel rotates clockwise to close the valve.

III. Bevel Gear and Worm Gear Operators:

a. Gate Valves
The handwheel is perpendicular to the pipeline, to the right side when looking downstream.

b. Butterfly Valves
With the valve shaft vertical, actuator on top, the handwheel is perpendicular to the pipeline, to the left side when looking downstream.
NOTE: On Figure 60 valves, downstream is looking into the side of the disc opposite the seat.

IV. Cylinders
Cylinders are mounted with the ports on the seat side.

V. Electric Motor Operator
Limit switch compartment is on the upstream side.

VI. Limit Switches
Limit switches are mounted on the seat side of the valve, same as cylinder ports.

VII. Directional Control Valves (solenoids, etc…)
Control valves are mounted on the seat side of the valve, same as cylinder ports.

VIII. Positioners
Positioners are mounted on the right side of the valve when looking downstream, and are piped to open valve with increasing signal.

IX. Filter-Regulator-Lubricator
Shipped loose. Can be furnished mounted and piped to the supply port of the directional control valve (valve orientation must be supplied).

X. Fail Safe System
Shipped loose

XI. Levers
Lever is perpendicular to pipeline, to the right side when looking downstream.

XII. Position Indicators
Position indicators are mounted to the upstream side of valve, to the right side when looking downstream.

Exterior Coatings

Standard Coating
Type: Low Sheen Alkyd Primer
Color: Dark Blue
Thickness: 2-3 mils
Maximum Temperature: 200° F (93°C)

Optional Coatings

- ***Corrosion Resistant***
  Type: Coal Tar Epoxy
  Color: Black
  Thickness: 8-20 mils
  Maximum Temperature: 350° F (177°C)

- ***Corrosion Resistant***
  Type: Two-part Epoxy
  Color: Dark Blue
  Thickness: 2-3 mils
  Maximum Temperature: 230° F (110°C)

- ***High Temperature***
  Type: Polysiloxane Inorganic
  Color: Deep Gray
  Thickness: 4-6 mils
  Maximum Temperature: 2000° F (1093°C)

Technical

Revision 2

Knife Gate and Wedge Gate Valve Flange Bolting

Assumptions:

1. 1/16" allowed for compressed gasket thickness.
2. Mating flange thickness is based on ANSI B16.5, 150# Flanges. Tolerences of +1/8" on valve sizes 2" to 18" and +3/16" on sizes 20" and 24" are not taken into consideration.
3. Due to machining tolerances, etc., flange thickness and tapped bolt hole depth may vary slightly. Therefore, it is recommended that studs be used in the tapped holes in the chest area. If bolts are used, flat washers should be used to prevent the bolts from bottoming in the tapped hole and either harming the chest or preventing proper tightening.

Valve Size	Figures C33, C133, C37, C45, C67 and C134						Figures F 10, F11, F36 & F71**
	Bolt Size	Total No. Bolts	No. Tapped Holes in Chest Area		Minimum Stud Length (Inches)	Bolt Length (Inches)	Minimum Bolt Length (Inches)
			Series C37, C45, C134 & C67	Series C33, C133			
2	.625-11NC	4	2	4	2.00	1.25	2.25
3	.625-11NC	4	2	4	2.25	1.50	2.50
4	.625-11NC	8	2	8	2.25	1.50	2.50
5 *	.75-10NC	8	2	8	2.50	1.50	2.50
6	.75-10NC	8	2	8	2.50	1.50	2.50
8	.75-10NC	8	2	8	2.75	1.88	2.75
10	.875-9NC	12	4	12	2.75	1.88	3.00
12	.875-9NC	12	4	12	3.00	2.00	3.00
14	1.00-8NC	12	4	12	3.25	2.13	3.25
16	1.00-8NC	16	6	12	3.25	2.25	3.50
18	1.125-7NC	16	6	16	3.50	2.38	3.75
20	1.125-7NC	20	8	20	4.00	2.88	4.00
24	1.25-7NC	20	8	20	4.50	3.25	4.25

* 5" Valve is fabricated, not cast.

** Flange holes are not tapped. Drilling is 1/8" larger than recommended bolt size. Nuts are required.

Packing Gland Bolting

The standard nuts for the packing gland bolting feature a nylon insert type anti-vibration lock.

NOTE: Applications above 400°F (204°C) must be identified so nuts with an alternative locking device can be used in lieu of the nylon insert.

Installation Caution

Mating piping must be properly supported, and care should be exercised in mating up the flanges, to prevent distortion of the valve body and/or flanges caused by piping stresses and/or installation procedures.

Mechanical Properties of Stem Nut Materials

	Acid Resistant Bronze	316 SS	Ni-Resist
Tensile (PSI x 10^3)	65	75	25
Yield (PSI x 10^3)	20	30	25

Bearing Properties *in Order of Preference*

1. Manganese Bronze
2. Ni-Resist
3. 316 SS*

*Care must be taken to reduce surface loads and provide lubrication and differential hardness between components to avoid galling.

NOTE: ITT Engineered Process Solutions reserves the right to substitute comparable materials to achieve equivalent performance.

Technical

Revision 2

Codes, Standards and Specifications

Fabri-Valve continually keeps abreast of new standards and/or revised standards through participation in MSS, ASME, ASTM, ANSI, NACE and AWS. Listed below are some of the more commonly used codes and standards, along with a brief summary of each.

ANSI	American National Standards Institute (formerly ASA and USAS)
ASME	American Society of Mechanical Engineers
ISO	International Organization for Standardization
MSS	Manufacturers Standardization Society for the Valves & Fittings Industry
ASTM	American Society for Testing and Materials
API	American Petroleum Institute
AWWA	American Water Works Association
AISC	American Institute of Steel Construction
NACE	National Association of Corrosion Engineers
AWS	American Welding Society
DIN	Deutsche Industrie Norm (Germany Industry Standard or Norm)
SSPC	Steel Structures Painting Council
TAPPI	Technical Association of the Pulp and Paper Industry
BS	British Standards

ANSI

a. **B16.1 Cast Iron Pipe Flanges and Flanged Fittings** (CL. 25, 125, 250, and 800.) CL. 25 and 125 lb. to 96" size, CL. 250 lb. to 48" size. CL. 25 and CL. 125 flange drilling matches B16.5, CL. 150 steel flanges, except CL. 25 bolts are smaller. CL. 250 flange drilling matches B16.5, CL. 300 steel flanges.

When using valves between cast iron flanges, flat-faced valve flanges or spacers should be used to prevent breaking the cast iron flanges.

b. **B16.5 Pipe Flanges and Flanged Fittings** (CL. 150, 300, etc.) to 24" size.

This standard is used by Fabri-Valve for flange bolting pattern dimensions through 24" size unless specified otherwise. Fabri-Valve standard flange thicknesses do not match this standard, due to pressure ratings.

This standard also contains pressure/temperature rating charts, which basically are as follows:

1. A CL. 150 mild steel flange or fitting manufactured from A515 Gr. 70, is good for 150 PSI at approximately 550°F. At ambient temperature, it is good for 285 PSI. NOTE***:*** Ambient is -20 to 100°F. Charts then give pressure ratings at other temperatures up to 1000°F for various materials of construction.

2. A CL. 300 mild steel flange, valve or fitting manufactured from A515 Gr. 70, is good for 300 PSI at approximately 840°F. At ambient temperature, it is good for 740 PSI. **NOTE:** It is very important that it is understood whether an ANSI class valve is required or if a CWP valve may be utilized. Example: CL. 150 or 150 PSI CWP.

c. **B16.10 Face-to-Face and End-to-End Dimensions of Valves** This standard is used by Fabri-Valve for face-to-face and end-to-end dimensions on 2"-24" wedge gate valves (Figure 71, 72 and 78) and check valves (Figure 10 & 11).

d. **B16.34-Valves Flanged, Threaded, And Welding End** This standard covers fabricated valves, but: proscribes a minimum wall thickness that requires very thick pressure walls – making valves more costly, requires flanged valves be class rated, restricts the materials that can be used, and specifies a minimum weld efficiency factor which dictates spot x-ray of pressure vessel welds.

e. **B16.47 Large Diameter Steel Flanges: NPS 26 Through NPS 60** This standard is used by Fabri-Valve for flange bolting pattern dimensions for valves over 24" unless specified othenvise. Fabri-Valve standard flange thicknesses do not match this standard, due to pressure ratings.

f. **B31.1 Power Piping** Short section on valves, basically referring that B16.34 valves may be designed to B31.1 and may include proof-testing.

g. **B31.3 Petroleum Refinery Piping** Same as "F" (B31.1 above.

ASME

a. **Section II-Material Specifications** Usually closely parallels ASTM specifications.

b. **Section VIII, Division 1-Pressure Vessels** For unfired pressure vessels.

Used as a guide in design of Fabri-Valves. Has charts showing allowable stresses for various materials at various temperatures (some to 1500°F). Establishes casting and joint welding efficiency factors depending on degree of non-destructive testing. Also has section on proof testing and design of flanges.

c. **Section IX-Welding Qualifications** Procedures for weld and welder qualifications for use in pressure vessels. Used as a guide for Fabri-Valve welders and welding procedures.

Technical

Revision 2

ISO

International organization to establish international standards for items including valves.

MSS

SP-6 **Finishes for Contact Faces of Connecting End Flanges of Ferrous Valves and Fittings.**

SP-9 **MSS Spot-Facing Standard.**

SP-25 **Standard Marking System for Valves, Fittings, Flanges and Unions**

SP-42 **MSS 150 lb. Corrosion Resistant Cast Flanged Valves** (to 12" size)

SP-44 **MSS Steel Pipeline Flanges** Formerly an addition to ANSI B16.5 with additional flange sizes. Now information included in ANSI B16.47

SP-61 **Hydrostatic Testing of Steel Valves** Covers wedge gate and check valves.

SP-67 **Butterfly Valves**

SP-81 **Stainless Steel, Bonnetless, Flanged, Wafer Knife Gate Valves** Fabri-Valve Figure C37 meets this standard.

ASTM

Specifications for materials, including chemistry and physical properties.

API

a. **API 595 Cast Iron Gate Valves**

b. **API 598 Valve Inspection and Test**

c. **API 600 Steel Gate Valves**

AWWA

a. **C207 Standard for Steel Pipe Flanges** This standard is used by Fabri-Valve for flange bolting pattern dimensions greater than 60" size unless specified otherwise. Fabri-Valve standard flange thicknesses do not match this standard, due to pressure ratings.

b. **C504-Rubber Sealed Butterfly Valves**

AISC

Steel Construction Manual. Used primarily for building and bridge design, but can be and is used as a guide in designing large, low-pressure valves and structural components of all valves such as yokes.

NACE

The Technical Society concerned exclusively with the protection and performance of materials in corrosive environments.

Std. MR-01-75-material requirements-materials for valves for resistance to sulfide stress cracking in production and pipeline service.

AWS

The AWS structural welding code specify the nature and size of acceptable discontinuities which may remain in a particular type of welded structure for a specific service. The code usually requires the removal and repair of cracks, but permit limited amounts of some other discontinuities, particularly porosity.

DIN

Standards for flanges used in Germany and other parts of Europe.

DIN 2501-ND10 **Flange Dimensions** – superceded by

DIN EN 1092-1 **Flanges and their joints.** Circular flanges for pipes, valves, fittings and accessories, PN designated. Steel flanges

SSPC

a. **SP-6 Commercial Blast Cleaning**

b. **SP-10 Near-White Blast Cleaning**

TAPPI

TIS 405-8 and 405-20 **Valve Standards for Pulp and Paper Mills** (Standard for Stainless Steel, Bonnetless, Flanged Wafer Knife Gate Valves). Revoked by TAPPI, were same as MSS SP-81.

British Standards

BS10 **British Standard Flange**

BS EN 1092-1 **Flanges and their joints.** Circular flanges for pipes, valves, fittings and accessories, PN designated. Steel flanges

Technical

Revision 2

Standard Domestic Packaging

(Protection for shipment by Common Carrier) Plywood covers are secured to flange faces on all valves prior to shipment. Handwheels are installed on the valve when shipped, except handwheels larger than 24" in diameter and handwheels for bevel gears, which are removed and strapped to one flange. Cylinders are provided with a cardboard cover to protect against strap abrasion. Cylinder actuated valves having instrumentation/controls subject to damage are provided with an additional wooden box cover for protection. All 24" valves and larger will be skidded for shipping unless otherwise directed by customer. Skids will be utility grade timbers with cross-members adequate for support, unit bolted and/or strapped to skid, and handwheel secured to flange cover or yoke. Stem nut assembly will be secured with tape or other means to prevent loss of parts in shipment. Specialty items requiring skidding or pallets are prepared as required to insure damage-free delivery at destination.

Export Crating

"Optional Export Crating" includes a fully enclosed non-coniferous and/or OSB (Oriented Strand Board) wooden box with reinforced ends and sides from utility grade 3/4" net lumber with skids. Goods are stowed inside in a manner to insure minimum movement and no damage from top stowage. Polyethylene sheet is draped over the valves. Boxes are steel strapped at each end and stenciled or painted with shipping information supplied by customer. Items are stowed in the box to take full advantage of all available space. Fabri-Valve will supply the customer with critical information on Net and Gross weights, cubic dimensions, and other pertinent data, as it becomes available. Other box liner materials and/or protective coatings are available on request. See Pricebook for export crating charge.

Export or Domestic Crating Other than Standard

Special crating or other preparation will be furnished at customers' expense. Specify requirements on your purchase order.

Recommended Long Term Storage Procedure for Fabri-Valve® Products

I. Handwheel, Lever, or manual gear operated gate valve.

a. **Objective**
The following are Fabri-Valve's recommendations for storage procedures to retain maximum product integrity during long-term storage of 1 to 5 years.

b. **Location**

1. The preferred storage location is a clean, dry, protected warehouse.

2. If valves are to be stored outside, precautions should be taken to keep valves clean and dry.

c. **Equipment Orientation**
Valves may be stored in the vertical or horizontal position. In horizontal position, seat side of valve should be on bottom.

d. **Storage Preparation**

1. Valves may be stored as shipped, provided the above storage location and equipment orientation instructions are followed.

2. If the as shipped condition must be altered for receiving inspection, reattach flange covers and repackage valve.

3. Then follow the above Instructions for location and equipment orientation.

NOTE: O-ring valves should be stored with the gate slightly open (Gate off of seating wedges)

e. **Storage Inspection**

1. Visual inspection shall be performed on a semi-annual basis and results recorded.

2. Visual inspection as a minimum shall include checking the following: Packaging, Covers, Dryness, and Cleanliness.

f. **Maintenance**
Maintenance shall consist of correcting deficiencies noted during inspection. All maintenance activity shall be recorded.

II. Cylinder Operated Gate Valve

a. **Objective**
The following are Fabri-Valve's recommendations for storage procedures to retain maximum product integrity during long-term storage of 1 to 5 years.

b. **Location**

1. The preferred location is a clean, dry protected warehouse.

2. If valves are to be stored outside, precautions should be taken to keep valves clean and dry.

c. **Equipment Orientation**

1. The preferred orientation for optimum protection of cylinder is with the valve fully opened and with the cylinder in the vertical position.

2. An acceptable alternate for valves with cylinder diameters of 6" or less is with the cylinder in the horizontal position. In horizontal position, seat side of valve should be on bottom.

3. If valves with cylinders larger than 6" in diameter must be stored with the cylinder in the horizontal position then the cylinder must be operated 6-12 times every 3-4 months.

d. **Storage Preparation**

1a. For storage of up to 3 years - Squirt a good grade of hydraulic oil into cylinder ports and operate cylinder 6-12 times on a yearly basis.

1b. For storage of 3-5 years - Squirt a good grade of hydraulic oil into cylinder ports and operate cylinder 6-12 times. Extend cylinder rod, until valve is fully closed. Then coat cylinder gland and rod with heavy grease. Retract cylinder rod until valve is fully open, drawing good grade of hydraulic oil into rod end of cylinder.

2. Securely plug cylinder ports with pipe plugs, if cylinder is not piped.

3. Cover flange faces with flange covers. Plywood flange covers installed at factory are acceptable.

4. Then follow the above instructions on location and equipment orientation.

NOTE: O-ring valves should be stored with the gate slightly open. (Gate off of seating wedges)

e. Storage Inspection

1. Visual inspection shall be performed on a semi-annual basis and results recorded.

2. Visual inspection as a minimum, shall include checking the following: Packaging, Covers, Dryness and Cleanliness.

f. **Maintenance**

Maintenance shall consist of correcting deficiencies noted during inspection. All maintenance activity shall be recorded.

III. Electric Motor Operated Gate Valve – Normal Storage

a. **Objective**

The following are Fabri-Valve's recommendations for storage procedures to retain maximum product integrity during long-term storage of 1 to 5 years.

b. **Location**

Valves to be stored in a clean, dry protected warehouse, free from excessive vibration and rapid tem perature changes.

NOTE: The maximum source of equipment deterioration anticipated during long-term storage is from possible condensation within the actuator enclosure that may be produced by rapid temperature changes. The user should consider the connection of built-in heaters or addition of heat sources in the electrical enclosures during storage.

c. **Equipment Orientation**

1. The preferred storage position is with the valve stem and motor shaft in the horizontal position and the actuator limit switch compartment cover vertically up.

2. An acceptable alternate position is with the valve stem vertical, the motor shaft horizontal and the limit switch compartment cover either facing to the side or vertically up.

3. The assembly shall be stored off the floor on suitable skids and shall be covered with an unsealed dust cover with the bottom open and air holes in the side.

d. **Storage Preparation, Inspection and Maintenance**

1. For storage situations of 1 to 2 years maximum, spray electric contacts with CRC #2-26®. (This preservative does not have to be removed prior to usage of the actuator.)

2. For storage situations between 2 and 5 years, spray electric contacts with CRC Lectra Shield® spray coating. (This coating must be removed with a suitable cleaner, such as any standard petroleum solvent, prior to making electrical connections.)

3. Cover flange faces with flange covers. Plywood flange covers installed at factory are acceptable.

e. **Storage Inspection**

1. Visual inspection shall be performed on a semi-annual basis and results recorded.

2. Visual inspection as a minimum, shall include checking the following: Packaging, Plugs, Covers, Dryness, Cleanliness, and Function of heat sources (when used).

NOTE: O-ring valves should be stored with the gate slightly open (Gate off of seating wedges)

f. **Maintenance**

Maintenance shall consist of correcting deficiencies noted during inspection. All maintenance activity shall be recorded.

IV. Storage of Rubber Products

While the various rubbers possess differing degrees of resistance to the deteriorating influences which may be present during storage, the same general recommendations apply to all. Vulcanized rubber products should be stored in a cool, dry, dark place away from steam pipes, sunlight, etc. The product should be supported so that no portion of it is under undue stress from loading or bending. For example, replacement seals should not be hung over a hook or allowed to kink, but should be stored in a flat position. Seals in assembled valves and actuators should be positioned to minimize compression on the seals. For example, storage of valves in the vertical position with the gate or disc open will minimize the occurrence of compression on the seals.

Technical

Revision 6

Elastomer Chemical Resistance Tables

The following tables show the expected compatibility of Fabri-Valve® seat and seal materials when installed in an atmosphere containing the listed chemicals. These ratings are not a guarantee of performance. Specific conditions or mixture of reagents may produce different results.

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Other media characteristics that will influence the choice of a particular material include temperature, pressure, velocity, and abrasiveness, etc. Therefore, these ratings should not be interpreted as a guarantee of performance but rather as one of the bases for material selection. Specific conditions, or a mixture of reagents may produce varied results. User preference, trade practice, cost, and experience should also be considered in the final choice.

NOTE: Not all seat materials are available for all valves.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Acetaldehyde	3	3	2	4	—	3	2	2	3
Acetamide	1	1	1	3	1	1	2	4	2
Acetanilide	3	3	1	3	—	1	1	1	1
Acetic Acid, 30%	—	—	1	—	—	—	—	—	—
Acetic Acid, 5%	2	2	1	1	—	1	1	2	1
Acetic Acid, Glacial	2	2	1	2	—	4	2	2	3
Acetic Acid, Hot, High Pressure	4	4	3	4	—	4	4	4	3
Acetic Anhydride	3	4	2	4	2	2	2	2	2
Acetoacetic Acid	3	3	1	3	—	1	1	1	1
Acetone	4	4	1	4	4	4	1	4	3
Acetone Cyanohydrin	3	3	1	3	—	1	1	1	1
Acetonitrile	3	—	1	1	—	—	—	—	—
Acetophenetidine	2	2	4	1	—	4	4	4	4
Acetophenone	4	4	1	4	—	4	2	4	4
Acetotoluidide	2	2	4	1	—	4	4	4	4
Acetyl Acetone	4	4	1	4	4	4	1	4	4
Acetyl Bromide	4	4	1	1	—	4	1	4	4
Acetyl Chloride	4	4	4	1	—	4	4	4	4
Acetylacetone	4	4	1	4	—	—	—	—	—
Acetylene	1	1	1	1	—	2	1	2	2
Acetylene Tetrabromide	4	4	1	1	—	2	1	—	—
Acetylene Tetrachloride	4	4	1	1	—	2	1	—	—
Acetylsalicylic Acid	2	2	4	1	—	4	4	4	4
Acrolein	3	3	1	3	—	1	1	1	1
Acrylic Acid	2	2	4	1	—	4	4	4	4
Acrylonitrile	4	4	4	3	—	4	4	3	3
Adipic Acid	1	1	2	—	—	—	—	—	—
Aero Lubriplate	1	1	4	1	—	1	4	4	1
Aero Shell 17 Grease	1	1	4	1	—	2	4	4	1
Aero Shell 750	2	2	4	1	—	4	4	4	4
Aero Shell 7A Grease	2	2	4	1	—	2	4	4	1

Unless otherwise noted ratings are at room temperature.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Aero Shell IAC	1	1	4	1	—	2	4	4	1
Aerosafe 2300	4	4	1	4	—	4	2	4	4
Aerosafe 2300W	4	4	1	4	—	4	2	4	4
Aerozene 50 (50% Hydrazine 50% UDMH)	3	3	1	4	—	4	1	4	4
Air Below 200° F	2	2	1	1	—	1	1	2	1
Air, 200 - 300° F	3	3	2	1	—	2	2	4	2
Air, 300 - 400° F	4	4	4	1	—	4	4	4	4
Air, 400 - 500° F	4	4	4	3	—	4	4	4	4
Aliphatic Dicarboxylic Acid	2	2	4	1	—	4	4	4	4
Alkanes (Paraffin Hydrocarbons)	1	1	4	1	—	2	4	4	2
Alkanesulfonic Acid	1	1	4	1	—	2	4	4	2
Alkazene	4	4	4	2	—	4	4	4	4
Alkenes (Olefin Hydrocarbons)	2	2	4	1	—	4	4	4	4
Alkyl Acetone	3	3	1	3	—	1	1	1	1
Alkyl Alcohol	1	1	4	1	—	2	4	4	2
Alkyl Amine	1	1	4	1	—	2	4	4	2
Alkyl Aryl Sulfonates	1	1	4	1	—	2	4	4	2
Alkyl Aryl Sulfonic Acid	—	—	1	—	—	—	—	—	—
Alkyl Aryl Sulfonics	1	1	4	1	—	2	4	4	2
Alkyl Benzene	2	2	4	1	—	4	4	4	4
Alkyl Chloride	2	2	4	1	—	4	4	4	4
Alkyl Sulfide	2	2	4	1	—	4	4	4	4
Alkylnaphthalene Sulfonic Acid	1	1	4	1	—	2	4	4	2
Allyl Chloride	2	2	4	1	—	1	—	—	—
Allylidene Diacetate	3	3	1	3	—	1	1	1	1
Alpha Picoline	3	3	1	3	—	1	1	1	1
Alum Solution <10%	1	1	1	1	—	—	—	—	—
Alum Solution >10%	1	1	1	1	—	—	—	—	—

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available
* Since some applications have high concentrations of turpentine and tall oil, EPDM's rating has been reduced.
** Specify AFLAS® Viton®-B for applications with elevated concentrations of Sodium Hydroxide

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Aluminum Acetate	2	2	1	4	—	2	1	1	4
Aluminum Bromide	1	1	1	1	—	1	1	1	1
Aluminum Chlorate	3	3	1	3	—	1	1	1	1
Aluminum Chloride	1	1	1	1	—	1	1	1	1
Aluminum Fluoride	1	1	1	1	—	1	1	2	1
Aluminum Formate	3	3	1	3	—	1	1	1	1
Aluminum Hydroxide	2	—	1	2	—	—	—	—	—
Aluminum Linoleate	1	1	4	1	—	2	4	4	2
Aluminum Nitrate	1	1	1	1	—	1	1	1	1
Aluminum Oxalate	3	3	1	3	—	1	1	1	1
Aluminum Phosphate	1	1	1	1	—	1	—	—	—
Aluminum Potassium Sulfate	3	3	1	3	—	1	1	1	1
Aluminum Salts	1	1	1	1	—	1	1	1	1
Aluminum Sodium Sulfate	3	3	1	3	—	1	1	1	1
Aluminum Sulfate	1	1	1	1	—	1	1	1	1
Alums-NH3 -Cr -K	1	1	1	4	—	1	1	1	1
Ambrex 33 (Mobil)	1	1	4	1	—	2	4	4	3
Ambrex 830 (Mobil)	1	1	3	1	—	2	3	4	2
Amines-Mixed	4	4	2	4	—	2	2	2	4
Ammonia & Lithium Metal in Sol'n	2	2	2	4	—	—	2	4	4
Ammonia (Anhydrous)	2	2	1	4	—	1	1	4	4
Ammonia, Gas, Cold	1	1	1	4	—	1	1	1	1
Ammonia, Gas, Hot	4	4	2	4	—	2	2	4	2
Ammonia, Liquid (Anhydrous)	2	2	1	4	—	1	1	4	2
Ammonium Acetate	3	3	1	3	—	1	1	1	1
Ammonium Arsenate	3	3	1	3	—	1	1	1	1
Ammonium Benzoate	3	3	1	3	—	1	1	1	1
Ammonium Bicarbonate	3	3	1	3	—	1	1	1	1
Ammonium Bifluoride	1	1	1	1	—	—	—	—	—
Ammonium Bisulfite	3	3	1	3	—	1	1	1	1
Ammonium Bromide	1	1	1	1	—	1	1	1	1
Ammonium Carbamate	3	3	1	3	—	1	1	1	1
Ammonium Carbonate	4	4	1	1	—	1	1	1	1
Ammonium Chloride, 2N	1	1	1	1	—	1	1	1	1
Ammonium Citrate	3	3	1	3	—	1	1	1	1
Ammonium Dichromate	3	3	1	3	—	1	1	1	1
Ammonium Diphosphate	3	3	1	3	—	1	1	1	1
Ammonium Fluoride	1	1	1	1	—	1	1	1	1
Ammonium Formate	3	3	1	3	—	1	1	1	1
Ammonium Hydroxide, 3 Molar	1	1	1	3	—	1	1	2	1
Ammonium Hydroxide, Conc.	4	4	1	4	—	1	1	3	1
Ammonium Iodide	1	1	1	1	—	1	1	1	1
Ammonium Lactate	3	3	1	3	—	1	1	1	1
Ammonium Metaphosphate	3	3	1	3	—	1	1	1	1
Ammonium Molybdenate	3	3	1	3	—	1	1	1	1
Ammonium Nitrate, 2N	1	1	1	—	—	1	1	3	1
Ammonium Nitrite	1	1	1	—	—	1	1	1	1
Ammonium Oxalate	3	3	1	3	—	1	1	1	1
Ammonium Perchlorate	3	3	1	3	—	1	1	1	1
Ammonium Persulfate 10%	4	4	1	—	—	1	1	1	—
Ammonium Persulfate Solution	4	4	1	—	—	—	1	1	—

Unless otherwise noted ratings are at room temperature.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Ammonium Phosphate	1	1	1	4	—	1	1	1	1
Ammonium Phosphate, Dibasic	1	1	1	—	—	1	1	1	1
Ammonium Phosphate, Monobasic	1	1	1	—	—	1	1	1	1
Ammonium Phosphate, Tribasic	1	1	1	—	—	1	1	1	1
Ammonium Phosphite	3	3	1	3	—	1	1	1	1
Ammonium Picrate	3	3	1	3	—	1	1	1	1
Ammonium Polysulfide	3	3	1	3	—	1	1	1	1
Ammonium Salicylate	3	3	1	3	—	1	1	1	1
Ammonium Salts	1	1	1	3	—	1	1	1	1
Ammonium Sulfamate	3	3	1	3	—	1	1	1	1
Ammonium Sulfate	1	1	1	4	—	1	1	1	1
Ammonium Sulfate Nitrate	1	1	1	4	—	1	1	1	1
Ammonium Sulfide	1	1	1	4	—	1	1	1	1
Ammonium Sulfite	3	3	1	3	—	1	1	1	1
Ammonium Thiocyanate	3	3	1	3	—	1	1	1	1
Ammonium Thioglycolate	3	3	1	3	—	1	1	1	1
Ammonium Thiosulfate	3	3	1	3	—	1	1	1	1
Ammonium Tungstate	3	3	1	3	—	1	1	1	1
Ammonium Valerate	3	3	1	3	—	1	1	1	1
Amyl Acetate	1	1	3	4	—	4	3	4	4
Amyl Alcohol	2	2	1	2	—	2	1	2	2
Amyl Borate	1	1	4	1	—	1	4	4	1
Amyl Butyrate	1	1	4	1	—	2	4	4	2
Amyl Chloride	—	—	4	1	—	4	4	4	4
Amyl Chloronaphthalene	4	4	4	1	—	4	4	4	4
Amyl Cinnamic Aldehyde	2	2	4	1	—	4	4	4	4
Amyl Laurate	2	2	4	1	—	4	4	4	4
Amyl Mercaptan	2	2	4	1	—	4	4	4	4
Amyl Naphthalene	4	4	4	1	—	4	4	4	4
Amyl Nitrate	3	3	1	3	—	1	1	1	1
Amyl Nitrite	3	3	1	3	—	1	1	1	1
Amyl Propionate	1	1	4	1	—	2	4	4	2
Anderol, L-826 (di-ester)	2	2	4	1	—	4	4	4	4
Anderol, L-829 (di-ester)	2	2	4	1	—	4	4	4	4
Anderol, L-774 (di-ester)	2	2	4	1	—	4	4	4	4
ANG-25 (Di-ester Base) (TG749)	2	2	4	1	—	4	4	4	4
ANG-25 (Glyceral Ester)	2	2	1	1	—	2	2	2	2
Aniline	4	4	2	3	1	4	2	4	4
Aniline Dyes	4	4	2	2	—	2	2	2	2
Aniline Hydrochloride	2	2	2	2	—	4	2	2	4
Aniline Hydrochloride	3	3	1	3	—	1	1	1	1
Aniline Oil	4	4	2	3	—	4	2	4	4
Aniline Sulfate	3	3	1	3	—	1	1	1	1
Aniline Sulfite	3	3	1	3	—	1	1	1	1
Animal Fats	1	1	2	1	—	2	—	—	—
Animal Oil (Lard Oil)	1	1	2	1	—	2	2	4	2
AN-O-3 Grade M	1	1	4	1	—	2	4	4	2
AN-O-366	1	1	4	1	—	2	4	4	2
AN-O-6	1	1	4	1	—	2	4	4	2

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Ansul Ether 161 or 181	3	3	3	4	—	4	3	4	4
Anthracene	2	2	4	1	—	4	4	4	4
Anti-freeze Solutions	3	3	1	3	—	1	1	1	1
Antimony Chloride	1	1	4	1	—	2	4	4	2
Antimony Pentachloride	1	1	4	1	—	2	4	4	2
Antimony Tribromide	1	1	4	1	—	2	4	4	2
Antimony Trichloride	1	1	4	1	—	2	4	4	2
Antimony Trifluoride	1	1	4	1	—	2	4	4	2
Antimony Trioxide	1	1	4	1	—	2	4	4	2
AN-VV-O-366b Hydr. Fluid	1	1	4	1	—	2	4	4	2
Aqua Regia	4	3	3	2	—	4	—	—	—
Argon	1	1	1	1	—	1	1	1	1
Aroclor, 1248	3	3	2	1	—	4	2	4	4
Aroclor, 1254	4	4	2	1	—	4	4	4	4
Aroclor, 1260	1	1	—	1	—	1	1	1	1
Aromatic Fuel - 50%	2	2	4	1	—	4	4	4	4
Arsenic Acid	1	1	1	1	—	1	1	2	1
Arsenic Trichloride	1	1	4	4	—	1	—	—	—
Arsenic Trioxide	1	1	4	4	—	1	—	—	—
Arsenic Trisulfide	1	1	4	4	—	1	—	—	—
Ascorbic Acid	3	3	1	3	—	1	1	1	1
Askarel Transformer Oil	2	2	4	1	—	4	4	4	4
Aspartic Acid	3	3	1	3	—	1	1	1	1
Asphalt	2	2	4	1	—	2	4	4	2
ASTM Oil, No.1	1	1	4	1	—	1	4	4	2
ASTM Oil, No.2	1	1	4	1	—	2	4	4	4
ASTM Oil, No.3	1	1	4	1	—	4	4	4	4
ASTM Oil, No.4	2	2	4	1	—	4	4	4	4
ASTM Oil, No.5	1	1	4	1	—	2	—	—	—
ASTM Reference Fuel A	1	1	4	1	—	2	4	4	2
ASTM Reference Fuel B	1	1	4	1	—	4	4	4	4
ASTM Reference Fuel C	2	2	4	1	—	4	4	4	4
ASTM Reference Fuel D	2	2	4	1	—	4	—	—	—
ATL-857	2	2	4	1	—	4	4	4	4
Atlantic Dominion F	1	1	4	1	—	2	4	4	4
Atlantic Utro Gear-e	1	1	4	1	—	2	—	—	—
Atlantic Utro Gear-EP Lube.	1	1	4	1	—	2	4	4	4
Aure 903R (Mobil)	1	1	4	1	—	2	4	2	4
Automatic Transmission Fluid	1	1	4	1	1	2	4	4	3
Automotive Brake Fluid	3	3	1	4	—	2	2	—	2
Bardol B	4	4	4	1	—	4	4	4	4
Barium Carbonate	3	3	1	3	—	1	1	1	1
Barium Chlorate	3	3	1	3	—	1	1	1	1
Barium Chloride	1	1	1	1	—	1	1	1	1
Barium Cyanide	1	1	1	1	—	1	1	1	1
Barium Hydroxide	1	1	1	1	—	1	1	1	1
Barium Iodide	1	1	1	1	—	1	1	1	1
Barium Nitrate	3	3	1	3	—	1	1	1	1
Barium Oxide	1	1	1	1	—	1	1	1	1
Barium Peroxide	3	3	1	3	—	1	1	1	1
Barium Polysulfide	3	3	1	3	—	1	1	1	1
Barium Salts	1	1	1	1	—	1	1	1	1

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Barium Sulfate	1	1	1	1	—	1	—	—	—
Barium Sulfide	1	1	1	1	—	1	1	1	1
Bayol 35	1	1	4	1	—	2	4	4	4
Bayol D	1	1	4	1	—	2	4	4	4
Beer	1	1	1	1	—	1	1	1	1
Beet Sugar Liquids	1	1	1	1	—	1	—	—	—
Beet Sugar Liquors	1	1	1	1	—	2	1	1	1
Benzaldehyde	4	4	1	4	2	4	1	4	1
Benzamide	2	2	4	1	—	4	4	4	4
Benzanthrone	2	2	4	1	—	4	4	4	4
Benzene	4	4	4	1	3	4	4	4	4
Benzenesulfonic Acid 10%	4	4	4	1	—	2	4	4	1
Benzidine	2	2	4	1	—	4	4	4	4
Benzidine 3 Sulfonic Acid	2	2	4	1	—	4	4	4	4
Benzil	2	2	4	1	—	4	4	4	4
Benzilic Acid	2	2	4	1	—	4	4	4	4
Benzine (Ligroin)	1	1	4	1	—	2	4	4	3
Benzocatechol	2	2	4	1	—	4	4	4	4
Benzochloride	4	4	1	1	—	4	2	4	4
Benzoic Acid	4	4	4	1	—	4	4	4	4
Benzoin	2	2	4	1	—	4	4	4	4
Benzonitrile	3	3	1	3	—	1	1	1	1
Benzophenone	—	—	2	1	—	—	2	—	—
Benzoquinone	—	—	2	1	—	—	2	—	—
Benzotrichloride	4	4	1	1	—	4	—	—	—
Benzotrifluoride	4	4	1	1	—	4	—	—	—
Benzoyl Chloride	—	—	—	1	—	4	4	4	4
Benzoylsulfonilic Acid	2	2	4	1	—	4	4	4	4
Benzyl Acetate	3	3	1	3	—	1	1	1	1
Benzyl Alcohol	4	4	2	1	1	2	2	4	2
Benzyl Benzoate	4	4	4	1	—	4	2	4	4
Benzyl Bromide	4	4	4	1	—	4	4	4	4
Benzyl Butyl Phthalate	3	3	1	3	—	1	1	1	1
Benzyl Chloride	4	4	4	1	1	4	4	4	4
Benzyl Phenol	2	2	4	1	—	4	4	4	4
Benzyl Salicylate	2	2	4	1	—	4	4	4	4
Beryllium Chloride	1	1	1	1	—	3	1	3	3
Beryllium Fluoride	1	1	1	1	—	3	1	3	3
Beryllium Oxide	1	1	1	1	—	3	1	3	3
Beryllium Sulfate	3	3	1	3	—	1	1	1	1
Bismuth Carbonate	3	3	1	3	—	1	1	1	1
Bismuth Nitrate	3	3	1	3	—	1	1	1	1
Bismuth Oxychloride	3	3	1	3	—	1	1	1	1
Black Liquor	2	—	3*	1**	—	1	—	—	—
Black Point 77	1	1	1	1	—	3	1	3	3
Blast Furnace Gas	4	4	4	1	—	4	4	4	4
Bleach Liquor	3	3	1	1	—	2	1	3	1
Bleach Solutions	—	—	1	1	—	—	—	—	—
Boiler Feed Water	3	2	1	4	—	3	4	—	—
Borated Water, <12% <300° F	3	3	1	4	—	—	4	—	—
Borated Water, <5% <300° F	3	3	1	4	—	—	4	—	—
Borated Water, >12% <300° F	3	3	1	4	—	—	4	—	—

Unless otherwise noted ratings are at room temperature.

- Since some applications have high concentrations of turpentine and tall oil, EPDM's rating has been reduced.

** Specify AFLA~ Viton" ·B lor applications with elevated concentrations ol Sodium Hydroxide

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Borax	2	2	1	1	—	4	1	2	4
Borax Solutions	—	—	1	1	—	—	—	—	—
Bordeaux Mixture	2	2	1	1	—	2	1	2	1
Boric Acid	1	1	1	1	—	1	1	1	1
Boric Oxide	3	3	1	3	—	1	1	1	1
Borneol	2	2	4	1	—	4	4	4	4
Bornyl Acetate	2	2	4	1	—	4	4	4	4
Bornyl Chloride	2	2	4	1	—	4	4	4	4
Bornyl Formate	2	2	4	1	—	4	4	4	4
Boron Fluids (HEF)	2	2	4	1	—	4	4	4	4
Brake Fluid DOT3 (Glycol Type)	3	3	1	4	—	2	2	—	2
Bray GG-130	2	2	4	1	—	4	4	4	4
Brayco 719-R (VV-H-910)	3	3	1	4	—	2	2	2	2
Brayco 885 (MIL-L-6085A)	2	2	4	1	—	4	4	4	4
Brayco 910	2	2	1	4	—	2	1	1	1
Bret 710	2	2	1	4	—	2	1	1	1
Brine	1	1	1	1	—	—	—	—	—
Brine (Seawater)	1	1	1	1	—	4	—	—	—
Brom - 113	3	3	4	—	—	4	4	—	4
Brom - 114	2	2	4	2	—	2	4	4	2
Bromic Acid	3	3	1	3	—	1	1	1	1
Bromine	4	4	4	1	1	4	4	4	4
Bromine Pentafluoride	4	4	4	4	—	4	4	4	4
Bromine Trifluoride	4	4	4	4	—	4	4	4	4
Bromine Water	4	4	2	1	—	4	4	4	1
Bromobenzene	4	4	4	1	—	4	4	4	4
Bromobenzene Cyanide	3	3	1	3	—	1	1	1	1
Bromochloro Trifluoroethane (Halothane)	4	4	4	1	—	4	4	4	4
Bromoform	2	2	4	1	—	4	4	4	4
Bromomethane (Methyl Bromide)	2	2	4	1	—	4	4	4	4
Brucine Sulfate	3	3	1	3	—	1	1	1	1
Bunker Oil	1	1	4	1	—	4	4	4	4
Bunker's C (Fuel Oil)	1	—	—	1	—	—	—	—	—
Butadiene (Monomer)	4	4	4	1	—	4	4	4	4
Butane	1	1	4	1	—	1	4	4	2
Butane, 2, 2-Dimethyl	1	1	4	1	—	2	4	4	2
Butane, 2, 3-Dimethyl	1	1	4	1	—	2	4	4	2
Butanedial	3	3	1	3	—	1	1	1	1
Butanol (Butyl Alcohol)	1	1	2	1	—	1	2	1	1
Butene 2-Ethyl (1-Butene 2-Ethyl)	1	1	4	1	—	4	4	4	4
Butter-Animal Fat	1	1	1	1	—	2	2	4	2
Butyl Acetate or n-Butyl Acetate	4	4	2	4	—	4	2	4	4
Butyl Acetyl Ricinoleate	2	2	1	1	—	2	1	4	2
Butyl Acrylate	4	4	1	4	—	4	4	4	4
Butyl Alcohol	1	1	2	1	—	1	2	1	1
Butyl Alcohol (Secondary)	2	2	2	1	—	2	2	2	2
Butyl Alcohol (Tertiary)	2	2	2	1	—	2	2	2	2
Butyl Amine or N-Butyl Amine	1	1	3	4	—	4	4	4	4
Butyl Benzoate	3	3	1	3	—	1	1	1	1
Butyl Benzoate or n-Butyl Benzoate	4	4	1	1	—	4	1	4	4
Butyl Butyrate or n-Butyl Butyrate	4	4	1	1	—	4	1	4	4
Butyl Carbitol	4	4	1	3	—	3	1	4	2
Butyl Cellosolve	3	3	2	4	—	3	2	4	4
Butyl Cellosolve Acetate	3	3	1	3	—	1	1	1	1
Butyl Cellosolve Adipate	4	4	2	2	—	4	2	4	4
Butyl Chloride	1	1	4	1	—	2	4	4	2
Butyl Ether or n-Butyl Ether	3	3	3	4	—	4	3	4	4
Butyl Glycolate	3	3	1	3	—	1	1	1	1
Butyl Lactate	3	3	1	3	—	1	1	1	1
Butyl Laurate	3	3	1	3	—	1	1	1	1
Butyl Mercaptan (Tertiary)	4	4	4	1	—	4	4	4	4
Butyl Methacrylate	3	3	1	3	—	1	1	1	1
Butyl Oleate	4	4	2	1	—	4	2	4	4
Butyl Oxalate	3	3	1	3	—	1	1	1	1
Butyl Stearate	2	2	4	1	1	4	4	4	4
Butylbenzoic Acid	2	2	4	1	—	4	4	4	4
Butylene	2	2	4	1	—	3	4	4	4
Butyraldehyde	4	4	2	4	—	4	2	4	4
Butyric Acid	4	4	2	2	—	4	2	—	4
Butyric Anhydride	3	3	1	3	—	1	1	1	1
Butyrolactone	3	3	1	3	—	1	1	1	1
Butyryl Chloride	2	2	4	1	—	4	4	4	4
Cadmium Chloride	3	3	1	3	—	1	1	1	1
Cadmium Cyanide	3	3	1	3	—	1	1	1	1
Cadmium Nitrate	3	3	1	3	—	1	1	1	1
Cadmium Oxide	3	3	1	3	—	1	1	1	1
Cadmium Sulfate	3	3	1	3	—	1	1	1	1
Cadmium Sulfide	3	3	1	3	—	1	1	1	1
Calcine Liquors	1	1	1	1	—	—	1	—	—
Calcium Acetate	2	2	1	4	—	2	1	1	2
Calcium Arsenate	3	3	1	3	—	1	1	1	1
Calcium Benzoate	2	2	4	1	—	4	4	4	4
Calcium Bicarbonate	3	3	1	3	—	1	1	1	1
Calcium Bisulfide	3	3	1	3	—	1	1	1	1
Calcium Bisulfite	2	2	1	2	—	2	1	4	1
Calcium Bromide	1	1	1	1	—	1	1	1	1
Calcium Carbonate	1	1	1	1	—	1	1	1	1
Calcium Chlorate	3	3	1	3	—	1	1	1	1
Calcium Chloride	1	1	1	1	—	1	1	1	1
Calcium Chromate	3	3	1	3	—	1	1	1	1
Calcium Cyanide	1	1	1	—	—	1	1	1	1
Calcium Fluoride	1	1	1	1	—	1	1	1	1
Calcium Gluconate	3	3	1	3	—	1	1	1	1
Calcium Hydride	1	1	1	1	—	1	1	1	1
Calcium Hydrosulfide	3	3	1	3	—	1	1	1	1
Calcium Hydroxide	1	1	1	1	—	1	1	1	1
Calcium Hypochlorite	2	2	1	1	—	2	1	2	1
Calcium Hypophosphite	3	3	1	3	—	1	1	1	1

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Rating Legend

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3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Calcium Lactate	3	3	1	3	—	1	1	1	1
Calcium Nitrate	1	1	1	1	—	1	1	1	1
Calcium Oxalate	3	3	1	3	—	1	1	1	1
Calcium Oxide	1	1	1	1	—	1	1	1	1
Calcium Phenolsulfonate	3	3	1	3	—	1	1	1	1
Calcium Phosphate	1	1	1	1	—	2	1	1	1
Calcium Phosphate Acid	3	3	1	3	—	1	1	1	1
Calcium Propionate	3	3	1	3	—	1	1	1	1
Calcium Salts	1	1	1	1	—	1	1	1	1
Calcium Silicate	1	1	1	1	—	1	1	1	1
Calcium Stearate	2	2	4	1	—	4	4	4	4
Calcium Sulfamate	2	2	4	1	—	4	4	4	4
Calcium Sulfate	3	3	1	3	—	1	1	1	1
Calcium Sulfide	1	1	1	1	—	1	1	2	1
Calcium Sulfite	1	1	1	1	—	1	1	2	1
Calcium Thiocyanate	3	3	1	3	—	1	1	1	1
Calcium Thiosulfate	2	2	1	1	—	1	1	2	1
Calcium Tungstate	3	3	1	3	—	1	1	1	1
Caliche Liquors	1	1	1	1	—	1	1	1	1
Camphene	2	2	4	1	—	4	4	4	4
Camphor	2	2	4	1	—	4	4	4	4
Camphoric Acid	2	2	4	1	—	4	4	4	4
Cane Sugar Liquors	1	1	1	1	—	1	1	1	1
Capric Acid	1	1	4	1	—	2	4	4	2
Caproic Acid	1	1	4	1	2	2	4	4	2
Caproic Aldehyde	—	—	2	4	—	—	2	2	—
Caprolactam	1	1	4	1	—	2	4	4	2
Capronaldehyde	1	1	4	1	—	2	4	4	2
Carbamate	3	3	2	1	—	2	2	4	2
Carbitol	2	2	2	2	—	2	2	2	2
Carbolic Acid (Phenol)	4	4	2	1	—	4	2	4	4
Carbon Bisulfide	4	4	4	1	—	4	4	4	4
Carbon Dioxide	1	1	1	1	—	1	1	1	1
Carbon Dioxide (Explosive Decompression Use)	1	1	1	1	—	1	1	1	1
Carbon Disulfide	4	4	4	1	1	4	4	4	4
Carbon Fluorides	2	2	4	1	—	4	4	4	4
Carbon Monoxide	1	1	1	1	—	2	1	2	2
Carbon Tetrachloride	2	2	4	1	4	4	4	4	4
Carbon Tetrafluoride	2	2	4	1	—	4	4	4	4
Carbonic Acid	2	2	1	1	—	1	1	1	1
Casein	3	3	1	3	—	1	1	1	1
Castor Oil	1	1	2	1	1	1	2	1	1
Caustic Lime	3	3	1	3	—	1	1	1	1
Caustic Potash	3	3	1	3	—	1	1	1	1
Caustic Soda (Sodium Hydroxide)	3	3	1	3	—	1	1	1	1
Cellosolve	4	4	2	4	—	4	2	4	4
Cellosolve Butyl	4	4	2	4	—	4	2	4	4
Cellosolve, Acetate	4	4	2	4	—	4	2	4	4
Celluguard	1	1	1	1	—	1	1	1	1
Cellulose Acetate	3	3	1	3	—	1	1	1	1
Cellulose Acetate Butyrate	3	3	1	3	—	1	1	1	1
Cellulose Ether	3	3	1	3	—	1	1	1	1
Cellulose Nitrate	3	3	1	3	—	1	1	1	1
Cellulose Tripropionate	3	3	1	3	—	1	1	1	1
Cellutherm 2505A	2	2	4	1	—	4	4	4	4
Cerium Sulfate	3	3	1	3	—	1	1	1	1
Cerous Chloride	3	3	1	3	—	1	1	1	1
Cerous Fluoride	3	3	1	3	—	1	1	1	1
Cerous Nitrate	3	3	1	3	—	1	1	1	1
Cetane (Hexadecane)	1	1	4	1	—	2	4	4	2
Cetyl Alcohol	1	1	4	1	—	2	4	4	2
China Wood Oil (Tung Oil)	1	1	4	1	—	2	3	4	3
Chloral	3	3	1	3	—	1	1	1	1
Chloranthraquinone	2	2	4	1	—	4	4	4	4
Chlordane	2	2	4	1	—	3	4	4	3
Chlorextol	2	2	4	1	—	2	4	4	4
Chloric Acid	3	3	1	3	—	1	1	1	1
Chlorinated Solvents, Dry	4	4	4	1	—	4	4	4	4
Chlorinated Solvents, Wet	4	4	4	1	—	4	4	4	4
Chlorine (Dry)	2	2	4	1	—	4	4	4	4
Chlorine Dioxide	4	4	3	1	—	4	3	4	3
Chlorine Dioxide, 8% Cl as NaClO2 in solution	4	4	4	1	—	4	4	4	4
Chlorine Trifluoride	4	4	4	4	—	4	4	4	4
Chlorine Water	3	3	2	1	—	4	—	—	—
Chlorine, Dry	4	4	—	2	—	2	—	4	2
Chlorine, Wet	4	4	—	2	—	4	—	4	2
Chloro 1-Nitro Ethane (1-Chloro 1-Nitro Ethane)	4	4	4	4	—	4	4	4	4
Chloro Xylenols	2	2	4	1	—	4	4	4	4
Chloroacetaldehyde	3	3	1	3	—	1	1	1	1
Chloroacetic Acid	4	4	2	4	—	4	2	4	1
Chloroacetone	4	4	1	4	—	4	2	4	4
Chloroamino Benzoic Acid	3	3	1	3	—	1	1	1	1
Chloroaniline	3	3	1	3	—	1	1	1	1
Chlorobenzaldehyde	3	3	1	3	—	1	1	1	1
Chlorobenzene	4	4	4	1	—	4	4	4	4
Chlorobenzene (Mono)	4	4	4	1	—	4	4	4	4
Chlorobenzene Chloride	2	2	4	1	—	4	4	4	4
Chlorobenzene Trifluoride	2	2	4	1	—	4	4	4	4
Chlorobenzochloride	2	2	4	1	—	4	4	4	4
Chlorobenzotrifluoride	2	2	4	1	—	4	4	4	4
Chlorobromo Methane	4	4	2	1	—	4	2	4	4
Chlorobromopropane	2	2	4	1	—	4	4	4	4
Chlorobutadiene	4	4	4	1	—	4	4	4	4
Chlorobutane (Butyl Chloride)	1	1	4	1	—	2	4	4	2
Chlorododecane	4	4	4	1	—	4	4	4	4
Chloroethane	1	1	4	1	—	2	4	4	2
Chloroethane Sulfonic Acid	3	3	1	3	—	1	1	1	1
Chloroethylbenzene	2	2	4	1	—	4	4	4	4
Chloroform	4	4	4	1	4	4	4	4	4
Chlorohydrin	3	3	1	3	—	1	1	1	1

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Rating Legend

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4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Chloronaphthalene or o-Chloronaphthalene	4	4	4	1	—	4	4	4	4
Chloronitrobenzene	3	3	1	3	—	1	1	1	1
Chlorophenol or o-Chlorophenol	4	4	4	1	—	4	4	4	4
Chloropicrin	2	2	4	1	—	4	4	4	4
Chloroprene	2	2	4	1	1	4	4	4	4
Chlorosulfonic Acid	4	4	4	4	—	4	4	4	4
Chlorotoluene	4	4	4	1	—	4	4	4	4
Chlorotoluene Sulfonic Acid	3	3	1	3	—	1	1	1	1
Chlorotoluidine	2	2	4	1	—	4	4	4	4
Chlorox	2	2	2	1	—	2	2	4	2
Cholesterol	2	2	4	1	—	4	4	4	4
Chrome Alum	1	1	1	1	—	1	1	1	1
Chrome Plating Solutions	4	4	2	1	—	4	2	4	4
Chromic Acid	4	4	2	1	—	4	4	4	4
Chromic Oxide	4	4	2	1	—	4	—	—	—
Chromium Potassium Sulfate (Alum)	2	—	2	1	—	—	—	—	—
Cinnamic Acid	2	2	4	1	—	4	4	4	4
Cinnamic Alcohol	2	2	4	1	—	4	4	4	4
Cinnamic Aldehyde	2	2	4	1	—	4	4	4	4
Circo Light Process Oil	1	1	4	1	—	2	4	4	2
Citric Acid	1	1	1	1	1	1	1	1	1
City Service #65 #120 #250	1	1	4	1	—	2	4	4	4
City Service Koolmoter-AP Gear Oil 140-EP lube	1	1	4	1	—	2	4	4	2
City Service Pacemaker #2	1	1	4	1	—	2	4	4	4
Clorox	2	—	2	1	—	—	—	—	—
Coal Tar	1	—	—	1	—	—	—	—	—
Cobalt Chloride	1	1	1	1	—	1	1	1	1
Cobalt Chloride, 2N	1	1	1	1	—	1	1	1	1
Cobaltous Acetate	3	3	1	3	—	1	1	1	1
Cobaltous Bromide	1	1	1	1	—	1	1	1	1
Cobaltous Sulfate	3	3	1	3	—	1	1	1	1
Coconut Oil	1	1	3	1	—	3	3	4	3
Cod Liver Oil	1	1	1	1	—	2	1	4	2
Codeine	2	2	4	1	—	4	4	4	4
Coffee	1	1	1	1	—	1	1	1	1
Coke Oven Gas	4	4	4	1	—	4	4	4	4
Coliche Liquors	2	2	2	—	—	1	2	1	—
Convelex 10	4	4	—	—	—	4	4	4	4
Coolanol 20 25R 35R 40 & 45A (Monsanto)	1	1	3	1	—	2	4	4	2
Copper Acetate	2	2	1	4	—	2	1	1	2
Copper Ammonium Acetate	3	3	1	3	—	1	1	1	1
Copper Carbonate	3	3	1	3	—	1	1	1	1
Copper Chloride	1	1	1	1	—	2	1	1	2
Copper Cyanide	1	1	1	1	—	1	1	1	1
Copper Gluconate	3	3	1	3	—	1	1	1	1
Copper Nitrate	2	—	2	1	—	—	—	—	—
Copper Oxide	1	1	1	1	—	1	1	1	1
Copper Salts	1	1	1	1	—	1	1	1	1
Copper Sulfate	1	1	1	1	—	1	2	2	1
Copper Sulfate 10%	1	1	1	1	—	1	2	2	1
Copper Sulfate 50%	1	1	1	1	—	1	2	1	1
Corn Oil	1	1	3	1	—	3	3	4	2
Corn Syrup	1	1	1	1	—	1	—	1	1
Cottonseed Oil	1	1	3	1	1	3	3	4	2
Creosote, Coal Tar	1	1	4	1	—	2	4	4	4
Creosote, Wood	1	1	4	1	—	2	4	4	4
Cresol (Methyl Phenol)	—	—	—	1	—	—	—	—	—
Cresols	4	4	4	2	—	4	4	4	4
Cresylic Acid	4	4	4	1	—	4	4	4	4
Crotonaldehyde	2	2	4	1	—	4	4	4	4
Crotonic Acid	2	2	4	1	—	4	4	4	4
Crude Oil	2	2	4	1	—	4	4	4	4
Cumaldehyde	2	2	4	1	—	4	4	4	4
Cumene	4	4	4	1	—	4	4	4	4
Cupric Sulfate	2	—	2	1	—	—	—	—	—
Cutting Oil	1	1	4	1	—	2	4	4	2
Cyclohexane	1	1	4	1	2	3	4	4	4
Cyclohexanol	1	1	4	1	—	2	4	4	2
Cyclohexanone	4	4	2	4	2	4	2	4	4
Cyclohexene	2	2	4	1	—	4	4	4	4
Cyclohexylamine	1	1	4	1	—	2	4	4	2
Cyclohexylamine Laurate	1	1	4	1	—	2	4	4	2
Cyclopentadiene	2	2	4	1	—	4	4	4	4
Cyclopentane	1	1	4	1	—	3	4	4	4
Cyclopolyolefins	1	1	4	1	—	3	4	4	4
Cymene or p-Cymene	4	4	4	1	—	4	4	4	4
DDT (Dichlorodiphenyltri-chloroethane)	2	2	4	1	—	4	4	4	4
Decalin	4	4	4	1	—	4	4	4	4
Decane	1	1	4	1	—	3	4	4	3
Delco Brake Fluid	3	3	1	4	—	2	2	—	2
Denatured Alcohol	1	1	1	1	—	1	1	1	1
Detergent, Water Solution	1	1	1	1	—	2	1	2	2
Developing Fluids (Photo)	1	1	2	1	—	1	2	1	1
Dexron	1	1	4	1	—	2	—	—	—
Dexron	1	1	4	1	—	2	4	4	4
Dexron III	1	1	4	1	—	3	1	—	—
Dextrin	1	1	4	1	—	2	4	4	2
Dextro Lactic Acid	3	3	1	3	—	1	1	1	1
Dextrose	3	3	1	3	—	1	1	1	1
DI Water	2	—	1	2	—	1	1	1	1
Diacetone	4	4	1	4	—	4	1	4	4
Diacetone Alcohol	4	4	1	4	—	2	1	4	2
Dialkyl Sulfates	3	3	1	3	—	1	1	1	1
Diamylamine	1	1	4	1	—	2	4	4	2
Diazinon	3	3	4	2	—	3	4	4	3
Dibenzyl (sym-Diphenylethane)	2	2	4	1	—	4	4	4	4
Dibenzyl Ether	4	4	2	4	—	4	2	4	4
Dibenzyl Sebacate	4	4	2	2	—	4	2	4	4
Dibromoethane	2	2	4	1	—	4	4	4	4

Unless otherwise noted ratings are at room temperature.

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Dibromoethyl Benzene	4	4	4	1	—	4	4	4	4
Dibutyl Cellosolve Adipate	3	3	1	3	—	1	1	1	1
Dibutyl Ether	4	4	3	3	—	4	3	4	4
Dibutyl Methylenedithio Glycolate	2	2	4	1	—	4	4	4	4
Dibutyl Phthalate	4	4	2	3	—	4	3	4	4
Dibutyl Sebacate	4	4	2	2	—	4	2	4	4
Dibutyl Thioglycolate	2	2	4	1	—	4	4	4	4
Dibutyl Thiourea	2	2	4	1	—	4	4	4	4
Dibutylamine	4	4	1	4	—	3	4	4	4
Dichloroacetic Acid	2	2	4	1	—	4	4	4	4
Dichloroaniline	3	3	1	3	—	1	1	1	1
Dichlorobenzene or o-Dichlorobenzene	4	4	4	1	—	4	4	4	4
Dichlorobenzene or p-Dichlorobenzene	4	4	4	1	—	4	4	4	4
Dichlorobutane	2	2	4	1	1	4	4	4	4
Dichlorobutene	2	2	4	1	—	4	4	4	4
Dichlorodiphenyl-Dichloroethane (DDD)	2	2	4	1	—	4	4	4	4
Dichloroethane	2	2	4	1	—	4	4	4	4
Dichloroethylene	2	2	4	1	—	4	4	4	4
Dichlorohydrin	3	3	1	3	—	1	1	1	1
Dichloroisopropyl Ether	4	4	3	3	—	4	4	4	4
Dichloromethane	2	2	4	1	—	4	4	4	4
Dichlorophenol	2	2	4	1	—	4	4	4	4
Dichlorophenoxyacetic Acid	2	2	4	1	—	4	4	4	4
Dichloropropane	2	2	4	1	—	4	4	4	4
Dichloropropene	2	2	4	1	—	4	4	4	4
Dicyclohexylamine	1	1	4	4	—	4	4	4	4
Dicyclohexylammonium Nitrate	3	3	1	3	—	1	1	1	1
Dieldrin	2	2	4	1	—	4	4	4	4
Diesel Oil	1	1	4	1	—	3	4	4	3
Di-ester Lubricant MIL-L-7808	2	2	4	1	—	4	4	4	4
Di-ester Synthetic Lubricants	2	2	4	1	—	4	4	4	4
Diethanolamine (DEA)	3	3	1	3	—	1	1	1	1
Diethyl Benzene	—	—	—	1	—	—	—	—	—
Diethyl Carbonate	3	3	1	3	—	1	1	1	1
Diethyl Ether	4	4	4	4	—	3	4	4	4
Diethyl Phthalate	2	2	4	1	—	4	4	4	4
Diethyl Sebacate	2	2	2	2	—	4	2	4	4
Diethyl Sulfate	4	—	1	3	—	4	—	—	—
Diethylamine	2	—	1	4	—	1	1	1	1
Diethylaniline	3	3	1	3	—	1	1	1	1
Diethylene Glycol	1	1	1	1	—	1	1	1	1
Difluorodibromomethane	4	4	2	—	—	4	2	4	4
Difluoroethane	2	2	4	1	—	4	4	4	4
Difluoromonochloroethane	2	2	4	1	—	4	4	4	4
Diglycol Chloroformate	3	3	1	3	—	1	1	1	1
Diglycolic Acid	3	3	1	3	—	1	1	1	1
Dihydroxydiphenylsulfone	3	3	1	3	—	1	1	1	1
Diisobutyl Ketone	—	—	1	—	—	—	1	—	—
Diisobutylcarbinol	1	1	4	1	—	2	4	4	2

	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Diisobutylene	2	2	4	1	—	4	4	4	4
Diisooctyl Sebacate	3	3	3	2	—	4	4	4	4
Diisopropyl Ketone	4	4	1	4	—	4	1	4	4
Diisopropylbenzene	2	2	4	1	—	4	4	4	4
Diisopropylidene Acetone	2	2	4	1	—	4	4	4	4
Dimethyl Acetamide	3	3	1	3	—	1	1	1	1
Dimethyl Aniline (Xylidine)	2	2	4	1	—	4	4	4	4
Dimethyl Disulfide (DMDS)	1	1	4	1	—	2	4	4	2
Dimethyl Ether	1	—	2	2	—	3	—	—	—
Dimethyl Formaldehyde	3	3	1	3	—	1	1	1	1
Dimethyl Formamide (DMF)	2	2	1	4	—	3	2	4	4
Dimethyl Hydrazine	3	3	1	3	—	1	1	1	1
Dimethyl Phenyl Carbinol	2	2	4	1	—	4	4	4	4
Dimethyl Phenyl Methanol	2	2	4	1	—	4	4	4	4
Dimethyl Phthalate	4	4	2	2	—	4	2	4	4
Dimethyl Sulfoxide (DMSO)	3	3	1	3	—	1	1	1	1
Dimethyl Terephthalate (DMT)	2	2	4	1	—	4	4	4	4
Dimethylamine (DMA)	2	2	1	4	—	2	2	2	3
Dinitrochlorobenzene	2	2	4	1	—	4	4	4	4
Dinitrotoluene (DNT)	4	4	4	4	—	4	4	4	4
Dioctyl Phthalate	4	4	2	2	—	4	2	4	4
Dioctyl Sebacate	4	4	2	2	—	4	2	4	4
Dioctylamine	1	1	4	1	—	2	4	4	2
Dioxane	4	4	2	4	4	4	2	4	4
Dioxolane	4	4	2	4	—	4	3	4	4
Dipentene	2	2	4	1	—	4	4	4	4
Diphenyl	4	4	4	1	2	4	4	4	4
Diphenyl Oxides	4	4	4	1	—	4	4	4	4
Diphenylamine (DPA)	2	2	4	1	—	4	4	4	4
Diphenylpropane	2	2	4	1	—	4	4	4	4
Dodecylbenzene	2	2	4	1	—	4	4	4	4
Dow Chemical 50-4	—	—	1	4	—	2	2	—	2
Dow Chemical ET378	4	4	—	—	—	4	4	4	4
Dow Chemical ET588	3	3	1	4	—	2	2	—	2
Dow Corning -11	2	2	1	1	—	1	1	1	1
Dow Corning 1208, 4050, 6620, F-60, xF-60	1	1	1	1	—	1	—	—	—
Dow Corning -1265 Fluorosilicone Fluid	2	2	1	1	—	1	1	1	1
Dow Corning -200	2	2	1	1	—	1	1	1	1
Dow Corning 220	1	1	1	1	—	1	—	—	—
Dow Corning -3	2	2	1	1	—	1	1	1	1
Dow Corning -33	2	2	1	1	—	1	1	1	1
Dow Corning -4	2	2	1	1	—	1	1	1	1
Dow Corning -44	2	2	1	1	—	1	1	1	1
Dow Corning -5	2	2	1	1	—	1	1	1	1
Dow Corning -510	2	2	1	1	—	1	1	1	1
Dow Corning -55	2	2	1	1	—	1	1	1	1
Dow Corning -550	2	2	1	1	—	1	1	1	1
Dow Corning -704	2	2	1	1	—	1	1	1	1
Dow Corning -705	2	2	1	1	—	1	1	1	1
Dow Corning -710	2	2	1	1	—	1	1	1	1

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Rating Legend

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2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Dow Corning F-61	1	1	1	1	—	1	—	—	—
Dow Guard	1	1	1	1	—	1	1	1	1
Dowtherm, 209	3	3	1	4	—	2	2	—	—
Dowtherm, A	4	4	4	1	—	4	4	4	4
Dowtherm, E	4	4	4	1	—	4	4	4	4
Dowtherm, G	4	4	4	1	—	4	4	4	4
Dowtherm, H	4	4	4	1	—	4	4	4	4
Dowtherm, LF	4	4	4	1	—	4	4	4	4
Drinking Water	1	1	1	1	—	2	1	1	1
Dry Cleaning Fluids	3	3	4	1	—	4	4	4	4
DTE 20 Series, Mobil	2	2	4	1	—	1	4	2	2
DTE named series, Mobil	1	1	4	1	—	2	4	3	1
DuraClear - Pure Synthetic Barrier Fluid	1	1	4	1	—	—	—	—	—
DuraClear - Synthetic Blend Barrier Fluid	1	1	4	1	—	—	—	—	—
Dye Liquors	—	—	—	1	—	—	—	—	—
Elco 28-EP lubricant	1	1	4	1	—	3	4	4	4
Emkarate RL32S POE	1	1	2	—	—	3	—	—	—
Epichlorohydrin	4	4	2	4	—	4	2	4	4
Epoxy Resins	—	—	1	4	—	1	1	—	—
Epsom Salt	1	1	1	1	—	1	—	—	—
Esam-6 Fluid	—	—	1	4	—	2	2	—	2
Esso Fuel 208	1	1	4	1	—	2	4	4	3
Esso Golden Gasoline	2	2	4	1	—	4	4	4	4
Esso Motor Oil	1	1	4	1	—	3	4	4	4
Esso Transmission fluid (Type A)	1	1	4	1	—	2	4	4	4
Esso WS2812 (MIL-L-7808A)	1	1	4	1	—	4	4	4	4
Esso XP90-EP lubricant	1	1	4	1	—	2	4	4	2
Esstic 42, 43	1	1	4	1	—	2	4	4	4
Ethane	1	1	4	1	—	2	4	4	2
Ethanol	3	3	1	3	—	1	1	1	1
Ethanol Amine	2	2	1	4	—	2	2	2	3
Ethers	4	4	3	3	—	4	4	4	4
Ethoxyethyl Acetate (EGMEEA)	3	3	1	3	—	1	1	1	1
Ethyl Acetate-Organic Ester	4	4	2	4	—	4	2	4	4
Ethyl Acetoacetate	4	4	2	4	—	4	2	3	4
Ethyl Acrylate	4	4	2	4	—	4	2	4	4
Ethyl Alcohol	3	3	1	3	1	1	1	1	1
Ethyl Benzene	4	4	4	1	2	4	4	4	4
Ethyl Benzoate	4	4	4	1	3	4	4	4	4
Ethyl Bromide	2	2	4	1	—	4	4	4	4
Ethyl Cellosolve	4	4	2	4	—	4	2	4	4
Ethyl Cellulose	2	2	2	4	—	2	2	2	2
Ethyl Chloride	1	1	3	1	—	4	4	4	4
Ethyl Chlorocarbonate	4	4	2	1	—	4	4	4	4
Ethyl Chloroformate	4	4	2	4	—	4	3	4	4
Ethyl Ether	3	3	3	4	—	4	3	4	4
Ethyl Formate	4	4	2	1	—	2	2	4	2
Ethyl Hexanol	1	1	1	1	—	1	1	1	1
Ethyl Lactate	3	3	1	3	—	1	1	1	1

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Ethyl Mercaptan	4	4	—	2	—	3	4	4	3
Ethyl Nitrite	3	3	1	3	—	1	1	1	1
Ethyl Oxalate	4	4	1	2	—	4	4	4	4
Ethyl Pentachlorobenzene	4	4	4	1	—	4	4	4	4
Ethyl Pyridine	2	2	4	1	—	4	4	4	4
Ethyl Silicate	1	1	1	1	—	1	1	2	2
Ethyl Stearate	2	2	4	1	—	4	4	4	4
Ethyl Sulfate	—	—	1	4	—	—	—	—	—
Ethyl Valerate	2	2	4	1	—	4	4	4	4
Ethylacrylic Acid	4	4	2	—	—	2	2	4	4
Ethylamine	3	3	1	3	—	1	1	1	1
Ethylcyclopentane	1	1	4	1	—	3	4	4	4
Ethylene	3	2	4	2	—	4	4	4	4
Ethylene Chloride	4	4	4	2	—	4	4	4	4
Ethylene Chlorohydrin	4	4	2	1	1	2	2	2	2
Ethylene Cyanohydrin	2	2	4	1	—	4	4	4	4
Ethylene Diamine	1	1	1	4	—	1	1	1	2
Ethylene Dibromide	4	4	3	1	—	4	3	4	4
Ethylene Dichloride	4	4	3	1	2	4	3	4	4
Ethylene Glycol	1	1	1	1	—	1	1	1	1
Ethylene Hydrochloride	4	4	3	1	—	4	3	4	4
Ethylene Oxide	4	4	3	4	—	4	3	4	4
Ethylene Oxide, (12%) and Freon 12 (80%)	3	3	2	4	—	4	2	4	4
Ethylene Trichloride	4	4	3	1	—	4	3	4	4
Ethylmorpholene Stannous Octotate (50/50 mix)	4	4	2	4	—	—	2	—	—
Ethylmorpholine	2	2	4	1	—	4	4	4	4
Ethylsulfuric Acid	3	3	1	3	—	1	1	1	1
F-60 Fluid (Dow Corning)	1	1	1	1	—	1	1	1	1
F-61 Fluid (Dow Corning)	1	1	1	1	—	1	1	1	1
Fatty Acids	2	2	3	1	—	2	3	4	2
FC-43 Heptacosofluorotributylamine	1	1	1	1	—	1	1	—	1
FC75 & FC77 (Fluorocarbon)	1	1	1	2	—	1	1	—	1
Ferric Acetate	3	3	1	3	—	1	1	1	1
Ferric Ammonium Sulfate	3	3	1	3	—	1	1	1	1
Ferric Chloride	1	1	1	1	—	2	1	1	2
Ferric Ferrocyanide	3	3	1	3	—	1	1	1	1
Ferric Hydroxide	3	3	1	3	—	1	1	1	1
Ferric Nitrate	1	1	1	1	—	1	1	1	1
Ferric Persulfate	1	1	1	1	—	1	—	—	—
Ferric Sulfate	1	1	1	1	—	1	—	—	—
Ferrous Ammonium Citrate	3	3	1	3	—	1	1	1	1
Ferrous Ammonium Sulfate	3	3	1	3	—	1	1	1	1
Ferrous Carbonate	3	3	1	3	—	1	1	1	1
Ferrous Iodide	3	3	1	3	—	1	1	1	1
Ferrous Sulfate	3	3	1	3	—	1	1	1	1
Ferrous Tartrate	3	3	1	3	—	1	1	1	1
Fish Oil	2	2	4	1	—	4	4	4	4
Fisher Reagent	—	—	2	—	—	—	—	—	—
Fluorinated Cyclic Ethers	—	—	1	—	—	—	—	—	—

Unless otherwise noted ratings are at room temperature.

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Fluorine (Liquid)	4	4	4	2	—	—	—	—	—
Fluorobenzene	2	2	4	1	—	4	4	4	4
Fluoroboric Acid	1	—	1	—	—	—	—	—	—
Fluorocarbon Oils	—	—	1	—	—	—	—	—	—
Fluorolube	1	1	1	2	—	1	1	—	1
Fluorosilicic Acid	1	1	2	2	—	1	—	—	—
Formaldehyde	3	3	2	4	1	3	2	2	2
Formamide	3	3	1	3	—	1	1	1	1
Formic Acid	—	—	1	4	2	1	—	—	—
Freon, 11	4	4	4	2	—	4	4	4	1
Freon, 112	2	2	4	1	—	2	4	4	2
Freon, 113	1	1	4	2	—	1	4	4	1
Freon, 113 + High and Low Aniline Oil	1	—	—	—	—	—	—	—	—
Freon, 114	1	1	1	1	—	1	1	1	—
Freon, 114B2	2	2	4	2	—	2	4	4	1
Freon, 115, 116	1	1	1	2	—	1	1	1	—
Freon, 12	2	2	3	3	—	1	3	2	1
Freon, 12 & Suniso 4G (50:50)	2	2	4	1	—	3	4	4	2
Freon, 12 & ASTM Oil #2 (50:50)	2	2	4	1	—	3	4	4	2
Freon, 13	1	1	1	1	—	1	1	1	1
Freon, 134a (Tetrafluoroethane)	—	1	1	—	—	1	—	—	—
Freon, 13B1	1	1	1	1	—	1	1	1	1
Freon, 14	1	1	1	1	—	1	1	1	1
Freon, 142b	2	2	4	2	—	1	—	—	—
Freon, 21	4	4	4	4	—	3	4	4	4
Freon, 218	1	—	1	1	—	—	—	—	—
Freon, 22	4	3	2	4	—	1	3	1	1
Freon, 22 & ASTM Oil #2 (50:50)	4	4	4	2	—	2	4	4	—
Freon, 31	4	4	1	4	—	1	1	2	2
Freon, 32	1	1	1	4	—	1	1	1	1
Freon, 401a	—	4	1	—	—	1	—	—	—
Freon, 402a	—	3	1	—	—	1	—	—	—
Freon, 404a	—	1	1	—	—	1	—	—	—
Freon, 407c	—	2	2	—	—	1	—	—	—
Freon, 410a	—	2	1	—	—	1	—	—	—
Freon, 502	2	2	1	2	—	1	1	1	—
Freon, 507	—	1	1	—	—	—	—	—	—
Freon, BF	2	2	4	1	—	2	4	4	2
Freon, C316	1	—	1	1	—	—	—	—	—
Freon, C318	1	1	1	2	—	1	1	1	1
Freon, K-142b	1	1	1	4	—	1	1	2	1
Freon, K-152a	1	1	1	4	—	1	1	1	4
Freon, MF	2	2	4	2	—	4	4	4	1
Freon, PCA	1	1	4	2	—	1	4	4	1
Freon, TA	1	—	2	3	—	—	—	—	—
Freon, TC	1	—	2	1	—	—	—	—	—
Freon, TF	1	1	4	2	—	1	4	4	1
Freon, TMC	2	—	3	1	—	—	—	—	—

Unless otherwise noted ratings are at room temperature.

***** Since some green liquor applications include additional media, which is not compatible with EPDM, the rating has been reduced from 1 to 3.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Freon, T-P35	1	—	1	1	—	—	—	—	—
Freon, T-WD602	2	—	2	1	—	—	—	—	—
Fruit Juices	1	1	1	1	—	1	—	1	1
Fuel Oil, #6	2	2	4	1	—	4	4	4	4
Fuel Oil, 1, and 2	1	1	4	1	—	2	4	4	3
Fuel Oil, Acidic	1	1	4	1	—	2	4	4	4
Fumaric Acid	1	1	2	1	—	2	4	3	2
Fuming Sulphuric Acid (20/25% Oleum)	4	4	4	1	—	4	4	4	4
Furaldehyde	4	4	2	4	—	4	—	—	—
Furan (Furfuran)	4	4	3	1	—	4	4	4	4
Furfural (Furfuraldehyde)	4	4	2	4	—	4	2	4	3
Furfuraldehyde	4	4	2	4	—	4	2	4	3
Furfuryl Alcohol	4	4	2	—	—	4	2	4	4
Furyl Carbinol	4	4	2	—	—	4	2	4	4
Fyrquel 150 220 300 550	4	4	1	1	—	4	1	4	4
Fyrquel 90, 100, 500	4	4	1	1	—	—	—	—	—
Fyrquel a60	4	4	2	4	—	4	—	—	—
Gallic Acid	2	2	2	1	—	2	2	1	2
Gasoline	1	1	4	1	3	4	4	4	4
Gelatin	1	1	1	1	—	1	1	1	1
Girling Brake Fluid	3	3	1	4	—	2	2	—	2
Glauber's Salt	4	4	2	1	—	2	2	2	2
Gluconic Acid	3	3	1	3	—	1	1	1	1
Glucose	1	1	1	1	—	1	1	1	1
Glutamic Acid	3	3	1	3	—	1	1	1	1
Glycerine (Glycerol)	1	1	1	1	—	1	1	1	1
Glycerol Dichlorohydrin	3	3	1	3	—	1	1	1	1
Glycerol Monochlorohydrin	3	3	1	3	—	1	1	1	1
Glycerol Triacetate	3	3	1	3	—	1	1	1	1
Glycerophosphoric Acid	3	3	1	3	—	1	1	1	1
Glyceryl Phosphate	3	3	1	3	—	1	1	1	1
Glycidol	3	3	1	3	—	1	1	1	1
Glycolic Acid	3	3	1	3	—	1	1	1	1
Glycols	1	1	1	1	—	1	1	1	1
Glycoxylic Acid	3	3	1	3	—	1	1	1	1
Grease Petroleum Base	1	1	4	1	—	3	4	4	4
Green Sulfate Liquor	2	2	3*	1	—	2	1	2	2
Gulf Endurance Oils	1	1	4	1	—	2	4	4	4
Gulf FR Fluids (Emulsion)	1	1	4	1	—	2	4	4	4
Gulf FR G-Fluids	1	1	1	1	—	1	1	1	1
Gulf FR P-Fluids	4	4	2	2	—	4	2	4	4
Gulf Harmony Oils	1	1	4	1	—	2	4	4	4
Gulf High Temperature Grease	1	1	4	1	—	2	4	4	4
Gulf Legion Oils	1	1	4	1	—	2	4	4	4
Gulf Paramount Oils	1	1	4	1	—	2	4	4	4
Gulf Security Oils	1	1	4	1	—	2	4	4	4
Gulfcrown Grease	1	1	4	1	—	2	4	4	4
Halocarbon 4.2	—	—	2	2	—	—	—	—	—
Halothane	4	4	4	1	—	4	4	4	4
Halowax Oil	4	4	4	1	—	4	4	4	4
Hannifin Lube A	1	1	4	1	—	1	4	4	1

Rating Legend

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2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Heat Transfer Fluid, petroleum-based	1	1	4	1	—	2	1	3	—
Heat Transfer Fluid, PFPE-based	1	1	1	3	—	—	—	—	—
Heat Transfer Fluid, silicone-based	1	1	1	1	—	1	1	1	1
Heavy Water	1	1	1	—	—	2	1	1	1
HEF-2 (High Energy Fuel)	2	2	4	1	—	4	4	4	4
Helium	1	1	1	1	—	1	1	1	1
Heptachlor	2	2	4	1	—	4	4	4	4
Heptachlorobutene	2	2	4	1	—	4	4	4	4
Heptaldehyde (Heptanal)	1	1	4	1	—	2	4	4	2
Heptane or n-Heptane	1	1	4	1	—	2	4	4	2
Heptanoic Acid	1	1	4	1	—	2	4	4	2
Hexachloroacetone	3	3	1	3	—	1	1	1	1
Hexachlorobutadiene	2	2	4	1	—	4	4	4	4
Hexachlorobutene	2	2	4	1	—	4	4	4	4
Hexachloroethane	2	2	4	1	—	4	4	4	4
Hexaldehyde or n-Hexaldehyde	4	4	1	4	—	1	2	4	3
Hexamethylene (Cyclohexane)	1	1	4	1	—	2	4	4	2
Hexamethylene Diammonium Adipate	2	2	4	1	—	4	4	4	4
Hexamethylenediamine	3	3	1	3	—	1	1	1	1
Hexamethylenetetramine	3	3	1	3	—	1	1	1	1
Hexane or n-Hexane	1	1	4	1	—	2	4	4	2
Hexene-1 or n-Hexene-1	2	2	4	1	—	2	4	4	2
Hexone (Methyl Isobutyl Ketone)	3	3	1	3	—	1	1	1	1
Hexyl Acetate	1	1	4	1	—	2	4	4	2
Hexyl Alcohol	1	1	3	1	—	2	3	1	2
Hexylene Glycol	3	3	1	3	—	1	1	1	1
Hexylresorcinol	2	2	4	1	—	4	4	4	4
High Viscosity Lubricant, H2	1	1	1	1	—	2	1	—	—
High Viscosity Lubricant, U4	1	1	1	1	—	2	1	—	—
HiLo MS #1	4	4	1	4	—	4	2	4	4
Houghto-Safe 1010 phosphate ester	4	4	1	1	—	4	1	4	4
Houghto-Safe 1055 phosphate ester	4	4	1	1	—	4	1	4	4
Houghto-Safe 1120 phosphate ester	4	4	2	1	—	4	1	4	4
Houghto-Safe 271 (Water & Glycol Base)	1	1	1	2	—	2	2	—	—
Houghto-Safe 416 & 500 Series	1	1	1	—	—	—	—	—	—
Houghto-Safe 5040 (Water/Oil emulsion)	1	1	4	1	—	2	4	4	4
Houghto-Safe 620 Water/Glycol	1	1	1	2	—	2	2	—	—
Hydraulic Oil (Petroleum Base, Industrial)	1	1	4	1	—	2	4	4	2
Hydraulic Oils (Synthetic Base)	2	2	4	1	—	4	4	4	4
Hydrazine	2	2	1	4	—	2	1	1	2
Hydrazine (Anhydrous)	4	4	2	4	—	2	2	4	2
Hydrazine Dihydrochloride	3	3	1	3	—	1	1	1	1
Hydrazine Hydrate	3	3	1	3	—	1	1	1	1
Hydriodic Acid	2	2	4	1	—	4	4	4	4
Hydrobromic Acid	4	4	1	1	—	4	1	1	1
Hydrobromic Acid 40%	4	4	1	1	—	2	1	1	1
Hydrocarbons, Saturated	1	1	4	1	—	2	4	4	3
Hydrochloric Acid (cold) 37%	4	—	3	1	—	4	—	—	—
Hydrochloric Acid (hot) 37%	4	—	3	1	—	4	4	4	4
Hydrochloric Acid 3M to 158°F	2	2	1	1	—	2	1	3	1
Hydrochloric Acid Conc at 72°F	2	2	2	1	—	—	—	—	—
Hydrochloric Acid, Conc to 158°F	4	4	4	1	—	4	4	4	—
Hydrocyanic Acid	2	2	1	1	—	2	1	1	1
Hydro-Drive MIH-10 (Pet. Base)	1	1	4	1	—	2	4	4	4
Hydro-Drive MIH-50 (Pet Base)	1	1	4	1	—	2	4	4	4
Hydrofluoric Acid (conc.) Hot	4	—	4	3	—	—	—	—	—
Hydrofluoric Acid to 125°F	4	4	4	4	—	4	4	4	4
Hydrofluorosilicic Acid	2	2	1	1	—	2	1	1	1
Hydrogen Chloride gas	4	—	1	1	—	2	—	—	—
Hydrogen Fluoride (Anhydrous)	4	4	1	4	—	—	1	4	—
Hydrogen Gas, Cold	1	1	1	1	—	1	1	2	1
Hydrogen Gas, Hot	1	1	1	1	—	1	1	2	1
Hydrogen Peroxide	2	2	1	1	—	1	1	2	2
Hydrogen Peroxide 90%	4	4	3	1	—	4	3	4	3
Hydrogen Sulfide Dry Cold	1	1	1	4	—	1	1	1	1
Hydrogen Sulfide Dry Hot	4	4	1	4	—	2	1	4	3
Hydrogen Sulfide Wet Cold	4	4	1	4	—	1	1	4	2
Hydrogen Sulfide Wet Hot	4	4	1	4	—	2	1	4	3
Hydrolube-Water/ Ethylene Glycol	1	1	1	1	—	2	2	—	—
Hydrooxycitronellal	—	—	—	1	—	4	4	4	4
Hydroquinol	4	4	4	1	—	4	—	—	—
Hydroquinone	3	3	2	2	—	4	4	2	4
Hydroxyacetic Acid	3	3	1	3	—	1	1	1	1
Hydyne	2	2	1	4	—	2	2	2	—
Hyjet	4	4	1	4	—	4	—	—	—
Hyjet IV and IVA	4	4	1	4	—	4	2	4	4
Hyjet s4	4	—	1	4	—	4	—	—	—
Hyjet w	4	4	1	4	—	4	—	—	—
Hypochlorous Acid	4	4	2	1	—	4	2	2	1
Indole	—	—	—	1	—	4	4	4	4
Industron FF44	1	1	4	1	—	2	4	4	4
Industron FF48	1	1	4	1	—	2	4	4	4
Industron FF53	1	1	4	1	—	2	4	4	4
Industron FF80	1	1	4	1	—	2	4	4	4
Insulin	3	3	1	3	—	1	1	1	1
Iodic Acid	3	3	1	3	—	1	1	1	1
Iodine	2	2	2	1	—	4	2	—	2
Iodine Pentafluoride	4	4	4	4	—	4	4	4	4
Iodoform	—	—	4	1	—	4	4	4	4

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Rating Legend

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2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Isoamyl Acetate	3	3	1	3	—	1	1	1	1
Isoamyl Butyrate	3	3	1	3	—	1	1	1	1
Isoamyl Valerate	3	3	1	3	—	1	1	1	1
Isoboreol	—	—	—	1	—	4	4	4	4
Isobutane	1	1	4	1	—	2	4	4	2
Isobutyl Acetate	3	3	1	3	—	1	1	1	1
Isobutyl Alcohol	2	2	1	1	—	1	1	1	1
Isobutyl Chloride	4	4	4	1	—	4	—	—	—
Isobutyl Ether	2	2	4	4	—	3	—	—	—
Isobutyl Methyl Ketone	3	3	1	3	—	1	1	1	1
Isobutyl n-Butyrate	4	4	1	1	—	4	1	4	4
Isobutyl Phosphate	3	3	1	3	—	1	1	1	1
Isobutylene	—	—	—	1	—	4	4	4	4
Isobutylene Glycol	4	4	1	1	—	—	—	—	—
Isobutyraldehyde	3	2	2	4	—	3	—	—	—
Isobutyric Acid	1	1	2	4	—	4	—	—	—
Isocrotyl Chloride	—	—	—	1	—	4	4	4	4
Isodecanol	1	1	4	1	—	2	4	4	2
Isododecane	1	1	4	1	—	2	4	4	2
Isoeugenol	1	1	4	1	—	2	4	4	2
Isooctane	1	1	4	1	—	2	4	4	1
Isopentane	1	1	4	1	—	2	4	4	2
Isophorone (Ketone)	4	4	2	4	—	4	2	4	4
Isopropanol	2	2	1	1	—	2	1	1	1
Isopropyl Acetate	4	4	2	4	—	4	2	4	4
Isopropyl Alcohol	2	2	1	1	—	2	1	1	1
Isopropyl Chloride	4	4	4	1	—	4	4	4	4
Isopropyl Ether	2	2	4	4	—	3	4	4	3
Isopropylacetone	3	3	1	3	—	1	1	1	1
Isopropylamine	3	3	1	3	—	1	1	1	1
Jet Fuel A	2	2	4	1	—	4	4	4	4
JP-10	3	3	4	1	—	4	4	4	—
JP-3 (MIL-J-5624)	1	1	4	1	—	4	—	—	—
JP-4 (MIL-T-5624)	1	1	4	1	—	4	4	4	4
JP-5 (MIL-T-5624)	1	1	4	1	—	4	4	4	4
JP-6 (MIL-J-25656)	1	1	4	1	—	4	4	4	4
JP-8 (MIL-T-83133)	1	1	4	1	—	3	4	4	—
JP-9 (MIL-F-81912)	3	3	4	1	—	4	4	4	—
JP-9 -11	4	4	4	1	—	4	4	4	—
JPX (MIL-F-25604)	1	1	4	4	—	2	—	—	—
Kel F Liquids	1	1	1	2	—	—	1	—	1
Kerosene (Sim. to RP-1 and JP-1)	1	1	4	1	—	2	4	4	4
Keystone #87HX-Grease	1	1	4	1	—	4	4	4	4
Lacquer Solvents	4	4	4	4	—	4	4	4	4
Lacquers	4	4	4	4	—	4	4	4	4
Lactams-Amino Acids	4	4	2	4	—	2	2	4	2
Lactic Acid Cold	1	1	1	1	—	1	1	1	1
Lactic Acid Hot	4	4	4	1	—	4	4	4	3
Lactones (Cyclic Esters)	4	4	2	4	—	4	2	4	4
Lard Animal Fat	1	1	2	1	—	2	2	4	4
Lauric Acid	1	1	4	1	—	2	4	4	2

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Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Lavender Oil	2	2	4	1	—	4	—	—	—
LB 135	1	1	1	1	—	1	—	—	—
Lead Acetate	2	2	1	4	—	2	1	1	4
Lead Arsenate	3	3	1	3	—	1	1	1	1
Lead Bromide	3	3	1	3	—	1	1	1	1
Lead Carbonate	3	3	1	3	—	1	1	1	1
Lead Chloride	3	3	1	3	—	1	1	1	1
Lead Chromate	3	3	1	3	—	1	1	1	1
Lead Dioxide	3	3	1	3	—	1	1	1	1
Lead Linoleate	3	3	1	3	—	1	1	1	1
Lead Nitrate	1	1	1	—	—	1	1	1	1
Lead Oxide	3	3	1	3	—	1	1	1	1
Lead Sulfamate	2	2	1	1	—	1	1	2	1
Lehigh X1169	1	1	4	1	—	2	4	4	2
Lehigh X1170	1	1	4	1	—	2	4	4	2
Light Grease	1	1	4	1	—	4	—	—	—
Ligroin (Petroleum Ether or Benzene)	1	1	4	1	—	2	4	4	3
Lime Bleach	1	1	1	1	—	1	—	—	—
Lime Sulfur	—	—	—	1	—	4	4	4	4
Lindol, Hydraulic Fluid (Phosphate ester type)	4	4	1	2	—	4	1	4	4
Linoleic Acid	2	2	4	2	—	2	4	4	2
Linseed Oil	1	1	3	1	1	3	3	4	2
Liquid Oxygen (LOX)	4	4	4	4	—	4	4	4	4
Liquid Petroleum Gas (LPG)	1	1	4	1	—	2	4	4	4
Liquimoly	1	1	4	1	—	2	4	4	4
Lithium Bromide (Brine)	3	3	1	3	—	1	1	1	1
Lithium Carbonate	3	3	1	3	—	1	1	1	1
Lithium Chloride	3	3	1	3	—	1	1	1	1
Lithium Citrate	3	3	1	3	—	1	1	1	1
Lithium Hydroxide	3	3	1	3	—	1	1	1	1
Lithium Hypochlorite	3	3	1	3	—	1	1	1	1
Lithium Nitrate	3	3	1	3	—	1	1	1	1
Lithium Nitrite	3	3	1	3	—	1	1	1	1
Lithium Perchlorate	3	3	1	3	—	1	1	1	1
Lithium Salicylate	3	3	1	3	—	1	1	1	1
Lithopone	3	3	1	3	—	1	1	1	1
Lubricating Oils (Crude & Refined)	2	2	4	1	—	3	—	—	—
Lubricating Oils (Synthetic base)	—	—	—	1	—	4	4	4	4
Lubricating Oils, Di-ester	2	2	4	1	—	3	4	4	—
Lubricating Oils, petroleum base	1	1	4	1	—	2	4	4	4
Lubricating Oils, SAE 10, 20, 30, 40, 50	1	1	4	1	—	2	4	4	4
Lye Solutions	2	2	1	2	—	2	1	1	1
Magnesium Chloride	1	1	1	1	—	1	1	1	1
Magnesium Hydroxide	2	2	1	1	—	2	1	2	1
Magnesium Salts	1	1	1	1	—	1	1	1	1
Magnesium Sulfite and Sulfate	1	1	1	1	—	1	1	2	1
Malathion	2	2	4	1	—	—	4	4	—

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— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Maleic Acid	4	4	4	1	—	4	4	4	4
Maleic Anhydride	4	4	2	4	—	4	2	4	4
Maleic Hydrazide	3	3	1	3	—	1	1	1	1
Malic Acid	1	1	2	1	—	2	4	3	2
Mandelic Acid	3	3	1	3	—	1	1	1	1
Manganese Acetate	3	3	1	3	—	1	1	1	1
Manganese Carbonate	3	3	1	3	—	1	1	1	1
Manganese Chloride	3	3	1	3	—	1	1	1	1
Manganese Dioxide	3	3	1	3	—	1	1	1	1
Manganese Gluconate	3	3	1	3	—	1	1	1	1
Manganese Hypophosphite	3	3	1	3	—	1	1	1	1
Manganese Linoleate	3	3	1	3	—	1	1	1	1
Manganese Phosphate	3	3	1	3	—	1	1	1	1
Manganese Sulfate	3	3	1	3	—	1	1	1	1
Manganous Chloride	3	3	1	3	—	1	1	1	1
Manganous Phosphate	3	3	1	3	—	1	1	1	1
Manganous Sulfate	3	3	1	3	—	1	1	1	1
Mannitol	3	3	1	3	—	1	1	1	1
MCS 312	4	4	4	1	—	4	4	4	—
MCS 352	4	4	1	4	—	4	2	4	4
MCS 463	4	4	1	4	—	4	2	4	4
MDI (Methylene di-p-phenylene isocyanate)	3	3	1	3	—	1	1	1	1
Mercaptan	1	1	4	1	—	2	4	4	2
Mercaptobenzothiazole (MBT)	—	—	—	1	—	4	4	4	4
Mercuric Acetate	3	3	1	3	—	1	1	1	1
Mercuric Chloride	1	1	1	1	—	1	1	1	1
Mercuric Cyanide	3	3	1	3	—	1	1	1	1
Mercuric Iodide	3	3	1	3	—	1	1	1	1
Mercuric Nitrate	3	3	1	3	—	1	1	1	1
Mercuric Sulfate	3	3	1	3	—	1	1	1	1
Mercuric Sulfite	3	3	1	3	—	1	1	1	1
Mercurous Nitrate	3	3	1	3	—	1	1	1	1
Mercury	1	1	1	1	—	1	1	1	1
Mercury Chloride	3	3	1	3	—	1	1	1	1
Mercury Fulminate	3	3	1	3	—	1	1	1	1
Mercury Salts	3	3	1	3	—	1	1	1	1
Mercury Vapors	1	1	1	1	—	1	1	1	1
Mesityl Oxide (Ketone)	4	4	2	4	—	4	2	4	4
Meta-Cresol	—	—	—	1	—	4	4	4	4
Metaldehyde	3	3	1	3	—	1	1	1	1
Meta-Nitroaniline	3	3	1	3	—	1	1	1	1
Meta-Toluidine	—	—	—	1	—	4	4	4	4
Methacrylic Acid	3	3	1	3	—	1	1	1	1
Methallyl Chloride	—	—	—	1	—	4	4	4	4
Methane	1	1	4	1	—	2	4	4	2
Methanol	4	4	1	4	—	1	1	1	1
Methoxyethanol (DGMMA)	3	3	1	3	—	1	1	1	1
Methyl Abietate	—	—	—	1	—	4	4	4	4
Methyl Acetate	4	4	2	4	—	2	2	4	4
Methyl Acetoacetate	4	4	2	4	—	4	2	—	4
Methyl Acetophenone	—	—	—	1	—	4	4	4	4

Unless otherwise noted ratings are at room temperature.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Methyl Acrylate	4	4	2	4	—	2	2	4	4
Methyl Alcohol	4	4	1	4	1	1	1	1	1
Methyl Amylketone	3	3	1	3	—	1	1	1	1
Methyl Anthranilate	—	—	—	1	—	4	4	4	4
Methyl Benzoate	4	4	4	1	—	4	4	4	4
Methyl Bromide	2	2	4	1	—	4	4	4	4
Methyl Butyl Ketone	4	4	1	4	—	4	1	4	4
Methyl Butyrate Cellosolve	3	3	1	3	—	1	1	1	1
Methyl Butyrate Chloride	3	3	1	3	—	1	1	1	1
Methyl Carbonate	4	4	4	1	—	4	4	4	4
Methyl Cellosolve	3	3	2	4	1	3	2	4	2
Methyl Cellulose	2	2	2	4	—	2	2	2	2
Methyl Chloride	4	4	3	1	—	4	3	4	4
Methyl Chloroacetate	3	3	1	3	—	1	1	1	1
Methyl Chloroform	4	4	4	1	4	4	—	—	—
Methyl Chloroformate	4	4	4	1	—	4	4	4	4
Methyl Cyanide (Acetonitrile)	3	3	1	3	—	1	1	1	1
Methyl Cyclohexanone	1	1	4	1	—	2	4	4	2
Methyl Dichloride	—	—	—	1	—	4	4	4	4
Methyl Ether	1	1	4	1	—	3	4	4	4
Methyl Ethyl Ketone (MEK)	4	4	1	4	—	4	1	4	4
Methyl Ethyl Ketone Peroxide	4	4	4	4	—	4	4	4	4
Methyl Ethyl Oleate	—	—	—	1	—	4	4	4	4
Methyl Formate	4	4	2	—	—	2	2	4	2
Methyl Hexyl Ketone (2-Octanone)	3	3	1	3	—	1	1	1	1
Methyl Iodide	1	1	4	1	—	2	4	4	2
Methyl Isobutyl Ketone (MIBK)	4	4	3	4	4	4	3	4	4
Methyl Isocyanate	3	3	1	3	—	1	1	1	1
Methyl Isopropyl Ketone	4	4	2	4	—	4	2	4	4
Methyl Isovalerate	—	—	—	1	—	4	4	4	4
Methyl Lactate	3	3	1	3	—	1	1	1	1
Methyl Mercaptan	—	—	1	—	—	—	1	—	—
Methyl Methacrylate	4	—	4	4	—	4	4	4	4
Methyl Oleate	4	4	2	1	—	4	2	4	4
Methyl Pentadiene	—	—	—	1	—	4	4	4	4
Methyl Phenylacetate	—	—	—	1	—	4	4	4	4
Methyl Salicylate	4	4	2	—	3	4	2	3	4
Methyl Tertiary Butyl Ether (MTBE)	3	3	3	3	—	3	—	—	—
Methyl Valerate	—	—	—	1	—	4	4	4	4
Methyl-2-Pyrrolidone or n-Methyl-2-Pyrrolidone	—	—	2	—	—	—	—	—	—
Methylacrylic Acid	4	4	2	3	—	2	2	4	4
Methylamine	3	3	1	3	—	1	1	1	1
Methylamyl Acetate	3	3	1	3	—	1	1	1	1
Methylcyclopentane	4	4	4	1	—	4	4	4	4
Methylene Bromide	—	—	—	1	—	4	4	4	4
Methylene Chloride	4	4	4	2	2	4	4	4	4
Methylene Dichloride	4	4	4	2	—	4	4	4	4
Methylene Iodide	—	—	—	1	—	4	4	4	4
Methylglycerol	3	3	1	3	—	1	1	1	1

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Methylisobutyl Carbinol	1	1	4	1	—	2	4	4	2
Methylpyrrolidine	—	—	—	1	—	4	4	4	4
Methylpyrrolidone	—	—	—	1	—	4	4	4	4
Methylsulfuric Acid	3	3	1	3	—	1	1	1	1
MIL-A-6091	2	2	1	1	—	1	1	1	1
MIL-C-4339	1	1	4	1	—	4	4	4	4
MIL-C-7024	1	1	4	1	—	2	4	4	4
MIL-C-8188	2	2	4	2	—	4	4	4	4
MIL-E-9500	1	1	1	1	—	1	1	1	1
MIL-F-16884	1	1	4	1	—	3	4	4	3
MIL-F-17111	1	1	4	1	—	2	4	4	2
MIL-F-25558 (RJ-1)	1	1	4	1	—	2	4	4	2
MIL-F-25656	1	1	4	1	—	4	4	4	4
MIL-F-5566	2	2	1	1	—	2	1	1	1
MIL-F-81912 (JP-9)	3	3	4	1	—	4	4	4	—
MIL-F-82522 (RJ-4)	2	2	4	1	—	4	4	1	—
MIL-G-10924	1	1	4	1	—	2	4	4	2
MIL-G-15793	1	1	4	1	—	2	4	4	2
MIL-G-21568	1	1	1	1	—	1	1	1	1
MIL-G-25013	1	1	1	1	—	2	1	2	2
MIL-G-25537	1	1	4	1	—	2	4	4	2
MIL-G-25760	2	2	4	1	—	2	4	4	2
MIL-G-3278	2	2	4	1	—	4	4	4	4
MIL-G-3545	1	1	4	1	—	2	4	4	2
MIL-G-4343	2	2	3	1	—	2	3	1	1
MIL-G-5572	1	1	4	1	—	4	4	4	4
MIL-G-7118	2	2	4	1	—	2	4	4	2
MIL-G-7187	1	1	4	1	—	4	4	4	4
MIL-G-7421	2	2	4	1	—	2	4	4	2
MIL-G-7711	1	1	4	1	—	4	4	4	4
MIL-H-13910	1	1	1	1	—	1	1	1	1
MIL-H-19457	4	4	2	1	—	4	1	4	4
MIL-H-22251	2	2	1	—	—	2	1	—	2
MIL-H-27601	1	1	4	1	—	2	4	4	3
MIL-H-46170 -15°F to +400°F	1	1	4	1	—	2	4	4	2
MIL-H-46170 -20°F to +275°F	1	1	4	1	—	2	4	4	2
MIL-H-46170 -55°F to +275°F	1	1	4	1	—	2	4	4	2
MIL-H-46170 -65°F to +275°F	1	1	4	1	—	2	4	4	2
MIL-H-5606 -65°F to +235°F	1	1	4	1	—	2	4	4	2
MIL-H-5606 -65°F to +275°F	1	1	4	1	—	2	4	4	2
MIL-H-6083	1	1	4	1	—	1	4	2	2
MIL-H-7083	1	1	1	2	—	2	1	2	2
MIL-H-8446 (MLO-8515)	2	2	4	1	—	1	4	4	—
MIL-J-5161	2	2	4	1	—	4	4	4	4
Milk	1	1	1	1	—	1	1	1	1
MIL-L-15016	1	1	4	1	—	2	4	4	2
MIL-L-15017	1	1	4	1	—	2	4	4	2
MIL-L-17331	1	1	4	1	—	—	4	4	—
MIL-L-2104	1	1	4	1	—	2	4	4	3
MIL-L-21260	1	1	4	1	—	2	4	4	2
MIL-L-23699	2	2	4	1	—	3	4	4	3
MIL-L-25681	2	2	1	1	—	2	1	2	2

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
MIL-L-3150	1	1	4	1	—	2	4	4	2
MIL-L-6081	1	1	4	1	—	2	4	4	2
MIL-L-6082	1	1	4	1	—	2	4	4	2
MIL-L-6085	2	2	4	1	—	4	4	4	4
MIL-L-6387	2	2	4	1	—	4	4	4	4
MIL-L-7808	2	2	4	1	2	4	4	4	4
MIL-L-7870	1	1	4	1	—	2	4	4	4
MIL-L-9000	1	1	4	1	—	2	4	4	2
MIL-L-9236	2	2	4	1	—	4	4	4	4
MIL-O-3503	1	1	4	1	—	2	4	4	2
MIL-P-27402	2	2	1	—	—	2	1	—	2
MIL-R-25576 (RP-1)	1	1	4	1	—	2	4	4	2
MIL-S-3136, Type I Fuel	1	1	4	1	—	2	4	4	2
MIL-S-3136, Type II Fuel	2	2	4	1	—	4	4	4	4
MIL-S-3136, Type III Fuel	2	2	4	1	—	4	4	4	4
MIL-S-3136, Type IV Oil High Swell	1	1	4	1	—	4	4	4	4
MIL-S-3136, Type IV Oil Low Swell	1	1	4	1	—	1	4	4	1
MIL-S-3136, Type V Oil Medium Swell	1	1	4	1	—	2	4	4	2
MIL-S-81087	1	1	1	1	—	1	1	1	1
MIL-T-5624, JP-4, JP-5	1	1	4	1	—	4	4	4	4
MIL-T-83133	1	1	4	1	—	3	4	4	—
Mineral Oils	1	1	3	1	—	2	3	4	2
Mineral Spirits	1	1	4	1	—	3	2	—	—
Mixed Acids	3	3	1	3	—	1	1	1	1
MLO-7277 Hydr.	3	3	4	1	—	4	4	4	4
MLO-7557	3	3	4	1	—	4	4	4	4
MLO-8200 Hydr.	2	2	4	1	—	1	4	4	4
MLO-8515	2	2	4	1	—	1	4	4	3
Mobil 24dte	1	1	4	1	—	2	—	—	—
Mobil Delvac 1100, 1110, 1120, 1130	1	1	4	1	—	2	—	—	—
Mobil HF	1	1	4	1	—	2	—	—	—
Mobil Nivac 20, 30	1	1	1	1	—	1	—	—	—
Mobil SHC 500 Series	3	3	4	1	—	2	4	—	2
Mobil SHC 600 Series	3	3	4	1	—	2	4	—	2
Mobil Therm 600	1	1	4	1	—	2	—	—	—
Mobil Velocite c	1	1	4	1	—	2	—	—	—
Mobilgas WA200 ATF	1	1	4	1	—	2	—	—	—
Mobilgear 600 Series	3	3	3	1	—	1	3	4	2
Mobilgear SHC ISO Series	3	3	3	1	—	2	3	4	2
Mobilgrease HP	2	2	4	1	—	2	4	4	3
Mobilgrease HTS	2	2	4	1	—	2	4	4	3
Mobilgrease SM	2	2	4	1	—	2	4	4	3
Mobilith AW Series	2	2	4	1	—	2	4	4	3
Mobilith SHC Series	2	2	4	1	—	3	4	4	3
Mobilmistlube Series	3	3	3	1	—	1	3	4	2
Mobiloil SAE 20	1	1	4	1	—	2	—	—	—
Mobilux	1	1	4	1	—	2	—	—	—
Molasses	1	1	1	1	—	—	—	—	—
Molybdenum Disulfide Grease	1	—	4	1	—	4	—	—	—

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Rating Legend

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4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Molybdenum Oxide	3	3	1	3	—	1	1	1	1
Molybdenum Trioxide	3	3	1	3	—	1	1	1	1
Molybdic Acid	3	3	1	3	—	1	1	1	1
Monobromobenzene	4	4	4	1	2	4	4	4	4
Monobromotoluene	—	—	—	1	—	4	4	4	4
Monochloroacetic Acid	3	3	1	3	—	1	1	1	1
Monochlorobenzene	4	4	4	1	—	4	4	4	4
Monochlorobutene	—	—	—	1	—	4	4	4	4
Monoethanolamine (MEA)	4	4	2	4	—	4	2	2	4
Monoethyl Amine	3	3	1	3	—	1	1	1	1
Monoisopropylamine	3	3	1	3	—	1	1	1	1
Monomethyl Aniline	4	—	1	2	—	1	1	1	1
Monomethyl Ether (Methyl Ether)	1	—	4	1	—	—	—	—	—
Monomethyl Hydrazine	2	2	1	—	—	2	1	—	2
Monomethylamine (MMA)	3	3	1	3	—	1	1	1	1
Monomethylaniline	4	4	2	2	—	4	2	4	4
Mononitrotoluene	3	3	1	3	—	1	1	1	1
Mononitrotoluene & Dinitrotoluene (40/60 Mix)	4	4	1	3	—	4	4	4	4
Monovinyl Acetylene	1	1	1	1	—	2	1	2	2
Mopar Brake Fluid	3	3	1	4	—	2	2	—	2
Morpholine	—	—	—	1	—	4	4	4	4
Motor Oils	1	1	4	1	—	2	4	4	2
Muriatic Acid	4	4	4	1	—	—	—	—	—
Myristic Acid	—	—	—	1	—	4	4	4	4
Naphtha	2	2	4	1	1	4	4	4	4
Naphthalene	4	4	4	1	2	4	4	4	4
Naphthalene Chloride	—	—	—	1	—	4	4	4	4
Naphthalene Sulfonic Acid	—	—	—	1	—	4	4	4	4
Naphthalenic Acid	—	—	—	1	—	4	4	4	4
Naphthalonic Acid	—	—	—	1	—	4	4	4	4
Naphthenic Acid	2	2	4	1	1	4	4	4	4
Natural Gas	1	1	4	1	—	1	4	2	1
Neatsfoot Oil	1	1	2	1	—	4	2	4	4
Neon	1	1	1	1	—	1	1	1	1
Neville Acid	4	4	2	1	—	4	2	4	4
Nickel Acetate	2	2	1	4	—	2	1	1	4
Nickel Ammonium Sulfate	3	3	1	3	—	1	1	1	1
Nickel Chloride	1	1	1	1	—	2	1	1	1
Nickel Cyanide	3	3	1	3	—	1	1	1	1
Nickel Nitrate	3	3	1	3	—	1	1	1	1
Nickel Salts	1	1	1	1	—	2	1	1	1
Nickel Sulfate	1	1	1	1	—	1	1	2	1
Nicotinamide (Niacinamide)	—	—	—	1	—	4	4	4	4
Nicotinamide Hydrochloride	3	3	1	3	—	1	1	1	1
Nicotine	—	—	—	1	—	4	4	4	4
Nicotine Sulfate	3	3	1	3	—	1	1	1	1
Niter Cake	1	1	1	1	—	1	1	1	1
Nitric Acid - Red Fuming	4	4	4	2	—	4	—	—	—
Nitric Acid (0 - 50%)	4	—	2	1	—	—	—	—	—
Nitric Acid (50 - 100%)	4	—	4	3	—	—	—	—	—

Unless otherwise noted ratings are at room temperature.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Nitric Acid 3 Molar to 158°F	4	4	2	3	—	4	2	—	2
Nitric Acid Conc. at Room Temp.	—	—	4	2	—	—	—	—	—
Nitric Acid Concentrated to 158°F	4	4	4	4	—	4	4	4	—
Nitroaniline	3	3	1	3	—	1	1	1	1
Nitrobenzene	4	4	1	2	1	4	1	4	4
Nitrobenzoic Acid	3	3	1	3	—	1	1	1	1
Nitrocellulose	3	3	1	3	—	1	1	1	1
Nitrochlorobenzene	3	3	1	3	—	1	1	1	1
Nitrochloroform	3	3	1	3	—	1	1	1	1
Nitrodiethylaniline	3	3	1	3	—	1	1	1	1
Nitroethane	4	4	2	4	2	2	2	2	2
Nitrofluorobenzene	3	3	1	3	—	1	1	1	1
Nitrogen	1	1	1	1	—	1	1	1	1
Nitrogen Oxides	3	3	1	3	—	1	1	1	1
Nitrogen Tetroxide (N2O4)	4	3	4	4	—	4	3	4	4
Nitroglycerine	3	3	1	3	—	1	1	1	1
Nitrogylcerol	3	3	1	3	—	1	1	1	1
Nitroisopropylbenzene	3	3	1	3	—	1	1	1	1
Nitromethane	4	4	2	4	—	3	2	2	2
Nitrophenol	3	3	1	3	—	1	1	1	1
Nitropropane	4	4	2	4	—	4	2	4	4
Nitrothiophene	3	3	1	3	—	1	1	1	1
Nitrotoluene	3	3	1	3	—	1	1	1	1
Nitrous Acid	3	3	1	3	—	1	1	1	1
Nitrous Oxide	1	1	1	1	—	—	—	—	—
Nonane	1	1	4	1	—	2	4	4	2
Noryl GE Phenolic	1	1	1	—	—	—	—	—	—
Nyvac FR200 Mobil	1	1	1	1	—	2	4	4	3
Octachloro Toluene	4	4	4	1	—	4	4	4	4
Octadecane	1	1	4	1	—	2	4	4	2
Octanal (n-Octanaldehyde)	1	1	4	1	—	2	4	4	2
Octane or n-Octane	1	1	4	1	—	4	4	4	4
Octyl Acetate	3	3	1	3	—	1	1	1	1
Octyl Alcohol	2	2	3	1	—	2	2	2	2
Octyl Chloride	1	1	4	1	—	2	4	4	2
Octyl Phthalate	—	—	—	1	—	4	4	4	4
Olefins	—	—	—	1	—	4	4	4	4
Oleic Acid	3	3	4	2	1	4	4	4	4
Oleum (Fuming Sulfuric Acid)	4	4	4	1	—	4	4	4	4
Oleum Spirits	2	2	4	1	—	3	4	4	2
Oleyl Alcohol	—	—	—	1	—	4	4	4	4
Olive Oil	1	1	2	1	—	2	2	4	2
Oronite 8200	2	2	4	1	—	1	4	4	4
Oronite 8515	2	2	4	1	—	1	4	4	4
Ortho-Chloro Ethyl Benzene	4	4	4	1	—	4	4	4	4
Ortho-Chloroaniline	3	3	1	3	—	1	1	1	1
Ortho-Chlorophenol	3	3	1	3	—	1	1	1	1
Ortho-Cresol	3	3	1	3	—	1	1	1	1
Ortho-Dichlorobenzene	4	4	4	1	—	4	4	4	4
Ortho-Nitrotoluene	3	3	1	3	—	1	1	1	1

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
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3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
OS 45 Type III (OS45)	2	2	4	1	—	1	4	4	2
OS 45 Type IV (OS45-1)	2	2	4	1	—	1	4	4	2
OS 70	2	2	4	1	—	1	4	4	2
Oxalic Acid	2	2	1	1	—	2	1	2	2
Oxygen, 200-300°F (Evaluate for specific applications)	4	4	4	2	—	—	—	—	—
Oxygen, 300-400°F (Evaluate for specific applications)	4	4	4	2	—	4	4	4	4
Oxygen, Cold (Evaluate for specific applications)	2	2	1	1	—	1	1	2	1
Oxygen, Liquid	4	4	4	4	—	4	—	—	—
Ozonated Deionized Water	3	3	1	3	—	1	1	1	1
Ozone	4	3	1	1	—	2	2	4	1
Paint Thinner, Duco	4	4	4	2	—	4	4	4	4
Palm Oil	1	1	3	1	—	—	—	—	—
Palmitic Acid	1	1	2	1	—	2	2	2	3
Para-Aminobenzoic Acid	3	3	1	3	—	1	1	1	1
Para-Aminosalicylic Acid	3	3	1	3	—	1	1	1	1
Para-Chlorophenol	3	3	1	3	—	1	1	1	1
Paracymene	—	—	—	1	—	4	4	4	4
Para-Dichlorobenzene	4	4	4	1	—	4	4	4	4
Paraffins	1	1	4	1	—	2	4	4	2
Para-Formaldehyde	3	3	1	3	—	1	1	1	1
Paraldehyde	3	3	1	3	—	1	1	1	1
Par-al-Ketone	4	4	4	4	—	4	4	4	4
Para-Nitroaniline	3	3	1	3	—	1	1	1	1
Para-Nitrobenzoic Acid	3	3	1	3	—	1	1	1	1
Para-Nitrophenol	3	3	1	3	—	1	1	1	1
Parathion	—	—	—	1	—	4	4	4	4
Para-Toluene Sulfonic Acid	3	3	1	3	—	1	1	1	1
Parker O Lube	1	1	4	1	—	1	4	4	1
Peanut Oil	1	1	3	1	—	3	3	4	2
Pectin (Liquor)	—	—	—	1	—	4	4	4	4
Penicillin (Liquid)	—	—	—	1	—	4	4	4	4
Pentachloroethane	—	—	—	1	—	4	4	4	4
Pentachlorophenol	3	3	—	1	—	1	1	1	1
Pentaerythritol	3	3	1	3	—	1	1	1	1
Pentaerythritol Tetranitrate	3	3	1	3	—	1	1	1	1
Pentane or n-Pentane	1	1	4	1	—	1	4	4	2
Pentane, 2 Methyl	1	1	4	1	—	2	4	4	2
Pentane, 2-4 dimethyl	1	1	4	1	—	2	4	4	2
Pentane, 3-Methyl	1	1	4	1	—	2	4	4	2
Pentyl Pentanoate	1	1	4	1	—	2	4	4	2
Peracetic Acid	3	3	1	3	—	1	1	1	1
Perchloric Acid - 2N	4	4	1	1	—	2	2	4	2
Perchloroethylene	2	2	4	1	—	4	4	4	4
Petrolatum	1	1	4	1	—	2	4	4	2
Petroleum Ether	1	1	4	1	—	2	4	4	2
Petroleum Oil, Above 250°F	4	4	4	2	—	4	4	4	4
Petroleum Oil, Below 250°F	1	1	4	1	—	2	4	4	2
Petroleum Oil, Crude	1	1	4	1	—	2	4	4	2
PFPE Oils and Greases	1	1	1	3	—	1	—	—	—

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Phenol	4	4	4	1	1	4	4	4	4
Phenol, 70%/30% H2O	4	4	4	1	—	4	4	4	4
Phenol, 85%/15% H2O	4	4	4	1	—	4	4	4	4
Phenolic Sulfonate	3	3	1	3	—	1	1	1	1
Phenolsulfonic Acid	3	3	1	3	—	1	1	1	1
Phenylacetamide	—	—	—	1	—	4	4	4	4
Phenylacetate	3	3	1	3	—	1	1	1	1
Phenylacetic Acid	3	3	1	3	—	1	1	1	1
Phenylbenzene	4	4	4	1	—	4	4	4	4
Phenylethyl Alcohol	—	—	—	1	—	4	4	4	4
Phenylethyl Ether	4	4	4	4	—	4	4	4	4
Phenylethyl Malonic Ester	—	—	—	1	—	4	4	4	4
Phenylglycerine	3	3	1	3	—	1	1	1	1
Phenylhydrazine	4	4	2	1	—	4	4	1	4
Phenylhydrazine Hydrochloride	3	3	1	3	—	1	1	1	1
Phenylmercuric Acetate	3	3	1	3	—	1	1	1	1
Phorone	4	4	3	4	—	4	3	4	4
Phosphoric Acid 3 Molar to 158°F	1	1	1	1	—	2	1	—	1
Phosphoric Acid Conc 72°F	2	2	1	1	—	2	1	—	1
Phosphoric Acid Conc to 158°F	4	4	1	1	—	3	1	—	1
Phosphorus Trichloride	4	4	1	1	—	4	1	4	4
Phosphorus Trichloride Acid	4	4	1	1	—	4	—	—	—
Phthalic Acid	3	3	1	3	—	1	1	1	1
Phthalic Anhydride	3	3	1	3	—	1	1	1	1
Pickling Solution	4	4	3	2	—	4	3	4	2
Picric Acid (aq)	1	1	1	1	—	1	1	1	1
Picric Acid Molten	2	2	2	1	—	2	2	2	2
Pine Oil	1	1	4	1	1	4	4	4	4
Pine Tar	1	1	4	1	—	2	4	4	2
Pinene	2	2	4	1	—	3	4	4	4
Piperazine	—	—	—	1	—	4	4	4	4
Piperidine	4	4	4	1	—	4	4	4	4
Plating Solution (Co, Cu, Au, In, Fe, Pb, Ni, Ag, Sn, Zn)	1	1	1	1	—	—	—	—	—
Plating Solutions Chrome	4	4	2	1	—	4	2	4	4
Plating Solutions Others	1	1	1	1	—	4	1	4	1
Pneumatic Service	1	1	1	1	—	1	1	4	1
Polyalkylene Glycol (PAG)	1	1	1	1	—	1	—	—	—
Polyalpha Olefin (PAO)	1	1	1	1	—	1	—	—	—
Polyethylene Glycol	2	2	1	3	—	2	—	—	—
Polyglycerol	3	3	1	3	—	1	1	1	1
Polyglycol	3	3	1	3	—	1	1	1	1
Polypropylene Glycol	2	2	1	3	—	2	—	—	—
Polyvinyl Acetate Emulsion	—	—	1	—	—	2	1	2	2
Potash	1	1	1	1	—	1	—	—	—
Potassium Acetate	2	2	1	4	—	2	1	1	1
Potassium Acid Sulfate	3	3	1	3	—	1	1	1	1
Potassium Alum	3	3	1	3	—	1	1	1	1
Potassium Aluminum Sulfate	3	3	1	3	—	1	1	1	1
Potassium Antimonate	3	3	1	3	—	1	1	1	1

Unless otherwise noted ratings are at room temperature.

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Potassium Bicarbonate	3	3	1	3	—	1	1	1	1
Potassium Bichromate	3	3	1	3	—	1	1	1	1
Potassium Bifluoride	3	3	1	3	—	1	1	1	1
Potassium Bisulfate	3	3	1	3	—	1	1	1	1
Potassium Bisulfite	3	3	1	3	—	1	1	1	1
Potassium Bitartrate	3	3	1	3	—	1	1	1	1
Potassium Bromide	3	3	1	3	—	1	1	1	1
Potassium Carbonate	3	3	1	3	—	1	1	1	1
Potassium Chlorate	3	3	1	3	—	1	1	1	1
Potassium Chloride	1	1	1	1	—	1	1	1	1
Potassium Chromates	3	3	1	3	—	1	1	1	1
Potassium Citrate	3	3	1	3	—	1	1	1	1
Potassium Cupro Cyanide	1	1	1	1	—	1	1	1	1
Potassium Cyanate	3	3	1	3	—	1	1	1	1
Potassium Cyanide	1	1	1	1	—	1	1	1	1
Potassium Dichromate	1	1	1	1	—	1	1	1	1
Potassium Diphosphate	3	3	1	3	—	1	1	1	1
Potassium Ferricyanide	3	3	1	3	—	1	1	1	1
Potassium Fluoride	3	3	1	3	—	1	1	1	1
Potassium Glucocyanate	3	3	1	3	—	1	1	1	1
Potassium Hydroxide 50%	2	2	1	4	—	2	1	2	1
Potassium Hypochlorite	3	3	1	3	—	1	1	1	1
Potassium Iodate	3	3	1	3	—	1	1	1	1
Potassium Iodide	3	3	1	3	—	1	1	1	1
Potassium Metabisulfate	3	3	1	3	—	1	1	1	1
Potassium Metachromate	3	3	1	3	—	1	1	1	1
Potassium Monochromate	3	3	1	3	—	1	1	1	1
Potassium Nitrate	1	1	1	1	—	1	1	1	1
Potassium Nitrite	3	3	1	3	—	1	1	1	1
Potassium Oxalate	3	3	1	3	—	1	1	1	1
Potassium Perchlorate	3	3	1	3	—	1	1	1	1
Potassium Permanganate	3	3	1	3	—	1	1	1	1
Potassium Persulfate	3	3	1	3	—	1	1	1	1
Potassium Phosphate (Acid)	3	3	1	3	—	1	1	1	1
Potassium Phosphate (Alkaline)	3	3	1	3	—	1	1	1	1
Potassium Phosphate (Di/Tri Basic)	3	3	1	3	—	1	1	1	1
Potassium Pyrosulfate	3	3	1	3	—	1	1	1	1
Potassium Salts	1	1	1	1	—	1	1	1	1
Potassium Sodium Tartrate	3	3	1	3	—	1	1	1	1
Potassium Stannate	3	3	1	3	—	1	1	1	1
Potassium Stearate	3	3	1	3	—	1	1	1	1
Potassium Sulfate	1	1	1	1	—	1	1	2	2
Potassium Sulfide	3	3	1	3	—	1	1	1	1
Potassium Sulfite	1	1	1	1	—	1	1	2	2
Potassium Tartrate	3	3	1	3	—	1	1	1	1
Potassium Thiocyanate	3	3	1	3	—	1	1	1	1
Potassium Thiosulfate	3	3	1	3	—	1	1	1	1
Potassium Triphosphate	3	3	1	3	—	1	1	1	1
Prestone Antifreeze	1	1	1	1	—	1	1	1	1
PRL-High Temp. Hydr. Oil	2	2	4	1	—	2	4	4	4

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Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Producer Gas	1	1	4	1	—	2	4	4	2
Propane	1	1	4	1	—	2	4	4	2
Propionaldehyde	3	3	1	3	—	1	1	1	1
Propionic Acid	3	3	1	3	—	1	1	1	1
Propionitrile	1	1	4	1	—	2	—	—	—
Propyl Acetate	4	4	2	4	—	4	2	4	4
Propyl Acetone or n-Propyl Acetone	4	4	1	4	—	4	1	4	4
Propyl Alcohol	1	1	1	1	1	1	1	1	1
Propyl Nitrate	4	4	2	4	—	4	2	4	4
Propyl Propionate	3	3	1	3	—	1	1	1	1
Propylamine	3	3	1	3	—	1	1	1	1
Propylbenzene	—	—	—	1	—	4	4	4	4
Propylene	3	3	4	1	—	4	4	4	4
Propylene Chloride	—	—	—	1	—	4	4	4	4
Propylene Chlorohydrin	—	—	—	1	—	4	4	4	4
Propylene Dichloride	—	—	—	1	—	4	4	4	4
Propylene Glycol	3	3	1	3	—	1	1	1	1
Propylene Imine	—	—	—	1	—	4	4	4	4
Propylene Oxide	4	4	2	4	—	4	2	4	4
Pydraul 90e	4	4	1	1	—	4	—	—	—
Pydraul, 10E	4	4	1	4	—	4	1	4	4
Pydraul, 115E	4	4	1	1	—	4	1	4	4
Pydraul, 230C, 312C, 540C, A200	4	4	4	1	—	4	4	4	4
Pydraul, 29ELT 30E, 50E, 65E	4	4	1	1	—	4	1	4	4
Pyranol Transformer Oil	1	1	4	1	—	2	4	4	2
Pyridine	4	4	2	1	—	4	4	4	4
Pyridine Oil	4	4	2	4	2	4	2	4	4
Pyridine Sulfate	3	3	1	3	—	1	1	1	1
Pyridine Sulfonic Acid	3	3	1	3	—	1	1	1	1
Pyrogallol (Pyrogallic Acid)	2	2	4	1	—	4	4	4	4
Pyrogard 42, 43, 55	4	4	1	1	—	4	—	—	—
Pyrogard 53, Phosphate Ester	4	4	1	1	—	4	1	4	4
Pyrogard D, Water-in-Oil Emulsion	1	1	4	4	—	2	4	4	1
Pyroligneous Acid	4	4	2	4	—	2	2	4	2
Pyrolube	4	4	2	1	—	4	2	4	4
Pyrosulfuric Acid	3	3	1	3	—	1	1	1	1
Pyrosulfuryl Chloride	2	2	4	1	—	4	4	4	4
Pyrrole	4	4	4	4	—	4	4	2	2
Pyruvic Acid	3	3	1	3	—	1	1	1	1
Quinidine	2	2	4	1	—	4	4	4	4
Quinine	2	2	4	1	—	4	4	4	4
Quinine Bisulfate	3	3	1	3	—	1	1	1	1
Quinine Hydrochloride	3	3	1	3	—	1	1	1	1
Quinine Sulfate	3	3	1	3	—	1	1	1	1
Quinine Tartrate	3	3	1	3	—	1	1	1	1
Quinizarin	2	2	4	1	—	4	4	4	4
Quinoline	2	2	4	1	—	4	4	4	4
Quinone	2	2	4	1	—	4	4	4	4
Radiation (Gamma, 10^7 Rads)	3	3	2	4	—	—	4	4	—

Rating Legend

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3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Raffinate	2	2	4	1	—	4	4	4	4
Rapeseed Oil	2	2	1	1	—	2	1	4	2
Red Line 100 Oil	1	1	4	1	—	2	4	4	2
Red Oil (MIL-H-5606)	1	1	4	1	—	2	4	4	2
Resorcinol	3	3	1	3	—	1	1	1	1
Riboflavin	2	2	4	1	—	4	4	4	4
Ricinoleic Acid	2	2	4	1	—	4	4	4	4
RJ-1 (MIL-F-25558)	1	1	4	1	—	2	4	4	2
RJ-4 (MIL-F-82522)	2	2	4	1	—	4	4	4	—
Rosin	2	2	4	1	—	4	4	4	4
Royco 602	1	1	4	1	—	2	—	—	—
RP-1 (MIL-R-25576)	1	1	4	1	—	2	4	4	2
Saccharin Solution	3	3	1	3	—	1	1	1	1
Sal Ammoniac	1	1	1	1	—	1	1	1	1
Salicylic Acid	2	2	1	1	—	—	1	1	—
Santo Safe 300	4	4	3	1	—	4	3	4	—
Sea (Salt) Water	1	1	1	1	—	2	1	1	1
Sebacic Acid	3	3	1	3	—	1	1	1	1
Selenic Acid	3	3	1	3	—	1	1	1	1
Selenous Acid	3	3	1	3	—	1	1	1	1
Sewage	1	1	1	1	—	2	1	1	1
SF 1154 GE Silicone Fluid	2	2	1	1	—	1	1	1	1
SF1147 GE Silicone Fluid	2	2	3	1	—	—	3	—	—
SF96 GE Silicone Fluid	2	2	1	1	—	1	1	1	1
Shell 3XF Mine Fluid (Fire resist)	1	1	4	1	—	2	4	4	2
Shell Alvania Grease #2	1	1	4	1	—	2	4	4	4
Shell Carnea 19 and 29	1	1	4	1	—	4	4	4	4
Shell Diala	1	1	4	1	—	2	4	4	4
Shell Irus 905	1	1	4	1	—	2	4	4	4
Shell Lo Hydrax 27 and 29	1	1	4	1	—	2	4	4	4
Shell Macome 72	1	1	4	1	—	2	4	4	4
Shell Tellus #32 Pet. Base	1	1	4	1	—	2	4	4	4
Shell Tellus #68	1	1	4	1	—	2	4	4	4
Shell Tellus 27 (Petroleum Base)	1	1	4	1	—	2	—	—	—
Shell Tellus 33	1	1	4	1	—	2	—	—	—
Shell UMF (5% Aromatic)	1	1	4	1	—	2	4	4	4
Shellac	3	3	1	3	—	1	1	1	1
Silicate Esters	2	2	4	1	—	1	4	4	—
Silicone Greases	1	1	1	1	—	1	1	1	1
Silicone Oils	1	1	1	1	—	1	1	1	1
Silver Bromide	3	3	1	3	—	1	1	1	1
Silver Chloride	3	3	1	3	—	1	1	1	1
Silver Cyanide	3	3	1	3	—	1	1	1	1
Silver Nitrate	2	2	1	1	—	1	1	1	1
Silver Sulfate	3	3	1	3	—	1	1	1	1
Sinclair Opaline CX-EP Lube	1	1	4	1	—	2	4	4	2
Skelly, Solvent B, C, E	1	1	4	1	—	4	4	4	4
Skydrol 500 B4	4	4	1	4	—	4	2	4	4
Skydrol 7000	4	4	1	2	—	4	—	—	—
Skydrol LD-4	4	4	1	4	—	4	2	4	4

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Soap Solutions	1	1	1	1	—	2	1	2	1
Socony Mobile Type A	1	1	4	1	—	2	4	4	4
Socony Vacuum AMV AC781	1	1	4	1	—	2	4	4	4
Socony Vacuum PD959B	1	1	4	1	—	2	4	4	2
Soda Ash	1	1	1	1	—	1	1	1	1
Sodium Acetate	2	2	1	4	—	2	1	1	1
Sodium Acid Bisulfate	3	3	1	3	—	1	1	1	1
Sodium Acid Fluoride	3	3	1	3	—	1	1	1	1
Sodium Acid Sulfate	3	3	1	3	—	1	1	1	1
Sodium Aluminate	3	3	1	3	—	1	1	1	1
Sodium Aluminate Sulfate	3	3	1	3	—	1	1	1	1
Sodium Anthraquinone Disulfate	3	3	1	3	—	1	1	1	1
Sodium Antimonate	3	3	1	3	—	1	1	1	1
Sodium Arsenate	3	3	1	3	—	1	1	1	1
Sodium Arsenite	3	3	1	3	—	1	1	1	1
Sodium Benzoate	3	3	1	3	—	1	1	1	1
Sodium Bicarbonate (Baking Soda)	1	1	1	1	—	1	1	1	1
Sodium Bichromate	3	3	1	3	—	1	1	1	1
Sodium Bifluoride	3	3	1	3	—	1	1	1	1
Sodium Bisulfate or Bisulfite	1	1	1	1	—	1	1	1	1
Sodium Bisulfide	3	3	1	3	—	1	1	1	1
Sodium Bitartrate	3	3	1	3	—	1	1	1	1
Sodium Borate	1	1	1	1	—	1	1	1	1
Sodium Bromate	3	3	1	3	—	1	1	1	1
Sodium Bromide	3	3	1	3	—	1	1	1	1
Sodium Carbonate (Soda Ash)	1	1	1	1	—	1	1	1	1
Sodium Chlorate	3	3	1	3	—	1	1	1	1
Sodium Chloride	1	1	1	1	—	1	1	1	1
Sodium Chlorite	3	3	1	3	—	1	1	1	1
Sodium Chloroacetate	3	3	1	3	—	1	1	1	1
Sodium Chromate	3	3	1	3	—	1	1	1	1
Sodium Citrate	3	3	1	3	—	1	1	1	1
Sodium Cyanamide	3	3	1	3	—	1	1	1	1
Sodium Cyanate	3	3	1	3	—	1	1	1	1
Sodium Cyanide	1	1	1	—	—	1	1	1	1
Sodium Diacetate	3	3	1	3	—	1	1	1	1
Sodium Diphenyl Sulfonate	3	3	1	3	—	1	1	1	1
Sodium Diphosphate	3	3	1	3	—	1	1	1	1
Sodium Disilicate	3	3	1	3	—	1	1	1	1
Sodium Ethylate	3	3	1	3	—	1	1	1	1
Sodium Ferricyanide	3	3	1	3	—	1	1	1	1
Sodium Ferrocyanide	3	3	1	3	—	1	1	1	1
Sodium Fluoride	3	3	1	3	—	1	1	1	1
Sodium Fluorosilicate	3	3	1	3	—	1	1	1	1
Sodium Glutamate	3	3	1	3	—	1	1	1	1
Sodium Hydrogen Sulfate	3	3	1	3	—	1	1	1	1
Sodium Hydrosulfide	3	3	1	3	—	1	1	1	1
Sodium Hydrosulfite	3	3	1	3	—	1	1	1	1
Sodium Hydroxide, 3 Molar	2	2	1	2	—	2	1	1	1
Sodium Hypochlorite	2	2	1	1	—	2	1	2	1

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Rating Legend

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4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Sodium Hypophosphate	3	3	1	3	—	1	1	1	1
Sodium Hypophosphite	3	3	1	3	—	1	1	1	1
Sodium Hyposulfite	3	3	1	3	—	1	1	1	1
Sodium Iodide	3	3	1	3	—	1	1	1	1
Sodium Lactate	3	3	1	3	—	1	1	1	1
Sodium Metaphosphate	1	1	1	1	—	2	1	1	2
Sodium Metasilicate	3	3	1	3	—	1	1	1	1
Sodium Methylate	3	3	1	3	—	1	1	1	1
Sodium Monophosphate	3	3	1	3	—	1	1	1	1
Sodium Nitrate	2	2	1	—	—	2	1	2	1
Sodium Oleate	3	3	1	3	—	1	1	1	1
Sodium Orthosilicate	3	3	1	3	—	1	1	1	1
Sodium Oxalate	3	3	1	3	—	1	1	1	1
Sodium Perborate	2	2	1	1	—	2	1	2	2
Sodium Percarbonate	3	3	1	3	—	1	1	1	1
Sodium Perchlorate	3	3	1	3	—	1	1	1	1
Sodium Peroxide	2	2	1	1	—	2	1	2	2
Sodium Persulfate	3	3	1	3	—	1	1	1	1
Sodium Phenolate	3	3	1	3	—	1	1	1	1
Sodium Phenoxide	3	3	1	3	—	1	1	1	1
Sodium Phosphate (Dibasic)	1	1	1	1	—	2	1	1	1
Sodium Phosphate (Mono)	1	1	1	1	—	2	1	1	1
Sodium Phosphate (Tribasic)	1	1	1	1	—	2	1	1	1
Sodium Plumbite	3	3	1	3	—	1	1	1	1
Sodium Pyrophosphate	3	3	1	3	—	1	1	1	1
Sodium Resinate	3	3	1	3	—	1	1	1	1
Sodium Salicylate	3	3	1	3	—	1	1	1	1
Sodium Salts	1	1	1	1	—	2	1	1	1
Sodium Silicate	1	1	1	1	—	1	1	1	1
Sodium Stannate	3	3	1	3	—	1	1	1	1
Sodium Sulfate	1	1	1	1	—	1	1	2	1
Sodium Sulfide and Sulfite	1	1	1	1	—	1	1	2	1
Sodium Sulfocyanide	3	3	1	3	—	1	1	1	1
Sodium Tartrate	3	3	1	3	—	1	1	1	1
Sodium Tetraborate	3	3	1	3	—	1	1	1	1
Sodium Tetraphosphate	3	3	1	3	—	1	1	1	1
Sodium Tetrasulfide	3	3	1	3	—	1	1	1	1
Sodium Thioarsenate	3	3	1	3	—	1	1	1	1
Sodium Thiocyanate	3	3	1	3	—	1	1	1	1
Sodium Thiosulfate	2	2	1	1	—	1	1	2	1
Sodium Trichloroacetate	3	3	1	3	—	1	1	1	1
Sodium Triphosphate	3	3	1	3	—	1	1	1	1
Sorbitol	3	3	1	3	—	1	1	1	1
Sour Crude Oil	3	3	4	1	—	4	4	4	—
Sour Natural Gas	3	3	4	1	—	4	4	4	—
Sovasol No. 1, 2, and 3	1	1	4	1	—	2	4	4	2
Sovasol No. 73 and 74	2	2	4	1	—	2	4	4	2
Soybean Oil	1	1	3	1	—	3	3	4	3
Spry	1	1	2	1	—	2	2	4	4
SR-10 Fuel	1	1	4	1	—	4	4	4	4
SR-6 Fuel	2	2	4	1	—	4	4	4	4

Unless otherwise noted ratings are at room temperature.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Standard Oil Mobilube GX90-EP	1	1	4	1	—	2	4	4	2
Stannic Ammonium Chloride	3	3	1	3	—	1	1	1	1
Stannic Chloride	1	1	1	1	—	4	1	1	4
Stannic Chloride, 50%	1	1	1	1	—	4	1	1	4
Stannic Tetrachloride	3	3	1	3	—	1	1	1	1
Stannous Bisulfate	3	3	1	3	—	1	1	1	1
Stannous Bromide	3	3	1	3	—	1	1	1	1
Stannous Chloride (15%)	1	1	1	1	—	1	1	1	1
Stannous Fluoride	3	3	1	3	—	1	1	1	1
Stannous Sulfate	3	3	1	3	—	1	1	1	1
Starch	1	1	1	1	—	1	1	1	1
Stauffer 7700	2	2	4	1	—	4	4	4	4
Steam Below 400°F	4	4	1	4	1	4	2	4	4
Steam, 400° - 500°F	4	4	3	4	2	4	4	4	4
Stearic Acid	2	2	2	—	1	2	2	2	2
Stoddard Solvent	1	1	4	1	—	2	4	4	4
Strontium Acetate	3	3	1	3	—	1	1	1	1
Strontium Carbonate	3	3	1	3	—	1	1	1	1
Strontium Chloride	3	3	1	3	—	1	1	1	1
Strontium Hydroxide	3	3	1	3	—	1	1	1	1
Strontium Nitrate	3	3	1	3	—	1	1	1	1
Styrene (Monomer)	4	4	4	2	—	4	4	4	4
Succinic Acid	3	3	1	3	—	1	1	1	1
Sucrose Solutions	1	1	1	1	—	2	1	1	2
Sulfamic Acid	3	3	1	3	—	1	1	1	1
Sulfanilic Acid	3	3	1	3	—	1	1	1	1
Sulfanilic Chloride	2	2	4	1	—	4	4	4	4
Sulfanilimide	2	2	4	1	—	4	4	4	4
Sulfite Liquors	3	3	1	3	—	1	1	1	1
Sulfolane	2	2	1	2	—	2	—	—	—
Sulfonated Oils	2	2	4	1	—	4	4	4	4
Sulfonic Acid	3	3	1	3	—	1	1	1	1
Sulfonyl Choride	3	3	1	3	—	1	1	1	1
Sulfur	4	4	1	1	—	1	1	4	—
Sulfur (Molten)	4	4	3	1	—	3	3	4	4
Sulfur Chloride	4	4	4	1	—	4	4	4	4
Sulfur Dioxide, Dry	4	4	1	4	—	4	2	2	4
Sulfur Dioxide, Liquidified under pressure	4	4	1	4	—	4	2	4	4
Sulfur Dioxide, Wet	4	4	1	4	—	2	1	4	3
Sulfur Hexafluoride	2	2	1	3	—	1	—	—	—
Sulfur Liquors	2	2	2	1	—	2	2	2	2
Sulfur Monochloride	1	1	4	1	—	2	4	4	2
Sulfur Trioxide Dry	4	4	2	1	—	4	2	2	4
Sulfuric Acid (20% Oleum)	3	3	1	3	—	1	1	1	1
Sulfuric Acid, 3 Molar to 158°F	2	2	1	1	—	2	1	—	1
Sulfuric Acid, Conc Room Temp	—	—	3	1	—	—	—	—	—
Sulfuric Acid, Conc to 158°F	4	—	4	1	—	4	4	—	—
Sulfuric Chlorohydrin (Chlorosulfonic Acid)	3	3	1	3	—	1	1	1	1
Sulfurous Acid	2	2	2	1	—	2	2	2	1

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Sunisco 3GS Refrigerant Oil	1	1	4	—	—	3	—	—	—
Sunoco #3661	1	1	4	1	—	2	4	4	2
Sunoco All purpose grease	1	1	4	1	—	2	4	4	2
Sunoco SAE 10	1	1	4	1	—	2	4	4	2
Sunsafe (Fire resist. hydr. fluid)	1	1	4	1	—	2	4	4	2
Super Shell Gas	1	1	4	1	—	2	4	4	4
Surfuryl Chloride	3	3	1	3	—	1	1	1	1
Swan Finch EP Lube	1	1	4	1	—	4	4	4	4
Swan Finch Hypoid-90	1	1	4	1	—	2	4	4	4
Tall Oil	1	1	4	1	—	—	—	—	—
Tallow	1	1	4	1	—	2	4	4	2
Tannic Acid (10%)	1	1	1	1	—	1	1	1	1
Tar, bituminous	2	2	4	1	—	3	4	3	4
Tartaric Acid	1	1	2	1	—	2	2	3	1
Terephthalic Acid	3	3	1	3	—	1	1	1	1
Terpineol	2	2	3	1	—	4	3	4	4
Terpinyl Acetate	2	2	4	1	—	4	4	4	4
Tertiary Butyl Catechol or p-Tert Butyl Catechol	4	4	2	1	—	2	2	4	2
Tertiary Butyl Mercaptan	4	4	4	1	—	—	—	—	—
Tetrabromoethane	4	4	4	1	—	4	4	4	4
Tetrabromomethane	2	2	4	1	—	4	4	4	4
Tetrabutyl Titanate	2	2	1	1	—	2	2	2	4
Tetrachloroethylene	4	4	4	1	—	4	4	4	4
Tetrachoroethane	4	4	4	1	—	4	4	4	4
Tetraethyl Lead	2	2	4	1	—	2	4	4	4
Tetraethyl Lead Blend	2	2	4	1	—	4	4	4	4
Tetrahydrofuran	4	4	2	4	—	4	2	4	4
Tetralin	4	4	4	1	—	4	4	4	4
Tetramethyl Ammonium Hydroxide	3	3	1	3	—	1	1	1	1
Tetramethyldihydropyridine	2	2	4	1	—	4	4	4	4
Tetramethyldihydropyridine	2	2	4	1	—	4	4	4	4
Tetraphosphoglucosate	3	3	1	3	—	1	1	1	1
Texaco 3450 Gear Oil	1	1	4	1	—	4	4	4	4
Texaco Capella A and AA	1	1	4	1	—	2	4	4	4
Texaco Meropa 220 (No Lead)	1	1	4	1	—	2	4	4	4
Texaco Regal B	1	1	4	1	—	4	4	4	4
Texaco Uni-Temp Grease	1	1	4	1	—	2	4	4	4
Texamatic A 1581 Fluid	1	1	4	1	—	2	4	4	4
Texamatic A 3401 Fluid	1	1	4	1	—	2	4	4	4
Texamatic A 3525 Fluid	1	1	4	1	—	2	4	4	4
Texamatic A 3528 Fluid	1	1	4	1	—	2	4	4	4
Texamatic A Transmission Oil	1	1	4	1	—	2	4	4	4
Texas 1500 Oil	1	1	4	1	—	2	4	4	4
Therminol 44	4	4	4	1	—	4	4	—	—
Therminol 55	2	2	4	1	—	4	4	—	—
Therminol VP-1, 60, 65	4	4	4	1	—	4	4	—	—
Thioamyl Alcohol	1	1	4	1	—	2	4	4	2
Thiodiacetic Acid	3	3	1	3	—	1	1	1	1
Thioethanol	3	3	1	3	—	1	1	1	1
Thioglycolic Acid	3	3	1	3	—	1	1	1	1
Thiokol TP-90B	4	4	1	1	—	2	1	—	2
Thiokol TP-95	4	4	1	1	—	2	1	—	2
Thionyl Chloride	2	2	4	1	—	4	4	4	4
Thiophene (Thiofuran)	2	2	4	1	—	4	4	4	4
Thiophosphoryl Chloride	3	3	1	3	—	1	1	1	1
Thiourea	3	3	1	3	—	1	1	1	1
Thorium Nitrate	3	3	1	3	—	1	1	1	1
Tidewater Multigear, 140 EP Lube	1	1	4	1	—	2	4	4	2
Tidewater Oil-Beedol	1	1	4	1	—	2	4	4	4
Tin Ammonium Chloride	3	3	1	3	—	1	1	1	1
Tin Chloride	1	1	4	1	—	2	4	4	2
Tin Tetrachloride	1	1	4	1	—	2	4	4	2
Titanic Acid	3	3	1	3	—	1	1	1	1
Titanium Dioxide	3	3	1	3	—	1	1	1	1
Titanium Sulfate	3	3	1	3	—	1	1	1	1
Titanium Tetrachloride	2	2	4	1	—	4	4	4	4
Toluene	4	4	4	1	4	4	4	4	4
Toluene Diisocyanate (TDI)	4	4	2	4	—	4	2	4	4
Toluene Sulfonyl Chloride	2	2	4	1	—	4	4	4	4
Toluenesulfonic Acid	3	3	1	3	—	1	1	1	1
Toluidine	2	2	4	1	—	4	4	4	4
Toluol	3	3	1	3	—	1	1	1	1
Toluquinone	2	2	4	1	—	4	4	4	4
Tolylaldehyde	3	3	1	3	—	1	1	1	1
Transformer Oil	1	1	4	1	—	2	4	4	4
Transmission Fluid Type A	1	1	4	1	—	2	4	4	2
Triacetin	2	2	1	4	—	2	1	2	2
Triaryl Phosphate	4	4	1	1	—	4	1	4	4
Tribromomethylbenzene	2	2	4	1	—	4	4	4	4
Tributoxyethyl Phosphate	4	4	1	1	—	4	1	2	4
Tributyl Citrate	3	3	1	3	—	1	1	1	1
Tributyl Mercaptan	4	4	4	1	—	4	4	4	4
Tributyl Phosphate	4	4	1	4	1	4	2	2	4
Trichloroacetic Acid	2	2	2	3	—	4	2	2	4
Trichloroacetyl Chloride	2	2	4	1	—	4	4	4	4
Trichlorobenzene	2	2	4	1	—	4	4	4	4
Trichloroethane	4	4	4	1	—	4	4	4	4
Trichloroethanolamine	3	3	1	3	—	1	1	1	1
Trichloroethylene	3	3	4	1	4	4	4	4	4
Trichloromethane	4	4	4	1	—	4	4	4	4
Trichloronitromethane (Chloropicrin)	3	3	1	3	—	1	1	1	1
Trichloropropane	4	4	4	1	—	4	4	4	4
Trichlorosilane	4	4	4	1	—	4	4	4	4
Tricresyl Phosphate	4	4	1	2	—	3	1	4	4
Triethanol Amine	3	3	2	4	—	2	2	2	2
Triethyl Phosphate	2	2	4	1	—	4	4	4	4
Triethylene Glycol	3	3	1	3	—	1	1	1	1
Triethylenetetramine	3	3	1	3	—	1	1	1	1
Trifluoroacetic Acid	3	3	1	3	—	1	1	1	1
Trifluoroethane	4	4	4	1	—	4	4	4	4

Unless otherwise noted ratings are at room temperature.

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

Technical

Revision 6

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Trifluoromethane	4	4	4	1	—	4	4	4	4
Trifluorovinylchloride	2	2	4	1	—	4	4	4	4
Triisopropylbenzylchloride	2	2	4	1	—	4	4	4	4
Trimethylamine (TMA)	3	3	1	3	—	1	1	1	1
Trimethylbenzene	2	2	4	1	—	4	4	4	4
Trimethylborate (TMB)	2	2	4	1	—	4	4	4	4
Trimethylpentane	1	1	4	1	—	2	4	4	2
Trinitrololuene (TNT)	4	4	4	2	—	2	4	4	2
Trioctyl Phosphate	4	4	1	2	—	4	1	4	4
Triphenylphosphite	3	3	1	3	—	1	1	1	1
Tripoly Phosphate	4	4	1	2	—	3	1	4	4
Tripotassium Phosphate	3	3	1	3	—	1	1	1	1
Trisodium Phosphate	3	3	1	3	—	1	1	1	1
Tung Oil (China Wood Oil)	1	1	4	1	—	2	3	4	3
Turbine Oil	1	1	4	1	—	4	4	4	4
Turbine Oil #15 (MIL-L-7808A)	2	2	4	1	—	4	4	4	4
Turbo Oil #35	1	1	4	1	—	2	4	4	4
Turpentine	1	1	4	1	3	4	4	4	4
Type I Fuel (MIL-S-3136) (ASTM Ref. Fuel A)	1	1	4	1	—	2	4	4	2
Type II Fuel MIL-S-3136	2	2	4	1	—	4	4	4	4
Type III Fuel MIL-S-3136 (ASTM Ref. Fuel B)	2	2	4	1	—	4	4	4	4
Ucon Hydrolube J-4	1	1	1	1	—	2	1	—	—
Ucon Lubricant 50-HB-100	1	1	1	1	—	1	1	1	1
Ucon Lubricant 50-HB-260	1	1	1	1	—	1	1	1	1
Ucon Lubricant 50-HB-5100	1	1	1	1	—	1	1	1	1
Ucon Lubricant 50-HB55	1	1	1	1	—	1	1	1	1
Ucon Lubricant 50-HB-660	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-1145	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-135	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-285	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-300X	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-625	1	1	1	1	—	1	1	1	1
Ucon Lubricant LB-65	1	1	1	1	—	1	1	2	2
Ucon Oil 50-HB-280x	2	2	1	3	—	2	—	—	—
Ucon Oil Heat Transfer 500 (Polyalkalene Glycol)	1	1	1	1	—	1	1	1	1
Ucon Oil LB-385	1	1	1	1	—	1	1	1	1
Ucon Oil LB-400X	1	1	1	1	—	1	1	1	1
Undecylenic Acid	2	2	4	1	—	4	4	4	4
Undecylic Acid	2	2	4	1	—	4	4	4	4
Univis 40 (Hydr. Fluid)	1	1	4	1	—	2	4	4	2
Univolt #35 (Mineral Oil)	1	1	4	1	—	2	4	4	4
Unsymmetrical Dimethyl Hydrazine (UDMH)	2	2	1	4	—	2	1	1	1
UPDI (Ultrapure Deionized Water)	3	3	1	3	—	1	1	1	1
Uranium Hexachloride	—	—	—	1	—	—	—	—	—
Urea	4	4	1	4	—	1	—	—	—
Uric Acid	3	3	1	3	—	1	1	1	1
Valeraldehyde	3	3	1	3	—	1	1	1	1
Valeric Acid	3	3	1	3	—	1	1	1	1

Unless otherwise noted ratings are at room temperature.

***** Since some white liquor applications include additional media, which is not compatible with EPDM, the rating has been reduced from 1 to 3.

Media / Environment	Nitrile (NBR, Buna-N)	Hydrogenated Nitrile (HNBR, HSN)	Ethylene Propylene (EPR, EPDM)	Fluorocarbon (FKM, Viton)	TFE/Propylene (TFE/P, Aflas)	Neoprene (CR)	Polyurethane (EU)	Natural Rubber	Hypalon
Vanadium Oxide	1	1	4	1	—	2	4	4	2
Vanadium Pentoxide	1	1	4	1	—	2	4	4	2
Varnish	2	2	4	1	—	4	4	4	4
Vegetable Oil	1	1	3	1	—	3	3	4	—
Versilube F44, F55	1	1	1	1	—	1	—	—	—
Versilube F-50	1	1	1	1	—	1	1	1	1
Vinegar	2	2	2	3	—	2	2	2	—
Vinyl Acetate	2	2	1	3	4	2	—	—	—
Vinyl Benzene	2	2	4	1	—	4	4	4	4
Vinyl Benzoate	2	2	4	1	—	4	4	4	4
Vinyl Chloride	2	2	4	1	2	4	4	4	4
Vinyl Fluoride	2	2	4	1	—	4	4	4	4
Vinylidene Chloride	2	2	4	1	—	4	4	4	4
Vinylpyridine	2	2	4	1	—	4	4	4	4
Vitriol (White)	3	3	1	3	—	1	1	1	1
VV-H-910	3	3	1	1	—	2	2	2	2
Wagner 21B Brake Fluid	3	3	1	4	—	2	2	2	2
Water	1	2	1	2	1	2	1	1	1
Wemco C	1	1	4	1	—	2	4	4	4
Whiskey and Wines	1	1	1	1	—	1	1	1	1
White Liquor	1	1	3*	1	—	1	—	—	—
White Oil	1	1	4	1	—	2	4	4	4
White Pine Oil	2	2	4	1	—	4	4	4	4
Wolmar Salt	1	1	1	1	—	2	1	1	1
Wood Alcohol	1	1	1	4	—	1	1	1	1
Wood Oil	1	1	4	1	—	2	3	4	3
Xenon	1	1	1	1	—	1	1	1	1
Xylene	4	1	4	1	3	4	4	4	4
Xylidenes-Mixed-Aromatic Amines	3	3	1	4	—	4	4	4	4
Xylol	4	4	4	1	—	4	4	4	4
Yeast	1	1	1	1	—	1	1	1	1
Zeolites	1	1	1	1	—	1	1	1	1
Zerol 200 TD Refrigerant Oil	1	1	4	—	—	3	—	—	—
Zinc Acetate	2	2	1	4	—	2	1	1	4
Zinc Ammonium Chloride	3	3	1	3	—	1	1	1	1
Zinc Chloride	1	1	1	1	—	1	1	1	1
Zinc Chromate	3	3	1	3	—	1	1	1	1
Zinc Cyanide	3	3	1	3	—	1	1	1	1
Zinc Diethyldithiocarbamate	3	3	1	3	—	1	1	1	1
Zinc Dihydrogen Phosphate	3	3	1	3	—	1	1	1	1
Zinc Hydrosulfite	3	3	1	3	—	1	1	1	1
Zinc Nitrate	1	1	1	1	—	—	1	1	1
Zinc Oxide	1	1	1	1	—	—	1	1	1
Zinc Phenolsulfonate	3	3	1	3	—	1	1	1	1
Zinc Phosphate	1	1	1	1	—	1	1	1	1
Zinc Salts	1	1	1	1	—	1	1	1	1
Zinc Stearate	3	3	1	3	—	1	1	1	1
Zinc Sulfate	1	1	1	1	—	1	1	2	1
Zinc Sulfide	3	3	1	3	—	1	1	1	1
Zirconium Nitrate	1	1	1	1	—	1	1	2	1

Rating Legend

1 Little to Minor Effect, 0 to 5% Volume Swell
2 Minor to Moderate Effect, 5 to 10% Volume Swell
3 Moderate to Severe Effect, 10 to 20% Volume Swell
4 Not Recommended
— No Data Available

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