AAR SPEC
STANDARDS MANUAL
REPAIRS

HUGH NOT RELIABLE BUT A GUIDE.

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application	SHEET 1 OF 54

REASON: To standardize on gasket design requirements, types and materials used for specific commodities transported in tank cars. This standard should be used unless a customer has specified another material to be used in the Special Lessee Requirement Book.

GENERAL: This standard is divided into six (6) sections as follows:

Section I	Abbreviations
Section II	General Gasket Considerations
Section III	Bolt Torque Requirements to Seat Gasket
Section IV	Packing Troubleshooting and Installation
Section V	Approved Materials and Manufacturers
Section VI	Recommended Gasket Materials by Commodities

INSTRUCTIONS FOR USE OF THIS STANDARD:

1. Section I shows abbreviations used throughout this standard.
2. See Section VI under the heading of "Pressure" or "Non-Pressure" groupings for specific commodity or commodities being transported.
3. Select the material, paying particular attention to any notes which may be applicable in Section II.
4. After selecting material, turn to Section V for a material source from various manufacturers.
5. Section III should be used as a general guide for bolting torque to seat gaskets.
6. Section IV is to be used to troubleshoot packing problems and for the proper installation of packings.

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Section I - abbreviations

ACM Polyacrylate Rubber.
AF Air Force.
AFML Air Force Material Laboratory.
AMS Aerospace Material Specification.
AN (1) Army-Navy; (2) Air Force-Navy.
ANA Air Force-Navy Aeronautical Bulletin.
AND Air Force-Navy Design.
AQL Acceptable Quality Level.
ARP Aerospace Recommended Practice.
AS Aerospace Standard.
ASTM American Society for Testing and Materials.
atm Atmosphere (atmospheric).
AU Polyurethane Rubber.
BR Butadiene Rubber.
C or °C Degrees Centigrade.
cc Cubic centimeter.
C.G.S. Centimeter-Gram-Second. System of units for length, mass, and time.
CO Epichlorohydrin Rubber.
cpm Cycles per minute.
CR Chloroprene (Neoprene).
CS Cross Section.
CSM Hypalon Rubber.
Dia Diameter.
ECO Epichlorohydrin Rubber.
EP, EPM, EPDM Ethylene-Propylene Rubber.
EU Polyurethane Rubber.
F or °F Degrees Fahrenheit.
FED Federal Specification.
FKM (formerly FPM) Fluorocarbon Rubber (Viton, Fluorel).
fpm Feet per minute; fpm = shaft dia (in.) x rpm x .26.
F.P.S. Foot-Pound-Second. System of units for length, weight and time.
FSI (Now FVMQ)
FVMQ Fluorosilicone Rubber.
GRS "Government Rubber Styrene." Now SBR
ID Inside Diameter.
IIR Butyl Rubber.
in. Inch.
IR Isoprene Rubber.
JAN Joint Army-Navy.
JIC Joint Industry Conference on Hydraulic Standards for Industrial Equipment.
K or °K Degrees Kelvin (Absolute) = (°C −273).
Max Maximum.
MIL Military Specification.
Min Minimum.
MQ Silicone Rubber.
MS Military Standard.
NAS National Aerospace Standard (also National Aircraft Standards [older meaning]).
NASA National Aeronautics and Space Administration.
NBR Nitrile or Buna N Rubber.
No Number.
NR Natural Rubber.
OD Outside Diameter.
Pg Page.
PMQ Silicone Rubber.
psi Pounds per square inch.
PSI (Now PMQ).
PVMQ Silicone Rubber.
PVSI (Now PVMQ).
QPL Military Qualified Products List.
R or °R Degrees Rankine (Absolute) = (°F −460).
Rad Radius.
RMA Rubber Manufacturers Association.
RMS Root-mean-square; average value of surface roughness measured in microinches.
rpm Revolutions per minute.
SAE Society of Automotive Engineers, Inc.
SBR Styrene Butadiene Rubber
Sect Section
SI (Now MQ)
sfm Surface Feet per minute.
Spec Specification
T Polysulfide Rubber
Temp. Temperature.
USAF United States Air Force.
VMQ Silicone Rubber
VSI (Now VMQ)
W Width (seal cross section)
WPAFB Wright-Patterson Air Force Base
XNBR Carboxylated Nitrile Rubber

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Section II - General Gasket Considerations

1. All flat gaskets shall be 1/8" thick, unless otherwise specified.

2. O-ring sizes shall be specified by the Aerospace Standard 568 uniform dash number published by SAE - (sizes established by military specifications have been accepted as standard throughout the industry. Reference: Parker Seal Company's O-ring Handbook Number ORD-5700).

3. Gaskets for pressure cars shall be sized to fit standard gasket grooves as specified in Appendix "E" of the AAR Tank Car Specifications.

4. Gaskets used for flammable gas service on pressure cars must be of asbestos type or approved high temperature resistant equivalent per Tariff BOE 6000-B Part 179.102-3 (3). Section IV.A. of this standard meets this requirement.

5. Gaskets for non-pressure type cars should preferably be of the ring type rather than full face design. When gaskets are used for a standard ASA or ASME flange, the gasket sizes should conform to industry standards. For non-standard size flanges, unless otherwise specified, the O.D. of gaskets should be a minimum of 2" larger than the I.D. but not more than 3" due to excessive bolting requirements.

6. Gaskets may be ordered pre-cut from manufacturers, gasket supply houses or may be purchased in sheet form and cut at the shop as shop circumstances dictate.

7. Gasket at groove of bottom outlet valve and universal saddle shall be stainless steel spiral wound metallic gasket with asbestos or teflon filler. Use of a compatible sealant is permissible. (Locktite 59231 or 56747, a teflon paste pipe sealant.)

8. Gaskets applied to manway covers or other loose attachments must be cemented in place with Swift 7149 contact cement or equivalent (obtain from Swift and Company, Adhesive Products Division, 115 West Jackson, Chicago, IL 60604 (312) 431-3560).

9. Generally, asbestos-type material will be used for manway and valve flange applications, while elastomerics are the only materials used for safety valve, vacuum relief valve and unloading valve seals. NOTE: Teflon is not suitable for safety valve or vacuum relief valve applications.

10. In certain cases the use of elastomerics may be required for non-pressure manways and other flange applications as indicated on listing, or due to material availability to return car to service. On non-pressure applications, it is acceptable to use an elastomeric material in lieu of compressed asbestos type.

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11. Gasket materials are generally divided into three (3) groups:

    a. Flat asbestos-type gaskets

    b. Gaskets cut, molded or of the O-ring type made from various elastomeric and plastic materials

    c. Packing material or packing rings

12. See TCB 9.02 for ACF-SCL standard color coding of seals and gaskets for various materials.

13. If a shop has information that a recommended gasket material failed prematurely, please advise SCL/Engineering.

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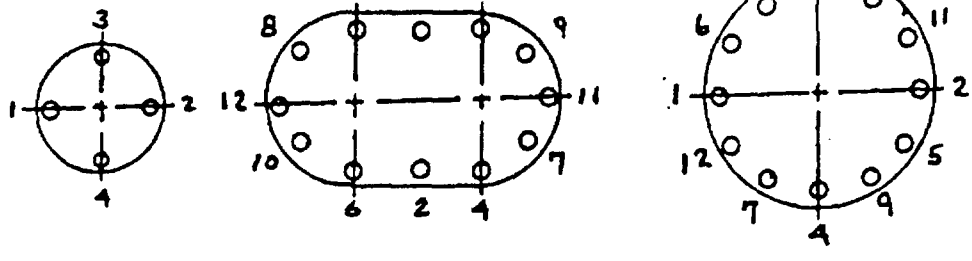
	Pounds Per Square Inch	30,000	[illegible]
1/2"		30#	45#
9/16"		45#	68#
5/8"		60#	90#
3/4"		100#	150#
7/8"		160#	240#
1"		245#	368#
1 1/8"		390#	533#

2. Lubricate bolts with graphite and oil mixture prior to tightening since unlubricated bolts require a torque value approximately double that of a lubricated bolt.

3. Bolts should be tightened uniformly from side to side. Typical patterns are as follows:



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installation of packings on pumps:

1) **REMOVE ALL THE OLD PACKING FROM THE STUFFING BOX.** Clean box and shaft thoroughly and examine shaft or sleeve for wear and scoring. Replace shaft or sleeve if wear is excessive.

2) **USE THE CORRECT CROSS-SECTION OF PACKING OR DIE-FORMED RINGS.** To determine the correct packing size, measure the diameter of the shaft (inside the stuffing box area if possible) and then measure the diameter of the stuffing box (to give the O.D. of the ring). Subtract the I.D. measurement from the O.D. measurement and divide by two. The result is the required size.

CUT . . . DON'T WIND

3) **WHEN USING COIL OR SPIRAL PACKING, ALWAYS CUT THE PACKING INTO SEPARATE RINGS.** Never wind a coil of packing into a stuffing box. Rings can be cut with butt (square), bias or diagonal joints, depending on the method used for cutting. The following illustration shows these methods of preparing bulk packing. The best way to cut packing rings is to cut them on a mandrel with the same diameter as the shaft in the stuffing box area. If there is no shaft wear, rings can be cut on the shaft outside the stuffing box.

Hold the packing tightly on the mandrel, but do not stretch excessively. Cut the ring and insert it into the stuffing box, making certain it fits the packing space properly. Each additional ring

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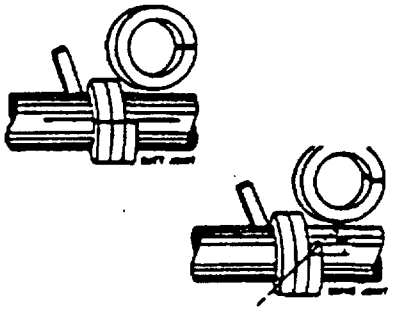
can be cut in the same manner, or the first ring can be used as a master from which the balance of the rings are cut.



If the butt cut rings are cut on a flat surface, be certain that the side of the master rings, and not the O.D. or I.D. surface, is laid on the rings to be cut. This is necessary so that the end of the rings can be reproduced.

When cutting diagonal joints, use a maple miter board so that each successive ring can be cut at the correct angle.

It is necessary that the rings be cut to the correct size. Otherwise, service life is reduced. This is where die-cut rings are of great advantage, as they give you the exact size ring for the I.D. of the shaft and the O.D. of the stuffing box. There is no waste due to incorrectly cut rings.

4) **INSTALL ONE RING AT A TIME.** Make sure it is clean, and has not picked up any dirt in handling. If desired, lubricate the shaft and the inside of the stuffing box.

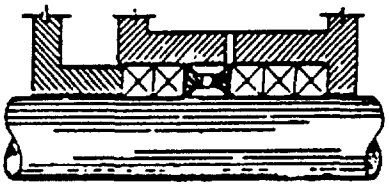
Seat rings firmly (except PTFE filament and graphite yarn packings, which should be snugged up very gently, then tightened gradually after the pump is on stream). Joints of successive rings should be staggered and kept at least 90° apart. Each individual ring should be firmly seated with a tamping tool. When enough rings have been individually seated so that the nose of the gland will reach them, individual tamping should be supplemented by the gland.

5) **AFTER THE LAST RING IS INSTALLED,** take up bolts finger tight or very slightly snugged up. Do not jam the packing into place by excessive gland loading. Start pump, and take up bolts until leakage is decreased to a tolerable minimum. Make sure gland bolts are taken up evenly. ***STOPPING LEAKAGE ENTIRELY AT THIS POINT WILL CAUSE THE PACKING TO BURN UP.***

6) **ALLOW PACKING TO LEAK FREELY WHEN STARTING UP A NEWLY PACKED PUMP.** Excessive leakage during the first hour of operation will result in a better packing job over a longer period of time. Take up gradually on the gland as the packing seats, until leakage is reduced to a tolerable level.

NEVER TRY TO STOP LEAKAGE ENTIRELY, UNLESS PACKING MANUFACTURER INDICATES THAT IT IS SAFE TO DO SO.

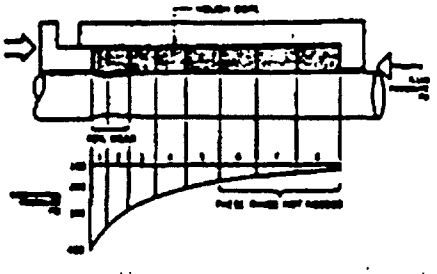
7) **WHEN SPECIFIED BY THE PUMP MANUFACTURER, PROVIDE MEANS OF LUBRICATING THE SHAFT AND PACKING THROUGH THE LANTERN RING BY SUPPLYING WATER, OIL, GREASE OR LIQUID HANDLED IN THE PUMP.** Fittings for this purpose are standard on many pumps.



8) **IF THE STUFFING BOX HAS A LANTERN RING (SEE ILLUSTRATION ABOVE),** make sure that the lantern ring, as installed, is slightly behind the fluid inlet so that it will move under the inlet as follower pressure is applied.

9) **REPLACE PACKING WHEN LEAKAGE CANNOT BE CONTROLLED BY FURTHER TAKEUP ON THE FOLLOWER GLAND.**

10) **ON BOTH CENTRIFUGAL AND RECIPROCATING PUMPS,** about 70% of wear is on the outer two packings nearest the gland. However, each additional ring does throttle some fluid pressure. On most machines, there must be enough rings so if one fails, another does the sealing, and the machine need not be shut down.



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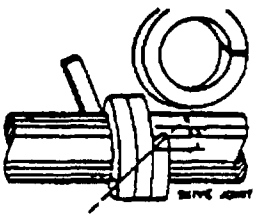
The mechanical pressure curve above shows eight packing rings. The first five rings do the majority of the sealing. The bottom three do little sealing, but are needed to fill the available space. The advantage of using fewer rings is less rod wear. Also, the stuffing box design is simpler and takes less material. But, wear isn't the only problem. With high temperatures, high pressures, corrosive chemicals, or abrasive particles in the fluid, more rings may be the only solution for some services. In such cases, the bottom ring contacting the fluid may have the most wear from these severe service conditions.

PACKING VALVES CORRECTLY

The first step in getting the most out of a valve pad packing is correct installation. Here is the correct way to pack valves.

1) **CAREFULLY PERFORM ALL OPERATIONS LISTED UNDER VALVE PACKING, STEPS 1-6.** Rings used on valves and expansion joints are generally cut with a diagonal joint. (Illustrated below.) In preparing diagonal cut (45°) rings, be sure that the first ring is cut carefully, and then tested on the stem.



2) **BRING THE FOLLOWER DOWN ON THE PACKING TO THE POINT WHERE HEAVY RESISTANCE TO WRENCHING IS FELT.** During this time, turn valve stem back and forth to determine ease of turning. Do not torque down to the point where the stem won't turn.

3) **AFTER THE VALVE HAS BEEN ON THE LINE A DAY OR SO, EVEN IF NO LEAKAGE EXISTS, THE FOLLOWER SHOULD BE TIGHTENED SLIGHTLY.** Obviously if leakage is occurring, the follower must be tightened.

3. SCL standard is to use Chevron V-type seal rings for all packing requirements. See Section V.C. - Packings Group C-3.

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SECTION V Index

Asbestos & Metal

A-1 W/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 New Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Flurosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

V. Listing of Approved Gasket Materials and Their Manufacturers or Suppliers.

A. Flat Gasket Specifications - Compressed Sheets and Metallic Gaskets

1. Chemical Asbestos - General Service #1

a. White chrystotile asbestos with neoprene binder (CR).

b. Meets ASTM F104, P1151A.

c. Total thickness variation not to exceed ±.005".

d. Temperatures up to 750°F maximum.

e. Graphite or anti-stick coating is acceptable.

f. Approved materials are as follow:

(1) American Gasket Co. Klinger K-51
(2) Anchor Packing Ankoprene #450
(3) Chicago Wilcox Style #JM-76 & Klinger K-51
(4) Clark Gasket Co. Stock #300
(5) Garlock Style 7228
(6) John Crane Packing Co. Style #891
(7) Johns Manville Style #JM-76
(8) Richard Klinger, Inc. Klinger K-51
(9) Nicholet, Inc. Style #357

2. Chemical Asbestos - General Service #2

a. White chrystotile asbestos with Buna-N Binder (NBR).

b. Meets ASTM F104, P1141A.

c. Total thickness variation not to exceed ±.005".

d. Temperatures up to 850°F maximum.

e. Graphite or anti-stick coating is acceptable.

f. Approved materials are as follow:

(1) American Gasket Co. Style #757 & Klingerit Universal
(2) Anchor Packing Co. Style #400
(3) Chesterton Style #270
(4) Chicago Wilcox Co. Style #JM-78 & Klingerit Universal
(5) Clark Gasket Co.
(6) Garlock Style #8748
(7) John Crane Packing Co. Style #888
(8) Johns Manville Style #JM-78
(9) Richard Klinger, Inc. Klingerit Universal
(10) Nicholet, Inc. Style #445

3. Chemical Asbestos - General Service #3

   a. White chrystotile asbestos with styrene butadiene rubber binder (SBR).

   b. Meets ASTM F104, P1161A.

   c. Total thickness variation not to exceed ±.005".

   d. Temperatures up to 850°F maximum.

   e. Anti-stick coating is acceptable.

   f. Approved materials are as follow:

      (1) American Gasket Co. Klinger RK
      (2) Anchor Packing Co. Style #480 (tauril)
      (3) Chesterton Style #210
      (4) Chicago Wilcox Co. Klinger RK
      (5) Clark Gasket Co. Clarbestos
      (6) Garlock Style 7021
      (7) John Crane Packing Co. Style #333
      (8) Johns Manville Style #70
      (9) Nicholet, Inc. Style #295
      (10) Raybestos Manhattan Style #503

4. Food Grade Asbestos for Food Products

   a. Meets requirements of general service asbestos #3 but is food grade.

   b. White chyrostotile asbestos with styrene butadiene rubber binder (SBR).

   c. Meets ASTM F104, P1161A.

   d. Temperatures up to 850°F maximum.

   e. FDA approved.

   f. Total thickness variation not to exceed ±.005".

   g. Color white to off white without graphite.

   h. Approved materials are as follows:

      (1) American Gasket Co. Style #751
      (2) Anchor Packing Co. Style 424
      (3) Chesterton Style #235
      (4) Chicago Wilcox Co. Klinger RK white
      (5) Garlock Style #7021
      (6) Johns Manville Style #JM-61
      (7) Richard Klinger Co. Klinger RK white

5. Chlorine Service Asbestos - Similar to Chemical Asbestos 3, but must meet MIL Spec. MH-P-46E.

   a. White asbestos with styrene butadiene rubber binder (SBR).
   b. Meets M.I Spec. MH-P-46E.
   c. Total thickness variation not to exceed ±.005".
   d. Temperatures up to 850°F maximum.
   e. Anti-stick coating is acceptable.
   f. Approved materials are as follow:
      (1) American Gasket Co. Klinger RK White and Klingerite
      (2) Anchor Packing Co. Style #424 and 425
      (3) Chesterton Style #210
      (4) Chicago Wilcox Co. Style #JM-60 or JM-61
      (5) Garlock Style #900-7021 and 7735
      (6) Johns Manville Style #JM-60 or JM-61
      (7) Raybestos Manhattan Style #663
      (8) Richard Klinger, Inc. Klinger RK-white and Klingerite
      (9) Nicholet, Inc. Style #240

6. Acid Resistant Asbestos

   a. Blue African crocidolite asbestos with butyl binder (IIR) or styrene butadiene rubber (SBR).
   b. Meets ASTM F104, P1151A.
   c. Total thickness variation not to exceed ±.005".
   d. Continuous service temperature to 400°F maximum.
   e. Graphite or anti-stick coating is acceptable.
   f. Approved materials are as follow:
      (1) American Gasket Co. Style #758 (IIR)
      (2) Chesterton Style #260 (SBR)
      (3) Clark Gasket Co. (IIR)
      (4) Garlock Style #7705 (SBR)

7. Chemical Asbestos - Acid and Alkali Resistant

   a. White chrystotile asbestos with ethylene propylene rubber binder (EPR) (EPM) (EPDM).
   b. Meets ASTM F104.
   c. Total thickness variation not to exceed ±.005".
   d. Temperatures up to 850°F maximum.
   e. Graphite or anti-stick coating is acceptable.
   f. Approved materials are as follow:
      (1) Chicago Wilcox Co. Style #JM-86A
      (2) Johns Manville Style #JM-86A

8. Spiral Wound Stainless Steel - General Service

   a. Stainless steel to be Type 304.
   b. Filler is white asbestos.
   c. Continuous service temperature to 1200°F maximum.
   d. Total thickness variation not to exceed ±.005".
   e. Seating stress must be minimum of 30,000 psi.
   f. Approved materials are as follow:

      (1) Anchor Packing Co. Style #672
      (2) Flexatallic Style R-1
      (3) Parker Seal Co. Spirotallic Style #911

9. Spiral Wound Stainless Steel - Acid Service.

   a. Stainless steel to be Type 316.
   b. Filler to be white crystotile asbestos or teflon.
   c. Continuous service temperature to 1200°F maximum for asbestos, 500°F maximum for Teflon.
   d. Total thickness variation not to exceed ±.005".
   e. Seating stress must be minimum of 30,000 psi.
   f. Approved materials are as follow:

      (1) Anchor Packing Co. Style #672 (asbestos filler)
      (2) Anchor Packing Co. Style #672 (teflon filler)
      (3) Flexatallic Style R-1 (asbestos filler)
      (4) Flexatallic Style R-1 (teflon filler)
      (5) Parker Seal Co. Spirotallic Style #911 (with asbestos)
      (6) Parker Seal Co. Spirotallic Style #911 (with teflon)

10. Copper

   a. ASTM B152 99.95% copper hot rolled and annealed. Maximum hardness Rockwell 65F. Maximum Tensile 38 KSI.
   b. Continuous service temperature to 600°F maximum.
   c. Requires 13,000 psi seating stress.
   d. Approved materials are as follow:

      (1) Anchor Packing Co. Style #611
      (2) Chicago Wilcox Co. Style #600 and #601
      (3) Clark Gasket Co.
      (4) Melrath Gasket Co. Style #35

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d. Approved materials are as follow:

(1) Acushnet O-ring Compound S15147
(2) Anchor Packing Co. Style #425
(3) Armstrong Cork Co.
(4) Garlock Style #91
(5) Johns Manville Style #107 and 114
(6) Melrath Gasket Co.
(7) Minor Rubber Co. SBR

4. Butyl (IIR)

a. IIR - Isobutene - Isoprene Rubber

b. 60 ± 10 Durometer.

c. Continuous service temperature to 225°F maximum.

d. Approved materials are as follow:

(1) Acushnet O-ring Compound B-12017
(2) American Gasket Co. Style #728
(3) Anchor Packing Co. Style #4616
(4) Clark Gasket Co. Flat or Molded
(5) Melrath Gasket Co.
(6) Minnesota Rubber Co. Style #480 DR
(7) Minor Rubber Co. and O-rings
(8) Parker Seal Co. O-ring Compound B318-70

5. Ethylene Propylene Rubber (EPR, EPDM)

a. EPDM ethylene propolene rubber.

b. 60 ± 10 Durometer.

c. Continuous service temperature to 300°F maximum.

d. Approved materials are as follow:

(1) Acushnet O-ring Compound E17018
(2) American Gasket Co. Style #723
(3) Anchor Packing Co. Style #4619
(4) Clark Gasket Co. Flat or Molded
(5) Garlock Style #8314
(6) Minnesota Rubber Co. Style #560 ND
(7) Minor Rubber Co. and O-rings
(8) Parker Seal Co. O-ring Compound E540-80

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d. Approved materials are as follow:

(1) Acushnet O-ring Compound Y16007
(2) American Gasket Co. Style #721
(3) Anchor Packing Co. Style #3618
(4) Clark Gasket Co. Flat or Molded
(5) Minor Rubber Co. & O-rings

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9. Rubber (NR)

a. NR - Natural or Synthetic (Isoprene).

b. 65 ± 10 Durometer.

c. Continuous service temperature to 225°F maximum.

d. Approved materials are as follow:

(1) Acushnet O-ring Compound R19038
(2) American Gasket Co. Style #716
(3) Anchor Packing Co. Style #2411
(4) Chicago Wilcox Manufacturing Co. Gasket Cutter
(5) Clark Gasket Co. Flat or Molded
(6) Garlock Style #6023
(7) John Crane Packing Co. Style #555
(8) Johns Manville Style JM-112 or JM-113 (35-45 Duro)
(9) Minnesota Rubber Co. O-ring Compound 352AP (30 Duro)
(10) Minor Rubber Co. & O-rings
(11) Parker Seal Co. O-rings

10. Neoprene (CR)

a. CR - Chloroprene Rubber.

b. 70 ± 10 Durometer.

c. Continuous service temperature to 300°F maximum.

d. Approved materials are as follow:

(1) Acushnet O-ring Compound N18538
(2) American Gasket Co. Style #725
(3) Anchor Packing Co. Style #4613
(4) Chesterton Style #124
(5) Chicago Wilcox Manufacturing Co. Gasket Cutter
(6) Clark Gasket Co. Flat or Molded Stock #200
(7) Garlock Style #8639
(8) Goshen Rubber Co. O-ring Compound #2114
(9) John Crane Packing Co. Style #999
(10) Johns Manville Style #JM-103 and JM-104
(11) Minnesota Rubber Co. Style 486CT
(12) Minor Rubber Co. & O-rings
(13) Parker Seal Co. O-ring Compound C557-70

11. Neoprene - White Food Grade (CR)

a. CR - White Chloroprene Rubber
b. FDA Approved.
c. 60 ± 10 Durometer.
d. Continuous service temperature to 270°F maximum.
e. Approved materials are as follow:
   (1) American Gasket Co. Style #725W
   (2) Anchor Packing Co. Style #3613
   (3) Clark Gasket Co. Flat or Molded

12. Silicone (PVMQ)

a. PVMQ - Polysilozane Rubber (was S1)
b. 65 ± 10 Durometer.
c. Continuous service temperature to 270°F maximum.
d. Approved materials are as follow:
   (1) Acushnet O-ring Compound L13237
   (2) American Gasket Co. Style #729
   (3) Anchor Packing Co. Style #2521
   (4) Chicago Wilcox Manufacturing Co. Gasket Cutter
   (5) Clark Gasket Co. Flat or Molded
   (6) Garlock Style #9640
   (7) Goshen Rubber Co. O-ring Compound #S2167
   (8) John Crane Packing Co. Style #2000
   (9) Minor Rubber Co. & O-rings
   (10) Parker Seal Co. O-rings Compound #S604-70

11. Copper - Corregated or Double Jacketed Asbestos

a. Copper ASTM B152 99.5% Copper.

b. Continuous service temperature to 850°F maximum.

c. Corregated gasket requires seating stress of 3,700 psi.

d. Double jacketed gasket requires seating stress of 6,500 psi.

e. Approved materials are as follows:

(1) Anchor Packing Co. Corregated Style #614
(2) Anchor Packing Co. Double Jacketed Style #621
(3) Flexatallic Gasket Co. Corregated Style #126
(4) Flexatallic Gasket Co. Double Jacketed Style #123
(5) Melrath Gasket Co. Corregated Style #1500
(6) Melrath Gasket Co. Double Jacketed Style #21
(7) Parker Seal Co. Corregated Style #926
(8) Parker Seal Co. Double Jacketed Style #923

12. Teflon Envelope or Jacketed Gasket - Special

a. Teflon to be slit or machined.

b. Filler to be white chrystotile or blue asbestos.

c. Continuous service temperature to 500°F maximum.

d. Approved materials are as follows:

(1) Anchor Packing Co. Slit or Machined Style #1106
(2) Chicago Gasket Co. Slit or Machined
(3) Chicago Wilcox Co. Slit or Machined
(4) Clark Gasket Co. Slit Various Fillers
(5) Clark Gasket Co. Machined Style #1006
(6) Clark Gasket Co. Machined with Blue Asbestos Style #2000
(7) Garlock Slit or Machined Style #8754
(8) John Crane Packing Co. Slit or Machined Style #19 and 20

13. Teflon Impregnated White Asbestos Cloth

a. White chrystotile or blue African asbestos highly impregnated with teflon suspensoid.

b. Continuous service temperature to 500°F maximum.

c. Approved materials are as follow:

(1) Chicago Gasket Co. Style #JM-91 (White Asbestos)
(2) Clark Gasket Co. Style #3000 (White Asbestos)
(3) Clark Gasket Co. Style #2222 (Blue Asbestos)
(4) Johns Manville Style #JM-91 (White Asbestos)

14. Graphite Sheet (No Fillers or Binders)

a. All graphite sheet to 1/16" thickness.

b. Grafoil® registered trademark of Union Carbide.

c. Continuous service temperature to 6000°F maximum.

d. Approved materials are as follow:

(1) Chicago Wilcox Grafoil
(2) Johns Manville Grafoil
(3) Union Carbide Grafoil

15. There are a number of new non-asbestos gasket materials available from various manufacturers, and in some cases they can replace the asbestos materials. They will not be as compatible with as many commodities, and cost is approximately double. If a customer requests a non-asbestos material, consult with SCL/Engineering for compatibility for service intended.

a. The following is a list of the non-asbestos materials available:

(1) Anchor Packing Co. Style #443 Green Leaf
(2) Armstrong Cork Co. 8080 Blended Fiber w/NBR Binder
(3) Armstrong Cork Co. 8090 Blended Fiber w/NBR Binder
(4) Armstrong Cork Co. 9000 Blended Fiber w/NBR Binder
(5) Armstrong Cork Co. 9001 Blended Fiber w/Polychlorprene Binder
(6) Garlock 3000 Kevlar Arimid Fiber w/NBR Binder
(7) Garlock 3100 Kevlar Arimid Fiber w/SBR Binder
(8) Garlock 3200 Synthetic Fiber Blend w/SBR Binder
(9) Garlock 3300 Synthetic Fiber Blend w/CR Binder
(10) Johns Manville Red Devil Compressed Sheet
(11) Richard Klinger, Inc. Kevlar Armid Fiber w/NBR Binder
(12) Chesterton Kevlar Armid Fiber w/NBR Binder

B. Elastomeric - Flat, Molded and O-rings

1. Buna-N (NBR)

a. NBR - Butadiene acrylonitrile rubber.

b. 60 ± 10 durometer.

c. Continuous service temperature to 275°F maximum.

d. Approved materials are as follow:

(1) Acushnet O-ring Compound H14136
(2) American Gasket Co. Style #726 and O-rings
(3) Anchor Packing Co. Style #4614
(4) Armstrong Cork Co. Style #
(5) Chicago Wilcox Manufacturing Co. Gasket Cutter
(6) Clark Gasket Co. Black Nitrile Flat or Molded
(7) Garlock Style #8495
(8) Goshen Rubber Co. O-rings Compound #2109
(9) John Crane Packing Co. Style #900
(10) Johns Manville Style #JM-127 (JM126 35-45 Durro)
(11) Melrath Gasket Co.
(12) Minnesota Rubber Co. Style #3664 and O-rings
(13) Minor Rubber Co. and O-rings
(14) Parker Seal Co. O-rings Compound N674-20

2. Buna-N (NBR) - Food Grade

a. NBR - Butadiene acrylonitrile rubber.

b. 60 ± 10 Durometer.

c. Continuous service temperature to 275°F maximum.

d. Approved materials are as follow:

(1) Anchor Packing Co.
(2) Armstrong Cork Co.
(3) Chesterton Style #125
(4) Clark Gasket Co. White Nitrile
(5) Parker Seal Co. O-ring Compound N1000-70 (Gray)

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13. Teflon (PTFE)

a. PTFE - Polytetrafluoroethene

b. Pure virgin teflon material

c. 85J Rockwell Hardness.

d. Continuous service temperature to 500°F maximum.

e. Approved materials are as follow:

(1) Anchor Packing Co. Style #1182 and 1183
(2) Chesterton Style #2000
(3) Chicago Gasket Co. & O-rings
(4) Chicago Wilcox Manufacturing Co. Gasket Cutter
(5) Clark Gasket Co.
(6) Disogrin Ind. O-rings
(7) Halogen Seal Corp. & O-rings
(8) John Crane Packing Co. & O-rings

NOTE: To install teflon O-ring place item with groove and O-ring in boiling water to soften and expand teflon and heat part to which O-ring is to be applied. Heating part will prevent premature cooling of the O-ring. After application of the O-ring, immerse again in hot water to shrink O-ring in place. Due to flow and set characteristics of teflon, it should never be used for safety valve or vacuum relief valve seals.

14. Teflon Encapsulated O-rings

a. Use in place of teflon O-rings for greater resilience. Check with SCL/Engineering before use.

b. Resilient elastomer core with seamless encapsulation of virgin teflon.

c. 80 ± Durometer average overall - Elastomer 70 ± 5 durometer.

d. Continuous service temperature to 400°F maximum.

e. Approved materials are as follow:

(1) Chesterton Aw Co. Vanway Style #70 and Style #76
(2) Keystone Seal Co.
(3) Disogrin Ind.

15. Teflon Filled Gasket Material

a. PTFE - Pure Polytetrafluoroethene with filler.
b. Filled to reduce cold flow.
c. Hardness as indicated below.
d. Continuous service temperature to 500°F maximum.
e. Approved materials are as follow:
(1) Garlock Gylon - Fawn 25% Ceramic Filled, 95 Durometer
(2) Garlock Gylon - Blue 25% Ceramic Filled Fluffed, 75 Durometer
(3) Garlock Gylon - Black 25% Graphite Filled, 95 Durometer

16. Thiokol (PTR)

a. PTR - Polysulfide rubber.
b. 65 ± 10 durometer.
c. Continuous service temperature to 225°F maximum.
d. Approved materials are as follow:
(1) Anchor Packing LE-A-KOL Style #4617
(2) Minor Rubber Co. & O-rings
(3) Parker Seal Co. O-ring Compound T341-65
(4) Thiokol Chemical Corp.

17. Urethane (AU-EU)

a. AU or EU - Polyurethane rubber.
b. 70 ± 10 Durometer.
c. Continuous service temperature to 200°F maximum.
d. Approved materials are as follow:
(1) Acushnet O-ring Compound U10016
(2) American Cyanamid Cyanaprene
(3) Anchor Packing Co. Style #2620
(4) Disogrin Ind. O-rings
(5) DuPont Adiprene
(6) General Tire Co. Genthane
(7) Minnesota Rubber Co. Style #522FX
(8) Minor Rubber Co. & O-rings
(9) Parker Seal Co. O-ring Compound P642-70

Packings - Square Braided Type

C-1. Graphite and Carbon - Square braided

a. Graphite filament - interlocking braid.

b. Lubricant impregnated.

c. Continuous service temperature to 1200°F maximum.

d. Sizes 1/8" - 1" in 1/16" increments.

e. Approved materials are as follow:

(1) American Gasket Co. Style #175
(2) Anchor Packing Co. Ankorlok Style #1742
(3) Chesterton Style #375
(4) John Crane Packing Co. Style #1625GR
(5) Garlock Style #100
(6) Johns Manville Style AF-1

C-2. Asbestos and Graphite Impregnated - Interlocking braid

a. White long asbestos fibers impregnated with graphite.

b. Lubricated.

c. Continuous service temperature to 350°F maximum.

d. Sizes 1/8" - 1" in 1/16" increments.

e. Approved materials are as follow:

(1) American Gasket Co. Style #191
(2) Anchor Packing Co. Style #317
(3) Chesterton Style #315
(4) Garlock Style #115
(5) John Crane Packing Co. Style #1810
(6) Johns Manville Style #270

C-3. Teflon Fiber Impregnated With Teflon Suspensoid - Interlocking braid

a. Lubricated with TFE lubricant.

b. Continuous service temperature to 500°F maximum.

c. Sizes 1/8" to 1" in 1/16" increments.

d. Approved materials are as follow:

(1) American Gasket Co. Style #174
(2) Anchor Packing Co. Style #1334
(3) Chesterton Style #1724
(4) Garlock Style #E5898
(5) John Crane Packing Co. Style #C1045
(6) Johns Manville Style CX-1

C-4. Packing - Braided Teflon Tape

a. Alternate for teflon envelope and cut gaskets.

b. Can be used with a 316 stainless steel connector for butt joint available from Chesterton or can cut to form tongue type endless joint.

c. Continuous service temperature to 400°F maximum.

d. Sizes 1/2" to 2" wide x 1/8" thick.

e. Approved materials are as follow:

(1) Chesterton Style #382
(2) Chicago Gasket Co. Tuflex

C-5. Packing - Chevron Seal Type

a. Virgin teflon moulded V-rings.

b. Continuous service temperature to 500°F maximum.

c. Constructed with one header compression ring and one follower. Order sufficient compression rings to make up given stack height. Stack height is measured with ten (10) pound load applied to unconfined state.

d. Minimum of three compression rings per set is recommended.

e. Approved materials are as follow:

(1) Anchor Packing Co. Anchorflex Style #1135T
(2) Chicago Gasket Co. Series 6225
(3) Chesterton Halogen's Style #608
(4) Halogen Seal Co. Style #608
(5) John Crane Packing Co. Style #C-VU
(6) John Crane Packing Co. Style #C-VH
(7) Johns Manville Chempac V-rings
(8) Johns Manville Uneepac Ring Packing

D. Manufacturers and Suppliers - Alphabetical Listing by Company Name.

1. Acushnet
P. O. Box E016 Dept. TR
New Bedford, MA 02742
(617) 997-2811

2. American Cyanamid
Elastomer & Polymer Div.
Bound Brook, NJ 08805
(201) 831-1234

3. American Packing & Gasket Co.
Dept. T.
P. O. Box 213
Houston, TX 77001
(713) 675-5271

4. Anchor Packing Company
One Buttonwood Square North
Philadelphia, PA 19130
(215) 568-7808

5. Armstrong Cork Company
Industry Products Div.
1010 Concord
Lancaster, PA 17604
(717) 397-0611

6. Chesterton AW Company
Middlesex Industrial Park
Route 93
Stoneham, MA 02180
(617) 438-7000

7. Chicago Gasket Company
1285 WEST North Avenue
Chicago, IL 60622
(312) 679-3340

8. Chicago Wilcox Mfg. Co.
16928 South State Street
South Holland, IL 60473
(312) 339-5000

9. Clark Gasket Company
2707 South Wells
Chicago, IL 60616
(312) 842-1744

10. Disogrin Ind. (Teflon O-ring)
Perimeter Rd.
Manchester, NH 03103
(603) 669-4050

11. Durable Mfg. Co.
P. O. Box 1010
Paoli, PA 19301
(215) 647-6900

12. E. I. DuPont Company
Plastics Dept. D-13127
Wilmington, DE 19898
(302) 774-2421

13. Flexitallic Gasket Company
P. O. Box 680
Bellmawr, NJ 08102
(609) 931-2500

14. Forslunds - Chesterton Dist.
1719 Main Street
Kansas City, MO 64108
(816) 842-0868

15. Garlock, Inc.
1666 Division Street
Palmyra, NJ 14522
(315) 597-4811

16. Goshen Rubber Company
Dist. Dow Corning
P. O. Box 517
1525 South Tenth street
Goshen, IN 46526
(219) 533-1111

17. Halogen Seal Corp. (Teflon)
150 Gaylord
Elk Grove, IL 60007
(312) 439-7400

18. John Crane Packing Company
6400 Oakton Street
Morton Grove, IL 60053
(312) 967-2400

19. Johns Manville Sales Corp.
Sealing Components Dept.
Ken Caryl Ranch
Denver, CO 80217
(303) 979-1000

20. Melrath Gasket Co., Inc.
P. O. Box 9830
39th & Huntington Park
Philadelphia, PA 19140
(215) 223-6000

21. Minnesota Rubber Company
3630 Wood Dale Avenue
Minneapolis, MN 55416
(612) 927-1400

22. Minor Rubber Co., Inc.
49 Ackerman Street
Bloomfield, NJ 07003
(201) 338-6800

23. Nicolet-Ambler Div.
Wissahickon Avenue
Ambler, PA 19002
(215) 646-4000

24. Parker Seal Company (O-rings)
2360 Palumbo Drive
P. O. Box 11751
Lexington, KY 40512
(606) 269-2351

25. Precision Assoc., Inc. (O-rings)
742 North Washington
Minneapolis, MN 55401

26. Raybestos Manhattan, Inc.
100 Oakview Drive
Trumbull, CT 06611
(203) 371-0101

27. Sealing Specialists, Inc.
Chesterton Dist.
1721 South 7th Street
St. Louis, MO 63104
(314) 621-6210

28. Sealtite Corp. (Supplier/cutter)
1923 Washington Avenue.
St. Louis, MO
(314) 231-7724

29. Thiokol - Marketing Division
930 Lower Ferry Road
Trenton, NJ 08650
(609) 396-4001

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SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

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VI. Standard Gaskets for Various Commodities. If a specific commodity is not shown in Tables A or B, contact Engineering for instructions.

A. Gaskets for Pressure Cars

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-12 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Substrate
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ACROLEIN	A7	A1	A2	B5	B10	B1
ALUMINUM TRIETHYL	A6	A2	A8	B4	B1	B13
ALUMINUM TRIMETHYL	A6	A2	A8	B4	B1	B13
AMMONIA, ANHYDROUS	A1	A7	A6	B10	B5	B4
AMMONIUM NITRATE SOLUTION	A2	A7	A1	B1	B5	B10
AMYL MERCAPTAN	A3	A1	A13	B6	B10	B8
ARGON	A6	A7	A2	B4	B5	B1
BORON TRICHLORIDE	A2	A1	A7	B6	B7	B16
BORON TRIFLUORIDE	A2	A1	A7	B6	B7	B16
BROMINE	A14	Lead		B6	B7	B16
BUTADIENE	A2	A1	A7	B6	B7	B13
BUTANE	A2	A1	A7	B1	B10	B5
BUTYL LITHIUM	A2	A7	A13	B16	B17	B13
BUTYL MERCAPTAN	A7	A6	A13	B5	B4	B13
BUTYLENE	A7	A6	A13	B6	B7	B16
CARBON DIOXIDE	A2	A7	A6	B1	B5	B4
CHLORINE	A5	A3		B6	B10	B8
CHLOROPICRIN	A1	A6	A7	B10	B1	B6
DICHLORODIFLUOROMETHANE	A1	A2	A3	B10	B3	B6
DICHLOROMONOFLUOROMETHANE	A1	A2	A3	B10	B3	B6
DICHLOROTETRAFLUOROETHANE	A1	A2	A3	B10	B3	B6
DIMETHYL ETHER	A2	A1	A3	B1	B7	B12
ETHANE	A2	A1	A3	B1	B6	B7
ETHION	A7	A6	A13	B5	B4	B6
ETHYL ALUMINUM SESQUICHLORIDE	A7	A6	A13	B5	B4	B6
ETHYLAMINE ANHYDROUS	A6	A1	A2	B4	B10	B1
ETHYL CHLORIDE	A2	A7	A13	B1	B6	B7
ETHYLENE	A7	A2	A1	B5	B1	B10

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.B. (Cont'd)

(B. Gaskets for Non-pressure Cars - Cont'd)

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
CETYL ALCOHOL	A2	A1	A13	B1	B7	B6
CHLORAL	A7	B6	A1	B5	B4	B10
CHLORAL HYDRATE	A7	B6	A1	B5	B4	B10
CHLORDANE	A2	A3	A1	B6	B1	B7
CHLORINATED PARAFFIN	A2	A3	A1	B6	B1	B7
✓ CHLOROACETIC ACID SOLUTION	A7	A1	A6	B5	B10	B6
✓ CHLOROACETYL CHLORIDE	A7	A1	A6	B5	B10	B6
CHLOROANILINE	A7	A6	A1	B5	B4	B6
CHLOROBENZALDEHYDE	A7	A6	A13	B5	B4	B8
CHLOROBENZENE	A2	A13	C4	B6	B7	B16
CHLOROBENZENETHIOL	A2	A13	C4	B6	B7	B16
CHLOROBENZOTRIFLUORIDE	A1	A6	A7	B6	B7	B8
CHLOROFORM	A1	A6	A7	B6	B7	B8
CHLORO-IPC	A1	A6	A7	B6	B10	B4
CHLORONAPHTHALENE	A7	A2	A1	B6	B7	B8
CHLOROPHENOL	A7	A2	A13	B6	B7	B8
para-CHLOROPHENYL ISOCYANATE	A7	A2	A13	B6	B7	B8
CHLOROSULFONIC ACID	A3	A13	C4	B3	B13	B15
CHLOROTOLUENE	A7	A6	A2	B6	B5	B4
CITRIC ACID	A1	A2	A7	B10	B1	B5
CITRONELLA	A1	A3	A7	B10	B1	B5
CLAY SLURRY	A2	A3	A1	B1	B3	B10
COAL TAR	A2	A1	A7	B1	B10	B5
COAL TAR PITCH	A2	A1	A7	B1	B10	B5
COD LIVER OIL	A2	A7	A6	B1	B5	B4
CREOSOTE	A2	A1	A3	B1	B6	B7
CRESOL	A1	A3	A6	B6	B7	B8
CRESYL DIPHENYL PHOSPHATE	A1	A3	A6	B6	B7	B8
CRESYLIC ACID	A6	A7	A13	B6	B7	B8
CROTONALDEHYDE	A7	A1	A2	B5	B10	B8
CUMENE	A7	A2	A13	B6	B7	B8

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.A. (Cont'd)

(A. Gaskets for Pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non-Asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ETHYLENE OXIDE	A9			B5	B13	
ETHYL MERCAPTAN	A1	A3	A7	B6	B10	B8
HELIUM	A6	A1	A2	B4	B10	B1
HYDROCYANIC ACID	A7	A6	A2	B5	B4	B6
HYDROFLUORIC ACID, ANHYDROUS	A10	A11	A13	B8	B13	B15
HYDROGEN	A7	A1	A2	B5	B10	B1
HYDROGEN CHLORIDE	A6	A7	A1	B4	B5	B6
HYDROGEN SULFIDE	A7	A6	A1	B5	B4	B16
ISOBUTANE	A2	A1	A7	B1	B10	B5
ISOBUTYLENE	A7	A1	A2	B5	B10	B12
ISOPROPYL MERCAPTAN	A6	A7	A13	B4	B5	B13
LIQUEFIED PETROLEUM GAS	A2	A1	A7	B1	B10	B16
METHANE	A2	A7	A13	B1	B6	B16
METHYL ALUMINUM SESQUIBROMIDE	A7	A6	A13	B5	B4	B6
METHYLAMINE, ANHYDROUS	A6	A1	A2	B4	B10	B1
METHYL BROMIDE	A2	A7	A13	B6	B7	B1
METHYL CHLORIDE	A7	A1	A6	B6	B7	B5
METHYL MERCAPTAN	A7	A6	A13	B5	B4	B13
METHYL PARATHION	A7	A6	A13	B5	B4	B6
MONOCHLORODIFLUOROMETHANE	A1	A3	A4	B10	B3	B8
MONOCHLOROTETRAFLUOROETHANE	A1	A3	A4	B10	B3	B8
MOTOR FUEL ANIT-KNOCK COMPOUND	A2	A1	A7	B6	B1	B10
NITROGEN	A6	A7	A2	B4	B5	B1
NITROGEN DIOXIDE	A6	A7	A13	B4	B5	B13
NITROGEN FERTILIZER SOLUTION (above 40 psia)	A2	A6	A1	B1	B4	B10
OXYGEN	A1	A7	A6	B12	B6	B10
PARATHION	A7	A6	A13	B5	B4	B6
PHOSGENE	A6	A7	A1	B6	B7	B10

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.A. (Cont'd)

(A. Gaskets for Pressure Cars - Cont'd)

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
PROPANE	A2	A1	A13	B1	B6	B15
PROPYLENE	A1	A2	A7	B6	B7	B15
REFRIGERANT GASES	A1	A2	A3	B10	B1	B3
SODIUM	A2	A7	A6	B1	B5	B6
SULFUR DIOXIDE	A7	A6	A2	B5	B4	B1
TETRAETHYL LEAD	A2	A1	A7	B6	B1	B10
TIN TETRACHLORIDE	A2	A6	A7	B6	B1	B4
TRIMETHYLAMINE, ANHYDROUS	A7	A1	A6	B5	B10	B4
VINYL CHLORIDE	A7	A1	A2	B6	B5	B10

Asbestos & Metal

A-1 W/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chloroprene)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Facings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

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B. Gaskets for Non-pressure Cars

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non-Asbestos Materials
A-15 Grafoil Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Grafoil/Carbon
C-2 Asbestos/Grafoil
C-3 Teflon/Satinwaste
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ACETALDEHYDE	A7	A2	A6	B5	B4	B1
ACETAMIDE	A1	A2	A7	B10	B1	B5
ACETIC ACID	A7	A1	A6	B5	B10	B6
ACETIC ANHYDRIDE	A1	A7	A6	B10	B5	B4
ACETONE	A7	A6	C4	B5	B4	B16
ACETONE CYANOHYDRIN	A7	A6	C4	B5	B6	B4
ACETONITRILE	A7	A6	C4	B5	B6	B4
ACETOPHENONE	A7	A6	C4	B5	B4	B6
ACETYL CHLORIDE	A13	C4	--	B6	B7	B13
ACETYL TRIBUTYL CITRATE	A7	A6	A13	B5	B4	B13
ACRYLIC ACID	A7	A1	A2	B5	B10	B1
ACRYLIC EMULSION	A7	A1	A2	B5	B10	B1
ACRYLIC RESIN SOLUTION	A7	A1	A2	B5	B10	B1
"ACRYLOID" OIL ADDITIVE (in a flammable solvent)	A7	A6	A13	B5	B4	B16
"ACRYLOID" OIL ADDITIVE (in a nonflammable solvent)	A13	A2	C4	B6	B1	B7
ACRYLONITRILE	A13	A1	A3	B10	B3	B8
ADIPIC ACID SOLUTION	A1	A2	A6	B10	B1	B4
ADIPONITRILE	A13	A1	A3	B10	B3	B8
ADMIXTURES	A13	A1	A3	B10	B3	B8
ALDOL	A7	A2	A6	B5	B3	B1
ALFONIC	A7	A6	A2	B5	B4	B1
ALKYD RESIN	A1	A6	A2	B10	B4	B9
ALKYLATE	A7	A6	A1	B5	B4	B9
ALLYL ALCOHOL	A2	A1	A13	B1	B10	B4
ALLYL BROMIDE	A2	A1	A13	B1	B10	B4
ALLYL CHLORIDE	A6	A1	A2	B4	B10	B1
ALLYL TRICHLOROSILANE	A6	A1	A2	B4	B10	B1
ALUMINA TRIHYDRATE SLURRY	A6	A1	A2	B4	B10	B1
ALUMINUM ACETATE SOLUTION	A7	A6	A13	B6	B5	B4
ALUMINUM AMMONIUM SULFATE	A2	A1	A6	B1	B10	B4

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.B. (Cont'd)

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensate
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ALUMINUM CHLORIDE SOLUTION	A2	A7	A1	B1	B5	B10
ALUMINUM FLUORIDE SOLUTION	A2	A7	A1	B1	B5	B10
ALUMINUM SULFATE	A2	A7	A1	B1	B5	B10
ALUMINUM SULFATE (FOOD)	A4	A13	C4	B2	B11	B11
AMINOETHYLETHANOLAMINE	A6	A1	A2	B10	B1	B4
AMINOPHENOL SOLUTION	A6	A7	A13	B6	B7	B13
AMINOTHIAZOLE	A6	A6	A1	B5	B4	B10
AMMONIA, AQUA	A1	A2	A6	B10	B4	B5
AMMONIUM CARBONATE SOLUTION	A1	A7	A6	B10	B5	B4
AMMONIUM NITRATE SOLUTION	A2	A7	A1	B1	B5	B10
AMMONIUM SULFAMATE SOLUTION	A2	A7	A1	B1	B5	B10
AMMONIUM SULFATE SOLUTION	A2	A7	A1	B1	B5	B10
AMMONIUM SULFIDE SOLUTION	A2	A7	A1	B1	B5	B10
AMMONIUM SULFITE SOLUTION	A2	A7	A1	B1	B5	B10
AMMONIUM THIOCYANATE	A13	C4	--	B6	B7	B16
AMMONIUM THIOSULFATE SOLUTION	A2	A7	A1	B1	B5	B10
AMYL ACETATE	A7	A13	C4	B5	B13	B15
AMYL CHLORIDE	A7	A1	A13	B5	B7	B13
AMYL NITRATE	A7	A6	A13	B5	B4	B8
AMYL NITRITE	A7	A6	A13	B5	B4	B8
AMYL PHENOL	A6	A7	A13	B6	B7	B13
AMYL TRICHLOROSILANE	A1	A3	A13	B6	B10	B1
AMYLENE	A2	A1	A13	B1	B6	B16
ANILINE	A7	A6	A1	B5	B4	B6
ANIMAL FEED SOLUTION	A2	A6	A1	B1	B4	B10
ANIMAL OILS	A7	A6	A13	B5	B4	B13
ANTIMONY PENTACHLORIDE	A6	A7	A13	B4	B5	B6
AROCHLOR	A7	A6	A13	B6	B5	B12
AROMATIC CONCENTRATE	A2	A1	A13	B1	B6	B7
ARSENIC ACID	A7	A2	A1	B5	B1	B10
ASPHALT, LIQUID	A2	A1	A3	B6	B16	B2

(B. Gaskets for Non-pressure Cars - Cont'd)

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ATRAZINE	A1	A2	A13	B6	B7	B13
BANVEL D	A1	A2	A13	B6	B7	B13
BARIUM CHLORATE SOLUTION	A1	A2	A6	B10	B1	B2
BASAGRAN	A1	A2	A13	B6	B7	B13
BENZALDEHYDE	A7	A6	A13	B5	B4	B8
BENZENE	A2	A13	C4	B6	B16	B13
BENZENE PHOSPHORUS DICHLORIDE	A7	A1	A2	B6	B8	B10
BENZENE SULFONIC ACID	A7	A1	A2	B6	B8	B10
BENZOIC ACID SOLUTION	A7	A1	A2	B6	B7	B16
BENZOYL CHLORIDE	A7	A1	A2	B6	B7	B13
BENZYL ALCOHOL	A7	A6	A1	B6	B5	B4
BENZYL CHLORIDE	A7	A1	A2	B6	B7	B5
BIPHENYL	A7	A1	A2	B6	B7	B16
BISPHENOL SOLUTION	A7	A1	A2	B6	B7	B16
BORIC ACID SOLUTION	A2	A1	A7	B1	B10	B5
BROMOCHLOROMETHANE	A2	A1	A7	B6	B7	B13
BROMOCHLOROPROPANE	A2	A1	A7	B6	B7	B13
BUTYL ACETATE	A7	A6	A13	B5	B4	B13
normal-BUTYL ACRYLATE	A3	A6	A7	B16	B4	B13
BUTYL ALCOHOL	A2	A1	A6	B1	B10	B6
BUTYLAMINE	A7	A2	A4	B5	B1	B13
BUTYL BENZYL PHTHALATE	A7	A2	A4	B5	B1	B13
BUTYL CARBITOL	A7	A6	A1	B5	B4	B10
BUTYL CELLOSOLVE	A7	A6	A1	B5	B4	B12
BUTYL CHLORIDE	A2	A1	A7	B6	B7	B13
tert-BUTYL-m-CRESOL	A2	A1	A7	B6	B7	B5
BUTYL ETHER	A2	A7	A13	B16	B17	B13
BUTYL GLYCOL	A7	A6	A13	B6	B16	B12
BUTYL LACTATE	A6	A7	A13	B6	B16	B12
BUTYL METHACRYLATE	A6	A13	C4	B16	B13	B15
BUTYL OLEATE	A7	A6	A1	B6	B5	B4

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 W/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomeric

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Kapton (HN)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Aramid
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
BUTYL PHENOL	A7	A1	A2	B6	B5	B16
BUTYL PROPIONATE	A5	A1	A3	B6	B4	B10
BUTYL SEBACATE	A7	A6	A13	B6	B5	B4
BUTYL STEARATE	A2	A7	A13	B6	B16	B1
BUTYL TRICHLOROSILANE	A7	A6	A13	B5	B4	B6
BUTYRALDEHYDE	A7	A6	A13	B5	B4	B16
BUTYRIC ACID	A7	A6	A13	B6	B4	B5
BUTYROLACTONE	A7	A6	A13	B5	B4	B16
BUTYRONITRILE	A7	A5	A13	B5	B4	B7
CALCIUM ARSENATE	A7	A1	A2	B5	B10	B1
CALCIUM ARSENITE	A7	A1	A2	B5	B10	B1
CALCIUM CARBONATE SLURRY	A2	A7	A1	B1	B5	B10
CALCIUM CHLORIDE SOLUTION	A2	A7	A1	B1	B5	B10
CALCIUM CITRATE	A1	A7	A2	B10	B5	B1
CALCIUM HYDROXIDE SLURRY	A2	A7	A1	B1	B5	B10
CALCIUM HYPOCHLORITE	A7	A6	A2	B5	B4	B6
CAMPHENE	A2	A7	A6	B6	B7	B16
CAPRIC ACID	A2	A7	A3	B1	B5	B3
CAPROLACTAM	A13	A12	C4	B13	B15	
CARAMEL COLORING	A4	A13	C4	B2	B11	B13
CARBARYL	A7	A6	A1	B6	B7	B5
CARBITOL SOLVENT	A7	A2	A1	B5	B1	B6
CARBOFURAN	A7	A13	C4	B16	B5	B13
CARBON BLACK OIL	A1	A2	A6	B10	B1	B4
CARBON DISULFIDE	A3	A7	A1	B6	B7	B16
CARBON TETRACHLORIDE	A2	A3	A13	B6	B1	B7
CASTOR OIL	A4	A13	C4	B2	B11	B13
CELLOSOLVE ACETATE	A7	A6	A13	B5	B4	B7
CELLOSOLVE SOLVENT	A7	A6	A13	B5	B4	B7
CELLULOSE ACETATE	A7	A6	A13	B5	B4	B16
CEMENT CLINKER GRINDING COMPOUND	A7	B6	A1	B5	B4	B10

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and SLS S.S..
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-12 Teflon (PTFE)
B-13 Teflon Encapsulated O-ring
B-15 Teflon Filled Materials
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
CYCLOHEXANE	A2	A1	A7	B1	B6	B7
CYCLOHEXANOL	A2	A1	A7	B1	B6	B7
CYCLOHEXANONE	A6	A7	A13	B5	B4	B16
CYCLOHEXENE	A2	A1	A7	B1	B6	B7
CYCLOHEXYLAMINE	A6	A7	A13	B5	B4	B16
CYCLOPENTADIENE	A2	A1	A7	B1	B6	B7
CYCLOPENTANE	A2	A1	A7	B1	B6	B7
CYCLOPROPANE CARBONITRILE	A2	A1	A7	B1	B6	B7
2,4-D	A7	A2	A13	B6	B7	B8
2,4-D, BUTYL ESTER	A7	A2	A13	B6	B7	B8
2,4-D, ISOOCTYL ESTER	A7	A2	A13	B6	B7	B8
D-D SOIL FUMIGANT	A7	A2	A13	B6	B7	B8
DECANOL	A2	A1	A13	B1	B6	B7
DIACETONE ALCOHOL	A7	A6	A1	B5	B6	B10
DIALLYLAMINE	A7	A2	A1	B5	B1	B10
DIAMINODIPHENYL METHANE	A7	A6	A1	B6	B7	B13
DIAMMONIUM PHOSPHATE SOLUTION	A1	A2	A6	B10	B1	B4
DIAMYLAMINE	A7	A2	A1	B5	B1	B10
DIAMYL PHENOL	A7	A6	A1	B6	B7	B13
DIAMYL PHTHALATE	A6	A7	A2	B4	B5	B10
DIAZINON	A2	A1	A6	B6	B7	B1
DIBENZYL SEBACATE	A7	A6	A1	B6	B5	B4
DIBROMOCHLOROPROPANE	A7	A6	A2	B6	B5	B7
DIBUTYLAMINE	A1	A13	C4	B10	B13	B15
DIBUTYL CRESOL	A7	A6	A1	B16	B17	B5
DIBUTYL FUMARATE	A7	A6	A1	B5	B4	B1
DIBUTYL MALEATE	A7	A6	A1	B5	B4	B1
DIBUTYL PHTHALATE	A7	A6	A13	B5	B7	B16
DIBUTYLTIN DILAURATE	A7	A6	A1	B5	B4	B1
DICAPRYL PHTHALATE	A6	A7	A2	B4	B5	B10
DICHLOROACETALDEHYDE	A7	A6	A13	B5	B4	B8

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 H/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Salic
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
DICHLOROANILINE	A6	A1	A2	B4	B7	B16
ortho-DICHLOROBENZENE	A2	A13	C4	B6	B7	B13
para-DICHLOROBENZENE	A2	A13	C4	B6	B7	B16
DICHLOROBUTANE	A2	A13	C4	B6	B1	B7
DICHLOROETHYLENE	A6	A13	C4	B4	B6	B7
DICHLOROMETHYL ETHER	A7	A2	C4	B16	B17	B5
DICHLOROPHENOL	A7	A2	A13	B6	B7	B8
DICHLOROPROPIONIC ACID	A7	A6	A1	B5	B4	B10
DICYCLOHEXYLAMINE	A2	A13	C4	B1	B13	B15
DICYCLOPENTADIENE	A2	A13	C4	B6	B7	B13
DIESEL OIL	A2	A1	A13	B1	B6	B7
DIETHANOLAMINE	A7	A1	A2	B5	B10	B1
DIETHYLAMINE	A7	A2	A1	B5	B1	B10
DIETHYLALUMINUM CHLORIDE	A2	A7	A1	B1	B5	B10
DIETHYLBENZENE	A2	A13	C4	B6	B7	B16
DIETHYL CARBONATE	A1	A2	A6	B10	B1	B4
DIETHYLENE GLYCOL	A7	A2	A1	B5	B1	B10
DIETHYLENE GLYCOL DIETHYL ETHER	A1	A2	A13	B16	B7	B13
DIETHYLENE GLYCOL MONOETHYL ETHER ACETATE	A1	A2	A13	B16	B7	B13
DIETHYLENE GLYCOL MONOMETHYL ETHER	A1	A2	A13	B16	B7	B13
DIETHYLENETRIAMINE	A7	A1	A6	B5	B10	B4
DIETHYLETHANOLAMINE	A7	A1	A6	B5	B10	B4
DIETHYL KETONE	A7	A6	A13	B5	B4	B13
DIETHYL PHOSPHITE	A7	A6	A13	B5	B4	B6
DIETHYL PHOSPHOROCHLORIDO-THIONATE	A7	A6	A13	B5	B4	B6
DIETHYL PHTHALATE	A7	A6	A13	B5	B4	B7
DIETHYL SULFATE	A6	A2	A3	B4	B1	B3
DIFLUOROETHANE	A6	A1	A7	B4	B6	B7
DIISOBUTYL CARBINOL	A7	A6	A1	B5	B4	B10

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 W/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Satamaloid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
DIISOBUTYLENE	A7	A6	A13	B6	B7	B16
DIISOBUTYL KETONE	A7	A6	A13	B5	B4	B16
DIISOBUTYL PHTHALATE	A7	A6	A13	B5	B4	B16
DIISODECYL PHTHALATE	A7	A6	A13	B5	B4	B16
DIISOOCTYL AZELATE	A6	A1	A2	B4	B10	B1
DIISOOCTYL PHTHALATE	A7	A6	A13	B5	B4	B16
DIISOPROPANOLAMINE	A7	A1	A6	B4	B10	B4
DIISOPROPYLAMINE	A7	A1	A6	B5	B10	B4
DILAURYL - 3,3'- THIODIPROPIONATE	A7	A6	A13	B5	B4	B6
DIMER ACID	A1	A2	A7	B6	B10	B1
N,N-DIMETHYL ACETAMIDE	A7	A1	A6	B5	B10	B4
DIMETHYLAMINE, ANHYDROUS	A7	A1	A6	B5	B10	B4
DIMETHYLAMINE, AQUEOUS	A7	A1	A6	B5	B10	B4
N,N-DIMETHYLANILINE	A7	A1	A6	B5	B10	B4
DIMETHYLDICHLOROSILANE	A7	A1	A6	B5	B10	B4
DIMETHYLETHANOLAMINE	A7	A1	A6	B5	B10	B4
N, N-DIMETHYL FORMAMIDE	A7	A2	A6	B5	B1	B4
DIMETHYL HEXANE	A2	A1	A3	B1	B10	B3
DIMETHYL HYDRAZINE	A6	A1	A2	B4	B10	B1
DIMETHYLHYDROXYLAMINE	A7	A1	A6	B6	B5	B10
DIMETHYLOL PROPIONIC ACID SOLUTION	A7	A6	A1	B5	B4	B10
O,O-DIMETHYL PHOSPHOROCHLORIDOTHIOATE	A7	A6	A13	B5	B4	B6
DIMETHYL PHTHALATE	A7	A6	A13	B5	B4	B7
DIMETHYL SEBACATE	A6	A7	A13	B6	B4	B5
DIMETHYL SULFATE	A1	A2	A6	B10	B1	B4
DIMETHYL SULFIDE	A1	A2	A6	B10	B1	B4
DIMETHYL SULFOXIDE	A1	A2	A6	B10	B1	B4
ortho-DINITROBENZENE	A2	A13	C4	B6	B7	B16
DINITROCHLOROBENZENE	A2	A13	C4	B6	B7	B16
DINITROCHLOROBENZOTRIFLUORIDE	A2	A13	C4	B6	B7	B16

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 New Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspension
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
DINITROPHENOL	A6	A7	A3	B6	B7	B13
DINITROTOLUENE	A1	A7	A3	B6	B10	B7
DIOCTYL ADIPATE	A7	A6	A1	B5	B4	B6
DIOCTYL AZELATE	A6	A1	A2	B4	B10	B1
DIOCTYL MALEATE	A7	A6	A1	B5	B4	B1
DIOCTYL PHTHALATE	A7	A6	A1	B5	B4	B6
DIOCTYL SEBACATE	A7	A6	A1	B5	B4	B6
DIOXANE	A7	A6	A13	B5	B4	B13
DIPENTENE	A2	A13	C4	B6	B5	B16
DIPHENYLAMINE	A1	A2	A6	B6	B7	B16
DIPHENYLDICHLOROSILANE	A1	A2	A6	B6	B7	B16
DIPROPYLENE GLYCOL	A1	A2	A6	B10	B1	B4
DIPROPYLENE GLYCOL DIBENZOATE	A1	A2	A6	B10	B1	B4
DIPROPYLENE GLYCOL MONOMETHYL ETHER	A2	A1	A3	B1	B7	B12
DISODIUM EDTA SOLUTIONS	A2	A3	A7	B1	B3	B5
DISODIUM PHOSPHATE	A2	A3	A7	B1	B3	B5
DISULFIDE OIL	A7	A2	A1	B5	B1	B10
DITRIDECYLPHTHALATE	A7	A6	A13	B5	B4	B16
DIVINYLBENZENE	A2	A13	C4	B6	B7	B16
DODECANOL	A6	A1	A2	B4	B10	B1
DODECYLANILINE	A6	A7	A2	B4	A5	A1
DODECYLBENZENE	A2	A13	C4	B6	B7	B16
DODECYLBENZENESULFONIC ACID	A3	A13	C4	B3	B13	B15
DODECYL MERCAPTAN	A1	A13	C4	B5	B7	B13
DODECYLPHENOL	A7	A6	A13	B5	B7	B13
DODECYLTRICHLOROSILANE	A1	A2	A6	B6	B7	B16
DOWTHERM A	A7	A1	A3	B5	B10	B3
DRILLING MUD	A2	A3	A1	B1	B3	B10
DRIPOLENE (UNION CARBIDE)	A7	A6	A1	B6	B5	B4

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.B. (Cont'd)

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (PVMQ)
B-13 Teflon (PTFE)
B-14 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspension
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
DUAL	A1	A2	A6	B6	B7	B16
DUTREX	A1	A3	A6	B6	B7	B8
DYFONATE	A1	A3	A6	B6	B7	B8
EPICHLOROHYDRIN	A7	A6	A13	B5	B4	B13
EPOXY RESIN, UNCURED	A7	A1	A6	B5	B10	B4
EPTAM	A7	A1	A6	B5	B10	B4
ERADICATOR	A7	A1	A6	B5	B10	B4
ESTER GUM	A1	A7	A6	B1	B5	B4
ETHANOLAMINE	A1	A7	A6	B10	B5	B4
ETHYL ACETATE	A7	A6	A1	B5	B4	B12
ETHYL ACETOCETATE	A7	A6	A13	B5	B4	B12
ETHYL ACRYLATE	A7	A6	A13	B5	B4	B12
ETHYL ALCOHOL	A7	A2	A1	B5	B1	B10
ETHYLAMINE AQUEOUS	A6	A1	A2	B4	B10	B1
ETHYL AMYL KETONE	A7	A6	A13	B5	B4	B16
N-ETHYLANILINE	A7	A1	A6	B5	B10	B4
ETHYLBENZENE	A2	A13	C4	B6	B7	B16
ETHYL BROMIDE	A7	A2	A1	B6	B1	B7
ETHYL BUTANOL	A7	A2	A1	B5	B1	B10
ETHYL BUTYL KETONE	A7	A6	A13	B5	B4	B16
S-ETHYL-N-CYCLOHEXYL-N-ETHYLTHIOCARBAMATE	A7	A1	A3	B6	B7	B5
ETHYL DICHLOROSILANE	A1	A2	A7	B6	B10	B1
ETHYLENE CHLOROBROMIDE	A7	A6	A13	B6	B5	B4
ETHYLENE CHLOROHYDRIN	A1	A2	A7	B6	B10	B1
ETHYLENE DIAMINE	A7	A2	A1	B5	B1	B10
ETHYLENE DIBROMIDE	A7	A2	A1	B6	B1	B7
1,2-ETHYLENE DICHLORIDE	A6	A7	A13	B6	B4	B7
ETHYLENE GLYCOL	A7	A1	A2	B5	B10	B1

SUBJECT: Gaskets - All Tank Car Nozzles and Fittings - Selection and Application

SECTION VI.B. (Cont'd)

(B. Gaskets for Non-pressure Cars - Cont'd)

Asbestos & Metal

A-1 w/Neoprene Binder (CR)
A-2 w/BUNA-N Binder (NBR)
A-3 w/BUNA-S Binder (SBR)
A-4 w/BUNA-S Binder (Food)
A-5 w/BUNA-S Binder (Chlorine)
A-6 w/Butyl Binder (IIR)
A-7 w/Ethylene Prop. Binder (EPR)
A-8 Spiral w/304 Stainless Steel
A-9 Spiral w/TFE and 316 S.S.
A-10 Copper/Solid
A-11 Copper Jacketed
A-12 Teflon Envelope
A-13 TFE Impregnated Asbestos
A-14 Non Non-asbestos Materials
A-15 Graphite Sheet

Elastomerics

B-1 BUNA-N (NBR)
B-2 BUNA-N (NBR) Food
B-3 BUNA-S (SBR)
B-4 Butyl (IIR)
B-5 Ethylene Prop. (EPR)
B-6 Viton A (FKM)
B-7 Fluorosilicone (FVMQ)
B-8 Hypalon (CSM)
B-9 Rubber (NR)
B-10 Neoprene (CR)
B-11 Silicone (FVMQ)
B-12 Teflon (PTFE)
B-13 Teflon Encapsulated O-ring
B-15 Teflon Filled Material
B-16 Thiokol (PTR)
B-17 Urethane (AU-EU)

Packings

C-1 Graphite/Carbon
C-2 Asbestos/Graphite
C-3 Teflon/Suspensoid
C-4 Teflon Tape
C-5 Teflon V-rings

COMMODITY	ASBESTOS GASKET			FLAT ELASTOMERIC OR O-RING		
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	A2	A1	A3	B1	B7	B12
ETHYL ETHER	A2	A7	A6	B16	B17	B13
ETHYL FORMATE	A1	A7	A6	B6	B7	B10
2-ETHYL HEXALDEHYDE	A7	A6	A13	B5	B4	B8
2-ETHYLHEXOIC ACID	A7	A6	A13	B5	B4	B8
2-ETHYLHEXYL ACRYLATE	A7	A6	A13	B5	B4	B12
ETHYLIDENE NORBORNENE	A7	A6	A13	B6	B7	B10
ETHYL METHACRYLATE	A7	A6	A1	B16	B13	--
ETHYL METHYL ETHER	A2	A7	A6	B16	B17	B13
ETHYL MORPHOLINE	A7	A6	A13	B5	B4	B8
ETHYL NITRATE	A6	A1	A2	B4	B10	B1
ETHYL NITRITE	A6	A1	A2	B4	B10	B1
ETHYL OXALATE	A6	A7	A1	B6	B7	B4
ETHYL PHOSPHONOTHIODICHLORIDE	A6	A7	A13	B6	B4	B7
ETHYL SILICATE	A7	A1	A2	B5	B10	B1
ETHYL TOLUIDINE	A7	A6	A2	B5	B4	B2
ETHYL TRICHLOROSILANE	A7	A1	A2	B5	B10	B1
FATTY ACID	A1	A2	A7	B6	B10	B1
FATTY ALCOHOL	A1	A2	A7	B6	B10	B1
FATTY AMINE	A1	A2	A7	B6	B10	B1
FERRIC CHLORIDE SOLUTION	A2	A7	A6	B1	B5	B4
FERROUS SULFATE SOLUTION	A2	A7	A6	B1	B5	B4
FISH OIL	A2	A6	A1	B1	B4	B10
FLUOPHOSPHORIC ACID	A7	A6	A3	B5	B4	B6
FLUOROSULFONIC ACID	A7	A6	A3	B5	B4	B6
FOOTS	A2	A6	A1	B1	B4	B10
FORMALDEHYDE SOLUTION	A7	A6	A1	B5	B4	B10