PLAINTIFF'S EXHIBIT

FBW-2

IN THE COURT OF COMMON PLEAS
CUYAHOGA COUNTY, OHIO

IOLA E. BERRY, INDIVIDUALLY, AND AS PERSONAL REPRESENTATIVE OF THE HEIRS AND ESTATE OF LUTHER AUGUSTINE BERRY, DECEASED	)	CASE NO. 429667
	)	JUDGE HARRY A. HANNA
Plaintiff	)	
vs.	)	
A-BEST PRODUCTS COMPANY, ET AL.	)	
Defendants	)	

DEFENDANT, F.B. WRIGHT COMPANY'S RESPONSES TO PLAINTIFF'S REQUESTS FOR PRODUCTION OF DOCUMENTS PROPOUNDED TO F.B. WRIGHT COMPANY

Defendant, F.B. Wright Company hereby answers the Plaintiff's Requests for Production of Documents in accordance with Ohio Civil Rule 34.

PRELIMINARY STATEMENT AND GENERAL OBJECTIONS

F.B. Wright Company, at all times relevant hereto, has been a distributor of industrial rubber and plastics products. It has never been a manufacturer of any product and therefore objects to any interrogatory that implies or suggests that this Defendant manufactured any asbestos or asbestos-containing product, which it did not. Defendant objects to the "Instructions" and "Definitions" segments of Plaintiff's First Request for Production of Documents to Each Named Defendant to the extent that either seeks to impart on this answering Defendant any requirements or obligations beyond those which

are required under the Ohio Rules of Civil Procedure or to the extent they define terms other than as those terms are commonly understood or defined under Ohio Law.

Because F.B. Wright Company did not distribute any asbestos-containing product after 1979, Defendant objects to any Request for Production which seeks the discovery of, or otherwise implies, information relevant to customers and/or distributees beyond the applicable time of Defendant's sales. Defendant further objects to Plaintiffs' First Request for Production of Documents to Each Named Defendant to the extent they seek any information regarding sales to entities other than the Plaintiffs' employers as those employers are identified on Exhibit "A", attached to Plaintiffs' discovery requests. F.B. Wright Company reserves its right to amend these responses in the event new and/or more accurate information becomes available.

Defendant, F.B. Wright Company further objects to Plaintiffs' First Request for Production of Documents to Each Named Defendant to the extent they seek information which is protected by the Attorney/Client privilege, the Attorney Work Product Doctrine, or as trial preparation material, as well as to the extent they seek the opinions of expert witnesses which are beyond the scope of discovery within this stage of the Court's Case Management Plans.

Defendant F.B. Wright Company incorporates this Preliminary Statement and General Objections into each and every interrogatory answer, below, without repeating and restating them individually.

Without waiving any of these objections, and subject thereto, Defendant, F.B. Wright Company hereby responds to the Plaintiffs' First Request for Production of Documents to Each Named Defendant, as follows.

REQUEST FOR PRODUCTION NO. 1

Please produce a true and correct copy of each photograph or picture of each asbestos-containing product that Defendant has ever mined, manufactured, sold, marketed, installed, and/or distributed.

RESPONSE: **Defendant, F.B. Wright Company has no photographs or pictures of any asbestos-containing product it distributed. F.B. Wright Company has never mined, manufactured or installed any asbestos-containing product.**

REQUEST FOR PRODUCTION NO. 2:

Please produce a true and correct copy of each document which reflects sales of those asbestos-containing products listed in response to Interrogatory No. 5 to any of the job sites listed on Exhibit A, attached hereto.

RESPONSE: **Upon information and belief, Defendant F.B. Wright Company did not make any sales of any asbestos-containing products to any of the job sites listed on Exhibit A and therefore the response to this request is not applicable.**

REQUEST FOR PRODUCTION NO. 3:

Please produce a true and correct copy of each document which reflects sales of Defendant's asbestos-containing products to companies that may have distributed, packaged, labeled, and/or sold Defendant's asbestos-containing products.

RESPONSE: **Objection. This request suggests facts not in evidence and is otherwise misleading and ambiguous. Notwithstanding this objection, and not waiving it, the answer to this Request is none.**

REQUEST FOR PRODUCTION NO. 4:

Please produce a true and correct copy of each record and/or contract which reflects the sales of Defendant's asbestos-containing products to any of the job sites listed on Exhibit A, attached hereto.

RESPONSE: **See response to Request for Production No. 2.**

REQUEST FOR PRODUCTION NO. 5:

Please produce a true and correct copy of each record and/or contract which reflects the sales of Defendant's asbestos-containing products to distributors and marketers who may have called on any of the job sites listed on Exhibit A, attached hereto.

RESPONSE: **Defendant F.B. Wright Company knows of no sales of any asbestos-containing products to distributors or marketers who may have called on any of the job sites on Exhibit A, and therefore the response to this Request is not applicable.**

REQUEST FOR PRODUCTION NO. 6:

Please produce a true and correct copy of each contract and/or work order that reflects contracts for Defendant to have asbestos-containing products installed or removed at any of the job sites listed on Exhibit A, attached hereto.

RESPONSE: **None; not applicable.**

REQUEST FOR PRODUCTION NO. 7:

Please produce a true and correct copy of each work order and contract that reflects contract business between Defendant and any of the job sites listed on Exhibit A, attached hereto, for the application of asbestos-containing products.

RESPONSE: **None; not applicable.**

REQUEST FOR PRODUCTION NO. 8:

Please produce a true and correct copy of each document relating to the design and preparation of the asbestos-containing products listed in Defendant's answer to Interrogatory No. 5.

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 9:

For each product listed in response to Interrogatory No. 5, please produce a copy of all tests that were conducted to determine any potential health hazards involved in its use or exposure (this Request for Production relates to Plaintiff's Interrogatory No. 18 previously propounded to Defendant in this litigation).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 10:

Please produce a true and correct copy of all documents relating to the testing of any product which Defendant listed in response to Interrogatory No. 5 (this Request for Production relates to Plaintiff's Interrogatory No. 19 previously propounded to Defendant in this litigation).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 11:

Please produce a true and correct copy of all tests which Defendant conducted and/or has in its possession to determine potential health hazards involved in the use of or exposure to asbestos products listed in response to Interrogatory No. 5 (this Request for Production relates to Plaintiff's Interrogatory No. 21 previously propounded to Defendant in this litigation).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 12:

Please produce a true and correct copy of all studies which Defendant conducted or caused to be conducted concerning the effects of the inhalation of asbestos dust and/or fibers in workers or other persons using, working with and/or around, installing and/or applying any of the asbestos products mined, manufactured, sold, distributed, marketed, installed and/or relabelled for distribution by Defendant or Defendant's predecessor (this Request for Production relates to Plaintiff's Interrogatory No. 22 previously propounded to Defendant in this litigation).

RESPONSE: **Objection. This Request is vague, ambiguous and misleading to the extent that it implies that the F.B. Wright Company was a manufacturer or installer of any asbestos-containing product, or that it had a predecessor, neither of which is correct. Notwithstanding this objection, however, and not intending to waive it, the response to this request for production is not applicable.**

REQUEST FOR PRODUCTION NO. 13:

Please produce a true and correct copy of all documents relating to any studies made or caused to be made by Defendant, to determine whether the asbestos-containing products mined, manufactured, sold, marketed, installed or distributed by Defendant or Defendant's predecessor would be hazardous to people (this Request for Production relates to Plaintiff's Interrogatory No. 23 previously propounded to Defendant in this litigation).

RESPONSE: **See response to Request for Production No. 12.**

REQUEST FOR PRODUCTION NO. 14:

Please produce a true and correct copy of all tests in the field which Defendant conducted or caused to be conducted to determine the nature and extent of asbestos dust and/or fiber exposure to insulators, applicators, fellow employees or other workers removing and/or tearing out asbestos-containing products (this Request for Production relates to Plaintiff's Interrogatory No. 24 previously propounded to Defendant in this litigation).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 15:

Please produce a true and correct copy of each test which Defendant conducted or caused to be conducted regarding the quantity, quality, or threshold limit value of asbestos dust, fibers, and/or particles to which workers were exposed while using, working with and/or around, installing and/or applying Defendant's asbestos-containing products (this Request for Production relates to Plaintiff's Interrogatory No. 3 1 previously propounded to Defendant in this litigation).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 16:

For each product listed in response to Interrogatory No. 5, please produce a true and correct copy of all promotional or sales material including, but not limited to, brochures, pamphlets, catalogs, packaging, or other written materials of any kind or character.

RESPONSE: **See documents produced herewith labeled FBW 001 - FBW 306.**

REQUEST FOR PRODUCTION NO. 17:

Please produce a true and correct copy of all warnings, cautions, caveats or directions concerning the possible health effects of the products listed in response to Interrogatory No. 5 (this Request for Production relates to Plaintiff's Interrogatory No. 41 previously propounded to Defendant).

RESPONSE: **Objection. Defendant is unaware of the existence of any documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 18:

Please produce a true and correct copy of all written materials prepared by Defendant or Defendant's predecessors or any of Defendant's subsidiaries indicating how the products listed in response to Interrogatory No. 5 should be used or maintained by the ultimate user (this Request for Production relates to Plaintiff's Interrogatory No. 43 previously propounded to Defendant).

RESPONSE: **Objection. This Request is misleading in that it implies Defendant prepared such written materials which is incorrect. No such written materials were prepared by Defendant F.B. Wright Company.**

REQUEST FOR PRODUCTION NO. 19:

Please produce a true and correct copy of all notices received by Defendant prior to 1968 that any person was claiming injury or had sustained an abnormal x-ray reading as a result of using asbestos-containing products mined, manufactured, sold, marketed, installed, or distributed by Defendant (this Request for Production relates to Plaintiff's Interrogatory No. 48 previously propounded to Defendant).

RESPONSE: **Objection. This request is ambiguous and misleading in that it implies that Defendant did receive notices prior to 1968 of personal injuries claimed from the use of asbestos-containing products distributed by F.B. Wright Company. Upon information and belief, no such notice was ever received prior to 1968.**

The request is further misleading in its characterization that Defendant F.B. Wright Company manufactured or installed any asbestos-containing products, which it did not. Notwithstanding this objection, and intending to waive them, the response to this request for production is unknown.

REQUEST FOR PRODUCTION NO. 20:

Please produce a true and correct copy of statements from all people with knowledge of relevant facts to this lawsuit.

RESPONSE: **Objection. Attorney work product doctrine. Notwithstanding this objection, however, and not intending to waive it, the answer to this interrogatory is none.**

REQUEST FOR PRODUCTION NO. 21:

Please produce a true and correct copy of all documents which mention, allude or refer to tests performed on breathing devices to prevent the inhalation of asbestos dust and/or fibers (this Request for Production relates to Plaintiff's Interrogatory No. 52 previously propounded to Defendant).

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 22:

Please produce a true and correct copy of all reports by experts that Defendant may call upon at the trial of this case (this Request for Production relates to Plaintiff's Interrogatory No. 5 3 previously propounded to Defendant).

RESPONSE: **Undecided. This response will be timely supplemented in accordance with the Court's Case Management Plans.**

REQUEST FOR PRODUCTION NO. 23:

Please produce a true and correct copy of all policies of insurance under which any person carrying on an insurance business may be liable to satisfy part or all of a judgment which may be entered in the action or to indemnify or reimburse for payments made to satisfy the judgment.

RESPONSE: **Plaintiff's counsel is requested to contact Defendants' counsel with respect to a response to this request for production.**

REQUEST FOR PRODUCTION NO. 24:

Please produce a true and correct copy of all notices received by Defendant prior to 1968 that any person was claiming an injury or had sustained an abnormal x-ray reading as a result of using asbestos-containing products, regardless of the manufacturer or seller of the products.

RESPONSE: **Objection. See response to Request for Production No. 19.**

REQUEST FOR PRODUCTION NO. 25:

Please produce a true and correct copy of all documents, correspondence or communications pertaining to all marketing, sales, negotiations, delivery or distribution of all of your asbestos-containing or industrial insulation products to all Defendants to this lawsuit other than the answering Defendant.

RESPONSE: **Objection. This request is misleading in that it implies Defendant might have such documents or that it marketed, sold, negotiated, delivered or distributed asbestos-containing or industrial insulation products to all Defendants in this lawsuit, which it did not. Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 26:

Please produce a true and correct copy of all documents memorializing or referring, relating or pertaining to communications or correspondence among and/or between your officers, director, agents, representatives, employees or consultants and any employer, purchaser or user of your asbestos-containing products, its officers, directors, agents, representatives, employees or consultants which in any way relates, refers or pertains to asbestos, asbestos-containing products, pneurnoconiosis, asbestos-related illness, injury or disease, dust or workplace health or safety.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 27:

Please produce a true and correct copy of all annual reports of Defendant to employees or stock holders for the years 1960 through 1969 and for the past five years.

RESPONSE: **Objection. This request for production seeks discovery of information which is neither relevant nor admissible nor reasonably calculated to lead to the discovery of relevant or admissible evidence. Furthermore, it seeks proprietary and confidential information regarding this privately-held corporation and is overly broad and over-reaching.**

REQUEST FOR PRODUCTION NO. 28:

Please produce the originals or true and correct copies of all safety or health manuals, pamphlets or brochures issued by Defendant between 1930 and the present and any documents relating to whom said manuals were issued.

RESPONSE: **Defendant F.B. Wright Company did not issue any, and therefore has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 29:

Please produce a true and correct copy of all safe workplace practices manuals, pamphlets or brochures issued by Defendant from 1900 through the present.

RESPONSE: **Defendant F.B. Wright Company has not issued any, and therefore has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 30:

Please produce a true and correct copy of all documents referring, relating or pertaining to the Industrial Health Foundation or the Industrial Hygiene Foundation in the custody, possession or control of Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 31:

Please produce a true and correct copy of all documents referring, relating or pertaining to the Trudeau Institute and Saranac Lake Laboratory in the custody, possession or control of Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 32:

Please produce a true and correct copy of all documents referring, relating or pertaining to the Quebec Asbestos Mining Association (QAMA) in the custody, possession or control of Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 33:

Please produce a true and correct copy of all documents referring, relating or pertaining to the National Insulation Manufacturers Association (NIMA) in the custody, possession or control of Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 34:

Please produce a true and correct copy of all documents referring, relating or pertaining to the Thermal Insulation Manufacturers Association (TUvIA) in the custody, possession or control of Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 35:

Please produce a true and correct copy of all documents relating to any conferences, symposia, or meetings attended by any of your officers, physicians, agents, servants, employees or consultants which in any way considered, discussed, reviewed or made recommendations concerning asbestos-related illness, injury or disease; pneumoconiosis; occupational lung disease; dust; industrial hygiene; and/or worker or workplace health or safety.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request and did not attend any such meetings as suggested by this Request.**

REQUEST FOR PRODUCTION NO. 36:

Please produce a true and correct copy of all documents to and/or from Defendant and any person, organization, institution, laboratory, foundation, corporation, entity, board or consultants which refer, relate or pertain to air quality studies, dust counts or dust studies, alleged maximum allowable concentrations (NIAC), alleged threshold limit values (TLV) or protection of your employees or any other employees or persons from actual or alleged hazards associated with asbestos exposure.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 37:

Please produce a true and correct copy of all documents to and/or from Defendant and any person, organization, institution, laboratory, foundation, corporation, entity, board or consultants which refer, relate or pertain to air quality studies, dust counts or dust studies, alleged maximum allowable concentrations (MAC), alleged threshold limit values (TLV) or protection of your employees or any other employees or persons.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 38:

Please produce a true and correct copy of all documents to and/or from Defendant involving any physician, industrial hygienist or public health specialist which in any way relates, refers or pertains to asbestos-related injury, illness or disease, pneumoconiosis, occupational lung disease, dust, industrial hygiene or worker or workplace health or safety.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 39:

Please produce a true and correct copy of all photographs, pictures, prints or any visual depiction at any time generated showing workers or any person or persons installing, applying, removing or in any manner handling or utilizing an asbestos-containing product at any time manufactured, sold or distributed by Defendant.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 40:

Please produce a true and correct copy of all documents pertaining to the acquisition, purchase or sale by Defendant of any asbestos-containing product manufacturing facility or asbestos-containing product or product line.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 41:

Please produce a true and correct copy of all documents pertaining to the acquisition, purchase or sale by Defendant of any asbestos-containing product from any other Defendant in this case or to any other Defendant in this case.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 42:

For each and every affirmative defense asserted in Defendant's Answer to Plaintiff's Complaint, the cross-claims or counter-claims of any party against Defendant, produce each and every document which will be offered to prove each and every affirmative defense. For each and every allegation of Defendant in cross-claim(s) asserted by Defendant in this litigation, produce each and every document which will be offered to prove each and every allegation in Defendant's cross-claim(s).

RESPONSE: **Undecided. Defendant F.B. Wright Company will supplement this response on a timely basis in accordance with the Ohio Rules of Civil Procedure and this Court's Case Management Plans.**

REQUEST FOR PRODUCTION NO. 43:

Please produce a true and correct copy of every transcript of testimony of each witness Defendant intends to call at trial.

RESPONSE: **Undetermined. Defendant F.B. Wright Company will supplement this response on a timely basis in accordance with the Ohio Rules of Civil Procedure and this Court's Case Management Plans.**

REQUEST FOR PRODUCTION NO. 44:

Please produce a true and correct copy of each and every medical record in the custody, possession or control of Defendant relating to Plaintiffs in this case other than those medical records produced by Plaintiffs and provided to Defendants in this case.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 45:

Please produce a true and correct copy of each and every document or other tangible item upon which Defendant will rely for impeachment or rebuttal purposes in the trial of this matter.

RESPONSE: **Undecided. This response will be timely supplemented according to the Ohio Rules of Civil Procedure and this Court's Case Management Plans.**

REQUEST FOR PRODUCTION NO. 46:

Please produce a true and correct copy of each and every document, recording or other tangible item that constitutes in whole or in part a statement by Plaintiffs or a statement by any of Plaintiff's witnesses in this matter.

RESPONSE: **Defendant F.B. Wright Company is unaware of any statements made by Plaintiff or Plaintiff's witnesses other than the depositions which have been taken and of which the Plaintiff's counsel are aware.**

REQUEST FOR PRODUCTION NO. 47:

Please produce a true and correct copy of each and every photograph, videotape recording or other tangible item that is a photographic representation of Plaintiffs in this matter.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 48:

Please produce a true and correct copy of all work records or other tangible items relating to Plaintiffs or their employers.

RESPONSE: **Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 49:

Please produce a true and correct copy of every transcript, affidavit or sworn statement by each and every witness called by Defendant in any litigation related to insurance that may cover the claims in this case.

RESPONSE: **Objection. This request for production seeks discovery of information which is neither relevant nor admissible nor reasonably calculated to lead to the discovery of relevant or admissible evidence. Notwithstanding this objection, and not intending to waive it, Defendant F.B. Wright Company has no documents responsive to this request.**

REQUEST FOR PRODUCTION NO. 50:

For each document for which any privilege is asserted, produce an index containing the following information:

a. Author of document;
b. Position, title or affiliation of author;
c. Date of document;
d. Each recipient of the document
e. The position, title or affiliation of each recipient of the document;
f. The subject matter of the document with sufficient specificity to determine the matters discussed therein; and
g. The privilege(s) asserted.

RESPONSE: **Objection. See Response to Request for Production No. 27.**

REQUEST FOR PRODUCTION NO. 51:

If Defendant claims that the documents are too voluminous to produce as requested, provide the following:

a. The numerical amount of documents responsive to requests herein;
b. The method of storage of documents responsive to requests herein;
c. The method of organization of documents responsive to requests herein;
d. The location of documents responsive to requests herein;
e. Whether there is an index or indices, lists, inventories, or other such information for records responsive to requests herein;
f. If there is an index, indices, lists, inventories or other such information for records responsive to requests herein, whether such index, indices, lists, inventories or other such information for records responsive herein is printed, or electronically stored, (i.e. listed in a computer, imaged, part of a database, etc.).
g. If the index, indices, lists, inventories or other such information for records responsive to requests herein, whether such index, indices, lists, inventories or other such information for records responsive herein is electronically stored, (i.e. listed in a computer, imaged, part of a database, etc.), the method of such storage and software used to create and/or maintain said an index, indices, lists, inventories or other such information for records responsive to requests herein, whether such index, indices, lists, inventories or other such information for records responsive herein.

RESPONSE: **Not applicable.**

REQUEST FOR PRODUCTION NO. 52

If any answer to requests herein is subject to an ongoing investigation or continuing discovery, provide the following information:

a. The person or persons responsible for the ongoing investigation or continuing discovery;
b. The means or methods used or being used for the ongoing investigation or continuing discovery;
c. The beginning date of such ongoing investigation or continuing discovery.

RESPONSE: **Objection. Attorney work product doctrine. Notwithstanding this objection, however, and not intending to waive it, Plaintiff's counsel are aware that discovery is ongoing in each of the cases, upon the completion of which these responses will be timely supplemented, if and where applicable.**

As to objections:

Samuel R. Martillotta (#0006473)
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(216) 523-1500
Counsel for Defendant F.B. Wright Company

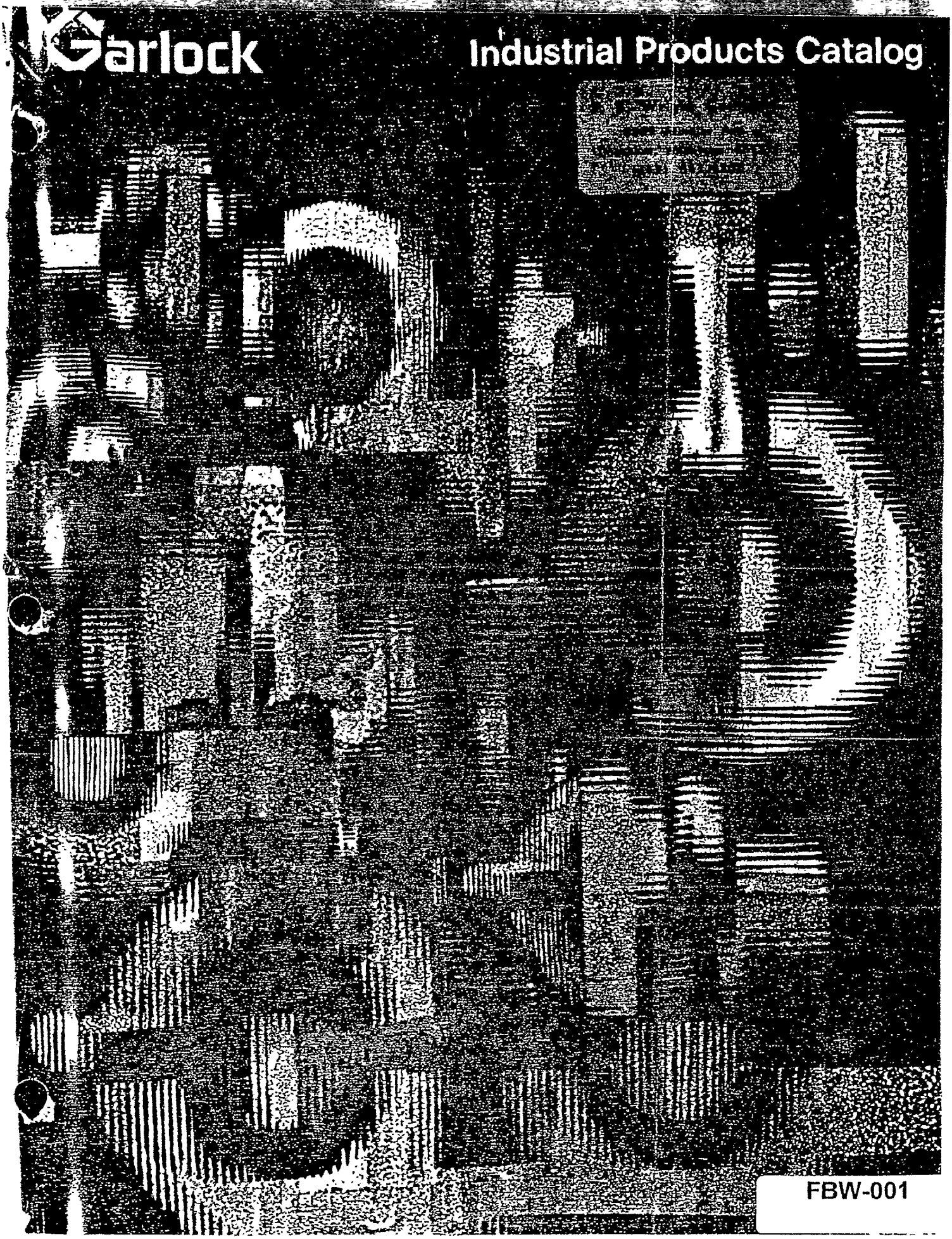
CERTIFICATE OF SERVICE

The original of the foregoing Responses to Plaintiff's Requests for Production of Documents Propounded to F.B. Wright Company was served upon Ladd R. Gibke, Esq., Co-counsel for Plaintiff, at Baron & Budd, 3102 Oak Lawn Avenue, Suite 1100, Dallas, TX 75219; and upon Susan L. Bozorth, Esq., Co-counsel for Plaintiff, at Baron & Budd, 30 Overbrook Boulevard, Suite F, Monroe, OH 45050, by U.S. Ordinary Mail this 31 day of July, 2002.

Samuel R. Martillotta

Garlock

Industrial Products Catalog



FBW-001

Table of contents

General

Style Number Index 1
This Is Garlock 2-3
Garlock Materials vs. Various Media Under Typical Conditions 4-5

Packing Recommendations for the Following Equipment

Accumulators & Intensifiers 6
Compressors...
Reciprocating 6
Rotary 6
Crystallizers 6
Cylinders...
Hydraulic 7
Pneumatic 7
Die Casting Machines 7
Digesters, Pulp Mill 7
Distillation Columns 8
Expansion Joints, Slip Type 8
Filters, Rotary 8
Grinders, Wood Pulp 8
Heat Exchangers, Floating Head 9
Homogenizers 9
Mixers & Agitators 9
Presses...
Baling 9
Extrusion & Forging 10
Hydraulic 10
Pumps...
Centrifugal 10
Reciprocating 10
Rotary 11
Soot Blowers 11
Steam Engines 12
Steam Hammers 12
Stern Tubes 12
Turbines, Hydraulic 12
Valves...
Bronze & Cast Iron 13
Forged & Cast Steel 13
Stainless & Special Alloys 13

Gaskets & Gasketing

Choosing The Right Gasket Material 14-17
Designing Your Gasket Correctly 18-19
Anti-Stick Compressed Asbestos Sheet 20-21
Homogeneous Rubber Sheet 22-23
Cloth Inserted Rubber Sheet 24
Woven Asbestos Cloth, Tape & Gaskets 25
Vegetable Fiber Sheet 26
Solid TFE Gaskets and TFE Sheet 27
TFE Envelope Gaskets 28-29
GYLON® Gaskets 30
GUARDIAN® Spiral Wound Gaskets 31-32

Expansion Joints and Pipe Connectors

Elastomeric Expansion Joints 33
Rubber Pipe Connectors 34
GUARDIAN® "200" FEP-Lined Expansion Joints & Pipe Connectors 35
[illegible] Expansion Joints & Couplings 35

Garlock Industrial Catalog

Soft Packing Products

Types of Soft Packing 36
Graphite Filament Packing 37
Possible Causes of Soft Packing Failures 38
Compression Packing Maintenance Tips 38
Soft Packing Style No's.—
Description, fluids & temperatures for which they are recommended 39-42
Ordering Information...
sizes available & approximate weight and feet per box 43-44

Hydraulic-Pneumatic Products

CHEVRON® Packing
Fabric and Rubber 46
Homogeneous 47
Leather 48-49
TFE and Asbestos 50
All TFE 50
Cups...
Flat Bottom for Piston Application 51
U-Cups...
For light duty piston & rod applications 52-53
Flange Packing 54
Style No's., description, fluids & temperatures for which they are recommended 55

Mechanical Seals

MECHANIPAK® "HR" & "PK" Seals 56
CHEMISEAL® & MECHANIPAK® "75" 57
Environmental Controls 58
Mechanical Seals Maintenance Tips 59

Miscellaneous Garlock Maintenance Products

510 Enamel Paint 60
520 Reducer 60
TFE All-Purpose Lube 60
Dry Graphite Lube 60
Chain Drive Lube 61
Wire Rope and Gear Lube 61
Cutting Oil 61
Silicone Lubricant 61
Silicone Mold Release 61
Moly-S_2 High Temp Lube 61
Belt Dressing 61
Anti-Rust and Demoisturant 61
Degreaser 61
Vinyl Protective Coating 61
Penetrating Oil 62
LUBALL® Packing Lubricant 62
Tapping Compound 62
Lubricating Compound #2 62
Gasketing Compound 101-S 63
PLASTI-PAK™ Twisted Packing 63
PLASTI-THREAD® Seal Tape 63
Pipe Thread Compound 63
Flexible Packing Hooks 64

Engineering Data

Steam Table 64
RPM/FPM Conversion Table 65
Fahrenheit & Centrigrade Conversion Table 66

FBW-002

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Style number index

Style No.	Product	Page No.
2	Lubricating Compound	62
19	Cloth-Inserted Rubber Sheet	24
22	Homogeneous Rubber Sheet	22
31	Regular Braid Packing	39
75	MECHANIPAK® Seals	57
90	Regular Braid Packing	39
91	Homogeneous Rubber Sheet	22
100	Regular Braid Packing	37-39
101-S	Gasketing Compound	62
116	Penetrating Oil	62
117-B	Braid-over-Braid Packing	39
117-T	Twisted Packing	39
127	Graphite Coated Braided Jacket Packing	39
150	Rolled Packing	39
200	Expansion Joints & Pipe Connectors	35
233	Braid-over-Braid Packing	39
234	Regular Braid Packing	39
237	Regular Braid Packing	39
262	Laminated Packing	40
333	Laminated Packing	40
353	Homogeneous Rubber Sheet	22
432	CHEVRON® Packing	55
433	CHEVRON Packing	55
510	Enamel Paint	60
520	Reducer	60
532	CHEVRON Packing	55
540	U-Cups	55
555	GUARDIAN® Spiral Wound Gaskets	31
604	Man Hole & Hand Hole Gaskets	25
605	Woven Asbestos Cloth	25
612	Folded Gasketing Tape	25
619	Cloth-Inserted Rubber Sheet	24
631	Twisted Packing	40
633	Twisted Packing	40
635	Twisted Packing	40
644	Regular Braid Packing	40
660	Vegetable Fiber Sheet	26
681	Vegetable Fiber Sheet	26
711	Laminated Packing	40
730	LATTICE BRAID® Packing	40
731	LATTICE BRAID Packing	40
733	LATTICE BRAID Packing	40
734	LATTICE BRAID Packing	41
735	LATTICE BRAID Packing	41
736	LATTICE BRAID Packing	41
737	LATTICE BRAID Packing	41
740	LATTICE BRAID Packing	41
745	LATTICE BRAID Packing	41
751	LATTICE BRAID Packing	41
813	Cups & "U" Packing	55
900	Compressed Asbestos Sheet	21
908	Plastallic Packing	41
909	Plastallic Packing	41
5005	Braid-over-core Packing	41
5501	Die-Formed Rings	42
	[illegible] Braided Jacket Packing	42
5780	LATTICE BRAID Packing	42
5862	LATTICE BRAID Packing	42
5876	LATTICE BRAID Packing	42
5882	LATTICE BRAID Packing	42
5884	LATTICE BRAID Packing	42
5888	LATTICE BRAID Packing	42
5889	LATTICE BRAID Packing	42
5898	LATTICE BRAID Packing	42
6023	Homogeneous Rubber Sheet	23
7021	Compressed Asbestos Sheet	21
7130	Laminated Packing	42
7131	U-Cups	55
7228	Compressed Asbestos Sheet	21
7350	FLEXO-MATIC® Rubber Pipe Connectors	34
7271	Cups & "U" Packing	55
7450	FLEXO-MATIC Rubber Pipe Connectors	34
7450	FLEXO-MATIC Rubber Pipe Connectors	34
7705	Compressed Asbestos Sheet	21
7797	Homogeneous Rubber Sheet	23
7815	CHEVRON Packing & Cups	55
7819	Compressed Asbestos Sheet	21
7857	CHEVRON Packing	55
7904	CHEVRON Packing	55
7986	Homogeneous Rubber Sheet	23
7992	Cloth-Inserted Rubber Sheet	24
8048	CHEVRON Packing	55
8051	CHEVRON Packing	55
8136	U-Cups	55
8312	Homogeneous Rubber Sheet	23
8452	CHEVRON, Cups, "U" Packing	55
8452	Homogeneous Rubber Sheet	23
8459	Homogeneous Rubber Sheet	23
8495	Homogeneous Rubber Sheet	23
8571	Steel & Asbestos Filler for CHEMISEAL® TFE-jacketed Gaskets	29
8619	Cups & "U" Packing	55
8639	Homogeneous Rubber Sheet	23
8660	Cups & "U" Packings	55
8748	Compressed Asbestos Sheet	21
8764	CHEMISEAL Solid TFE Pipe Flange Gaskets	27
8764	TFE Sheet	27
8764	CHEMISEAL TFE-jacketed Gaskets	28
8764	CHEVRON, Cups, "U" Packings	55
8798	Cloth-Inserted Rubber Sheet	24
9026	Asbestos Filler for CHEMISEAL TFE-jacketed Gaskets	29
9057	Compressed Asbestos Sheet	21
9122	Homogeneous Rubber Sheet	23
9166	Plastallic Packing	42
9188	CHEVRON Packing & Cups	55
9205	Cloth-Inserted Rubber Sheet	24
9210	CHEVRON, Cups, "U" Packings	55
9500	Compressed Asbestos Sheet	21
9511	"U" Cups	55
35404	GYLON® Gaskets Material (Chemical Service)	30
35444	GYLON Gasket Material (Hydrofluoric Acid Service)	30

• This chart indicates the general suitability of basic materials commonly used in packings and gaskets against various media and is intended only for the general information of the packing user. Obviously the subject of the interaction of packing materials with the several liquids listed is too complex to be covered adequately in a few words. Although chemical considerations are important in the selection of packings, the mechanical properties of the packing itself usually are of greater importance. Packings rarely are fully exposed to the gas or liquid and, therefore, do not necessarily react in the same degree as indicated for the base material. For these reasons packings or gaskets should not be accepted or rejected for any application solely on the basis of chemical consideration.

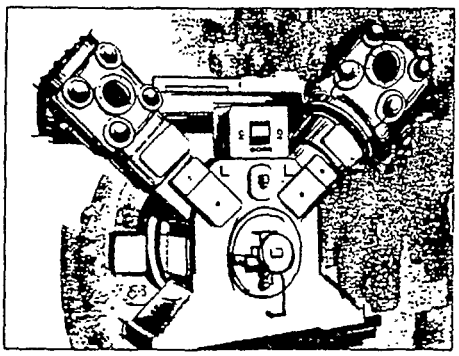
GRAPHITE YARN	VITON* and FLUOREL**	PHENOLIC RESINS	TFE FLUORO-CARBON	WHITE ASBESTOS	BLUE ASBESTOS	COTTON, FLAX, VISCOSE RAYON	PAPER	LEATHER
Satisfactory to 650°F.	Satisfactory but hardens above 500°F.	Reinforcing fiber usually establishes limits.	Satisfactory but softens above 500°F.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens and embrittles above 200°F.	Satisfactory from cryogenics to +200°F.
Not recommended.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory but softens above 500°F.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Not recommended.	Satisfactory up to 225°F.	Satisfactory except for effect on reinforcing fibers.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory but hardens above 500°F. Not recommended in steam above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Satisfactory but decomposes above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Limited depending on conditions.	Satisfactory unless solutions are strong and above 200°F.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Limited depending on conditions.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Limited depending on conditions.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Not recommended.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.
Not recommended above 100°F for concentrations above 25%.	Limited depending on conditions.	Not recommended.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory but deteriorates above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended
Not recommended.	Not recommended.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended
Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shri and hardens.
Satisfactory.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shr and hardens.
Satisfactory.	Not recommended.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shr and hardens.
Satisfactory.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shr and hardens.
Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but becomes porous hardens above 200°F.

Packing recommendations by equipment

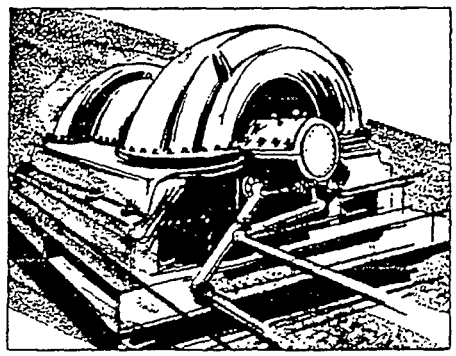
The recommendations shown here should only be considered as tentative until you have checked them out with *all* of the service conditions which exist in your particular application. When you take the basic factors which surround any application (fluid, temperature, pressure, speed, and type of motion) and add to them the age and condition of equipment, you can see that the variables are such as to make a concrete recommendation, based only on type of equipment and fluid involved, very difficult.

For most applications, we have made more than one packing recommendation. The first choice is the one which, in our opinion, will give the ultimate service under the most severe conditions. But other conditions, which only you can know, may make another recommendation preferable. For example, your equipment may be operating at temperatures well below those normally associated with the application.

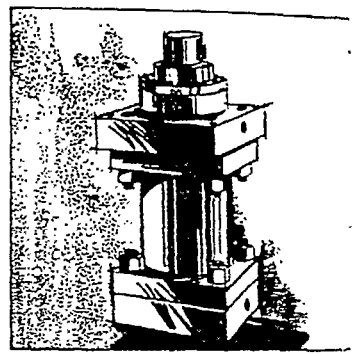
Reciprocating Compressor



Centrifugal Compressor



Hydraulic Cylinder



	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS
ACCUMULATORS & INTENSIFIERS								432 5876 740	7904 433 5862				432 5876 740		
COMPRESSORS, RECIPROCATING					532 432 631	*8764 5888 5889	*8764 5898 5780								*CHEVRON®
CENTRIFUGAL					100 631 5862	5889 5888	5898 5780								
CRYSTALLIZERS	100 5889 5862	*100 5889 5884	100 5889 5862	100 5889 5884									100 5889 5862	5889 5862 5876	*Except in strong oxidizers

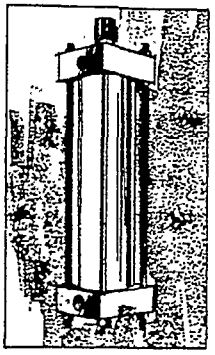
FBW-005

We suggest you use these pages as a starting point. Choose a style number and cross check it for other variables. plus a description of the product, on the Packing Description Pages. For those numbers printed in black, this information is contained on pages 39-42; for those printed in red, refer to page 55.

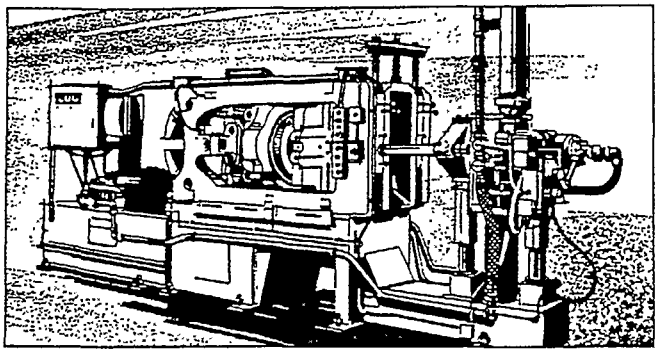
If no recommendation is shown, it only means that those fluids are not normally associated with the particular equipment. Garlock, of course, stands ready to make a recommendation upon receipt of full service condition information.

We recognize that many Garlock packings not shown have worked well in these applications for many years. However, this catalog is designed on the assumption that the user comes to it with a problem and in search of a solution. Packings shown here are those which have solved many similar problems.

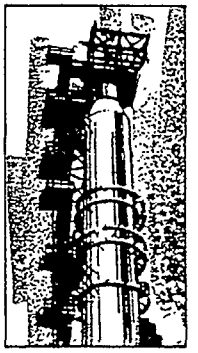
Air Cylinder



Die Casting Machine



Washing Digester

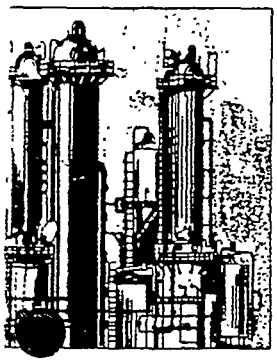


EQUIPMENT	ACIDS: MILD	ACIDS: CORROSIVE	ALKALIES: MILD	ALKALIES: CORROSIVE	GASES: AIR & DRY INDUSTRIAL GASES	GASES: BROMINE, CHLORINE	GASES: OXYGEN	OILS: PETROLEUM	OILS: SYNTHETICS	SOLVENTS: AROMATIC (BENZENE, ETC.)	SOLVENTS: ALIPHATIC (GASOLINE, ETC.)	SOLVENTS: STEAM	SOLVENTS: WATER & SALT SOLUTIONS	SOLVENTS: FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
CYLINDERS HYDRAULIC PISTON CUPS AND ROD CHEVRON								432 8452 7271 BITAN® Leather 432	433 7904 8764 9188 7904 433				540 8619 432		
CYLINDERS PNEUMATIC PISTON CUPS AND ROD CHEVRON					8764 8452 7131 8452 432										
DIE CASTING MACHINES								432	7904 433						
DIGESTERS CONTINUOUS AND LIQUOR PUMPS USED WITH BOTH BATCH AND CONTINUOUS SYSTEMS.	100 5889 5862	*100 5889 5884	100 5889 5884	100 5889 5884											*Except in strong oxidizers

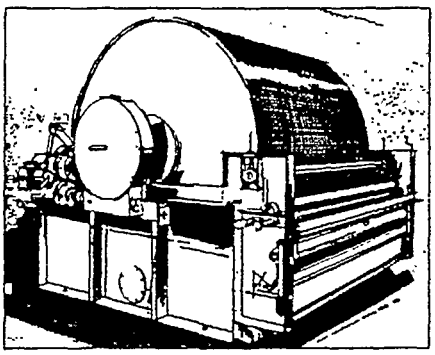
FBW-006

acking recommendations by equipment

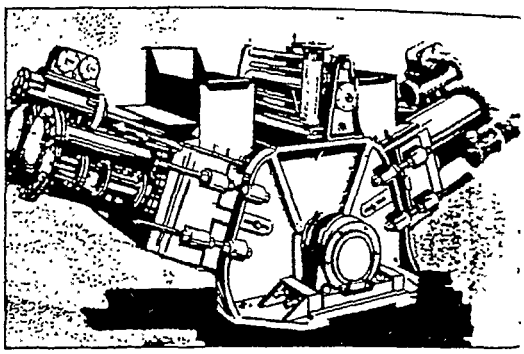
rochemical Plants



Paper Processing



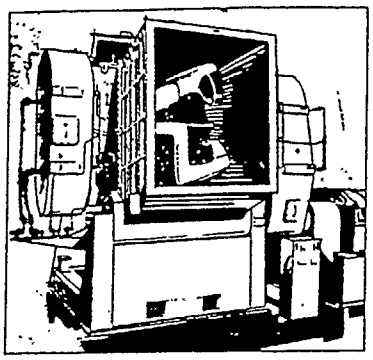
Wood Pulp Grinder



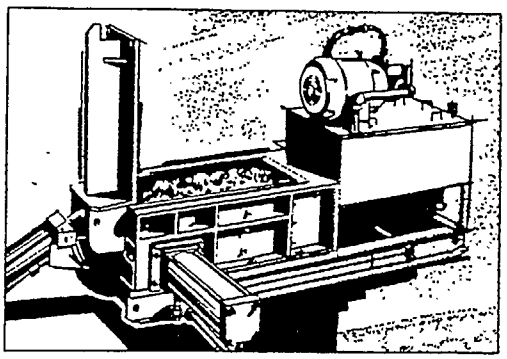
QUIPMENT	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
ISTILLATION OLUMNS—	5005	5005	5005	5005				5005	5005	5005	5005				
TRAY OR BELL & SPIGOT JOINTS	5889	5889	5889	5889				5889	5889	5889	5889				
	5555		5555					5555	5555	5555	5555				
XPANSION JOINTS	5862	5888	5862	5888	5862	5888	5898	127	127	127	127	127	127	5888	
SLIP TYPE	5876	5884	5876	5884	5876	5889	5780	5862	5862	5862	5862	5862	5862	5862	
	731	736	731	736	127			5876	5876	5876	5876	5876	5876	5876	
ILTERS—	100	*100	100	100	100			100	100	100	100		100	5889	*Except in [illegible] acid [illegible]
ROTARY														5862	
	5862	5889	5862	5889	5862			5862	5862	5862	5862	5862	5862	5876	
	5876	5884	5876	5884	5876			5876	5876	5876	5876	5876	5876		
RINDERS—PULP													432		
KET													745		
D													740		
PISTON													7131 BITAN Cups		
ROBERTS													100		
													5862		
													737		

FBW-007

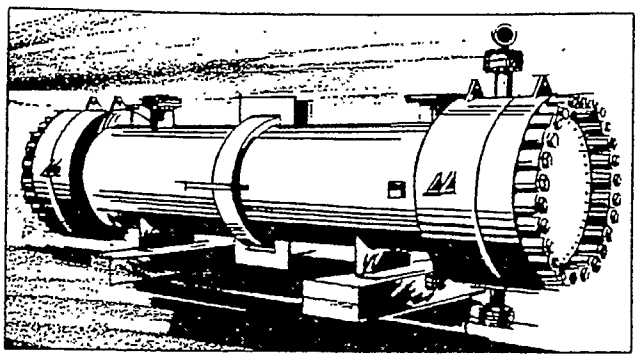
Vacuum Mixer



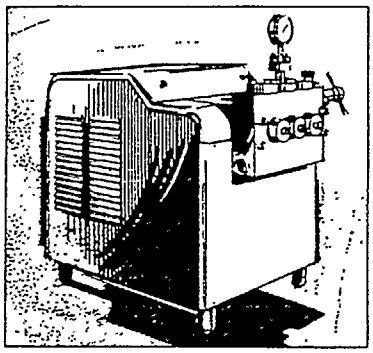
Baling Press



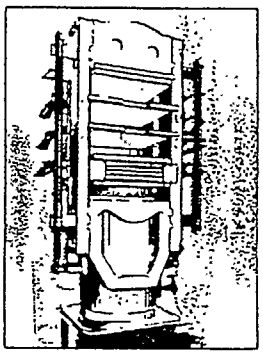
Heat Exchanger



Homogenizer



Side Plate Press

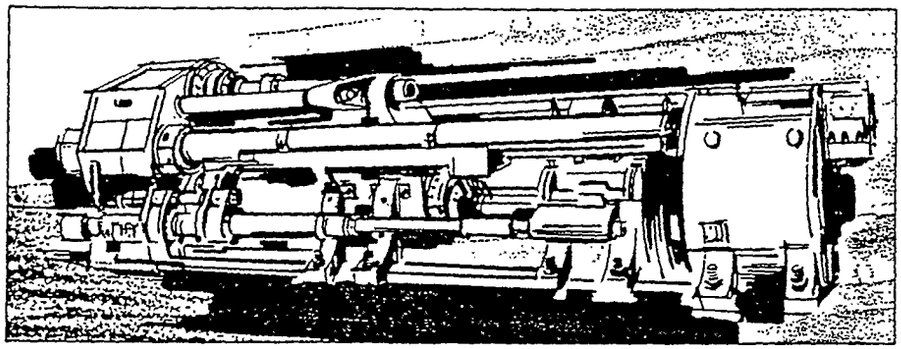


EQUIPMENT	ACIDS: MILD	ACIDS: CORROSIVE	ALKALIES: MILD	ALKALIES: CORROSIVE	GASES: AIR & DRY INDUSTRIAL GASES	GASES: BROMINE, CHLORINE	GASES: OXYGEN	OILS: PETROLEUM	OILS: SYNTHETICS	SOLVENTS: AROMATIC (BENZENE, ETC.)	SOLVENTS: ALIPHATIC (GASOLINE, ETC.)	SOLVENTS: STEAM	SOLVENTS: WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
HEAT EXCHANGERS FLOATING HEAD TYPE	5862 5876 731	5888 5884 736	5862 5876 731	5888 5884 736	5862 5876 731			5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5888 5862 737	
HOMOGENIZERS														8051	
MIXERS, AGITATORS	100 5889 5862	*100 5889 5884	100 5889 5862	100 5889 5884	100 5862 5876	5889 5888	5898 5780	100 5889 5862	100 5889 5862	100 5889 5862	100 5869 5862	100 5889 5862	100 5889 5862	5889 5862 5876	*Except in strong oxidizers
PRESSES BALING								7904 BITAN Leather 432	7904 BITAN Leather 433				7904 BITAN Leather 432		BITAN Leather will give best service if rams are scored.

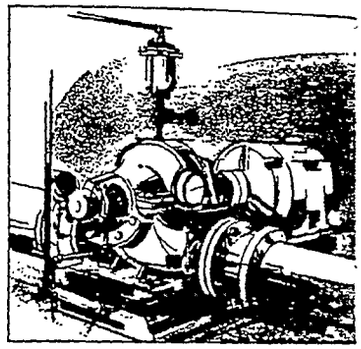
FBW-008

Packing recommendations by equipment

Extrusion Press



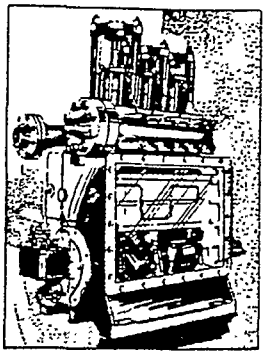
Centrifugal Pump



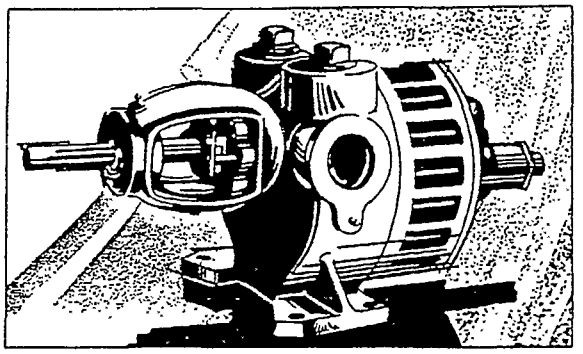
	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
PRESSES EXTRUSION & FORGING								7271 7904 432	 7904 433			 532	 7904 432		A high pressure application uses R.H. top & bottom adapters and the same gland follower plus top ring and support.
HYDRAULIC								7904 432	7904 433				7904 432		
PUMPS CENTRIFUGAL	100 5862 733	*100 5889 5884	100 5862 737	100 5889 5884	100 5862 733	5889 5888	5898 5780	100 5862 733	100 5889 5862	100 5889 5862	100 5889 5862	100 5862 730	100 5862 733	5889 5862 737	*Except in strong oxidizers
RECIPROCATING RODS & PLUNGER	7904 5862 5876	7904 5888 5884	7904 5862 5876	7904 5888 5884				432 5862 5876	433 5888 5862	7904 5888 5862	7904 5888 5862	532 5888 5862	432 5888 5862	8051 5888 5862	
PISTONS								8136 Cups or *262 R.H.				813 540 Cups or *262 R.H.	540 Cups or *262		*Ring style No. 261 or 262; R.H.

FBW-009

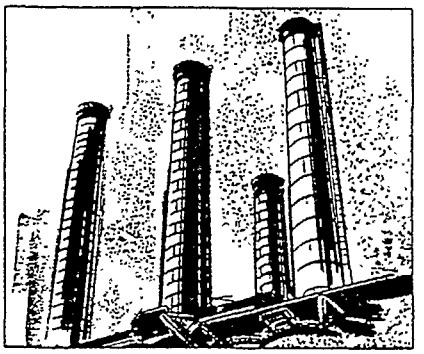
Reciprocating Pump



Rotary Pump



Power House

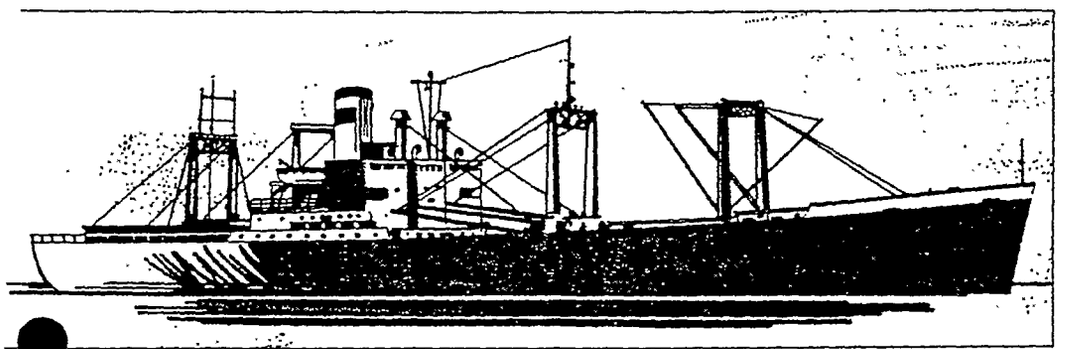


	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
PUMPS															
ROTARY	100	*100	100	100	100	5889 5888	5898 5780	100	100	100	100		100	5889 5862	*Except in strong oxidizers
POSITIVE DISPLACEMENT	5862 733	5889 5884	5862 737	5889 5884	5862 733			5862 733	5889 5862	5889 5862	5889 5862		5862 733	737	
SOOT BLOWERS															
INSULATED FEED					*8534 XV 5501 5862							*8534 XV 5501 5862			*A carbon-graphite filled TFE
UNINSULATED FEED					5501 127 735							5501 127 735			

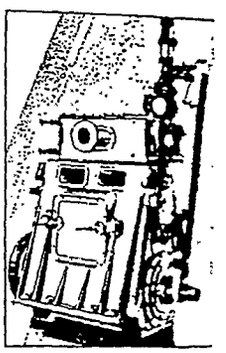
FBW-010

...king recommendations by equipment

...arine Products



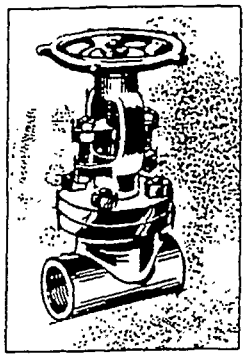
Steam Engine



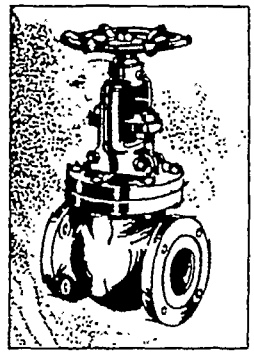
EQUIPMENT	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					COMMENTS:
	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	
STEAM ENGINES												7904 532 635			
STEAM HAMMERS												7904 532 150			
STERN TUBES													MARINEPAK® 5876 31		
TURBINES HYDRAULIC													5862 730 745		

FBW-011

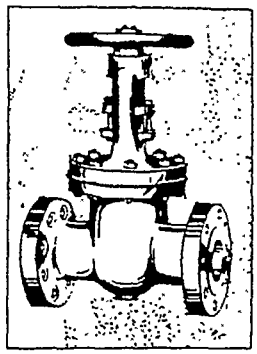
Forged Valve



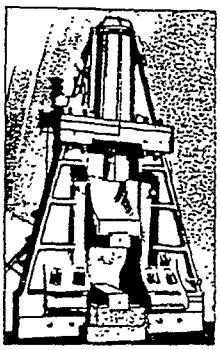
Cast Steel Valve



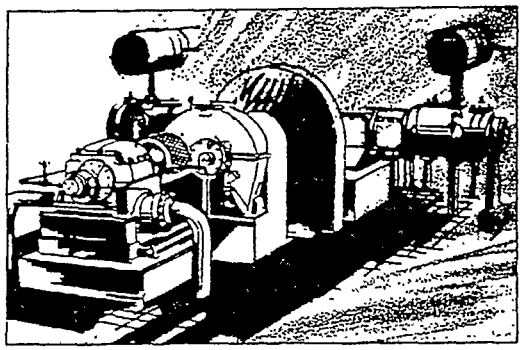
Stainless Valve



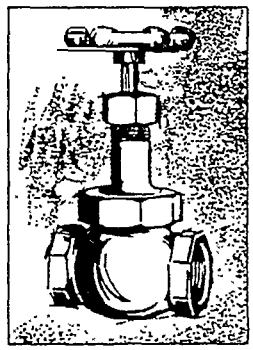
Steam Hammer



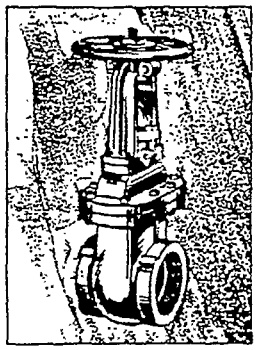
Hydraulic Turbine



Bronze Valve



Cast Iron Valve



	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
VALVES BRONZE & CAST IRON	5862 5876 731		5862 5876 127		127 5862 5876	5888 7130 5898	5898 5780	127 633 5862	127 633 5862	127 5862 5876	127 5862 5876	127 635 5862	127 5862 233	5888 5862 5876	
FORGED & CAST STEEL						5888 7130 5898		127 633 908	127 633 908	127 908 5862	127 908 5862	127 635 908	127 635 908		
STAINLESS & SPECIAL ALLOYS	*8764 5888 5862	*8764 5888 5884	*8764 5888 5862	*8764 5888 5884	*8764 5888 5862	*8764 5888 7130	*8764 5888 5780	*8764 5888 5862	*8764 5888 5862	*8764 5888 5862	*8764 5888 5862	5888		*8764 5888 5862	*CHEVRON®

FBW-012

ıoosing the right gasket material

ery gasket material available to industry has certain herent limitations that tend to restrict each mate-il's range of applications. However, many of these iitations may be partially or wholly eliminated by veral methods, including use of reinforcing inserts, mbining with other materials, varying construction, by the type of joint the material must seal.

though mechanical factors are important to the de-ın of the complete joint, primary selection of a gas-t material is greatly influenced by two factors:

ımperature of fluid or gas contained

ature of fluid or gas contained

ɛmperature

ith very few exceptions, a material should never be ɛd at temperatures higher than those recommended r its group.

ɛmperature ranges for rubber are: Natural—up to 0° F; SBR, Nitrile and Neoprene—up to 250° F; [illegible]-up to 450°F; Silicone—up to 500° F.

ɛgetable fiber sheet with glue-glycerine bond has a mperature range up to 250° F with synthetic rubber ɔnd up to 300° F.

oven asbestos cloth is effective up to 600° F; com-ɛssed asbestos up to 700° F.

ubber used in most cloth-inserted sheets usually ɛtermines the material's temperature range.

owever, you should never select or reject a gasket aterial solely on the preceding information as this is ɛrely a general guide. To be sure, consult your near-ɜt Garlock representative for more specific recom-ıendations.

luid contained

ɣ using the resistance chart on pages 15, 16 and 17, ou can easily ascertain a material's reaction to a spe-ific medium, and thereby determine its suitability in ervice. Four values appear throughout this chart. They re: G for good; F or fair; D for depends on conditions; nd U for unsuitable. With the exception of symbol D, ll values are self-explanatory. Where D is indicated, nd no other material is suitable for your specific ap-li[illegible]n, contact your Garlock representative. He'll lad[illegible] help you determine the material's suitability.

Although the above values are of extreme importance, arious other factors should also be given due con-ideration as they directly influence the fluid con-ained and its effect on the gasket material.

Concentration of the corrosive agent can have a decided effect upon the gasket material selection. Full strength solutions are not necessarily more corrosive than those of dilute proportions. The reverse is often true.

Purity of corrosive agent or the absence of contaminating compounds is another factor involved. Example: dissolved oxygen in otherwise chemically pure water may cause rapid oxidation of high temperature steam generating equipment.

Temperature of corrosive agent, in addition to temperature effect on mechanical properties, will also influence the rate of corrosive attack.

Location of gasket can often influence its chemical resistance. For example, a gasket either in a partially filled line or one at or above the solution level may be more subject to attack than those below the surface.

Construction of gasket material decidedly affects its chemical resistance. It is generally poor economy to use an inferior material that can cause frequent gasket replacements. This ultimately results in extremely high maintenance costs. However, if it is necessary that a joint be opened frequently, a less expensive, less resistant material may be quite satisfactory. Where a joint is seldom opened, the most resistant material, regardless of cost, is usually the most economical in the long run.

Also, if a slight swelling of the gasket occurs due to reaction to fluid, the overall effect may be a more positive seal. Conversely, materials that shrink and dry out usually cause early gasket failure.

Other factors that may influence material selection are internal pressures, operating cycle and vibration. A highly resilient material and proper design is essential where sudden variations in operating conditions occur frequently.

Bolt relaxation, caused by thermal expansion and creep, is sometimes an important consideration. Expansion and contraction of line or gasket and excessive bending movements on the flange may also limit selection of gasket material and construction.

To summarize... if these considerations are all taken into account and properly evaluated and a suitable gasket material is selected from the resistance chart, the choice, in most cases, can be narrowed to a small number. Final choice, then, can usually be made on the basis of relative cost, availability or personal experience.

FBW-013

TM–Du Pont Co.

RESISTANCE RATINGS	HOMOGENEOUS RUBBER						CLOTH INSERTED RUBBER (GASKETING)				ASBESTOS								VEGETABLE FIBER		
											WOVEN					COMPRESSED						
G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Acetic Acid: ..... Crude	F	D	D	F	D	U	F	D	U	U	D	F	F	G	G	D	G	G	G	U	U	U
Pure	F	D	U	F	U	U	F	F	U	U	D	F	F	G	F	D	F	F	G	U	U	U
Vapors	F	D	U	F	U	U	D	F	D	U	D	F	F	G	G	F	G	G	G	U	U	U
150 psi, 400° F.	U	U	U	U	U	U	U	U	U	U	D	U	U	G	U	U	D	D	D	U	U	U
Acetic Anhydride	D	D	U	D	D	U	D	D	D	D	D	U	U	G	U	G	G	G	G	U	U	U
Acetone	F	U	U	F	F	U	F	F	U	F	F	U	F	G	U	U	F	G	G	G	U	D
Acetylene	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Air	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Ammonia Gas ..... cold	G	G	G	G	G	G	G	G	G	U	G	G	G	G	G	G	G	G	G	F	G	G
hot	D	D	D	D	G	G	D	G	D	U	G	F	F	G	F	G	G	G	G	U	U	U
Ammonium hydroxide	D	D	D	D	G	G	D	G	D	U	G	G	D	G	G	G	G	G	G	U	G	G
Ammonium phosphate: ... Monobasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Dibasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Tribasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Amyl Acetate	F	U	U	U	U	U	U	U	U	U	U	D	F	G	D	D	D	D	D	G	F	F
Amyl Alcohol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	F	F
Aniline, aniline oil	U	U	U	U	U	U	U	U	D	U	U	D	U	G	D	D	F	D	U	G	F	F
Asphalt	U	F	F	U	U	F	U	U	F	U	U	F	U	G	F	G	G	U	U	F	G	G
Beer	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Beet sugar liquors	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Benzene, benzol	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	U	U	U	G	F	D
Benzene, petroleum ether naphtha ..	U	U	D	U	U	G	U	U	U	U	U	U	U	G	U	F	U	U	U	G	G	F
Black sulphate liquor	G	G	G	G	F	F	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Blast Furnace Gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	D	F	D
Bromine	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
Butane	D	G	G	D	U	G	U	D	F	U	D	G	F	G	G	G	G	F	F	D	G	D
Butyl acetate	F	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	U	F	F
Butyl alcohol, butanol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	F	F
Cane sugar liquors	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Carbon dioxide ..... dry	D	D	D	D	D	D	D	G	D	D	G	D	G	G	D	G	G	G	G	U	F	F
wet	D	D	D	D	D	D	D	G	D	D	G	G	G	G	D	G	D	D	G	U	F	F
Carbon bisulphide	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	D	U	U	U	F	D	D
Carbon monoxide, hot	D	D	D	D	G	G	D	G	D	D	G	D	D	G	D	G	G	G	G	U	D	D
Carbon tetrachloride	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	G	U	U	U	F	F	D
Castor oil	U	G	G	U	D	G	U	D	G	U	D	G	G	G	G	G	G	G	G	G	G	G
Chinawood oil, tungoil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	F	D	U	F	G	G
Chlorine ..... dry	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
wet	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
Chlorinated solvents	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	F	F	U	U	U	F	D
Chloroacetic acid	F	F	F	F	U	U	F	U	F	F	U	U	U	G	U	D	D	D	F	U	U	U
Chlorosulphonic acid	U	D	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	F	U	U	U
Chromic acid	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	D	D	D	F	U	U	U
Citric acid	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	F	F
Coke oven gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	D	F	D
Copper chloride	D	F	F	F	D	F	D	D	D	F	G	G	G	G	G	G	G	G	G	U	D	D
Copper sulfate	G	G	G	G	G	G	G	G	G	F	G	G	G	G	G	G	G	G	G	U	G	G
Corn oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	U	G	G	D	D	G	G	G
Cotton seed oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	D	F	G	D
Creosote ..... coal tar	U	D	D	U	U	G	U	U	U	U	U	F	U	G	F	G	D	U	U	D	D	D
wood	U	D	D	U	U	G	U	U	U	U	U	F	U	G	F	G	F	D	U	D	D	D
Cresols, cresylic acid	U	U	D	U	U	G	U	U	U	U	U	U	U	G	U	F	D	U	U	D	U	U
*Dowtherm A	U	U	U	U	U	D	U	U	U	U	U	F	U	G	F	F	F	U	U	U	U	U
*Dowtherm E	U	U	U	U	U	D	U	U	U	U	U	F	U	G	F	F	F	U	U	U	U	U

*TM—DOW CHEMICAL CO.

FBW-014

RESISTANCE RATINGS	HOMOGENEOUS RUBBER						CLOTH INSERTED RUBBER (GASKETING)				ASBESTOS								VEGETABLE FIBER		
											WOVEN					COMPRESSED						
G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Ethers	D	U	D	U	U	U	U	U	U	U	U	U	U	G	F	F	D	D	U	D	F	D
Ethyl acetate	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	U	G	F	D
Ethyl chloride	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	F	F	U	U	G	F	D
Ethylene glycol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Formaldehyde	G	D	G	G	U	U	G	U	D	D	U	F	G	G	F	G	G	G	G	U	G	G
Formic acid	G	F	G	G	D	U	F	D	D	D	D	D	G	G	D	G	G	G	G	U	U	U
*Freon 12	U	G	D	D	U	G	D	U	G	U	U	G	U	G	G	G	G	U	U	F	D	U
Fuel Oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	F
Furfural	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	U	U	F	F	F
Gasoline ... sour	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	U	U	G	G	G
refined	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	U	U	G	G	G
Gelatin	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Glucose	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Glue	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Glycerin, glycerol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Green sulphate liquor	G	G	G	G	D	G	G	D	G	G	D	G	G	G	G	G	G	G	G	U	F	F
Hydrobromic acid	U	D	D	D	U	U	D	D	D	U	D	U	U	G	U	F	F	F	F	U	U	U
Hydrochloric acid ... <150° F.	F	G	F	F	D	U	U	D	U	U	D	F	F	G	F	G	G	G	G	U	U	U
>150° F.	U	D	U	U	U	U	U	D	U	U	D	D	D	G	D	F	F	F	F	U	U	U
Hydrocyanic acid	F	F	F	F	F	F	F	F	F	D	G	F	F	G	F	G	G	G	F	U	U	U
Hydrofluoric acid ... cold <65%	D	G	D	D	D	G	U	D	U	U	D	D	U	G	D	D	F	F	F	U	U	U
>65%	U	U	U	U	U	D	U	U	U	U	U	D	U	G	D	F	F	F	F	U	U	U
hot <65%	U	U	U	U	U	G	U	U	U	U	U	U	U	G	D	D	F	D	F	U	U	U
>65%	U	U	U	U	U	D	U	U	U	U	U	U	U	G	D	U	D	U	F	U	U	U
Hydrofluorsilicic acid	G	F	F	F	U	D	U	U	U	U	U	U	U	G	D	U	D	U	F	U	U	U
Hydrogen gas ... cold	F	G	G	G	G	G	G	G	G	G	G	G	F	G	G	G	G	G	G	U	F	F
hot	F	G	G	G	G	G	D	D	D	D	D	G	F	G	G	G	G	G	G	U	U	U
Hydrogen sulphide ... dry, cold	D	G	G	G	F	G	D	D	G	D	D	G	D	G	G	G	G	G	G	U	F	F
hot	D	D	D	D	D	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	D	D
wet, cold	D	F	F	F	F	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	F	F
hot	D	D	D	D	D	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	D	D
Kerosene	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
Lacquers	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	G	F	D
Lacquer solvents	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	G	F	D
Lactic acid ... cold	D	G	G	G	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	U	G	G
hot	D	D	D	D	G	G	D	G	D	D	G	D	D	G	F	G	G	G	G	U	D	D
Linseed oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	F	D	D	G	F	F
Lubricating oils ... sour	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
refined	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
Magnesium hydroxide	G	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	G	G	G	U	G	G
Methyl alcohol, methanol	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Methyl chloride	U	U	U	U	U	U	U	U	U	U	U	D	D	G	U	D	D	D	D	D	D	U
Milk	G	G	G	G	G	G	G	G	G	U	G	G	G	G	G	G	G	G	G	U	G	G
Mineral oils	U	F	G	U	D	G	U	D	F	U	D	F	U	G	F	G	F	F	F	G	G	G
Natural gas	D	G	G	D	U	G	F	D	G	F	D	G	F	G	G	G	G	F	F	F	G	G
Nitric acid ... crude	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
diluted	U	U	U	U	D	U	U	D	U	U	D	U	U	G	U	D	D	D	D	U	U	U
concentrated	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	D	U	U	U	U	U	U	U	U	U	U	G	U	D	F	U	U	U	D	D
Oleic acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Oleum spirits	U	F	G	U	D	G	U	U	U	U	U	U	U	G	D	D	D	D	D	U	U	U
Oxalic acid	G	F	G	G	D	G	F	D	D	D	F	F	F	F	F	G	G	G	G	U	G	G

*TM—DU PONT COMPANY

FBW-015

RESISTANCE RATINGS	HOMOGENEOUS RUBBER						CLOTH INSERTED RUBBER (GASKETING)				ASBESTOS								VEGETABLE FIBER		
											WOVEN					COMPRESSED						
G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Oxygen ..... cold	D	D	D	D	F	F	U	F	U	U	F	U	U	G	U	U	U	U	U	U	U	U	U
<500° F.	U	U	U	U	D	D	U	D	U	U	D	U	U	G	U	U	U	U	U	U	U	U	U
Ozone	D	G	D	D	G	G	D	G	F	D	G	F	D	G	F	D	D	D	D	U	F	F
Palmitic Acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Petroleum oils ..... crude, <500° F.	U	F	G	U	D	G	U	D	D	U	D	G	U	G	G	G	G	D	U	D	D	D
>500° F.	U	U	U	U	U	D	U	U	U	U	U	U	U	D	U	D	D	U	U	U	U	U
Phosphoric acid ..... crude	D	F	F	D	D	D	U	D	U	U	D	F	D	G	F	G	G	G	G	U	F	F
Pure, <45%	D	F	F	D	D	G	U	D	U	U	D	F	D	G	F	G	G	G	G	U	D	D
>45%, cold	D	F	F	D	D	D	U	D	U	U	D	F	D	G	F	G	G	G	G	U	D	D
hot	D	D	D	D	D	D	U	D	U	U	D	D	D	G	D	F	F	F	F	U	D	D
Potassium hydroxide	D	D	G	D	D	U	D	D	D	D	D	D	F	G	F	G	D	F	F	U	U	U
Producer gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	U	F	D
Propane	D	G	G	D	U	G	U	D	F	U	D	G	F	G	G	G	D	F	F	D	G	D
Sewage	D	F	G	D	D	G	D	D	F	D	D	F	D	G	F	G	G	D	D	U	D	D
Soap solutions	D	F	G	D	G	G	F	G	F	G	G	F	D	G	F	G	G	G	G	U	F	F
Sodium hydroxide	D	D	G	D	D	U	D	D	D	D	D	D	F	G	F	G	D	F	F	U	U	U
Sodium hypochlorite	F	F	F	F	G	D	D	G	D	D	G	F	F	G	F	G	G	G	G	U	F	F
Sodium silicate	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Soybean oil	U	G	G	U	D	G	U	D	G	U	D	G	U	G	G	G	G	D	U	G	G	G
Stannic chloride	D	F	F	F	D	D	G	D	G	G	D	G	G	G	G	G	G	G	G	U	G	G
Steam ..... <500° F.	U	U	D	D	U	G	U	U	U	D	U	F	G	G	F	G	F	G	U	U	U	U
500-1000° F.	U	U	U	U	U	D	U	U	U	U	U	U	D	U	U	D	U	D	U	U	U	U
Stearic acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Sulphur	D	F	F	F	G	D	D	G	F	F	G	F	D	G	F	G	G	G	F	U	F	F
Sulphur chloride	U	D	D	U	U	D	U	U	D	U	U	D	U	G	D	F	F	F	F	D	D	D
Sulphur dioxide, dry	F	F	F	F	F	G	D	G	D	D	G	F	D	G	F	G	G	D	D	U	D	D
Sulphur trioxide, dry	D	D	D	D	D	G	D	D	D	D	D	F	D	G	F	G	G	D	D	U	D	D
Sulphuric acid ..... <10% cold	G	G	G	G	G	G	U	G	U	U	G	G	F	G	G	G	G	G	G	U	U	U
hot	F	F	F	F	U	G	U	U	U	U	U	F	F	G	F	G	G	G	G	U	U	U
10-75%, cold	D	D	D	D	D	D	U	U	U	U	D	D	D	G	D	D	D	D	F	U	U	U
hot	U	U	U	U	U	D	U	U	U	U	U	D	D	G	D	D	D	D	D	U	U	U
75-95%, cold	D	D	D	D	U	D	U	U	U	U	U	U	U	G	D	U	U	U	D	U	U	U
hot	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	U	U	U	D	U	U	U
fuming	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
Sulphurous acid	F	F	F	F	D	D	U	D	U	U	D	G	G	G	G	G	G	G	G	U	U	U
Tannic acid	F	F	F	F	D	F	F	D	F	F	D	G	G	G	G	G	G	G	G	U	F	D
Tar	U	D	G	U	F	G	U	F	D	U	F	G	U	G	G	G	G	D	D	D	F	F
Tartaric acid	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	F	F
Toluene	U	U	F	U	U	G	U	U	U	U	U	U	U	G	U	G	F	D	D	G	F	D
Trichloroethylene	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	D	D	D	F	D	D
Turpentine	U	U	G	U	U	G	U	U	U	U	U	U	U	G	U	G	D	D	D	F	F	F
Vinegar	F	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	G	G	G	U	G	G
Water, acid mine, containing oxidizing salt	G	G	G	G	D	G	D	D	D	D	D	G	G	G	G	G	G	G	G	U	F	F
no oxidizing salt	G	G	G	G	F	G	D	F	D	D	F	G	G	G	G	G	G	G	G	U	F	F
Water ..... fresh (tap, boiler, etc.)	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Distilled, lab. grade	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
return condensate	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Water, seawater	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Whiskey and wines	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Zinc chloride	D	F	F	F	D	F	D	D	G	D	D	G	G	G	G	G	G	G	G	U	D	D
Zinc Sulphate	G	G	G	G	F	G	G	F	G	D	F	G	G	G	G	G	G	G	G	U	G	G

FBW-016

Designing your gasket correctly

Ideally, the designer should adapt flange construction to the existing gasket design. However, this is usually impossible as joint features are, in most cases, already fixed and cannot be changed as easily as the gasket.

But, regardless of whether you are designing flange to gasket or gasket to flange, the design principles are identical . . . only the approach is different. In order to achieve satisfactory gasket design and, consequently, prolonged trouble-free service from your gaskets, the following design information should be followed carefully.

Gasket yield stress—"y" factor

If a tight seal is to be effected, gasket material must be compressed sufficiently and flow into imperfections of the contact faces . . . filling all voids between mating flanges. If this flow doesn't take place a seal can't be effected without using gasket pastes or compounds.

"y" factor is the amount of force, expressed in p.s.i., that must be applied to the gasket contact area causing this essential flow. "y" factor is wholly independent of internal pressure. It is the minimum amount of stress needed if a gasket is to seal at all . . .even at very low pressures.

For example, soft rubber requires so little stress that it is considered self-yielding. Therefore, rubber of less than 75 durometer has a "y" value of 0 p.s.i. Most gasket materials and designs require relatively high initial stress if gasket is to seal properly. Once high initial stress is effected, however, gasket load may be sharply reduced without loss of efficiency. If such loss does occur, it is normally caused by bolt expansion, creep and relaxation.

Gasket factor—"m" factor

There are three forces that largely determine the "m" factor (see fig. 1). They are:

1. Bolt load—the force that squeezes the gasket into the face voids to form seal.

2. Hydrostatic end force—force that tends to separate flanges when internal pressure is applied.

3. Internal pressure—pressure that acts on the portion of the gasket exposed to the pressure side of the joint. Tends to blow gasket out of joint.

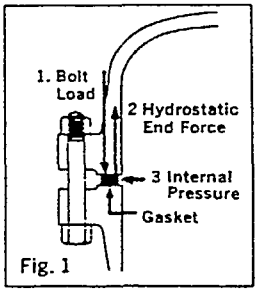


Fig. 1

"m" or gasket factor is the ratio of residual unit stress (bolt load minus hydrostatic end force) on gasket (p.s.i.) to internal pressure of the system. "m" factor usually remains constant throughout a wide range of pressure for a given gasket material and construction.

A gasket factor of 3.0, for example, would indicate that the residual stress of the gasket must be a minimum of three times the system's internal pressure if a proper seal is to be maintained.

Two basic steps

Step 1. First, designer must determine total force available: (a) to yield the gasket, and (b) to maintain a tight seal under service conditions. This force, usually supplied by bolts, will depend on the size and number of bolts in the flange and on the maximum allowable bolt stress. In turn, the maximum bolt stress will depend on the bolt material and operating temperature. Once this is obtained, total available bolt force can easily be determined by multiplying total bolt area by allowable stress.

Step 2. Next, an approximation of gasket dimensions should be ascertained. For some confined-joint facings, recess face dimensions limit gasket dimensions. On a full-face joint, a full-face gasket may be provided, reducing flange distortion. On other facings, considerable leeway is available. It is possible, then, to find "y" and "m" factors at the service pressure by determining the bolt force available and by having worked out a rough approximation of the gasket dimensions. By pairing these findings with a previous selection of materials, based on the recommendation chart and operating conditions, the proper gasket may be selected from a table of gasket factors and yield stresses (Tables 1 and 2).

Bolt load formulas

The initial bolt load required to seat a gasket sufficiently should be:

$Wm_2 = 3.14\ b\ GY.$

The required operating bolt load should be at least sufficient, under maximum operating conditions, to resist the hydrostatic end force and, in addition, to maintain a compression load on the gasket that experience has shown is sufficient, under maximum operating conditions, to resist the hydrostatic end force and, in addition, to maintain a compression load on the gasket that experience has shown is sufficient to assure a tight joint:

$Wm_1 = 0.785\ G^2P + (2b \times 3.14\ GMP)$

When determining number of bolts needed, use the greater of the two values Wm_1 or Wm_2

Nomenclature for the two formulas are:

Wm_1 = required bolt load for maximum operating conditions in lbs.

Wm_2 = required initial bolt load without internal pressure in lbs.

G = outside diameter of gasket contact face less 2b.

P = maximum allowable working pressure in p.s.i.

b = effective gasket seating width in inches (see Table 1)

Note: $b = b_0$ when b_0 is equal to or less than 1/4"

$b = \sqrt{\frac{b_0}{2}}$ when b_0 is greater than 1/4"

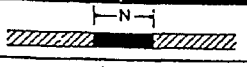
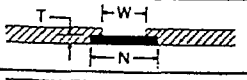
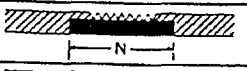
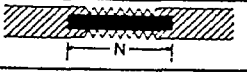
2b = effective gasket pressure width in inches

m = gasket factor (see Table 2)

y = gasket seating load in p.s.i. (see Table 2)

Note: This data applies only when the gasket is contained entirely within the inner edges of the bolt holes.

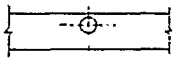
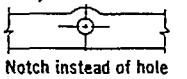
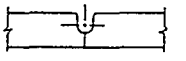
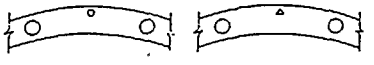
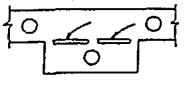
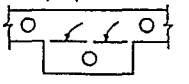
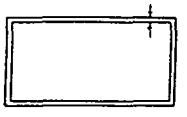
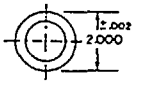
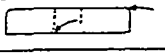
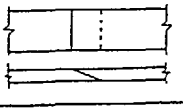
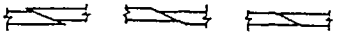
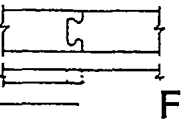
EFFECTIVE GASKET WIDTH—b (Table 1)

FACING LIMITS	GASKET SEATING WIDTH b
	$b_0 = \frac{N}{2}$
	$b_0 = \frac{W+T}{2}$, $\left(\frac{W+N}{4}\text{ maximum}\right)$
	$b_0 = \frac{7N}{16}$
	$b_0 = \frac{3N}{8}$

GASKET FACTORS (Table 2)

MATERIAL	"m"	"y"
Rubber		
Below 75 durometer	0.50	0
75 or higher durometer	1.00	200
Rubber with cotton fabric insert	1.25	400
Asbestos with a suitable binder for operating conditions:		
1/8" thickness	2.00	1600
1/16" thickness	2.75	3700
1/32" thickness	3.50	6500
Vegetable fiber	1.75	1100

COMMON FAULTS IN GASKET DESIGN AND SUGGESTED REMEDIES

DETAIL	WHY FAULTY	SUGGESTED REMEDY
Bolt holes close to edge 	Causes breakage in stripping and assembling	Projection or "ear"  Notch instead of hole 
Very small bolt holes or noncircular openings 	Require hand picking . . . easy to miss	Avoid hole sizes under 3/32-inch diameter. If small hole is for locating or indexing, change to notch 
Tear-away parts with open slots at attached edges 	Slots require hand picking, costly dies and die maintenance	Simple perforation 
Thin walls, delicate cross section in relation to over-all size 	High scrap loss; stretching or distortion in shipment or use. Restricts choice to high tensile strength materials	Have the gasket in mind during early design stages
Metalworking tolerances applied to gasket thickness, diameters, length, width, etc. 	Results in perfectly usable parts being rejected at incoming inspection. Requires time and correspondence to reach agreement on practical limits. Increases cost of parts and tooling. Delays deliveries	Most gasket materials are compressible. Many are affected by humidity changes. Try standard or commercial tolerances before concluding that special accuracy is required
Transference of fillets, radii, etc., from mating metal parts to gasket 	Unless part is molded, such features mean extra operations and higher cost	Most gasket stocks will conform to mating parts without preshaping. Be sure radii, chamfers, etc., are functional, not merely copied from metal members
Large gaskets made in sections with beveled joints 	Extra operations to skive. Extra operations to glue. Difficult to obtain smooth, even joints without steps or transverse grooves 	Die-cut dovetail joint 

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FBW-018

Anti-stick compressed asbestos sheet

Garlock's anti-stick releasing agent is blended into the surface of all compressed asbestos sheet, eliminating the need for graphited sheet.

Garlock Compressed Asbestos styles are made of either white or blue asbestos and several binders, including SBR, Neoprene or Nitrile. The asbestos and elastomeric binder are bonded under pressure and vulcanized into a homogeneous sheet.

All compressed sheet styles are ideal in applications employing rigid flanges with adequate bolting capacity. Garlock Compressed Asbestos sheet materials are excellent on such heavy-duty bolted and threaded joints as water and steam pipe fittings and manifold connections.

All styles are tough and durable with sufficient compressibility to provide a properly gasketed joint, but are resistant to plastic flow ordinarily encountered under heavy bolt loads.



Generally, white asbestos styles are suitable for service against hot oil, hot gases or steam. Blue asbestos sheet seals against hot or cold mineral acids, either alone or in conjunction with oils or organic solvents.

For more specific recommendations on all Garlock Compressed Asbestos styles see the Resistance Ratings Chart beginning on page 15. For technical information on each sheet, see the data on page 21.

Easy method for ordering compressed asbestos sheet packing

Now you can convert ordering data for Garlock compressed asbestos sheet packing into simple nine digit numbers . . . thus allowing further use of data processing equipment both for order entry and disbursements. To determine the correct nine-digit number, take the following steps:

1. First, make sure, by checking the following page, that the style number is available in the thickness you wish.
2. Use five digit number for the sheet style you wish to buy.
3. Follow this with the four digit number for the sheet size and thickness you wish.
4. In front of the resulting nine digit number, indicate the number of pounds or sheets you wish to buy.

Example:

2000# of Style 900 in 1/16" x 60 x 60 sheets would read . . . 2000# 31038-0521

50 sheets of 7705 in 1/8" x 60 x 120 sheets . . . 50 sheets 31064-0607

Style No.	Ordering No.	Style No.	Ordering No.
900	(31038-)	8748	(31114-)
7021	(31042-)	7819	(31595-)
7228	(31052-)	9057	(31571-)
7705	(31064-)	9500	(31657-)

SHEET SIZE AND THICKNESS NUMBER

Sheet Size	Sheet Thickness 1/64"	1/32"	1/16"	3/32"	1/8"	3/16"	1/4"
40 x 40"	-0429	-0471	-0512	-0554	-0596	-0680	-0764
40 x 60"	0431	0473	0514	0556	0598	0682	0766
40 x 80"	0432	0474	0515	0557	0599	0683	0767
40 x 120"	0433	0475	0516	0558	0600	0684	0768
50 x 50"	1702	1704	1706	1708	1710	1714	1827
50 x 75"	1723	1727	1731	1735	1739	1747	1755
50 x 150"	1724	1728	1732	1736	1740	1748	1756
60 x 60"	0438	0480	0521	0563	0605	0689	0773
60 x 80"	0439	0481	0522	0564	0606	0690	0774
60 x 120"	0440	0482	0523	0565	0607	0691	0775
75 x 75"	1761	1765	1769	1773	1777	1785	1793
75 x 150"	1762	1766	1770	1774	1778	1786	1794
80 x 80"	0441	0483	0524	0566	0608	0692	0776
80 x 120"	0442	0484	0525	0567	0609	0693	0777
120 x 120"	0443	0485	0526	0568	0610	0694	0778
150 x 150"	1797	1799	1801	1803	1805	1809	1813

Compressed Asbestos	900	7021	7228	7705	8748	7819	9057	9500
Material	White chrysotile asbestos with SBR binder	White chrysotile asbestos with SBR binder	White chrysotile asbestos with neoprene binder	Blue crocidolite asbestos with acid resisting SBR binder	White chrysotile asbestos with nitrile binder	White chrysotile asbestos with SBR binder	White chrysotile asbestos with chloroprene binder	White chrysotile asbestos with SBR binder
Tensile strength: With grain Across grain Average	 6000 p.s.i 3000 p.s.i. 4500 p.s.i.	 8000 p.s.i. 3600 p.s.i. 5800 p.s.i.	 5500 p.s.i. 3000 p.s.i. 4250 p.s.i.	 5000 p.s.i. 2000 p.s.i. 3500 p.s.i.	 8500 p.s.i. 4500 p.s.i. 6500 p.s.i.	 5000 p.s.i. 2600 p.s.i. 3800 p.s.i.	 9000 p.s.i. 4600 p.s.i. 6800 p.s.i.	 7500 p.s.i. 3500 p.s.i. 5500 p.s.i.
Compressibility, under 5000 p.s.i. load Recovery	12 ± 5% 40% min.	12 ± 5% 40% min.	12 ± 5% 40% min.	20 ± 5% 40% min.	12 ± 5% 40% min.	12 ± 5% 40% min.	12 ± 5% 40% min.	12 ± 5% 40% min.
Oil resistance after 5 hrs. in: ASTM #3 oil @ 300° F. Thickness increase Tensile loss	 30% 50%	 40% 50%	 20% 40%	 25% 50%	 3% 10%	 26.5% 56%	 15% 25%	 63% 76%
Fuel resistance, after 5 hrs. in: ASTM Ref. Fuel B @ R.T. Thickness increase Weight increase	 25% 20%	 20% 25%	 15% 15%		 5% 15%	 20% 20%	 17% 15%	 26% 22%
Flexibility	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking
Density (per cubic inch)	.93 oz.	.90 oz.	.91 oz.	.83 oz.	.85 oz.	.97 oz.	1.0 oz.	.98 oz.
Thicknesses available (inches)	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8	1/32 1/16 3/32 1/8	1/64 1/32 1/16 3/32 1/8	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8 3/16 1/4
Sheet sizes (inches)	The following sizes are available in all style numbers 40x40 40x60 40x80 40x120 50x50 50x75 50x150 60x60 60x80 60x120 75x75 75x150 80x80 80x120 120x120 150x150							
Tolerances on thicknesses (inches)	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010	1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.015	1/4 +.005 —.002 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/4 +.005 —.002 1/4 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015
Meets specifications	ASTM-D-1170-68T Grade P-1161A. MIL-G-12803A Grade P-1161A	HH-P-46C ASTM-D-1170-62T Grade P-1161A MIL-G-12803A Grade P-1161A MIL-A-17472B UL Approval	MIL-A-7021B Cl. I ASTM-D-1170 62T Grade P-1151-A AMS-3232H		ASTM-D-1170-62T Grade P-1161A MIL-G-12803A Grade 1141A AMS-3232H	ASTM-D-1170-62T Grade P-1161A	ASTM-D-1170-62T Grade P-1151A SAE J90A Grade P-1151A	ASTM-D-1170-62T Grade P-1161B SAE J90A Grade P-1161B
How branded	Style numbers 900, 7021, 7228 and 7705 are branded with Garlock name and style number thru 60". Over 60" std. is unbranded unless otherwise specified.				Garlock name only thru 60". Over 60" std. is unbranded unless otherwise specified		Unbranded	

FBW-020

Garlock homogeneous rubber sheet SBR • NATURAL • NEOPRENE • NITRILE

Garlock offers a wide range of natural and synthetic rubbers, all having certain basic characteristics that allow the gasket designer infinite design possibilities.

Rubber is incompressible—It can easily be deformed, depending upon durometer and cross section, but can never be reduced in volume.

Rubber is extensible—This feature is extremely valuable when a gasket must be assembled over a projection or shoulder with the idea of having it "snap tight" within a groove. Rubber is one of the few materials capable of withstanding such treatment.

Rubber is highly impermeable—This feature applies when describing rubber's ability to serve as a tight barrier against the passage of gases or fluids.

Rubber is elastic—As a result, relatively little flange pressure is required to effect intimate contact with the face of the rubber gasket. Also, this elasticity allows a rubber gasket to move with flange surfaces without disrupting the seal.

Generally, rubber's unique properties are best utilized in applications where controlled deformation is desirable.

Other materials—such as viton and silicone are also available on request.

Easy order method for homogeneous rubber sheeting

Now you can convert ordering data for homogenous rubber sheet into nine-digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements. It can be used for all standard widths.

1. First, check to make sure the style number is available in the thickness you wish.
2. Use five digit number for the sheet *style* you wish to buy.
3. Follow this with the four digit number for the sheet *thickness* you wish.
4. In front of the resulting nine digit number, indicate the number of standard rolls you wish to buy. (For 1/32", a standard roll is 100#, for 1/16" and up, a standard roll is 200 pounds.)

Example: 2000# of 1/8 Style No. 353 would read: 10 rolls 31016-0118. (2000# of 31016-0118 would also, of course, be acceptable.)

Style No.

22	(31003-)	7797	(31072-)	9122	(31560-)
91	(31006-)	7986	(31082-)	8495	(31100-)
353	(31016-)	8312	(31090-)	8459	(31098-)
6023	(31041-)	8639	(31108-)	8452	(31096-)

Thickness					
1/32"	(-0095)	3/32"	(-0110)	3/16"	(-0133)
1/16"	(-0102)	1/8"	(-0118)	1/4"	(-0149)

Homogeneous Rubber Sheet	91	22	353
Material	SBR	SBR	SBR
Hardness (Shore A)	60 ± 5	80 ± 5	80 ± 5
Tensile strength (Min.)	1500 p.s.i.	1000 p.s.i.	1200 p.s.i.
Elongation (Min.)	400%	250%	150%
Compression set ASTM method B 25% deflection	22 hrs./158° F. 25% max.	22 hrs./158° F. 60% max.	22 hrs./158° F. 40% max.
Weight (lbs.-approx.)	1/16—3.3# sq. yd.	1/16—4.7# sq. yd.	1/16—4.4# sq. yd.
Maximum volume change after immersion in: ASTM #1 oil, 70 hrs/212°F. ASTM #3 oil, 70 hrs/212°F.			
Thicknesses available (inches)	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater
Width available (inches)	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—42
Size of rolls available (approx.)	1/32"—100 lbs. 1/16" and over, 200 lbs.	1/32"—100 lbs. 1/16" and over, 200 lbs.	1/32"—100 lbs. 1/16" and over, 200 lbs.
Finishes available	Standard—cloth Special—smooth	Thru 1/8", cloth finish Over 1/8", smooth finish	Thru 1/8", cloth finish Over 1/8", smooth finish
Tolerances on thicknesses (inches)	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031
Meets specifications:	ASTM-D-735-SAE J 14 Grade R-615 B, F1, F2 ASTM-D-2000-SAE J 200 2AA615A13F17	HH-G-156-C Class C ASTM-D-1330 Grades 1 & 2	ASTM-D-735-SAE J 14 Grade R-810 ASTM-D-2000-SAE J 200 1AA810
How branded	Garlock name and style no.		

FBW-021

6023	8312	7986	8639	7797	9122	8495	8459	8452
Natural Rubber	Neoprene	Neoprene	Neoprene	Neoprene	Nitrile	Nitrile	Nitrile	Nitrile
35 ± 5	50 ± 5	60 ± 5	70 ± 5	80 ± 5	60 ± 5	70 ± 5	80 ± 5	90 ± 5
3000 p.s.i.	1500 p.s.i.	1800 p.s.i.	1900 p.s.i.	1500 p.s.i.	2000 p.s.i.	2600 p.s.i.	2100 p.s.i.	1900 p.s.i.
600%	375%	250%	275%	125%	600%	450%	300%	225%
22 hrs./150° F. 25% max.	70 hrs./212° F. 35% max.	70 hrs./212° F. 35% max.	70 hrs./212° F. 65% max.	70 hrs./212° F. 75% max.	22 hrs./212°F 20% max.	22 hrs./212°F 40% max.	22 hrs./212°F 25% max.	22 hrs./212°F 45% max.
1/16–2.8# sq. yd.	1/16–3.8# sq. yd.	1/16–4.0# sq. yd.	1/16–4.2# sq. yd.	1/16–4.3# sq. yd.	1/16–3.45# sq. yd.	1/16–3.5# sq. yd.	1/16–3.8# sq. yd.	1/16–3.9# sq. yd.
	−7 to 0% +60 to +90%	−4 to +3% +50 to +80%	0 to +10% +40 to +70%	−7 to 0% +45 to +60%	−10 to +5% 0 to +25%	−10 to +5% 0 to +35%	−5 to +5% +16 to +35%	−10 to +5% 0 to +25%
1/16 3/32 1/8 3/16 1/4 and greater	1/16 3/32 1/8 3/16 1/4 and greater	1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater
Standard—36	Standard—36	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—44	Standard—36 Special—44	Standard—36 Special—44	Standard—36 Special—44
200 lbs.	200 lbs.	200 lbs.	1/32"—100 lbs. 1/16" & over, 200 lbs.	1/32"—100 lbs. 1/16" & over, 200 lbs.	200 lbs. over 1/4-15 ft. lengths	200 lbs. over 1/4-15 ft. lengths	200 lbs. over 1/4-15 ft. lengths	200 lbs. over 1/4-15 ft. lengths
Smooth	Smooth	Smooth	1/32" & 1/16" cloth over 1/16" smooth	1/32" & 1/16" cloth over 1/16" smooth	Smooth	Smooth	Smooth	Smooth
1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.012 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031
HH-G-156C Class A	ASTM-D-735-SAE J 14 Grade SC515 B, E1, E3, F1 ASTM-D-2000-SAE J 200 2BC515A14 B14E14E34F17	ASTM-D-735-SAE J 14 Grade SC612 B, E1, E3, F1 ASTM-D-2000-SAE J 200 3BC610A14 B14E14E34F17	ASTM-D-735-SAE J 14 Grade SC720 E1, E3 ASTM-D-2000-SAE J 200 5BC720A14 E14E34	ASTM-D-735-SAE J 14 Grade SC815 E1, E3 ASTM-D-2000-SAE J 200 4BC815A14 E14E34		ASTM-D-735-SAE J 14 Grade SB 720A MIL-D-3377 Type I	ASTM-D-735-SAE J 14 Grade SB820 E1 MIL-D-3377	
Garlock name and style no.					1/16 x 1/8—Garlock name and style no. Others—Garlock name only	Garlock name only		1/16 x 1/8—Garlock name and style no. Others—Garlock name only

FBW-022

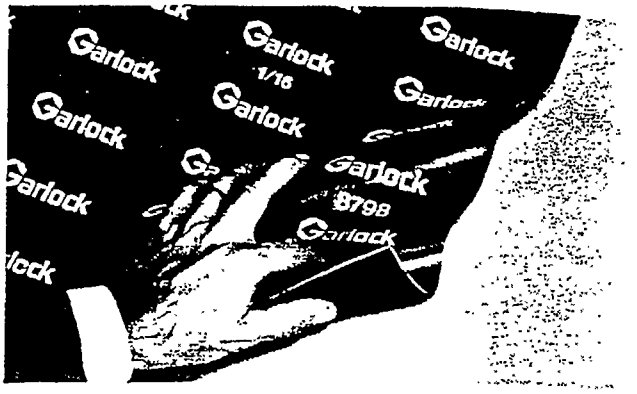
Cloth inserted rubber sheet for gasketing or diaphragm service

In the manufacture of rubber diaphragm sheet, Garlock utilizes the elasticity and extensibility features of rubber and the tough construction of a fabric insert. The result: a sturdy diaphragm sheet that has an extremely high burst strength and, yet, has the flexibility so vital in diaphragm service.

Each Garlock diaphragm style is specially compounded, using various combinations of rubbers and fabric inserts, to meet specific sets of service conditions.

For example, Garlock offers for normal service, where temperatures are low, SBR or neoprene rubbers with either cotton sheeting, hose duck or tire duck inserts. Nylon insert is combined with neoprene where higher pressure and temperature diaphragm service is encountered.

When selecting diaphragm sheet material, extreme care should be exercised. Such factors as pressures, fluids, required stroke, and life expectancy deserve careful consideration.



Detailed information provided in the chart below can give you valuable assistance in this selection process.

However, we suggest that before you make your final choice of diaphragm sheet, you contact your nearest Garlock sales representative. He will gladly help you in determining a diaphragm material's suitability for your particular needs.

Cloth-Inserted Rubber	19	619	7992	8798	9205
Material	SBR rubber with 5 oz. cotton sheeting in 1/32" thickness as fabric insert, 12 oz. cotton chafer in all others	SBR rubber with 17 oz. tire duck fabric insert	Neoprene with 17 oz. tire duck fabric insert	Neoprene with 13 oz. nylon fabric insert	Nitrile with 4.5 oz nylon fabric insert
Hardness (Shore A)	80	50	50	50	50
Burst Test across 2" diameter opening		270 p.s.i.g. (1/8"—1 ply)	270 p.s.i.g. (1/8"—1 ply)	1000 p.s.i.g. (1/8"—1 ply)	350 p.s.i. (1/32" or 1/16"—1 ply)
Number of plies	1/32 1/16 3/32—1 ply 1/8—2 ply 3/16—3 ply 1/4—4 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/32 & 1/16—1 ply
Weight (lbs. per square yard)	1/32"— 2.1 1/16"— 4.1 3/32"— 5.8 1/8"— 7.6 3/16"—11.4 1/4"—15.2	1/16"— 3.4 3/32"— 5.1 1/8"— 6.8 3/16"—10.1 1/4"—13.5	1/16"— 3.6 3/32"— 5.6 1/8"— 7.5 3/16"—11.1 1/4"—14.8	1/16"— 3.7 3/32"— 5.8 1/8"— 7.6 3/16"—11.4 1/4"—14.9	1/32"—2.06 1/16"—4.13
Thicknesses available (inches)	1/32, 1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/32, 1/16
Width available (inches)	44	44	44	44	44
Finish available	Smooth	Smooth	Smooth	Smooth	Smooth
Tolerances on thicknesses	1/32, 1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16 ±.016 1/32 ±.012
How branded	Garlock name and style no.				

FBW-023

Easy ordering method for cloth-inserted rubber sheet

Now you can convert ordering data for cloth-inserted rubber sheet into nine-digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements.

1. First, check the chart on page 24 to make sure the style number is available in the thickness you wish.

2. Use five digit number for the sheet *style* you wish to buy.

3. Follow this with the four digit number for the sheet *thickness* you wish.

4. In front of the resulting nine digit number, indicate the number or standard rolls you wish to buy. (For 1/32" a standard roll is 100#, for 1/16" and up, a standard roll is 200 pounds.)

Example:

1000# of 1/8" Style No. 8798 would read 5 rolls 31119-0270.

(1000# of 31119-0270 would also, of course, be acceptable.)

Style No.	Ordering No.
19	(31002-)
619	(31026-)
7992	(31180-)
8798	(31119-)
9205	(31136-)

Style No.	Ordering No.
1/32"	(-0247)
1/16"	(-0254)
3/32"	(-0261)
1/8"	(-0270)
3/16"	(-0285)
1/4"	(-0301)

Woven asbestos gasketing cloth style 605

Garlock 605 is woven from white asbestos yarn which has been reinforced with brass wire. It is impregnated with a high temperature-resistant natural rubber cement. Garlock 605 was specially designed for use against steam, gases and aqueous solutions other than strong mineral acids.

Easy ordering method for woven asbestos gasketing cloth style 605.

Now you can order style 605 Gasketing Cloth by nine-digit code number . . . thus allowing further use of data processing equipment for order entry and disbursements.

1. The five digit code number for all 605 cloth is 31018.

2. Follow this number with the four digit number for the thickness desired.

3/64"	(-0327)
1/16"	(-0330)
1/8"	(-0346)
3/16"	(-0361)
1/4"	(-0377)

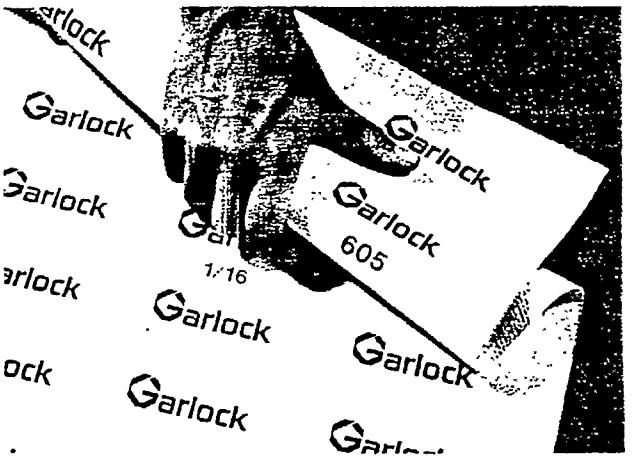
3. In front of the resulting nine digit number, indicate the number of rolls or pounds desired. 3/64" thickness comes in 100# rolls and 1/16" and up comes in 200# rolls.

How to order style 604 gaskets.

See current price pages for sizes of manhole and handhole gaskets.

How to order style 612 folded tape.

This tape is available in a large variety of widths and thicknesses. See current price pages for ordering information.



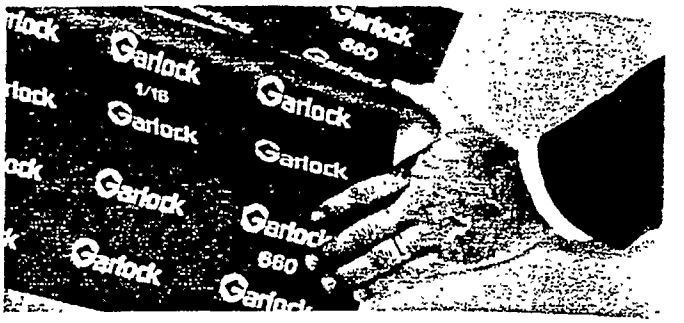
Woven Asbestos Cloth, Tape and Gaskets	605
	Asbestos Cloth with brass wire insertion, impregnated with a high temperature resistant rubber cement
Thicknesses available (inches)	3/64 1/16 1/8 3/16 1/4
Width available (inches)	48
Size of rolls	3/64" 100 lbs. 1/16" and up 200 lbs.
Also available in folded gasket form under style 604 and folded tape under style 612	

Vegetable fiber sheet

Garlock furnishes high-quality Vegetable Fiber sheets compounded with a glue-glycerine binder.

Garlock 660 is made of a combination of vegetable fiber, cork and glue-glycerine. It is suitable against oils, solvents, aromatic and non-aromatic fuels up to 250° F. Garlock 660 is a highly compressible sheet . . . especially useful where lightweight sheet metal flanges are involved.

Garlock 681 is a vegetable fiber sheet with a glue-glycerine binder. It is suitable against the same media as 660.



Easy ordering method for vegetable fiber sheet

Now you can convert ordering data for vegetable fiber sheet into nine digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements.

The code numbers can be used for both standard rolls and standard sheets.

Thicknesses

Standard rolls:	.006" thru .021"	100 lineal yards
	1/32" & 3/64"	50 lineal yards
	1/16" thru 1/8"	25 lineal yards
Standard sheets:	3/16" & 1/4"	36" x 36"

1. First check to make sure the style number you wish is available in the thickness you wish.

2. Use five digit number for the sheet style you wish to buy.

3. Follow this with the four digit number for the sheet *thickness* you wish.

4. In front of the resulting nine digit number indicate the number of standard rolls or sheets you wish to buy.

Example:

5 rolls of 1/16" Style 660 would read 5 rolls 31029-0102.

Style No.	Ordering No.
660	(31029-)
[illegible]	(31035-)

Style No.	Ordering No.
.006"	(-0077)
.010"	(-0084)
1/64"	(-0087)
.021"	(-0091)
1/32"	(-0095)
3/64"	(-0099)
1/16"	(-0102)
3/32"	(-0110)
1/8"	(-0118)
3/16"	(-0133)
1/4"	(-0149)

Vegetable Fiber Sheet	660	681
Material	Vegetable fiber and cork granules with glue-glycerine binder	Vegetabler fiber with glue-glycerine binder
Tensile strength (minimum)	1000 p.s.i.	2000 p.s.i.
Compressibility under 1000 p.s.i. load Recovery	40%—55% 40% (minimum)	25%—40% 40% (minimum)
Oil Resistance after 22 hours in: ASTM #3 oil at 70°-85° F. Thickness increase Weight increase	5% (maximum) 30% (maximum)	5% (maximum) 15% (maximum)
Fuel Resistance after 22 hours in: Fuel B at 70°-85° F. Thickness increase Weight increase	5% (maximum) 30% (maximum)	5% (maximum) 15% (maximum)
Water Absorption after 22 hours in: Distilled water at 70°-85° F. Thickness increase Weight increase	30% (maximum) 100% (maximum)	30% (maximum) 90% (maximum)
Thicknesses available (inches)	.010 1/64 .021 1/32 3/64 1/16 3/32 1/8 3/16 1/4	.005 .010 1/64 .021 1/32 3/64 1/16 3/32 1/8 3/16 1/4
Widths available (inches)	Standard 36" Special 48" in following thicknesses 1/32 1/16 3/32 1/8 3/16 1/4	Standard 36"
Tolerances on Thicknesses	.010 1/64 ±.0035" .021 1/32 3/64 ±.005" 1/16 ±.008" 3/32 & greater ±.016"	.010 1/64 ±.0035" .021 1/32 3/64 ±.005" 1/16 ±.008" 3/32 & greater ±.015"
Meets Specifications	ASTM-D-1170-62T Grade P-3415-A SAE J90 Grade P-3415-A	ASTM-D-1170-62T Grade P-3313-B SAE J90 Grade P-3313-B
How Branded	Garlock name and style number	

FBW-025

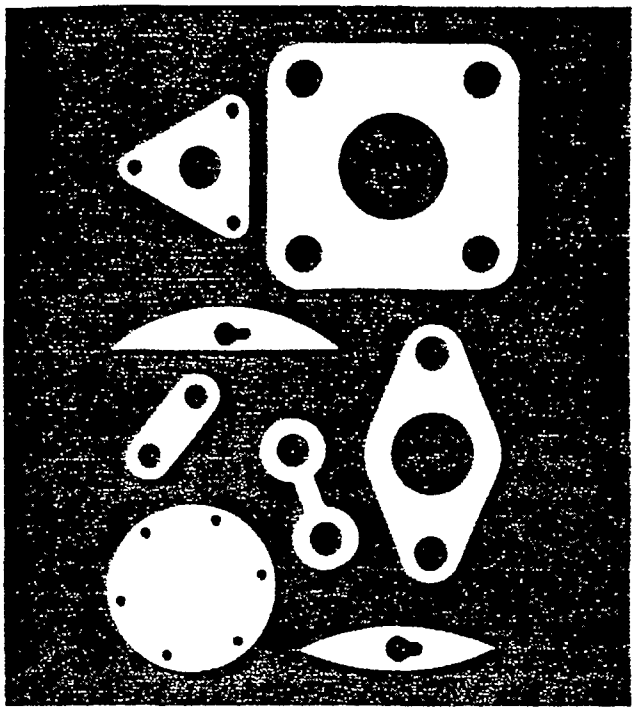
Garlock CHEMISEAL® solid TFE pipe flange gaskets

Corrosion-resistant non-contaminating wide temperature range (—450° F. to +500° F.)

Garlock gaskets of solid 8764 TFE fluorocarbon resin are used throughout industry wherever resistance to chemical attack or product non-contamination are important considerations. Generally, solid TFE fluorocarbon gaskets: (1) are serviceable against any material except molten alkali metals and fluorine under pressure—eliminating change of gaskets to suit medium; (2) have outstanding non-adhesive properties eliminating gasket sticking where joints are opened frequently.

Solid TFE CHEMISEAL gaskets are available in either ring, full face, or special-shaped forms.

Style 8764 TFE gaskets for standard pipe flanges are now "skin-packed" for added cleanliness, protection from damage and for convenience in storage. 1/16" thick gaskets are put up ten per pack and 1/8" thick are offered five per pack.



Standard Sizes Garlock 8764 Pipe Flange Ring Gaskets—Class 150 Pound Flange

PIPE SIZE (inches)	OLD STANDARD I.D.	OLD STANDARD O.D.	USA STANDARD* I.D.	USA STANDARD* O.D.
1	1	2 5/8	1 5/16	2 5/8
1 1/4	1 1/4	3	1 31/32	3
1 1/2	1 1/2	3 3/8	1 29/32	3 3/8
2	2	4 1/8	2 3/8	4 1/8
2 1/2	2 1/2	4 7/8	2 7/8	4 7/8
3	3	5 3/8	3 1/2	5 3/8
3 1/2	3 1/2	6 3/4	4	6 1/2

*Non-Metallic Gaskets for Pipe Flanges USA B16.21—1951.

PIPE SIZE (inches)	OLD STANDARD I.D.	OLD STANDARD O.D.	USA STANDARD* I.D.	USA STANDARD* O.D.
4	4	6 7/8	4 1/2	6 7/8
5	5	7 3/4	5 9/16	7 3/4
6	6	8 3/4	6 5/8	8 3/4
8	8	11	8 5/8	11
10	10	13 3/8	10 3/4	13 3/8
12	12	16 1/8	12 3/4	16 1/8

NOTE: USA standard size will be shipped unless "old standard" is specified on order.

Garlock 8764 TFE sheet

Garlock 8764 TFE Sheet, per United States Department of Commerce Standard CS-239-63 Grade B, is available for cutting gaskets in your plant to fill emergency needs for either standard or non-standard flanged joints. TFE Sheet is available in three standard sheet sizes: 24 in. x 24 in., 36 in. x 36 in. and 48 in. x 48 in. and twelve standard thicknesses shown in chart below. Standard sheet size tolerances are +.250 in. —.000 in.

THICKNESS (inches)	THICKNESS TOLERANCES (inches)	APPROX. WEIGHT (lb./sq. ft.)
1/32	+.015 —.005	0.40
*1/16	+.015 —.005	0.75
3/32	+.020 —.005	1.12
*1/8	+.016 —.008	1.45
3/16	+.022 —.011	2.17
1/4	+.030 —.015	2.89

THICKNESS (inches)	THICKNESS TOLERANCES (inches)	APPROX. WEIGHT (lb./sq. ft.)
3/8	+.038 —.019	4.32
1/2	+.046 —.022	5.73
5/8	+.054 —.027	7.16
3/4	+.070 —.035	8.60
7/8	+.078 —.039	10.00
†1	+.087 —.043	11.45

FBW-026

*48 in. x 48 in. sheets available in these thicknesses per United States Department of Commerce Standard CS-239-63 Grade C.
†Thicknesses greater than 1 in., per United States Department of Commerce Standard CS-239-63 Grade B available in standard sheet sizes on special order.

arlock CHEMISEAL® jacketed gaskets

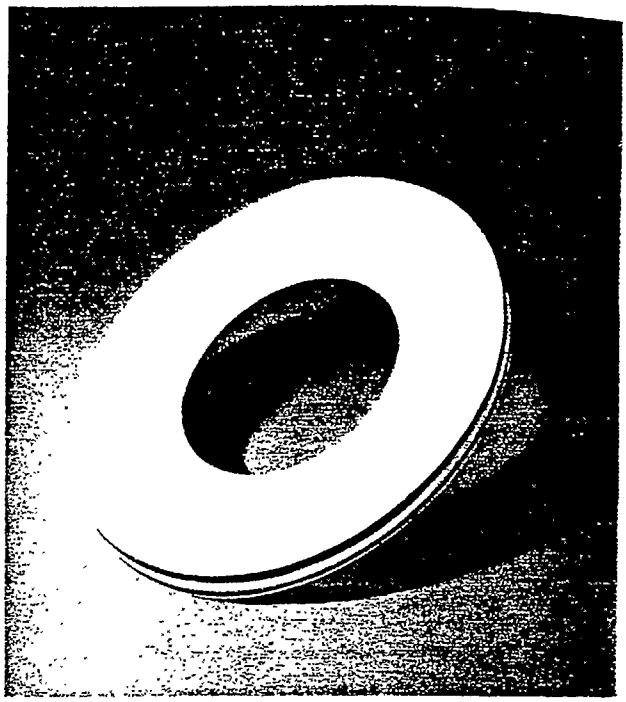
ır chemical-resistant piping and equipment.

IEMISEAL Jacketed Gaskets are now "skin-packed" to ep them clean, sanitary and perfectly flat for perfect ·aling ability whenever you are ready to use them.

arlock gaskets with 8764 TFE jackets (often called .velopes) are ideal for applications where corrosion, ntamination or other undesirable effects must be mbated . . . also where gasketing must be resilient ıd highly deformable. Good examples are glass-lined ping and such processing equipment as reactors, :ttles, condensers, heat exchangers and columns.

glass-lined steel piping, bolting pressures must not too heavy. Thus, the gasket filler material must be refully selected. From the several Garlock filler aterials you can choose the one with exactly the right :formability to assure a tight lasting seal on any spe-fic application.

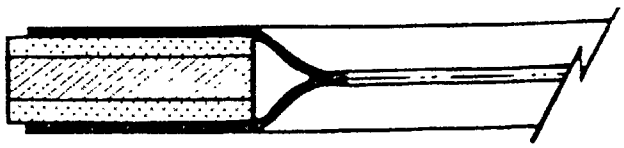
ı processing equipment, where corrosion and con-mination cannot be tolerated, the TFE jacket gives ·mplete resistance to both conditions . . . reduces .emical permeability to the base minimum—virtually :minating mechanical failure.



¦asic jacket designs

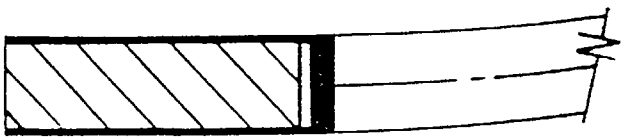
lit envelope jackets

it envelope jackets are basically ring gaskets .040 in. ick, split from outside diameter to about 1/16 in. ɔm inside diameter. Bearing surface is determined ' filler dimensions as jacket requires clearance be-'een filler I.D. and jacket I.D. Gasket outside diam-er nests within bolt circle. Inside diameter is approx-ıate nominal I.D. of pipe. Available for standard USA anges in pipe sizes from 1 in. through 12 in. Maximum .D. 24 in.



filled envelope jackets

illed envelope jackets are made from TFE cylinder ock. Jacket is machined from its O.D. to within 1/32 . of I.D., leaving shields of approximately .020 in. p bottom. Flat I.D. of jacket fits flush with pipe D. Gasket O.D. nests within bolt circle. Standard zes from 1 in. through 12 in. Maximum O.D. 24 in.

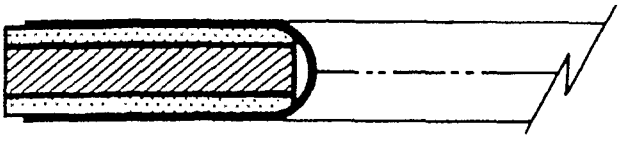


FBW-027

Formed shield jackets

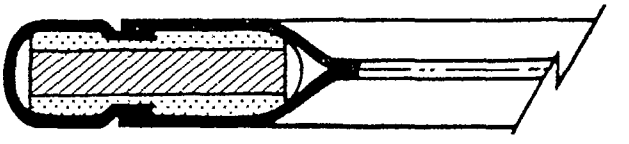
with exclusive butt welded construction

Formed shield jackets are necessary for diameters over 12 in. and such irregular openings as tank heads and man-holes. Over-all thicknesses range from 3/16 in. to 3/8 in. Patented Garlock Butt Welded Construction eliminates any "lump" at the seam and allows: (1) uniform bolting around entire flange surface for tight, leakproof seal; (2) much less bolt loading for a good seal, as compared with lap joint construction.



Double jacket design

Double jacket design. Two jackets are overlapped to protect O.D. as well as I.D. They can be either slit envelope, milled envelope or formed shield types. Especially recommended for vacuum service where outside atmosphere is corrosive enough to attack filler material. Minimum standard I.D. is 12 in. Under special conditions smaller sizes can be made.

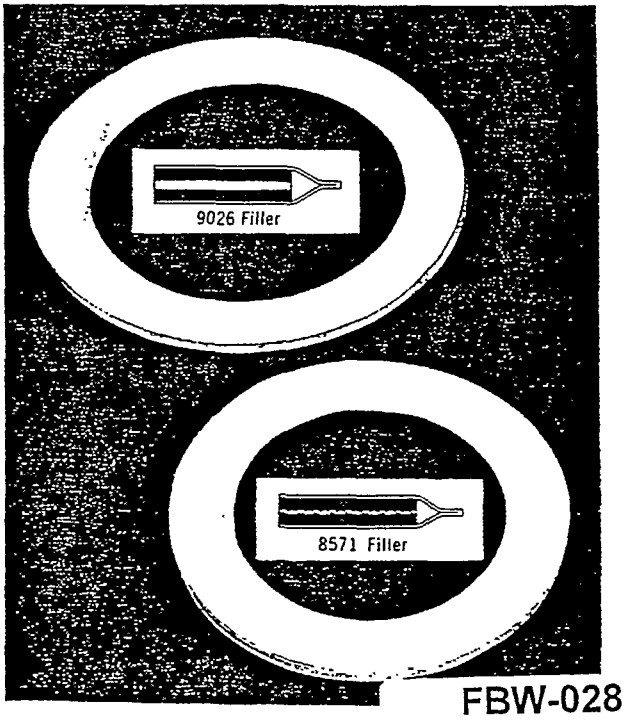


For glass lined steel flanged piping and equipment

Garlock 9026 filler. Made of compressed asbestos between two layers of felted blue asbestos. *Service:* For pressures under 300 psi on larger diameter openings.

Garlock 8571 filler. Made of corrugated steel between two layers of felted blue asbestos. *Service:* For high pressures (300 psi and over). Its use in nominal sizes up to 12 in. for low or high pressure service is recommended due to its ability to seal at lower bolt loads than 9026 Filler.

Interchangeable for any glass-lined flanged openings, these fillers are recommended because their resiliency and deformability make possible minimum bolt loading. This, in turn, accommodates the fragile characteristics of the glass lining. Other than glass-lined steel, these fillers should be used *only* where excessive flange surface irregularity is present. For vacuum service, double jacketed gaskets are recommended, with either of the above fillers completely shielded.



FBW-028

Garlock GYLON® gaskets

Designed specifically for chemical service.

GYLON gasket materials are made by an unique Garlock process that permits the restructuring of fluorocarbon particles to meet specific requirements of gasket applications. The recoverability, compressibility, stress relaxation and cold flow characteristics of GYLON gaskets exceed those of all known gasket materials with similar chemical resistance. GYLON gaskets are recommended for all liquids except molten alkali metals and certain active fluorine compounds. Additionally, a special style GYLON gasket material has been developed specifically for hydrofluoric acid service.

Benefits of GYLON Gaskets.

Garlock's improved fluorocarbon materials offer all the chemical resistance features of TFE with almost none of the problems. For example, GYLON gaskets have excellent pressure resistance with virtually no creep or cold flow. The compression set characteristics are unusually low and the recovery characteristics are excellent. Since GYLON gasket material is stable over a wide temperature range, there are no leakage problems during extremely hot or cold process cycles. All the benefits of GYLON gaskets combine to offer an improved fluorocarbon material that will provide better service and seal longer than any other known gasket material of comparable chemical resistance.

GYLON Gasket Specifications.

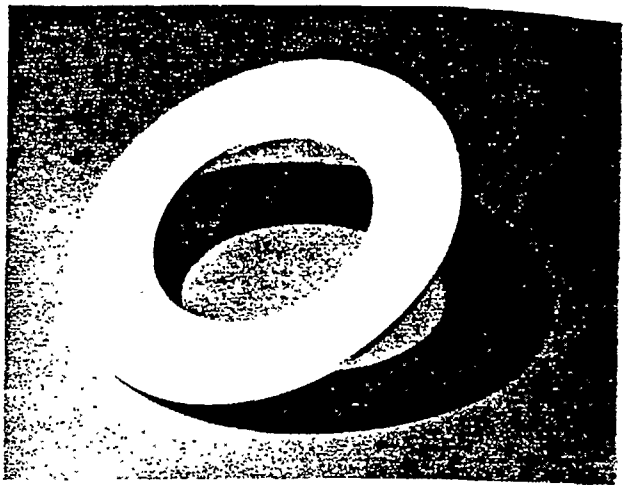
Chemical resistance of TFE
Special material for hydrofluoric acid service
Pressure to 500 psi
Temperature from cryogenic to 500° F
General Chemical Gasketing (color-coded Fawn) meets FDA specifications.

Thickness	Min. Design Seating Stress (y) PSI	Gasket Factor (m)
1/32	3200	2.00
1/16	2800	1.75
1/8	2300	1.50

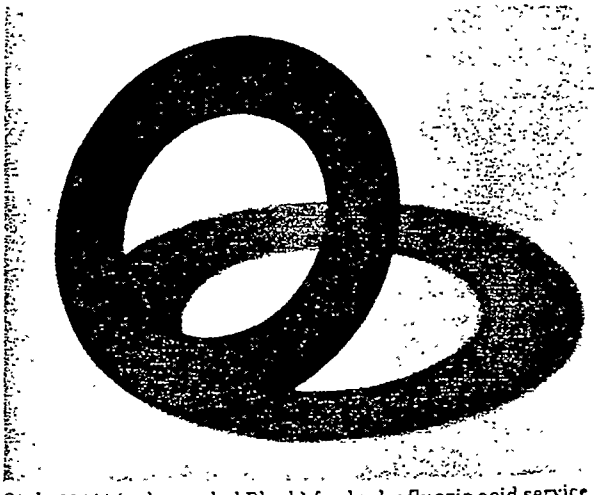
(Tests Based On Water)

Uses of GYLON Gasket Material.

GYLON gaskets should be considered for chemical applications where stress relaxation is a problem. The low compression set characteristics and excellent recovery features of GYLON gaskets make them ideal for [illegible], pumps, tank cars, pipe flanges, filters, strainers, mixing equipment and all processing equipment requiring chemical resistant gaskets. GYLON gaskets have solved many problems in the chemical, petrochemical and refining, and pulp and paper industries where acids, sulfanol, organic phosphates, soda ash, filtrates, etc. have been troublesome. Consult your Garlock representative for a recommendation to help you solve your tough gasketing problems.



Style 35404 (color-coded Fawn) for chemical service



Style 35444 (color-coded Black) for hydrofluoric acid service

Ordering information.

To help you order the correct GYLON gaskets for your particular requirement, refer to the following chart

Style	Color-Code	Service	Type
35104	Fawn	General Chemical	Sheet
35144	Black	Hydrofluoric Acid	Sheet
35404	Fawn	General Chemical	Standard Flange Gaskets
35444	Black	Hydrofluoric Acid	Standard Flange Gaskets
35904	Fawn	General Chemical	Special Gaskets
35944	Black	Hydrofluoric Acid	Special Gaskets

FBW-029

Garlock style 555 Type CR GUARDIAN® gaskets

Semi-metallic gaskets combining all the advantages of spiral-wound design and an integral gauge ring for sealing high pressures, high temperatures, in raised face, plain face and lapped joints.

Garlock Type CR GUARDIAN Spiral-Wound Gaskets are manufactured under the most rigid engineering specifications and quality control standards in the industry. Gaskets are packaged at the factory in heavy duty corrugated boxes for protection and easy identification. Factory packaging of spiral-wound gaskets keeps gaskets looking new and free from contamination, eliminates separation of gasket and ring components, facilitates storing until used and assures selection of the right gasket for the right joint to make a safe seal.

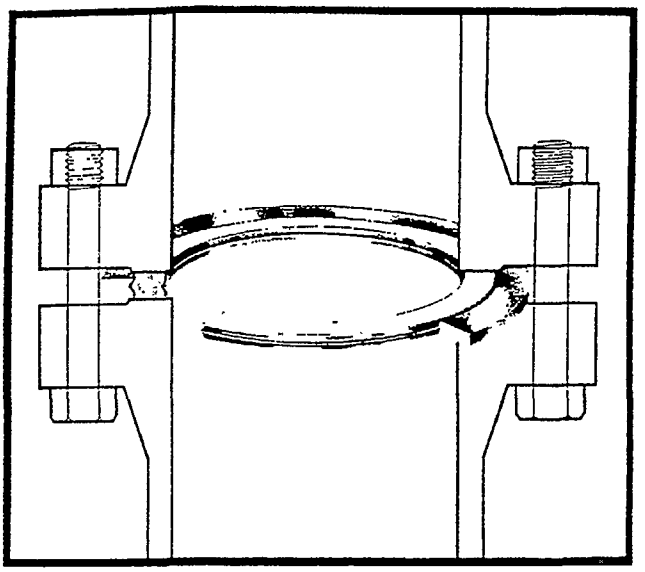
Garlock Type CR GUARDIAN Spiral-Wound Gaskets are made of alternating plies of preformed, "V" shaped, spring-like metals and asbestos or other fillers. Gasket density, i.e. the relationship of the engineered "V" design of the preformed metal to the selected filler, is varied according to the bolting of the joint asembly to maintain gasket resiliency and to control gasket compressibility. Type 304 stainless steel and white asbestos are the standard materials used in the sealing component. The gauge ring, stamped with identifying information, is cold rolled steel, plated to resist atmospheric corrosion. The ring O.D. equals the bolt circle less the diameter of one bolt, making it easy to center the gasket assembly in the joint.

The sealing component is .175 in. nominal thickness and the gauge ring is 1/8 in. nominal thickness. The unusual resiliency and rebound characteristics of the gasket permit it to adjust to varying conditions of loading, internal pressure and temperature changes. Optimum compression, without overstressing the bolts, is achieved when flange faces are brought down to the gauge ring, compressing the gasket to a .125 in.-.135 in. thickness.

Garlock Type CR GUARDIAN Spiral-Wound Gaskets are available for immediate delivery, in standard materials, from Garlock warehouses for USA standard flanged fittings (USA B16.5) to and including 2500 lb. series. Standard dimensions are in accordance with A.P.I. Standard 601 Specification. Type CR gaskets are also available in accordance with current Military Specifications.

Other Metals and Fillers

Garlock Type CR GUARDIAN Spiral-Wound Gaskets for all pipe sizes and pressure series are available in com-



binations of metals and fillers other than Type 304 stainless steel and white asbestos. Other available metals and alloys are: plated low carbon steel, Monel*, nickel, Inconel*, Hastelloy B†, phosphor bronze and stainless steel Types 309S, 316L and 347. Compressed asbestos sheet with various types of binders as fillers are also available. Blue African asbestos, TFE and TFE-suspensoid-treated asbestos are recommended as fillers for chemical and process applications requiring a high degree of resistance to corrosion.

How to Order

To order standard gaskets, give part number from chart on next page, nominal pipe size, pressure series and material specifications.

Cast Iron Flanges

To order for cast iron plain flanges USA Standard Class 125, give part number listed in 150 psi column and for USA Standard Class 250, give part number listed in 300 psi column.

Note: Bolting-up procedures prescribed by maintenance engineering should be followed in all cases to avoid damage to cast iron flanges.

FBW-030

Specials

Garlock Type CR GUARDIAN Spiral-Wound Gaskets can be designed and manufactured for special applications using other than standard fittings. When ordering, give complete details of joint design. Use the GUARDIAN Spiral-Wound Gasket Inquiry Data Sheet for this purpose. Copies of the form are available from your Garlock sales representative.

*International Nickel Co. trademarks

Other Types

Garlock GUARDIAN Spiral-Wound Gaskets are available for all USA recessed joints in nominal pipe sizes 1/4 in. —24 in. and all pressure series to 2500 psi. Ask your Garlock sales representative for information describing Type RM for large male and female joints, Type RL for large tongue and groove joints, and Type RS for small tongue and groove joints.

Garlock GUARDIAN Spiral-Wound Gaskets for man-holes and handholes are available for practically all standard makes of high pressure boilers and equipment. Dimensions and material specifications are outlined in current literature under Types BM and BR for boiler man-holes and BH for handholes and tubecaps.

Type CRI GUARDIAN Gaskets, basically, are Type CR Gaskets with the addition of a stainless steel or carbon steel inner ring. Outer ring and sealing element materials, rings, and element thicknesses, and optimum compression are identical.

The addition of inner ring serves three functions: First, it fills flange recess to keep pipe line fluids away from gasket . . . prevents gasket movement under extremely high bolt loads . . . and minimizes turbulence. This triple action protects gasket from contamination by corrosive fluids. Second, inner ring supplements outer ring as a compression gauge. Third, the inner ring adds the benefits of a grooved flange. Does it without the expense of grooving a flange to obtain the safety of a wholly-contained gasket.

Ask for our separate catalog AD-176-3 for complete specifications.

GUARDIAN gasket dimensions and part numbers

Nominal Pipe Size (inches)	O.D. (inches)	150 PSI I.D. (inches)	150 PSI Nominal Ring O.D. (inches)	150 PSI Part No.	300 PSI I.D. (inches)	300 PSI Nominal Ring O.D. (inches)	300 PSI Part No.	400 PSI I.D. (inches)	400 PSI Nominal Ring O.D. (inches)	400 PSI Part No.	600 PSI I.D. (inches)	600 PSI Nominal Ring O.D. (inches)	600 PSI Part No.
*1/4	7/8	1/2	1 3/4	CR01002	1/2	1 3/4	CR03002	1/2	1 3/4	CR04002	1/2	1 3/4	CR06002
*1/2	1 1/4	3/4	1 7/8	CR01005	3/4	2 1/8	CR03005	3/4	2 1/8	CR04005	3/4	2 1/8	CR06005
*3/4	1 5/8	1	2 1/4	CR01007	1	2 5/8	CR03007	1	2 5/8	CR04007	1	2 5/8	CR06007
1	1 7/8	1 1/4	2 5/8	CR01010	1 1/4	2 5/8	CR03010	1 1/4	2 7/8	CR04010	1 1/4	2 7/8	CR06010
1 1/4	2 1/4	1 23/32	3	CR01012	1 23/32	3 1/4	CR03012	1 23/32	3 1/4	CR04012	1 23/32	3 1/4	CR06012
1 1/2	2 3/4	1 31/32	3 3/8	CR01015	1 31/32	3 3/4	CR03015	1 31/32	3 3/4	CR04015	1 31/32	3 3/4	CR06015
2	3 3/8	2 3/4	4 1/8	CR01020	2 3/4	4 3/8	CR03020	2 3/4	4 3/8	CR04020	2 3/4	4 3/8	CR06020
2 1/2	3 7/8	3 1/8	4 7/8	CR01025	3 1/8	5 1/8	CR03025	3 1/8	5 1/8	CR04025	3 1/4	5 1/8	CR06025
3	4 3/4	4	5 3/8	CR01030	4	5 7/8	CR03030	4	5 7/8	CR04030	4	5 7/8	CR06030
*3 1/2	5 1/4	4 1/8	6 1/2	CR01035	4 1/8	6 1/2	CR03035	4 1/8	6 3/8	CR04035	4 1/8	6 3/4	CR06035
4	5 7/8	5	6 7/8	CR01040	5	7 1/8	CR03040	4 3/4	7	CR04040	4 3/4	7 1/4	CR06040
*4 1/2	6 1/2	5 5/16	7	CR01045	5 5/16	7 3/4	CR03045	—	—	—	—	—	—
5	7	5 13/16	7 3/4	CR01050	5 13/16	8 1/2	CR03050	5 13/16	8 3/8	CR04050	5 13/16	9 1/2	CR06050
6	8 1/4	7 3/16	8 3/4	CR01060	7 3/16	9 3/4	CR03060	6 7/8	9 3/4	CR04060	6 7/8	10 1/2	CR06060
8	10 3/4	9 5/16	11	CR01080	9 3/16	12 1/8	CR03080	8 1/8	12	CR04080	8 1/8	12 3/4	CR06080
10	12 1/4	11 5/16	13 3/8	CR01100	11 5/16	14 1/4	CR03100	10 13/16	14 1/8	CR04100	10 13/16	15 3/4	CR06100
12	14 3/4	13 3/8	16 1/4	CR01120	13 3/8	16 3/4	CR03120	12 7/8	16 1/2	CR04120	12 7/8	18	CR06120
14	16	14 1/8	17 3/4	CR01140	14 1/8	19 1/4	CR03140	14 1/4	19	CR04140	14 1/4	19 3/8	CR06140
16	18 1/4	16 1/4	20 1/4	CR01160	16 1/8	21 1/8	CR03160	16 1/4	21 1/8	CR04160	16 1/4	22 1/4	CR06160
18	20 1/4	18 1/16	21 5/8	CR01180	18 1/16	23 1/2	CR03180	18 1/2	23 3/4	CR04180	18 1/2	24 1/8	CR06180
20	22 3/4	20 1/16	23 7/8	CR01200	20 1/16	25 3/4	CR03200	20 1/2	25 1/2	CR04200	20 1/2	26 1/4	CR06200
24	27	24 1/4	28 1/4	CR01240	24 1/4	30 1/2	CR03240	24 1/4	30 1/4	CR04240	24 1/4	31 1/8	CR06240

*Not covered in API Standard 601 Specifications. Gasket dimensions are for USA B16.5 flanges.

Nominal Pipe Size (inches)	(inches) O.D.	900 PSI I.D. (inches)	900 PSI Nominal Ring O.D. (inches)	900 PSI Part No.	1500 PSI I.D. (inches)	1500 PSI Nominal Ring O.D. (inches)	1500 PSI Part No.	2500 PSI I.D. (inches)	2500 PSI Nominal Ring O.D. (inches)	2500 PSI Part No.
*1/2	1 1/4	3/4	2 1/2	CR09005	3/4	2 1/2	CR15005	3/4	2 3/4	CR25005
*3/4	1 5/8	1	2 3/4	CR09007	1	2 3/4	CR15007	1	3	CR25007
1	1 7/8	1 1/4	3 1/4	CR09010	1 1/4	3 1/4	CR15010	1 1/4	3 3/8	CR25010
1 1/4	2 1/4	1 5/8	3 1/2	CR09012	1 5/8	3 1/2	CR15012	1 5/8	4 1/4	CR25012
1 1/2	2 3/4	1 7/8	3 7/8	CR09015	1 7/8	3 7/8	CR15015	1 7/8	4 5/8	CR25015
2	3 3/8	2 5/16	5 1/8	CR09020	2 5/16	5 1/4	CR15020	2 5/16	5 3/4	CR25020
2 1/2	3 7/8	2 3/4	6 1/2	CR09025	2 3/4	6 1/2	CR15025	2 3/4	6 3/4	CR25025
3	4 3/4	3 3/4	6 3/4	CR09030	3 5/8	6 7/8	CR15030	3 5/8	7 3/4	CR25030
4	5 7/8	4 3/4	8 1/4	CR09040	4 5/8	8 1/4	CR15040	4 5/8	9 1/4	CR25040
*5	7	5 13/16	9 1/4	CR09050	5 13/16	10	CR15050	5 5/8	11	CR25050
6	8 1/4	6 7/8	11 1/8	CR09060	6 7/8	11 1/8	CR15060	6 1/4	12 1/2	CR25060
8	10 3/4	8 7/8	14 1/8	CR09080	8 1/2	13 3/8	CR15080	8 1/2	15 1/4	CR25080
10	12 1/4	10 13/16	17 1/8	CR09100	10 3/4	17 1/8	CR15100	10 3/4	18 3/4	CR25100
12	14 3/4	12 7/8	19 3/8	CR09120	12 3/4	20 1/2	CR15120	12 3/4	21 3/8	CR25120
14	16	14 1/4	20 1/2	CR09140	14 1/2	22 1/4	CR15140	—	—	—
16	18 1/4	16 1/4	22 3/4	CR09160	16 1/4	25 1/4	CR15160	—	—	—
18	20 1/4	18 1/4	25 1/4	CR09180	18 1/4	27 3/4	CR15180	—	—	—
20	22 3/4	20 1/4	27 1/2	CR09200	20 1/4	29 3/4	CR15200	—	—	—
24	27	24 1/4	32	CR09240	24 1/4	35 1/2	CR15240	—	—	—

*Not covered in API Standard 601 Specifications. Gasket dimensions are for USA B16.5 flanges.

FBW-031

Garlock engineered elastomeric expansion joints

For industrial piping systems, power stations, ships, pollution control & chemical plants.

Advantages of Garlock expansion joints

Garlock expansion joints are available in three basic designs to meet specific operating conditions:

1. Rubber-and-fabric expansion joints
2. GUARDIAN™ "200" FEP*-lined rubber-and-fabric expansion joints
3. All-TFE† expansion joints and flexible couplings

The natural and synthetic materials selected for their quality and physical characteristics offer many advantages over metallic expansion joints:

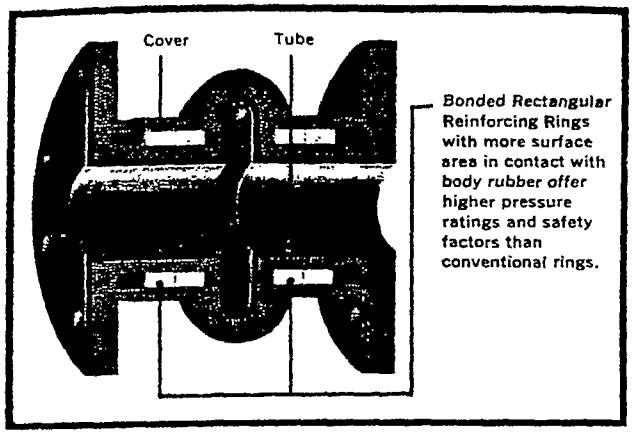
1. Less force to flex
2. Greater resistance to shock
3. Simultaneous axial and lateral deflection
4. No fatigue failure with age
5. Less space required
6. Lighter weight
7. Easier installation
8. No maintenance necessary
9. Lower initial cost
10. No stress corrosion

Construction features of rubber joints

One-Piece Construction—A leakproof lining extends through the bore and forms the outside surface of the flanges. Natural or synthetic rubber compounds are available to meet requirements of nearly all applications to assure trouble-free performance.

Longer Service—Longer life at higher pressure results from an exclusive design feature: "double-protection" construction. Bonded rectangular metal rings and the extra plies integrated with the arch reduce expansion joint failure.

*FEP–Fluorinated Ethelene Propylene Copolymer †TFE–Tetrafluoroethylene



No Gaskets—Elastomeric joints are supplied with full-face flanges of vulcanized rubber and fabric integrated with the tube, making gaskets unnecessary. The large sealing surface of the joint equalizes uneven surfaces of the pipe flange to provide a tight seal.

Resist Exposure—Hypalon cover paint is specially compounded to provide optimum resistance against aging and exposure to weather or oil. It also improves the fire resistance of the joint.

Capabilities of rubber joints

Temperatures to 400° F.

Pressures to 200 PSI or vacuum to 30" Hg.

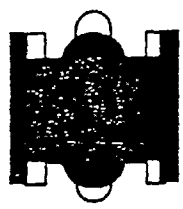
Elongation to 1/2", compression to 1 1/8" (even more for multiple arch joints).

Standard pipe sizes 3/4" through 78" (larger sizes on inquiry).

Styles and types for all applications: Concentric spool types and tapered spool types will solve most pipe movement problems. Write for our complete catalog of standard, rectangular, U-type, Navy, and special expansion joints.

Ask for our separate brochure AD-248-9R for complete specifications and standard sizes.

Garlock expansion joints compensate for these types of movement


Fig. 1
Axial
Compression

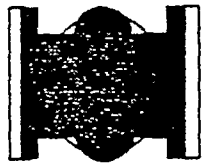

Fig. 2
Axial
Elongation


Fig. 3
Transverse
Movement

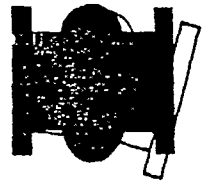

Fig. 4
Angular
Movement


Fig. 5
Vibration

FBW-032

;arlock FLEXO-MATIC® rubber pipe connectors

esigned to absorb noise and vibration in air-condi-oning, heating and industrial piping systems.

Construction features of rubber connectors

arlock FLEXO-MATIC® Rubber Connectors are com-osed of three basic elements: the tube, the body or arcass and the cover. The construction features of ach are as follows:

. **The Tube**—A protective, leakproof lining made of a ynthetic rubber which may vary depending on the ervice. Garlock's standard tube is specially com-ounded to resist the hot and cold water found in air onditioning and heating systems. The seamless tube xtends through the bore to the outer edge of the lange. Its purpose is to eliminate the possibility of the luid being handled from penetrating the carcass and veakening the fabric.

2. **The Body or Carcass**—Consists of fabric and rubber, einforced with metal.

A. *Fabric Reinforcement*—Cotton duck, Dacron* or ther suitable fabrics impregnated with an elastomer are wrapped and plied to provide the flexibility and support required between the tube and cover.

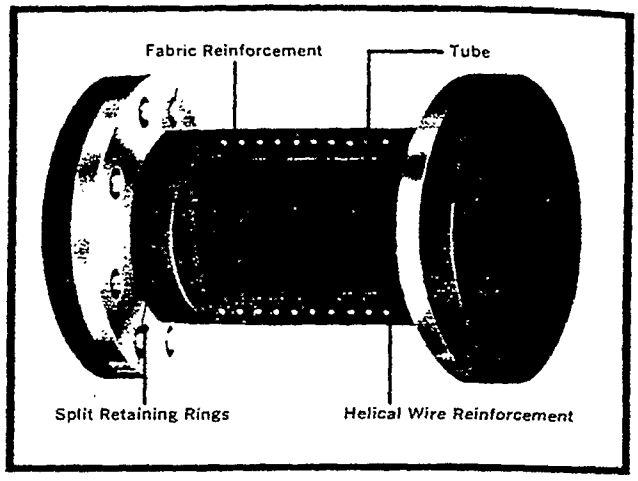
B. *Metal Reinforcement*—Helical-wound, steel reinforcement wire is firmly embedded in the carcass to provide resistance to both vacuum and pressure. Extra strength is provided in the critical flange corner area to provide positive flange sealing at 150 psi for Styles 7250 and 7450 or 250 psi in the case of Style 7350.

3. **The Cover**—A homogeneous layer of synthetic rubber to protect the carcass from corrosive attack or mechanical damage, the rugged cover withstands ageing and weathering for a long, trouble-free life.

4. **Flanges**—Garlock Rubber Connectors are furnished with USA Standard 125/150 lb. or 250 lb. drilling. Navy or other special drilling and beaded flanges are also available on request.

5. **Steel Retaining Rings**—Installed directly against the inner face of each flange, they provide a metal surface w equally distributes the bolt pressure around the flange. The bolts cannot damage the flange and yet sufficient pressure can be applied to effect a seal without using gaskets. Retaining rings are normally furnished with a corrosion-resistant coating; galvanized or stainless steel retaining rings are also available on request.

*Trademark of E. I. Du Pont de Nemours, Inc.



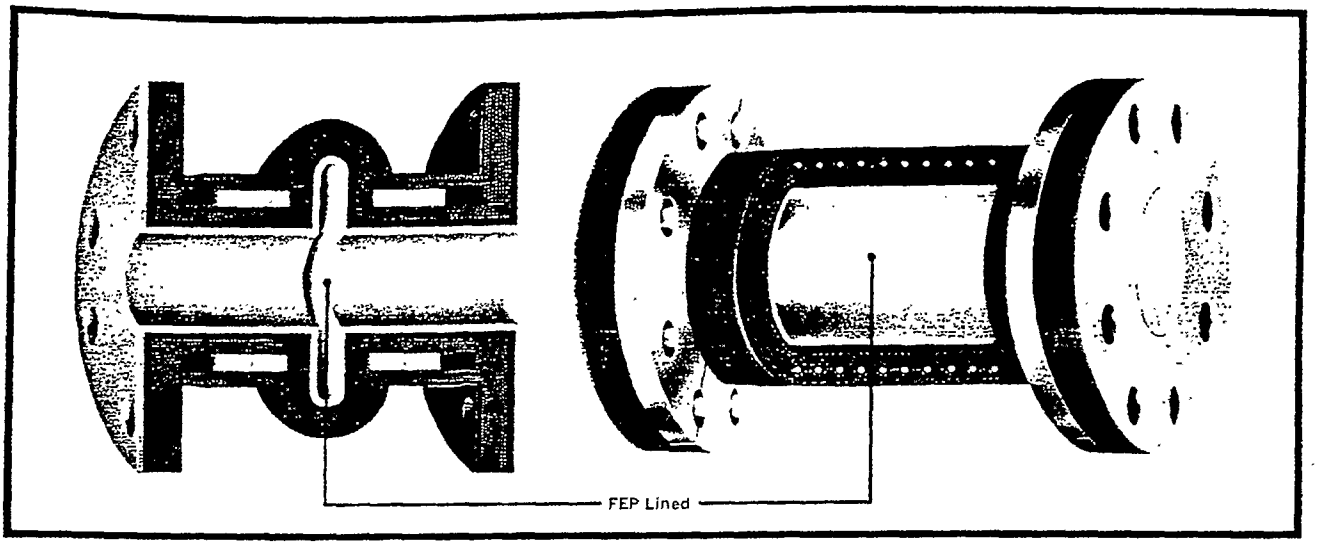
Advantages of Garlock rubber connectors

- **Eliminates noise** at its source . . . Garlock FLEXO-MATIC rubber connectors are designed to absorb equipment noise *before* it is transmitted through piping systems.
- **Reduces vibration** and lengthens equipment life because high frequency vibrations are virtually eliminated.
- **Expansion, contraction, misalignment** all compensated for with FLEXO-MATIC connectors.
- **Absorbs water hammer,** vibrations of the fluid itself, by the Garlock FLEXO-MATIC design.
- **No electrolytic action** since there is no metal-to-metal contact between connectors and metal pipe.
- **Temperatures to 400° F . . . pressure to 250 psi.**
- **Standard pipe sizes** from 2" through 12".
- **Style 7250 for standard service.** Full face flanged construction rated for a maximum operating pressure of 150 PSI and 180° F operating temperature. Standard drilling is 125/150 lb. USA with 250 lb. drilling also available. The beaded-type flange can also be supplied for pressure service under 100 PSI.
- **Style 7450 for high temperature service.** This high-temperature FLEXO-MATIC connector is rated for a maximum operating pressure of 150 PSI, and 250° F continuous operating temperature. Otherwise, the same as Style 7250, it is constructed of heat resistant Dacron and chlorobutyl.
- **Style 7350 for high-pressure and high-temperature service.** This high-pressure and high-temperature FLEXO-MATIC connector is rated for service to 250 PSI operating pressure. Standard construction permits service to 250° F.

Ask for our separate brochure AD-265-9 for complete specifications and standard sizes.

FBW-033

Garlock GUARDIAN™ "200" expansion joints and pipe connectors



FEP† possesses unusual characteristics of corrosion resistance, thermal stability and non-stick surface, making this fluorocarbon ideally suited for expansion joints and pipe connectors.

GUARDIAN "200" FEP-lined rubber joints and pipe connectors are frequently adopted by designers, architects and installers as standard equipment in piping systems conveying water, steam, gas, sludge, slurries and petroleum. Their greatest use, however, is in the chemical and pulp and paper industries where their ability to resist corrosive attack at normal or elevated temperatures and pressures is unmatched.

GUARDIAN "200" joints and pipe connectors, a Garlock specialty, provide chemical resistance against almost all corrosive fluids and gases. The lining is seamless and extends through the bore to the outer edge of both flanges. These products are manufactured using a Garlock proprietary process that results in a homogeneous, durable FEP lining integrally fused to the body. The result is far superior to conventionally attached liners, since the FEP cannot separate from the body in service.

The result is an expansion joint or pipe connector combining the best features of FEP fluorocarbons—chemical resistance, anti-stick properties, thermal stability, and resistance to age cracking—with the best features of elastomeric expansion joints and connectors—good noise and vibration dampening, high flexibility, high pressure ratings and standard face-to-face dimensions. Temperature ratings as high as 400° F. are possible with FEP, depending on construction of the elastomeric portion of the product.

GUARDIAN "200" joints are available in single-arch construction in standard sizes from 2" through 30" nominal pipe diameter. Joints without arches are available in the same sizes. GUARDIAN "200" pipe connectors are available in pipe sizes 2" through 12", lengths to 18".

Ask for separate brochures AD-248-9R and AD-265-9 for complete specifications and standard sizes.

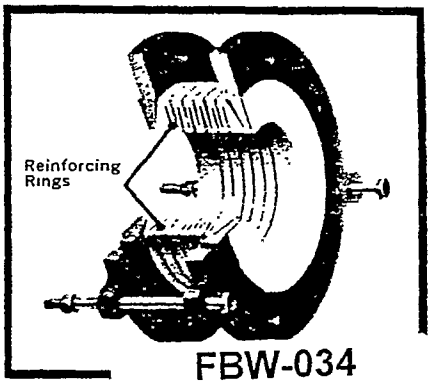
†FEP–Fluorinated Ethylene Propylene Copolymer

Garlock TFE expansion joints & couplings

Garlock all-TFE expansion joints and couplings are designed for use in air conditioning, heating, and chemical piping systems, providing excellent service as pump connectors, noise isolators, vibration dampeners, and compensators for expansion, contraction and misalignment.

- **Manufactured of corrosion resistant TFE.**
- **Non-aging even at temperatures to 400° F.**
- **Fatigue-proof even with axial movements of almost 2".**
- **Standard pipe sizes 1" thru 12".**
- **Complete assembly includes cadmium-plated ductile iron flanges, polyethylene covered tie rods and gaskets to assure positive sealing.**

Ask for our separate brochure AD-248-9T for complete specifications and standard sizes.



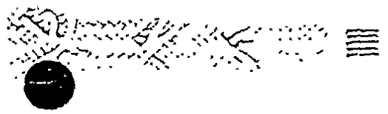
FBW-034

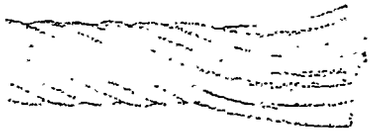
Garlock soft packings

Braided and twisted









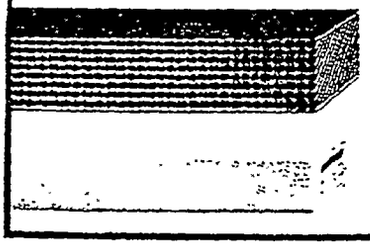
LATTICE BRAID® Packing, diagonally braided for greater strength and longer life. This packing is braided inside as well as outside. Each strand passes diagonally through the body of the packing at an angle of approximately 45°. This makes a completely unified structure. Every braided strand contributes to the strength of the entire packing. LATTICE BRAID packing has no single braid or outer cover to wear through. Lattice braiding holds together when worn far beyond the limits of ordinary packings. Lattice braiding also makes the packing much more flexible, and thus there is less stress when it is formed into rings.

Regular Braid (also called Square, Plaited or Flax Braid). Each strand passes over and under strands running in the opposite direction. Cross sections are square. These packings are especially suited for high speed rotary service, particularly at low pressures.

Braid-Over Braid (also known as Multiple or Round Braid). This packing is built up to required size by braiding one or more covers around a center core of braided, twisted or homogeneous materials. Recommended for slow speed and high pressure dynamic applications, valve stems and expansion joints. Especially good for valves where out-of-square cross sections are desired.

Twisted. Yarns or metallic strands are twisted around each other to obtain desired size. One packing size can be used for various size stuffing boxes. Because strands are easily undone, you can twist the desired size by using only the number of strands you need. This is primarily a general utility or emergency type of packing where packing space is small.

Fabric and rubber



Laminated Construction, where either duck and rubber or asbestos and rubber are laminated into slab form and then fabricated into coils, spirals or rings. All styles are laminated flat except Garlock 711, which is laminated diagonally.

Rolled Construction, made from rubber impregnated fabric rolled either around itself or a special rubber core or strip. Packings with a rubber center are designed to offer the added resiliency desirable in applications with a great deal of side movement.

Plastallic



Plastallic packings are soft and readily formable. Every style is scientifically compounded with pure asbestos, special lubricants and binders and graphite or mica. Some styles contain soft bearing metals. All are particularly suited to sealing gases. Plastallic packings are available in coil, spiral, formed rings, and in bulk-packaged cans.

Garlock treated graphite filament packing

When GARFITE® "100" graphite filament packing* was introduced a few years ago, it completely revolutionized industry's concepts about what a soft packing could do. Graphite filament has a high temperature tolerance . . . 650°F in an oxidizing atmosphere, 1200°F in steam and higher in neutral atmospheres. It is inert to all chemical attack except hot fuming sulfuric acid, nitric acid, dichromates, liquid oxygen or other strong oxidizers. More important, it has high thermal conductivity and low thermal expansion. High thermal conductivity means that frictional heat generated at the packing/shaft sleeve interface is readily transferred to the outside of the stuffing box at a greater rate than with any other non-metallic packing. Thus the packing can be compressed tighter against the shaft sleeve resulting in lower leakage rates. Low thermal expansion means that the packing will continue to seal effectively even though the temperature of the application fluctuates over a large range.

GARFITE "100" is graphite filament yarns in square braid construction with TFE suspensoid as additional lubrication, offering the permanent lubricity of graphite instead of added temporary lubricants. This permanent lubricity, combined with high thermal conductivity, low thermal expansion, and chemical resistance, make GARFITE "100" the packing answer for the most difficult applications.

*U.S. Patent 3,403,595



GARFITE "100" being installed in a centrifugal pump.

GARFITE "100" packing is solving problems...

in centrifugal pumps

92% Sulfuric acid with heavy slurry. GARFITE "100" installed in Durco pump, 2¼" SS shaft, 1750 RPM handling 92% sulfuric acid with heavy slurry. Temperature 50°C at 90-100 psi. Packing treated with Keystone #9 lube before installation, still running after 5 months. Previous maximum life, *TFE packing* 40 days, *mechanical seal* 3 months.

in reciprocating pumps

Gasoline and propane. The pressures here were 1200 psi and temperatures of 120°F. GARFITE "100" packing replaced a TFE impregnated asbestos packing which had been leaking so badly that the operator had installed a sump under the packing gland with the pump connected back into the suction side of the triplex pump. GARFITE "100" packing was installed and has been running with a minimum leakage rate for over five months!

in mixers

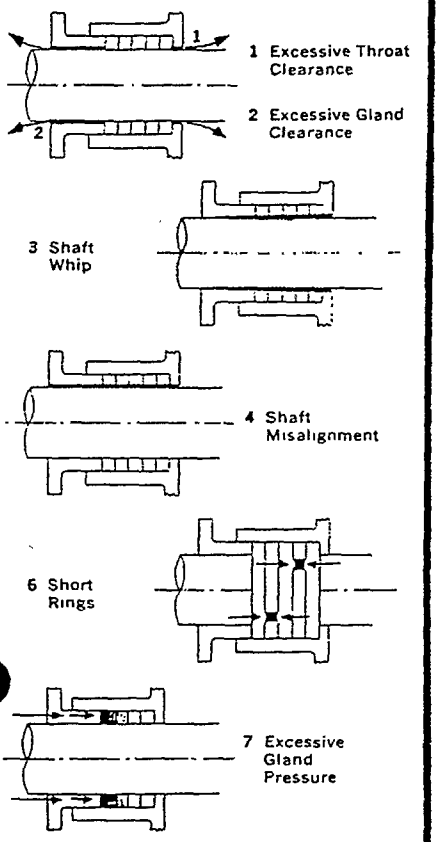
Maleic anhyride and steam. GARFITE "100" replaced conventional packing in stuffing boxes of a mixer handling maleic anhydride and steam. Shafts are 316 SS 4¾" diameter, 80 RPM. Temperature in the mixer 375°F, pressure 50 psi. Conventional packing failed after only 10 days. GARFITE "100" still running without leakage four months after installation.

FBW-036

in valves

Kerosene vapors. GARFITE "100" packing was installed on butterfly valves where TFE impregnated asbestos and even all-TFE packings had been tried. The other packings would extrude, char and flow from the stuffing box giving intolerable leakage. Temperatures were to 550°. GARFITE "100" packing performed for over one year of continuous service with continuous movement to the customer's complete satisfaction.

Possible causes of soft packing failure



Many times causes of packing failure are not readily apparent. However, careful examination of the used packing will often indicate the factors causing this failure. Listed below are some examples of how certain clues can pinpoint these underlying causes.

1. *If one or more rings are missing from the set*—Look for excessive shaft clearance allowing extrusion of rings into the system. (As a result of this condition, packing may get trapped in other equipment or contaminate the fluid being handled.)

2. *If packings tend to sheet-out or extrude between rod or shaft and gland follower*—Look for too great a clearance between rod or shaft and gland follower. Use of an anti-extrusion ring may be necessary if pressure is high or if clearances cannot be reduced.

3. *If packing radial thickness appears less than nominal in one or more places*—Look for an undersize shaft, badly worn bearings, causing shaft whip or rod or plunger wobble.

4. *If packing radial thickness directly beneath the rod, shaft or plunger is excessively reduced or early leakage occurs at top of rod or shaft*—Look for misalignment of center lines of shaft or rod and stuffing box bore.

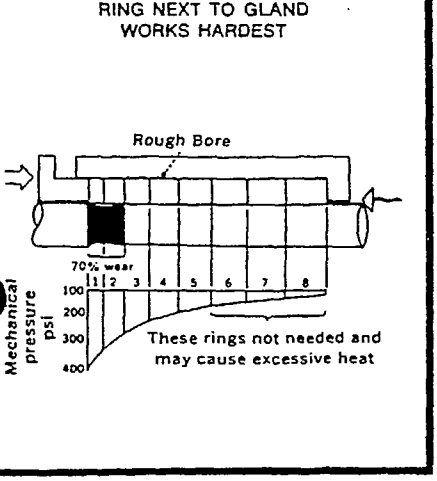
5. *If outside diameter of packing is worn*—Look for loose ring or rings rotating with shaft due to insufficient gland load.

6. *If one or more rings have "bulges" in the faces*—Look for adjacent rings cut too short, causing packing under pressure to be forced into the spaces at the joints.

7. *If bottom rings are in fair condition yet rings next to gland followers are prematurely deformed*—Look for improperly installed packings and use of excessive gland pressure.

8. *If specific packing problem is difficult to determine*—Give equal attention to I.D. & O.D. leakage, and check for a rough stuffing box bore.

Compression packing maintenance tips.



1. Always try to have a spare set of packing in stock, particularly for key pieces of equipment. But don't overstock. Store in a cool, clean place.

2. If a long stuffing box creates excessive heat, use a spacer in the bottom of the box to reduce the number of rings in the set. (See sketch.)

3. In typical compression packing installation, most of the sealing in the stuffing box is done by the ring next to the gland. Note where the wear usually occurs in the drawing at left. Be sure to compress the packing ring by ring to assure maximum sealing efficiency.

4. Clean the stuffing box thoroughly after removing old packing. Also thoroughly clean and polish the rod or shaft.

5. Over-tightening is usually the greatest single cause of packing failure.

6. Lubricate packings rings with LUBALL® packing lubricant prior to assembly.

7. When a packing set fails unexpectedly or after unusually short service life, save it for the manufacturer to examine. It can tell a lot about operating conditions and about possible causes of failure.

FBW-037

Garlock soft packing description and service condition reference table

	ACID		ALKALIES		GASES			OILS		SOLVENTS					MOTION					
STYLE	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUS.	BROMINE, CHLOR.	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BEN., ETC.)	ALIPHATIC (GAS., ETC.)	STEAM	WATER & SALT SOLU.	FLUIDS WHERE NON-CONTAM. REQUIRED	MAX. TEMP. °F	RECIPROCATING	ROTARY	HELICAL (VALVE STEM)	CONSTRUCTION AND MATERIALS	COMMENTS
31	o		o		o			o					o	o	220	o	o		Regular braid, square, flax with No. 2 long-fiber flax roving.	
90	o		o		o			o					o		220	o	o		Regular braid. Square cross-section No. 1 longest-fiber flax roving, free from tow and short fibers. Impregnated with modified marine and petroleum waxes and graphite lubricant. A relatively firm packing. For less severe service, specify Style 90-S (soft) or Style 90-VS (very soft).	
100	o	o*	o	o	o			o	o	o	o	o	o		650†	o	o	o	GARFITE "100"—Regular braid. Square cross section. Graphite filament yarn, lubricated with TFE suspensoid.	*Except strong oxidizers †1200°F in steam
117-B	o		o		o							o	o		500	o		o	Braid-over-braid. Round cross-section. Long-fiber white asbestos yarn with mineral-fat lubricant. Graphited throughout.	
117-T	o		o		o							o	o		500			o	Twisted. Round cross-section. Long-fiber white asbestos yarn with mineral-fat lubricant. Graphited throughout.	
127			o		o			o	o	o	o	o	o		1200**			o	Braided jacket. Square cross-section. Homogeneous core of white asbestos. Braided jacket of 90% Grade AAA asbestos, Inconel‡ wire inserted. Surface treated with Elastomeric material and graphite. Corrosion inhibitor. Also available without wire.	**Line Temperature ‡International Nickel Company Trademark.
150	o		o		o			o				o	o		500	o		o	Fabric jacket around a core of accordion-folded rubber-impregnated asbestos cloth, combined with resilient rubber strip. Square cross-section. Specially woven Garlock asbestos cloth, rubber impregnated (except outside surface). Externally treated with modified glycerol lubricant and graphite.	
233	o		o		o			o				o	o		500	o		o	Braid-over-braid. Square cross section. Long-fiber white asbestos yarn, impregnated with mineral fat lubricant. Graphited throughout. Available with wire, if specified.	
234	o		o		o			o				o	o		500		o		Regular braid. Square cross-section. White asbestos yarn, impregnated with mineral fat lubricant, graphited throughout. Available unlubricated but surface graphited when specified.	
237								o			o				220		o		Regular braid. Square cross-section. Long-fiber white asbestos yarn, lubricated with soap and glycerol compound and graphited throughout.	

FBW-038

Garlock soft packing description and service condition reference table

	ACID		ALKALIES		GASES			OILS		SOLVENTS					MOTION					
E	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUS.	BROMINE, CHLOR.	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BEN., ETC.)	ALIPHATIC (GAS., ETC.)	STEAM	WATER & SALT SOLU.	FLUIDS WHERE NON-CONTAM. REQUIRED	MAX. TEMP. °F	RECIPROCATING	ROTARY	HELICAL (VALVE STEM)	CONSTRUCTION AND MATERIALS	COMMENTS
262	o		o		o			o*	o*	o*	o*	o	o	o	220	o			A laminated special white hydraulic packing of fine cotton fabric plies, treated with natural rubber compound. No graphite, no lubricant. Regular cure for most applications. Rockhard for some high pressure hot water, oil and solvent services.	*Rockhard version only.
333	o		o		o							o	o		220	o		o	A laminate consisting of plies of closely woven heavyweight cotton duck, treated with special Garlock SBR rubber compound. Graphited and mineral oil lubricated. Has rubber top and bottom covers.	
631			o		o			o	o	o	o	o	o		500	o	o	o	Twisted. Square cross-section. Lubricated and graphited lead foil twisted around an asbestos core. A highly resilient packing.	
633					o			o	o	o	o				1000	o	o	o	Twisted. Rectangular cross-section. Lubricated and graphited aluminum foil, twisted around an asbestos core.	
635					o							o	o		1500	o	o	o	Twisted. Square cross-section. Lubricated, graphited copper foil, twisted around an asbestos core. Twisting forms crevices in foil to hold high-temperature oil and provide auxiliary lubricant.	
644			o		o			o				o	o		500	o	o		Regular braid. Square cross-section. Long-fiber white asbestos yarn and strands of soft lead twisted together and braided. Thoroughly mineral-fat lubricated. Graphite coated surface.	
711	o		o		o			o				o	o		220	o		o	Heavyweight cotton duck plies, treated with special Garlock SBR rubber compound. Laminated diagonally. Top and bottom covers of rubber and fabric. Graphited and mineral oil lubricated.	
730	o		o		o			o				o	o		500	o	o		Long-fiber asbestos yarn, lubricated and graphited throughout. Relatively firm packing.	
731	o		o		o			o				o	o		500	o	o	o	Long-fiber asbestos yarn. Controlled lubrication and graphited throughout. Contains no excess lubrication.	
733	o		o		o			o				o	o		500	o	o		Long-fiber asbestos yarn, lubricated and graphited throughout. Available unlubricated and ungraphited; or, with mica finish in place of graphite. Relatively soft packing.	

FBW-039

Garlock soft packing description and service condition reference table

	ACID		ALKA-LIES		GASES			OILS		SOL-VENTS						MOTION					
STYLE	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUS.	BROMINE, CHLOR.	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BEN., ETC.)	ALIPHATIC (GAS., ETC.)	STEAM	WATER & SALT SOLU.	FLUIDS WHERE NON-CONTAM. REQUIRED	MAX. TEMP. °F	RECIPROCATING	ROTARY	HELICAL (VALVE STEM)	CONSTRUCTION AND MATERIALS	COMMENTS
734					o			o	o						350		o		Long-fiber asbestos yarn lubricated with gasoline-resistant compound and graphited throughout. Available dry, ungraphited or with mica finish.	
735	o		o		o			o				o	o		500	o	o	o	Copper wire inserted long-fiber asbestos yarn. Controlled lubrication and graphited throughout. Available dry, ungraphited or with mica finish.	
736	o	o	o	o	o										500	o	o	o	African blue asbestos yarn, lubricated and graphited throughout. Also available with mica finish.	
737	o		o		o			o				o	o	o	500	o	o	o	Long-fiber asbestos yarn, lubricated and graphited throughout. Available unlubricated and ungraphited; or with mica finish in place of graphite. Relatively soft packing.	
740	o		o		o			o				o	o		220	o	o		Highest grade, long-fiber flax roving. Lubricated. Not graphited. Available unlubricated or with surface coating of graphite. Relatively soft packing.	
745	o		o		o			o				o	o		220	o	o		Highest grade, long-fiber flax roving with waterproof hydraulic lubricant containing graphite. Also surface graphited.	
751	o		o		o			o				o	o		220		o		High grade cotton yarn. Lubricated and graphited. Also available dry.	
908	o		o		o			o	o	o	o	o	o		600	o	o	o	A non-metallic, dry graphited packing. Asbestos fibers and graphite, bonded together with a water-resistant, oil-resistant binder. Special corrosive inhibiting agent.	
909			o		o			o	o	o	o	o	o		500	o	o	o	A dry, graphited plastic packing of asbestos fibers, lead particles and graphite bonded with a water-and-oil-resistant binder. Has corrosion inhibiting agent.	
5005	o	o	o	o	o	o		o	o	o	o	o	o	o	500	o	o	o	Specially treated and impregnated TFE fiber yarn braided as a jacket around a core of a plastic combination of TFE powder with synthetic hydrocarbon binder.	Specially developed for use as acid tray and bell and spigot joint packing on columns and towers.

FBW-040

Garlock soft packing description and service condition reference table

a Garlock recommendation is desired, please include the following information with your request:

. If possible, send a blueprint or sketch of stuffing box and surrounding equipment.

. Submit information about condition of equipment. (Surface finishes, runout, etc.)

. Normal operating hours; whether intermittent or continuous; rpm or cycles per minute, and length of stroke.

. Medium that will come in contact with packing (be specific as possible . . . is pumpage clean or dirty . . . is it abrasive . . . is it hydrochloric acid, propane gas, etc.).

5. Temperature of medium.

6. Pressure encountered at the bottom of the stuffing box.

7. Dimensions: (a) Rod or shaft diameter(s); (b) Bore of stuffing box(es); (c) Inside depth of stuffing box(es); (d) Bevels (if any).

8. Lantern ring location, when applicable.

9. Advise if pump has a cooling jacket.

10. State problem or reason for new recommendation request.

	ACID		ALKALIES		GASES			OILS		SOLVENTS						MOTION					
STYLE	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUS.	BROMINE, CHLOR.	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BEN., ETC.)	ALIPHATIC (GAS., ETC.)	STEAM	WATER & SALT SOLU.	FLUIDS WHERE NON-CONTAM. REQUIRED	MAX. TEMP. °F	RECIPROCATING	ROTARY	HELICAL (VALVE STEM)	CONSTRUCTION AND MATERIALS	COMMENTS
5501			o		o			o	o	o	o	o	o		1200*	o		o	Each ring has a plastallic core with a braided jacket of AAA asbestos reinforced with Inconel** wire. It provides high strength at high temperature, combined with excellent conformability for good sealing. The rings are individually die formed for accurate fit and easy installation.	*Line temperature. **International Nickel Company Trademark
5555	o		o		o			o	o	o	o	o	o	o	500	o	o	o	Braided jacket. Square cross-section. A plastallic packing with powdered TFE white asbestos core and single braided asbestos yarn jacket. Impregnated with TFE suspensoid. No graphite.	
5780							o								500	o	o	o	African blue asbestos yarn with TFE impregnation. Specially treated for oxygen service.	
5862	o		o		o			o	o	o	o	o	o	o	500	o	o	o	Long-fiber asbestos yarn with TFE impregnation and a white lubricant for easier run-in.	
5876	o		o		o			o	o	o	o	o	o	o	500	o	o	o	Long-fiber asbestos yarn with sintered TFE powder (U.S. Patent 3124032), and a white lubricant for easier run-in.	
5882	o	o	o	o	o			o	o	o	o			o	500	o	o	o	African blue asbestos yarn with sintered TFE powder (U.S. Patent 3124032), and a white lubricant for easier run-in.	
5884	o	o	o	o	o			o	o	o	o			o	500	o	o	o	African blue asbestos yarn with TFE impregnation and white lubricant for easier run-in.	
5888	o	o	o	o	o	o		o	o	o	o	o	o	o	500	o	o	o	TFE fiber yarn with TFE impregnation—a very fine weave.	
5889	o	o	o	o	o	o		o	o	o	o	o	o	o	500	o	o	o	Specially treated and impregnated TFE fiber yarn for improved break-in and high speed service.	
5898							o								500	o	o	o	TFE fiber yarn with TFE impregnation—a very fine weave. Specially treated for oxygen service.	
7130						o									150			o	Laminated fabric plied up and furnished in rectangular cross section. These rings are of Garlock asbestos cloth, frictioned with high grade SBR rubber binder. Rubber top and bottom covers. Treated with beeswax lubricant. Surface graphite coated. (Also available without graphite.)	Particularly recommended for use on valves on chlorine containment. Approved by the Chlorine Institute
9166	o	o	o	o	o	o		o	o	o	o	o	o	o	500	o	o	o	A plastic packing of TFE powder, graphite and synthetic hydrocarbon binder. Coils and rings have skeleton-braided covers of TFE yarn.	

FBW-041

Garlock soft packing / ordering information

Style No.	Approx. Box Wt.	APPROXIMATE FEET PER BOX													
		1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8	1
31	1		146	56	28	19	15								
	5		730	295	140	95	75	52	42	36	27				
	10						150	104	84	72	54	47	37		
	8½													24	
	9¼														20
90	1		140	57	28	19	13								
	5		700	275	140	95									
	10						130	100	78	62	46				
	15											59	50		
	10½													24	20
G-100	1		100	63	30.2	21.6	16.5	11.9	8.7	7.5	5.7				
	5		500	315	151	108	82.5	59.5	43.5	37.5	28.5				
	For ¾" & Up, Box Weight Can Be Specified By Customer.										Approximate Feet Per Pound		4.0	3	2.5
117-B	1	240	120	72	30	18	13								
	5		600	360	150	90	65	46	38	27	22				
	10											38	31		
	9½													24	
	10¼														20
117-T	1	220	77	57	26	15	11								
	5		385	275	130	75	55	45	35	25	21				
	10						110	90	70	50	42	32	30		
127	1		100	41	23	14	10								
	5		500	205	115	70	50								
	10						100	74	57	43	38				
	12¾													24	
	12¼														20
	15											45	40		
150	*														
233	1		120	72	28	18	13								
	5		600	360	140	90	65								
	10						130	91	69	54					
	10½													24	
	11¼														20
	15										67	57	47		
234	1		84	47	25	17	12								
	5		420	235	125	85									
	10						120	85	64	52					
	11													24	
	12														20
	15										63	51	45		
237	1		80	45											
	5		400	225	114	73									
	10						104	78	58						
	12													24	
	13½														20
	15									69	55	40			
	20												35		
262	*														
333	*														
631	*														
633	*														
635	*														
644	1		37	17											
	5		185	85	50										
	10					64	44								
	15							45	38						
	19½													15	
	24														15
	20									40	30				
	25											32	26		
711	*														
730	1				25	15.6	10								
	5				125	78									
	10						100	79	60	50	40				
	10¼													24	
	11·0														20
	15											51	42		
731	1				29	19	14								
	5				147	95									
	10						140	91	69	58	47				
	11¾													24	
	15											60	40		
	12½														20

FBW-042

*See chart on page 45

Style No.	Approx. Box Wt.	APPROXIMATE FEET PER BOX													
		1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8	1
733	1				26	17	11								
	5				130	85									
	10						110	89	66	53	41				
	11													24	
	12														20
	15											54	44		
734	1				25	17	12								
	5				125	85									
	10						120	82	63	50					
	12													24	
	13														20
	15										60	48	41		
735	1				24	16	12								
	5				119	80									
	10						120	74	57	48	40		29		
	11¼													24	
	13														20
	15											51	45		
736	1				24	16.0	11								
	5				118	80.0									
	10						110	75	58	47					
	11¼													24	
	12														20
	15										60	50	40		
737	1				29	18	14								
	5				145	90									
	10						140	91	69	58	47				
	11¼													24	20
	15											60	40		
740	1				31	18	12								
	5				155	90									
	10						120	99	74	62	50				20
	9¼													24	
	15											60	51		
745	1				29	18	12								
	5				145	90									
	10						120	92	71	61	47				
	9													24	
	10½														20
	15											56	48		
751	1				33	21									
	5				165	105									
	10						145	102	83	65	53	43			20
	8½													24	
	15												60		
908	*														
909	*														
5005 Rd.	5								33	25	20				
	10								66	50	40		28		
5005 Sq.	1				20	13	9								
	5				100	65	45		25	20	16				
	10						89		50	40	32		22		
5501	*														
5555	1		100	44	17	14	9								
	5		500	220	85	70	45	35	28	22	18				
	10						90	70	56	45	36				
	12													24	
	12¼														20
	15											45	39		
5780	1		100	37	25	14	12	9							
	5		500	185	125	70	60	45	31	27	21				
	10											38	29		
	11													24	20
	12														
5862	1		100	59	29	18	14	11							
	5		500	295	145	90	70	56	36	31	24	18	16		
	11													24	20
	12														
	15												48		
5876	1		108	41	27	17	11	9							
	5		540	205	135	85	55	45	30	25	23				
	10											38	33		
	11													24	20
5882	1		71	39	24	15	11	8							
	5		355	195	120	75	55	40	29	20	16				
	10											30	26		

*See chart on page 45

Style No.	Approx. Box Wt.	APPROXIMATE FEET PER BOX												
		1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8	1
5882 CONT.	12													24	
	11														20
	15												39		
	20												52		
5884	1		70	36	23	14	10	8							
	5		350	180	115	70	50	40	43	38	33				
	10											54	47		
	16½													24	
	17¼														20
	20												94		
5888	1		67	30	19	11	9								
	5		335	150	95	55	45	32	24	20	15	13	11		
	10												22		
	16													24	
	15														20
5889	1		61	28	17	10	8								
	5		305	140	85	50	40	28	24	20	15	12	11		
	10												22		
	16													24	
	17¾														20
5898	1		71	29	19	11	8								
	5		355	145	95	55	40	35	30	24	16	14	12		
	16													24	
	15														20
7130	*														
9166	*														

*See chart below.

Style No.		APPROXIMATE POUNDS AND FEET PER BOX												
		1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	7/8	1
150	Coils/Box		6	6	6	4	4	4	4	3	3	2	2	1	1
	Feet/Box		75	75	75	50	50	50	50	37.5	37.5	25	25	12.5	12.5
	Pounds/Box		1.5	2	4.5	4	6	8	10	10.5	12	10	12	8	10
	Spirals/Box		4	3	2	1	1	1	1	1	1	1	1	1	1
	Feet/Box		50	37.5	25	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
	Pounds/Box		1	1	1.5	1	1.5	2	2.5	3.5	4	5	6	8	10
262	Coils/Box			4	4	3	3	2	2	2	2	2	2	1	1
	Feet/Box			60	60	45	45	30	30	30	30	30	30	15	15
	Pounds/Box			1.5	2.5	3	4.5	4.75	5.25	6.5	8	10	11.5	8	10
333	Coils/Box		6	6	6	4	4	4	4	3	3	2	2	1	1
	Feet/Box		90	90	90	60	60	60	60	45	45	30	30	15	15
	Pounds/Box		1.5	2	4.5	4	6	7	8	7.5	10.5	9.5	10	6.5	8.5
	Spirals/Box		4	3	2	1	1	1	1	1	1	1	1	1	1
	Feet/Box		60	45	30	15	15	15	15	15	15	15	15	15	15
	Pounds/Box		1	1	1.5	1	1.5	1.75	2	2.5	3.5	4.75	5	6.5	8.5
631	Spirals/Box		2	1	1	1	1	1	1		1				
	Feet/Box		25	12.5	12.5	12.5	12.5	12.5	12.5		12.5				
	Pounds/Box		2	1.5	1.75	3	4	6	6.25		9.75				
633	Spirals/Box				1	1	1	1	1		1				
	Feet/Box				12.5	12.5	12.5	12.5	12.5		12.5				
	Pounds/Box				1	1.25	1.5	2	2		3				
635	Spirals/Box		2	1	1	1	1	1	1		1		1		
	Feet/Box		25	12.5	12.5	12. 5	12.5	12.5	12.5		12.5		12.5		
	Pounds/Box		.5	.75	1	1.5	2	2.5	3.5		4.75		7		
711	Coils/Box		6	6	6	4	4	4	4	3	3	2	2	1	1
	Feet/Box		90	90	90	60	60	60	60	45	45	30	30	15	15
	Pounds/Box		1.8	2.5	3.75	3	4	5	8	6.75	9	7	9	6	8
	Spirals/Box		4	3	2	1	1	1	1	1	1	1	1	1	1
	Feet/Box		60	45	30	15	15	15	15	15	15	15	15	15	15
	Pounds/Box		1.25	1.25	1.25	.75	1	1.25	2	2.25	3	3.5	4.5	6	8
908	Spirals/Box		4		1		1		1		1		1	1	1
	Feet/Box		60		17		17		16		16		15	15	15
	Pounds/Box		1		1		2		2.5		4		6	6.5	8.75
909	Spirals/Box		4		1		1		1		1		1	1	1
	Feet/Box		60		17		17		16		16		15	15	15
	Pounds/Box		1		1.25		2.25		3.5		5.5		5	9.25	11.5
5501	Soot Blower Packing Sets Including Adapters .. Specify I.D., O.D., and Set Height														
7130	This style is available in rings with beveled joints or "solid" if so specified. Available from stock in these standard sizes											1¾" X 1¾" X ½" 1¾" X 1¾" X 1¼" 1¾" X ⅞" X ¼"			

9166	Size	3/32 Round (0X)	¼ X 3/16 (X)	⅜ X ¼ (3-8X)	½ X ¼ (2X)	¾ X ⅜ (3X)	1" Square (4X)
	Coils/Box	—	—	—	3	2	1
	Feet/Box	—	—	—	51	26	20
	Pounds/Box	1# or 5# Spools	1# or 5# Spools	1# or 5# Spools	13½	11¾	12¾

AVAILABLE IN BULK IN 1#, 2# OR 5# CANS

FBW-044

Garlock CHEVRON® packing

For rams, plungers and reciprocating rods

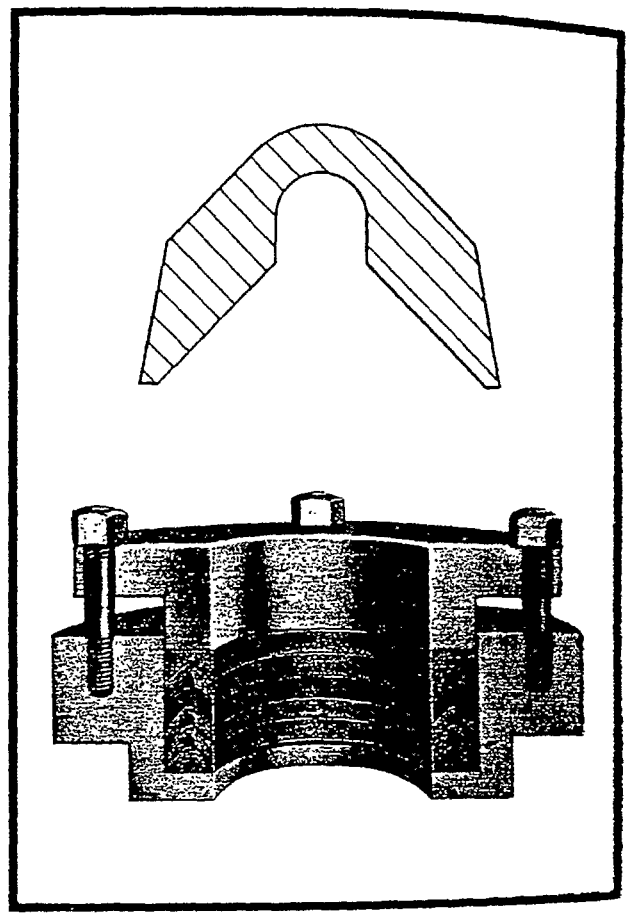
The packing that adjusts itself to automatically compensate for pressure changes. Instead of the usual inverted "V" construction, CHEVRON packing incorporates a flexible arch at the apex of the "V." See diagram. This allows the packing lips to fluctuate with changing pressures . . . tighten with increasing pressures . . . yield with diminishing pressures.

This friction relieving, pressure compensating action, plus a wide choice of materials put CHEVRON packings way ahead of ordinary V-types in trouble-free service life. Once you properly adjust the gland, no more adjustments are needed.

For the many materials in which this product is available . . . and the fluids and temperatures for which each is recommended . . . see the table on page 55.

Works efficiently in a shallow stuffing box. The design of CHEVRON packing permits nesting the rings. Thus you can use more rings in a stuffing box of given depth. A distinct advantage for shallow stuffing boxes . . . especially if pressures are high.

Furnished in rings and adapter rings. Garlock CHEVRON packing is available in ring form . . . usually in complete sets . . . a sufficient number of rings to fill required depth . . . male and female adapters are required to fit the set to the configuration of the box and gland. See depth tables Pages 48 - 51.



General recommendations for all CHEVRON packings against various pressures

This table is for general guidance. Many satisfactory CHEVRON packing installations can be made with packings smaller or larger than sizes indicated . . . and with more or less rings than shown. For sealing low pressures (static or dynamic) the use of a homogeneous ring is generally recommended. When pressures exceed 2000 psi we recommend the use of 261 male and female adapters or some other special hard material in adapter form.

Sizes from

3/16" I.D. thru 71" I.D.

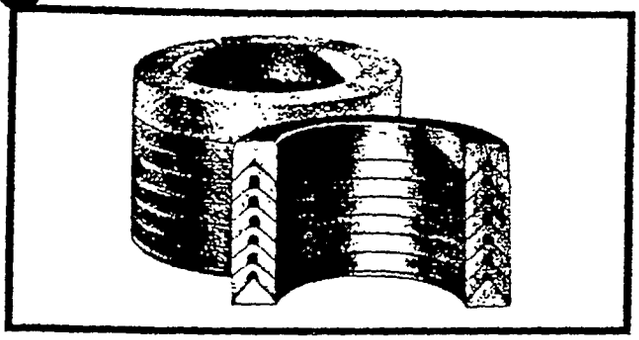
9/16" O.D. thru 72" O.D.

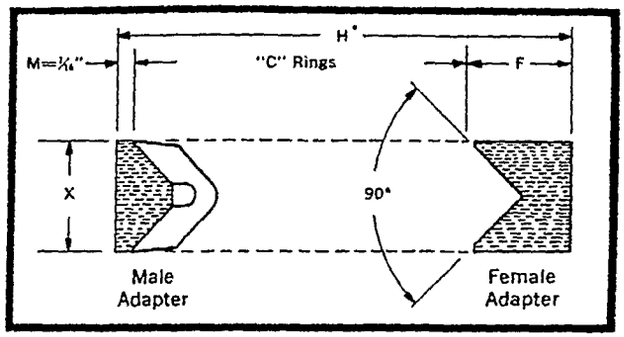
Diameter of Rod	¼" to 1½"	1½" to 2½"	2½" to 5"	5" to 16"	[illegible]
Packing Space	¼	5/16	⅜	½	[illegible]
Pressures up to 1000 psi, use 3 rings, nominal depth of set	41/64	57/64	1	1[illegible]	[illegible]
1000 to 2000 psi, use 4 rings, nominal depth of set	¾	1 1/16	1 3/16	1[illegible]	[illegible]
2000 to 4000 psi, use 5 rings, nominal depth of set	55/64	1 15/64	1 3/8	1[illegible]	[illegible]
4000 to 6000 psi, use 6 rings, nominal depth of set	31/32	1 13/32	1 5/8	2	[illegible]

FBW-045

*¼"—Other cross sections are available.

Garlock molded hydraulic and pneumatic packings





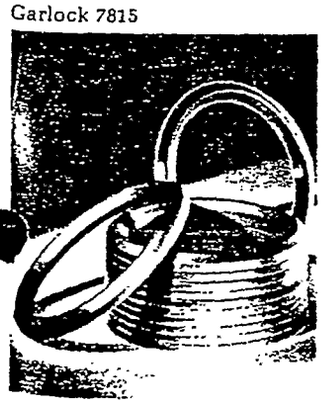
Special Notes: For ease in determining the nominal stack height of fabric CHEVRON packings refer to chart below. This chart does not apply to sets containing metal adapters or homogeneous CHEVRON.

Nominal Packing Space "X"	Stack Ht. of One CHEVRON "C" RING	Height of Adapter Rings M + F	Total Depth "H" (Which Includes "M" Plus "F" Plus Number of CHEVRON Rings as Indicated)					
			1 Ring	2 Rings	3 Rings	4 Rings	5 Rings	6 Rings
3/32	.109	.313	.422	.531	.641	.750	.859	.969
1/8	.109	.313	.422	.531	.641	.750	.859	.969
1/4	.109	.313	.422	.531	.641	.750	.859	.969
5/32	.156	.344	.500	.656	.813	.969	1.125	1.281
3/16	.172	.375	.547	.719	.891	1.063	1.234	1.406
13/32	.188	.406	.594	.781	.969	1.156	1.344	1.531
7/16	.188	.438	.625	.813	1.000	1.188	1.375	1.563
15/32	.188	.469	.656	.844	1.031	1.219	1.406	1.594
1/4	.234	.500	.734	.969	1.203	1.438	1.672	1.906
17/32	.234	.563	.797	1.031	1.266	1.500	1.734	1.969
1/2	.234	.594	.828	1.063	1.297	1.531	1.766	2.000
17/32	.234	.625	.859	1.094	1.328	1.563	1.797	2.031
9/16	.234	.656	.891	1.125	1.359	1.594	1.828	2.063
5/8	.281	.719	1.000	1.281	1.563	1.844	2.125	2.406
11/16	.281	.781	1.063	1.344	1.625	1.906	2.188	2.469
3/4	.328	.844	1.172	1.500	1.828	2.156	2.484	2.813
13/16	.328	.906	1.234	1.563	1.891	2.219	2.547	2.875
7/8	.375	1.000	1.375	1.750	2.125	2.500	2.875	3.250
15/16	.375	1.063	1.438	1.813	2.188	2.563	2.938	3.313
1	.406	1.125	1.531	1.938	2.344	2.750	3.156	3.563
1 1/16	.406	1.187	1.594	2.000	2.406	2.813	3.219	3.625
1 1/8	.453	1.250	1.703	2.156	2.609	3.063	3.516	3.969
1 3/16	.500	1.313	1.813	2.313	2.813	3.313	3.813	4.313
1 1/4	.500	1.375	1.875	2.375	2.875	3.375	3.875	4.375
1 5/16	.547	1.438	1.984	2.531	3.078	3.625	4.172	4.719
1 3/8	.547	1.500	2.047	2.594	3.141	3.688	4.234	4.781
1 7/16	.594	1.563	2.156	2.750	3.344	3.938	4.531	5.250
1 1/2	.641	1.625	2.266	2.906	3.547	4.188	4.828	5.547

Depths as shown normally held to ± 1/64 of inch per inch of stack height.

Homogeneous CHEVRON packings to J.I.C. standards

Garlock 7815



Garlock 8452 No-Hinge





Nominal Packing Space "X"	Stack Height of one CHEVRON "C" RING	R
1/16"	.083"	1/16"
3/32"	.083"	1/16"
1/8"	.083"	1/16"
3/16"	.140"	3/64"
1/4"	.156"	1/8"
5/16"	.197"	5/32"
1/2"	.197"	5/32"
5/16"	.197"	5/32"
1/2"	.250"	3/16"

FBW-046

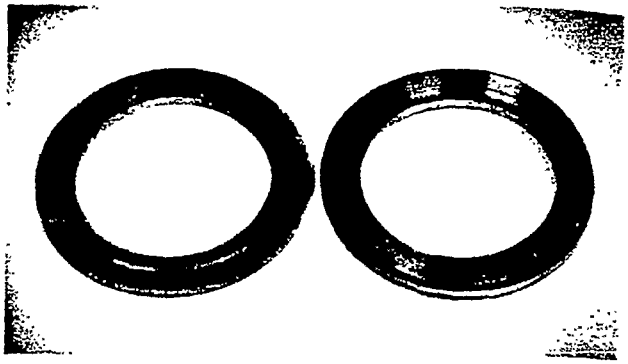
Garlock leather vee packings

For reciprocating, rotating, or oscillating motions

Space saving with low overall height per set, leather Vee packings assure long service at either low or high pressures. Sets of leather Vee packings are particularly recommended for non-adjustable glands where close control of overall height must be maintained. With low break-away and running frictions being natural, accepted assets of leather, these packings will give you long service life. Vee packings will not fail suddenly, but will gradually allow an increase in leakage as they wear out, giving you ample warning.

One typical application of impregnated leather Vee packings is a cylinder assembly as used in hydraulic jacks, presses and hydraulic valve or actuating devices.

Standard design dimensions. The following chart lists recommended standard dimensions as adopted by Joint Industries Conference. These standard sizes are recommended for new designs, but are not intended as a restriction to new or old applications. Garlock has many molds available to produce leather Vee packings



larger or smaller than those listed.

Also available are Vees molded with a 60° included angle instead of the standard 90°. These 60° packings have proven more satisfactory in special circumstances where extreme displacement exists in rod and pistons. And, too, where the pressure range varies from high vacuum to high pressure, these non-standard Vees should be considered. Check with your Garlock

Dash No.	ID	OD	B Stack height ± .005	R
8	¼	¾	.083	5/64
10	3/8	7/8	.083	5/64
12	½	1	.083	5/64
14	5/8	1⅛	.083	5/64
16	¾	1¼	.083	5/64
18	7/8	1⅜	.083	5/64
20	1	1½	.083	5/64
22	1⅛	1⅝	.083	5/64
24	1¼	1¾	.083	5/64
25	1¼	1⅜	.140	1/8
26	1⅜	2	.140	1/8
27	1½	2⅛	.140	1/8
28	1⅝	2¼	.140	1/8
29	1¾	2⅜	.140	1/8
30	1⅞	2½	.140	1/8
31	2	2⅝	.140	1/8
32	2⅛	2¾	.140	1/8
33	2¼	2⅞	.140	1/8
34	2⅜	3	.140	1/8
35	2½	3⅛	.140	1/8
36	2½	3¼	.156	5/64
38	2¾	3½	.156	5/64
40	3	3¾	.156	5/64
42	3¼	4	.156	5/64
44	3½	4¼	.156	5/64

Dash No.	ID	OD	B Stack height ± .005	R
46	3¾	4½	.156	5/64
49	4	4⅞	.197	3/16
50	4¼	5⅛	.197	3/16
51	4½	5⅜	.197	3/16
52	4¾	5⅝	.197	3/16
53	5	5⅞	.197	3/16
54	5¼	6⅛	.197	3/16
55	5½	6⅜	.197	3/16
56	5½	6½	.197	3/16
58	6	7	.197	3/16
60	6½	7½	.197	3/16
62	7	8	.197	3/16
64	7½	8½	.197	3/16
66	8	9	.197	3/16
67	8½	9½	.197	3/16
68	9	10	.197	3/16
69	9½	10½	.197	3/16
70	10	11	.197	3/16
71	10½	11½	.197	3/16
72	11	12	.197	3/16
74	12	13	.197	3/16
76	13	14	.197	3/16
78	14	15	.197	3/16
80	15	16	.197	3/16

Equal to AN 6225 drawing. B (Stack Height) = Leather Thickness × 1.414 (See Figure 1 on page 49)

FBW-047

presentative for information about molds available to produce these special packings.

For dimensional information pertaining to the design chart on page 48, see Figure 1 below.

Adapters. For long, effective service, adapters are required with Vee packings to give proper support to the sealing lips. These support rings can be made of a variety of materials, including metal, leather, fabric and rubber or plastic. Both metal and phenolic plastic adapters offer bearing surface and extrusion resistance where clearances are excessive, even though they are generally considered too rigid to provide the best support and wear pattern.

Leather and fabricated rubber adapters give Vee packings the longest service life and eliminate any danger of breaking or splitting at very high pressures. Clearances between inside cylinder walls and pistons or rams should be held to the following recommended dimensions.

Installation. The number of Vee packings used in a set is dependent upon the normal operating pressure. For maximum service life, use the number of Vees shown below. For extra depth use washers or longer adapters, but never more than six Vees in one set.

Vee packing sets assembled with either a coil spring or rubber gasket solve adjustment problems and increase packing life.

Assembly loading should average 5 to 6 lbs./in. of mean circumference with either of the designs below.

How to order. To insure a positive recommendation and fast delivery, enclose the following information with your order.

1. *Dimensions*

A.—O.D. B.—I.D.

C. Stack height of set or individual Vee

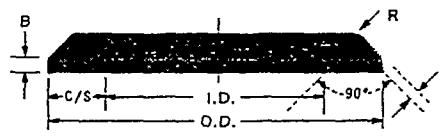
2. *Operating conditions*

A. Maximum temperature—°F.

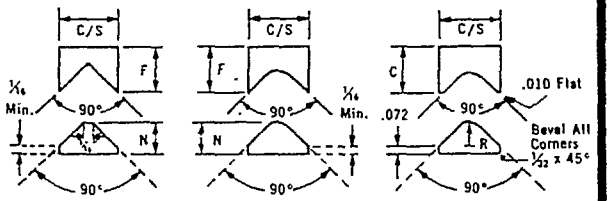
B. Normal pressure—p.s.i.

C. Medium—water, oil or air

Fig. 1



Adapter design



Fabricated Rubber Leather Metal

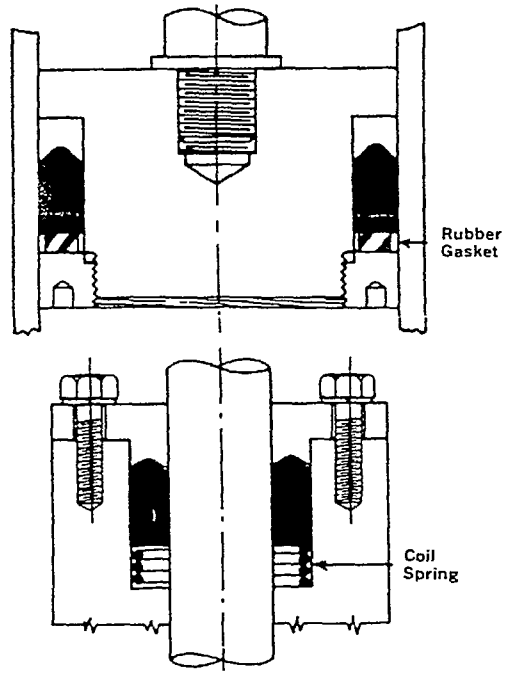
Adapter dimensions

C/S=F	R	C	N
1/4	5/64	.240	5/32
5/16	1/8	.302	3/16
3/8	9/64	.365	7/32
7/16	3/16	.427	1/4
1/2	3/16	.490	9/32
3/4	13/64	.740	13/32

Clearances

Rod or Cylinder Diameter	Pressures PSI Under 500	500 to 3000	3000 & over
3" and under	.006	.004	.003
3" to 8"	.008	.006	.004
8" to 12"	.012	.010	.006
12" to 24"	.015	.012	.008

Pressure PSI	Number of Vees per Set
0 to 500	3
500 to 5,000	4
5,000 to 10,000	5
10,000 and over	6

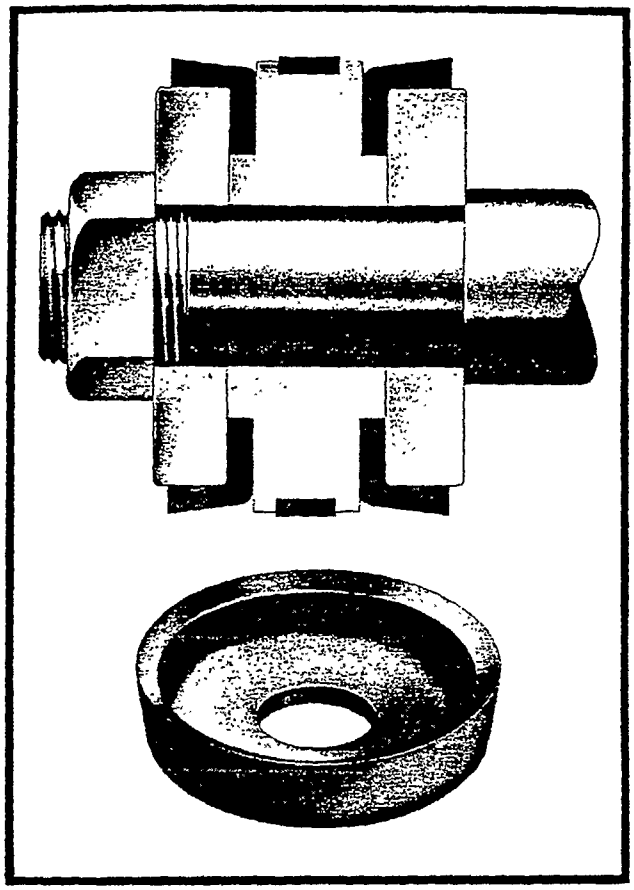


FBW-048

Garlock molded cups

For hydraulic and pneumatic pistons.

Garlock Molded Cups are available in a variety of types and materials. Each is designed to do its particular job best . . . against air, water, oils, greases, solvents or gases . . . at sub-zero cold or +450° F. heat . . . at high pressures or low . . . for light or heavy hydraulic or pneumatic service.



Garlock molded fabric and rubber cups

For normal hydraulic service. Garlock Molded Fabric and Rubber Cups are recommended for most regular hydraulic cylinder applications . . . at pressures up to 2000 psi. Sizes include cylinder diameters up to 24″.

For pneumatic and light hydraulic service. Homogeneous rubber molded. In this type of service, where close tolerances and fine finishes are present, Homogeneous Cups are recommended. In most cases, 90 durometer material gives you the best ratio of low friction and minimum wear.

TFE Fluorocarbon molded. When sealing against air or gas, adequate lubrication is essential for long-life, positive sealing. Where lubrication is impractical or impossible, consider TFE cups for lasting friction-free service. Both regular TFE or filled TFE cups are available to meet your specific needs.

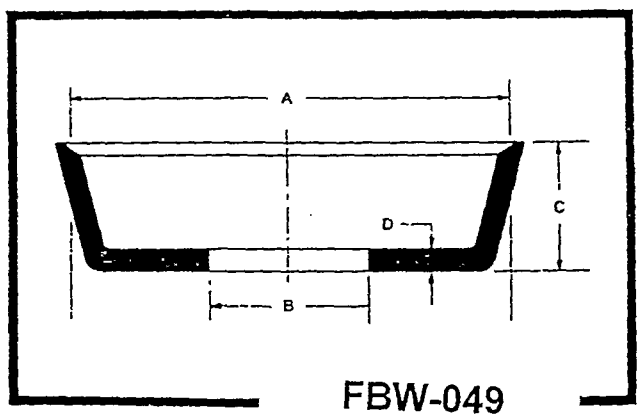
How to order Garlock molded cups

For general applications the cup dimensions shown in table below are recommended:

When ordering Garlock Molded Cups, specify:

1. Cylinder diameter (A)
2. Hole diameter (B)
3. Cup height (C)
4. Cup thickness (D)
5. Type of fluid: water, oil, air or other
6. Pressure (psi)
   (a) Normal operating
   (b) Maximum
   (c) Minimum
7. Temperature
   (a) Normal operating
   (b) Maximum
   (c) Minimum

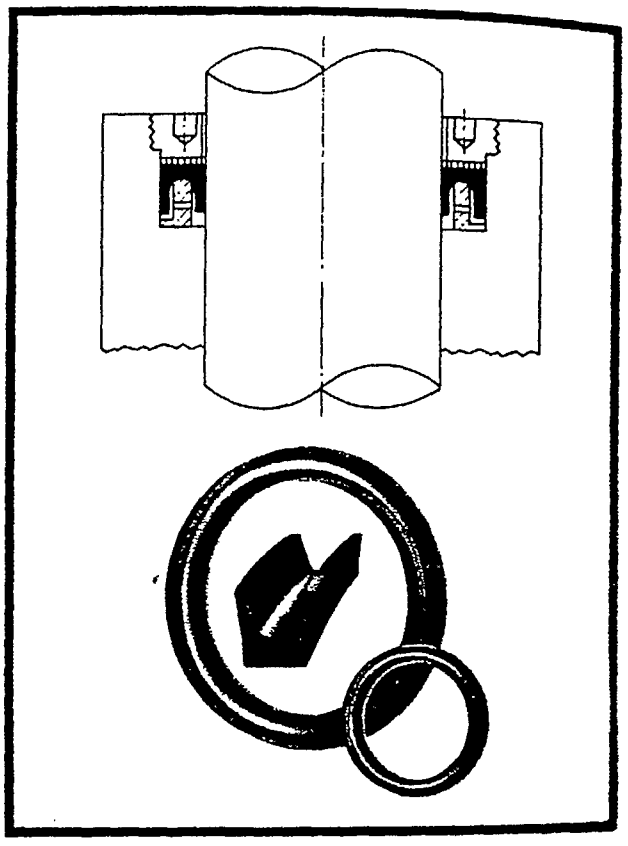
For Cylinder Diameters	Height of Cup		Thickness of Cup	
	Minimum	Maximum	Minimum	Maximum
Below 1″	5/16	7/16	1/16	3/32
1″ to 2″	3/8	1/2	3/32	1/8
2″ to 3″	3/8	5/8	3/32	3/16
3″ to 5″	1/2	3/4	1/8	3/16
5″ to 8″	3/4	1	1/8	1/4
8″ and up	1	1 1/4	3/16	1/4



FBW-049

Garlock U-cups

Garlock homogeneous and TFE flourocarbon U-cups

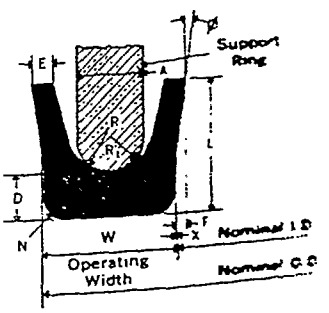


For pneumatic and light hydraulic service. In this type of service, where close tolerances and fine finishes are present, Homogeneous U-Cups are recommended. 70 durometer material gives excellent sensitivity and response to low or varying pressures. There are some 53 sizes available to you (all AN6226 sizes), ranging from 1/8" ID to 3 3/4" OD. When using homogeneous cups against air or gas, adequate lubrication is essential for long life, positive sealing.

Pressures. Garlock 9511 U-Cup Packing of 70 Shore durometer hardness is recommended for pressures up to 2000 psi. At higher pressures (above 500 psi), a back-up washer is recommended to support shoulder of the packing and prevent extrusion at the heel.

Installation. Garlock Homogeneous U-Cups should be installed on rods having maximum surface finish of 16 micro-inches or less to prevent excessive wear. The gland ring supporting bottom or heel must fit closely to rod (clearance, of course, is dependent upon pressures, but should never exceed .003 inches). Internal threads should be offset to prevent damage to packing lips when installed. U-Cups used for air service should be lubricated to prevent excess friction.

W&L	D	E	F	R	N	ø	X	R_1
1/8	3/64	.030	.020	.020	1/64	13°	.008	.015
3/16	1/16	.038	.030	.050	1/32	13°	.008	.040
1/4	3/32	.045	.030	.070	1/32	11°	.008	.050
5/16	1/8	.050	.032	.093	1/32	10°	.008	.062
3/8	1/8	.054	.035	.125	3/64	8°	.008	.093



Note: A = 2 x R_1

FBW-050

Garlock BITAN® leather U-cups

For heavy duty service on reciprocating shafts and plungers.

With these low-friction Garlock Leather U-Cup Packings you can seal against pressures up to 100,000 psi . . . and seldom have to adjust them after proper installation. Their minimum space requirements make them ideal for use on valves, pistons, plungers and rams with limited packing areas. They seal at either inside or outside lips, and can be installed two ways: *Outside Packed* (See Fig. 1) . . . with packing stationary, while its I.D. lip seals moving element. Examples: rams, reciprocating rods, valve stems; *Inside Packed* (See Fig. 2) . . . with packing carried by moving element, while its O.D. lip seals against stationary element. Examples: pistons, plungers.

Clearances

The chart below shows various size cylinders and the recommended diametral clearances that avoid extrusion nibbling wear.

How to order Garlock U-cups

To properly meet your requirements when ordering Garlock U-Cups, please include the following information:

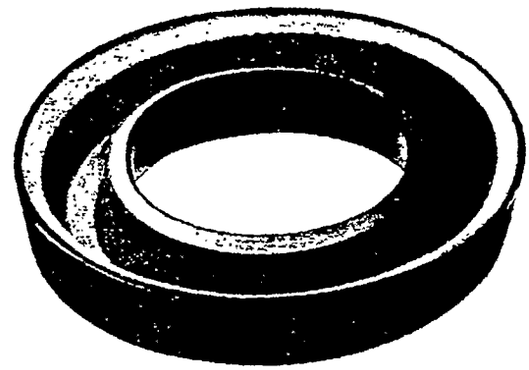
Homogeneous and Fluorocarbon

1. Diameter of rod, plunger or piston groove and diameter of stuffing box or cylinder
2. Back-up washer and/or support ring material
3. Operating conditions:
   (a) Maximum temperature—°F.
   (b) Normal pressure—psi
   (c) Type of fluid—water, oil, air or other

Leather

1. Diameter of rod or plunger and diameter of stuffing box or cylinder
2. Filler material—should be installed with spreader springs, fillers, or pedestals
3. Operating conditions:
   (a) Maximum temperature—°F.
   (b) Normal pressure—psi
   (c) Type of fluid—water, oil, air or other

Plunger or Cylinder Diameter	Pressures PSI		
	Under 500	500 to 3000	3000 & over
3" and under	0.006	0.004	0.003
3" to 8"	0.008	0.006	0.004
8" to 10"	0.010	0.008	0.005
10" to 12"	0.012	0.010	0.006
12" to 16"	0.014	0.012	0.007



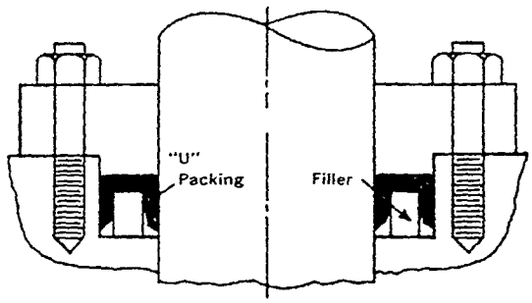


Fig. 1 Outside Packed

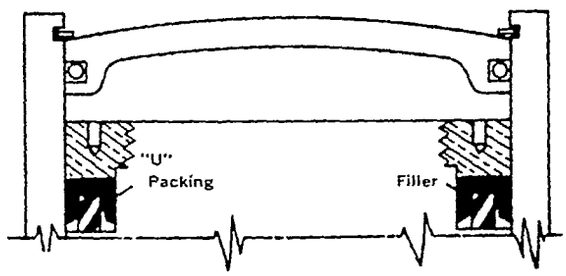


Fig. 2 Inside Packed

FBW-051

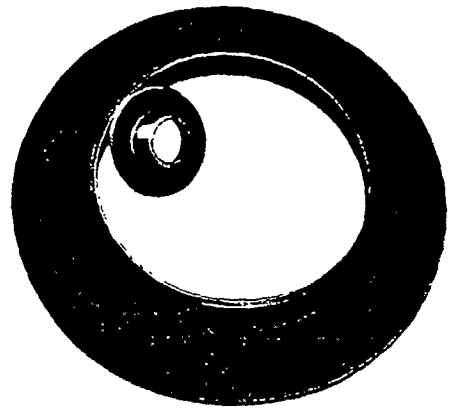
Garlock BITAN® leather flange packings

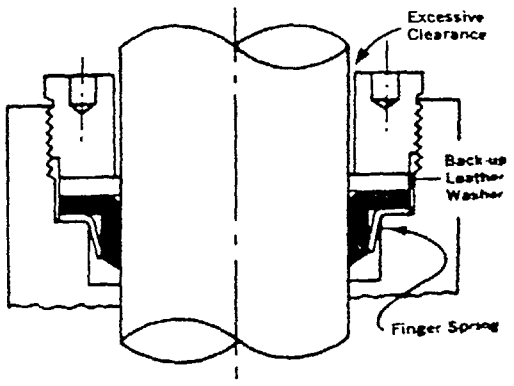
For plungers, valve-stems and rotating shafts

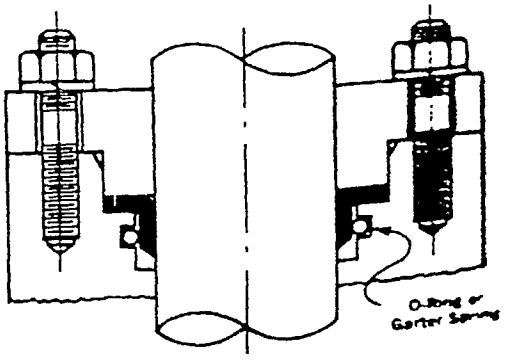
Garlock Bitan leather flange packings are sometimes called "hat" leathers. Simple in construction and effective in service, they withstand pressures up to 100,000 psi. Like cups, Garlock leather flange packings are single lipped. However, instead of sealing against the I.D. of cylinders, they seal against the O.D. of rods, stems or shafts. While many flange packings are used to seal fluid under pressure, others are designed as wipers to seal out dust and foreign matter. In either function this compact packing does a good job with lowest possible friction in the least amount of space. Sizes range from $1/2$" to $5\,1/2$" I.D. Other sizes available on special order.

Installation. Two common methods are illustrated at the right. Top drawing shows an O-ring or garter spring used to maintain contact between the flange packing and rod or shaft. Particularly useful when sealing at low pressures.

Bottom drawing shows a leather back-up washer between gland ring and flange packing. This acts as a protective heel or shoulder support . . . prevents damage to flange packing and distortion by twisting action of the gland ring during the tightening operation.



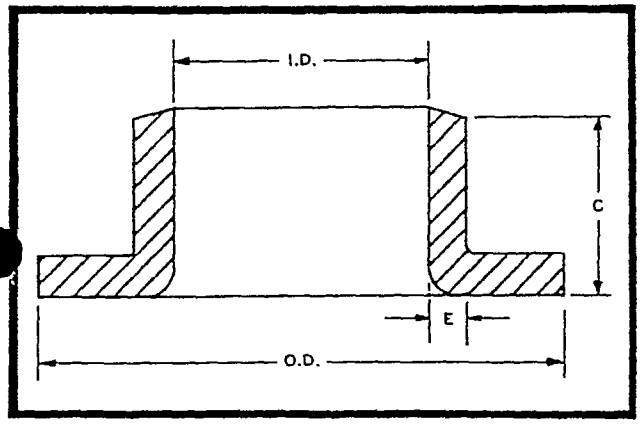




How to order

To ensure a positive recommendation and fast delivery please enclose the following information.

1. *Dimensions*
   (a) Diameter of rod or plunger
   (b) Diameter of stuffing box or recess for flange
   (c) Overall height of flange packing (C)
   (d) Leather thickness (E)
2. *Operating Conditions*
   (a) Maximum temperature—°F.
   (b) Normal pressure—psi
   (c) Medium—water, oil or air



FBW-052

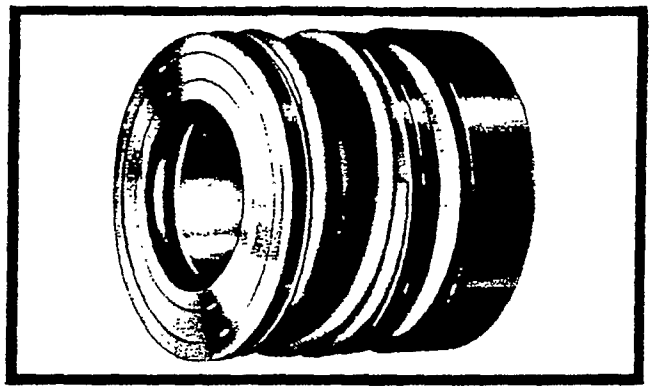
Garlock molded hydraulic & pneumatic packings

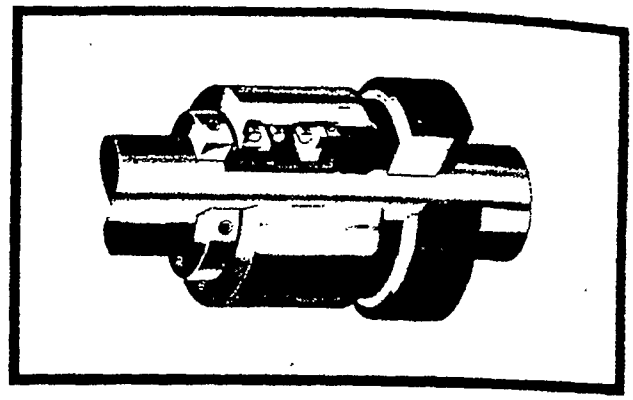
STYLE	FORM			MATERIALS OF CONSTRUCTION	RECOMMENDED FOR USE AGAINST										TEMPERATURE LIMIT °F.		RELATIVE HARDNESS	SPECIALLY RECOMMENDED FOR
STYLE	CHEVRON®	CUP	U-PACKING		AIR	ACIDS	ALKALIES	OIL	PHOSPHATE ESTERS	SOLVENTS	STEAM	WATER	WATER—GLYCOL	WATER IN OIL	Min.	Max.		
432	o			Cotton Duck and Nitrile Elastomer	o			o				o	o	o	—40	250	Firm	General Hydraulic Oils, water emulsions
433	o			Cotton Duck and Butyl Elastomer					o			o	o		—40	250	Firm	Phosphate ester fire resistant hydraulic fluids
532	o			Asbestos Cloth and Nitrile Elastomer	o			o			o	o	o	o	—40	300	Firm	High temperature general service including steam
540		o		Cotton Duck and SBR Elastomer								o	o		—40	250	Rockhard	Water Service High Pressure
813		o	o	Asbestos Cloth and SBR Elastomer							o	o	o		—40	300	Firm or Rockhard	Steam and hot water
7131		o		Fine Cotton Duck and Neoprene Elastomer	o			o							—40	250	Firm	Oil & air service, low to medium pressure
7271		o	o	Med. Weight Cotton Duck and Neoprene Elastomer	o			o							—40	250	Firm	Oil & air, medium to high pressure
7815	o	o		Natural Rubber with Asbestos Fibers	o			o				o	o	o	—40	225	Flex	Oil, air, water emulsions, medium to high pressure
7857	o			Cotton Duck and SBR Elastomer			o	o	o	o		o	o	o	—40	250	Rockhard	All except reactive fluids & certain solvents—very high press.
7904	o			Asbestos Cloth and TFE	o	o	o	o	o	o	o	o	o	o	cryogenic	500	Rockhard	All except very low pH fluids, hi-pressure
8048	o			Cotton Duck and Nitrile Elastomer				o				o	o	o	—40	250	Firm	Oil, water & emulsions, high performance
8051	o			Cotton Duck and White SBR								o	o		—40	250	Firm	Mild aqueous solutions where non-discoloring is required.
8136		o		Heavy Weight Cotton Duck and Neoprene Elastomer	o			o							—40	250	Firm	Oil and air, high pressure
8452	o	o	o	Homogeneous Nitrile	o			o				o	o	o	—40	225	Flex	Oil, air & water, low to med. pressure to high with back-up
8619		o	o	Med. Weight Cotton Duck and SBR Elastomer								o	o		—40	250	Rockhard or Firm	Water, high pressure
8660		o	o	Med. Weight Cotton Duck Butyl & TFE Suspensoid					o			o	o		—40	250	Firm	Straight Phosphate Esters
8764	o	o	o	Virgin TFE	o	o	o	o	o	o	o	o	o	o	cryogenic	450	Hard	All fluids, medium pressure
9188	o	o		Homogeneous Butyl					o			o	o		—40	250	Flex	Straight Phosphate Esters
9210	o	o	o	Polyurethane Elastomer	o			o				o	o	o	—40	200	Firm	Oil, air, water & emulsions, medium to high pressure
9511			o	Homogeneous Nitrile	o			o				o	o	o	—40	225	Flex	Oil, air, water & emulsions, low to medium pressure
	o	o	o	BITAN® Leather	o			o				o		o	cryogenic	160 (200)	Hard	Most neutral fluids (pH 5-8) to very high pressure

Phosphate Ester Fluids: When ordering seals for this family of fluids, specify the specific phosphate fluid by trade name and fluid style or number.

FBW-053

Garlock mechanical seals





Garlock "HR" seals

Garlock "HR" mechanical seals are primarily intended for use on cold water pumps, hot water circulators, and oil pumps. These low cost seals offer the same positive no-leak operation of more expensive seals. These seals incorporate the finest design, material, and workmanship. They will seal any fluid which is not detrimental to their Buna-N rubber or brass metal parts including water, oils, alcohols, mild acids and alkalies, and solvents.

Standard construction for 5/8" and 3/4" diameter sizes is brass metal parts, stainless steel spring, nitrile rubber parts, plastic seal face and ceramic seat. These seals are intended for applications not exceeding 212°F., 75 psi and 3600 rpm.

For more severe applications, they are also available with carbon faces and Viton A rubber parts that extend the maximum temperature to 350°F. at 100 psi. The 1" diameter size is available with carbon face only and both nitrile (225°F.) and Viton A (350°F.) rubber parts. Ni-Resist* seal seats are available on inquiry only.

Viton A rubber parts extend the application of these seals to many solvent applications and mild chemical solutions providing the brass metal parts are compatible with the fluid. (See chart, page 4, for Garlock materials vs. various media under typical conditions.)

Garlock "PK" seals

Garlock "PK" Mechanipak seals are made in several designs to meet various operating conditions. These seals are widely used on rotary shafts of various types of equipment such as centrifugal pumps, agitators and mixers, compressors, commercial dishwashers, gear boxes, speed reducers, etc., where pressures do not exceed 150 psi.

Normal applications are hot and cold water, petroleum and mild acid and alkali solutions at speeds to 5000 sfm.

Standard construction materials are carbon faces, brass metal parts, stainless steel springs, ceramic seats and nitrile (225°F.) rubber parts. Ni-Resist and bronze seal seats, 316 stainless steel metal parts, and Viton A (350°F.) rubber parts are also standard materials that may be ordered when required. Shaft collars for positioning the seal on the shaft are available as standard items.

The Garlock "PK" rotating element is of unitized construction. The assembly is protected by the metal shell that completely encompasses the spring, rubber bellows and seal ring as a unit. Due to the low cost of the Garlock "PK" Seal, complete replacement rather than repair is recommended.

Specifications

Shaft Size	5/8", 3/8", 1"
Maximum Temperature	350°F.
Maximum Pressure	100 PSI
Maximum Vacuum	25" Hg.
Maximum RPM	3600

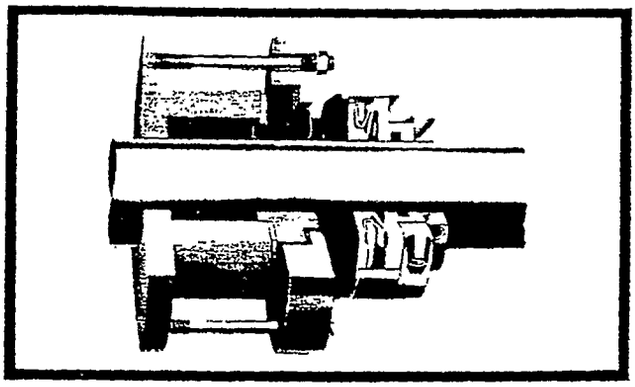
*Trademark–International Nickel Company

Specifications

Shaft Size	3/8" thru 1"
Maximum Temperature	350°F
Maximum Pressure	150 PSI
Maximum Vacuum	25" Hg
Maximum SFM	5000

Ask for our separate catalog AD-150-7 for complete specifications

FBW-054



Garlock CHEMISEAL® seals

Designed specifically for acid service and also for use in the pharmaceutical and food processing industries, the CHEMISEAL Series is available in two styles. The "INO" style is a one-piece construction with the seal faces an integral part of the virgin TFE bellows. The "RO" style offers a replaceable carbon seal face that extends the life and permits speeds of 5000 sfm. Both styles are externally mounted, and permit easy visual inspection and maintenance.

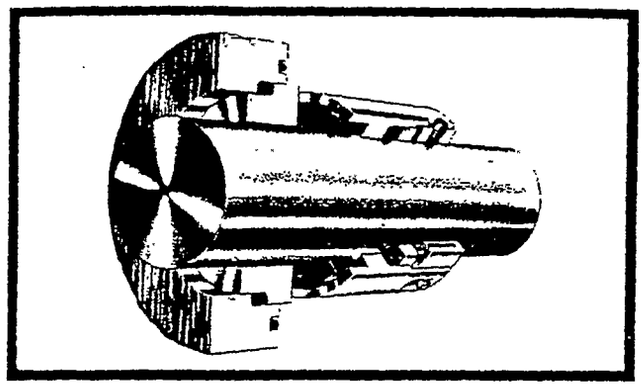
The materials of construction are chemically inert TFE bellows, 316 stainless steel metal parts, and seal faces of either glass-filled TFE (1000 sfm), carbon-filled TFE (2500 sfm), or carbon/graphite (5000 sfm). These materials, plus uniform face loading and two seal styles in standard pump sizes, make the Garlock CHEMISEAL Mechanical Seals ideal for chemical applications.

Since the pumpage contacts only TFE parts of the CHEMISEAL, and it is externally mounted, cleaning, sterilization, and change of pumping medium are easily accomplished. The CHEMISEAL is ideally suited for pharmaceutical and food processing service.

Specifications

Shaft Size	7/8" thru 2 1/8"
Maximum Pressure	450°F. (At Low Pressures)
Maximum Pressure	100 PSI at 167°F.
	75 PSI at 212°F.
Maximum Vacuum	Full
Maximum SFM	5000

Ask for our separate catalog AD-164-7 for complete specifications.



Garlock MECHANIPAK® "75" seals

Designed for heavy duty industrial equipment, these seals are engineered for the special requirements of chemical, refining, pharmaceutical and food processing industries. A complete line of standard seals from 2" through 6" interchanges in most pumps intended for soft packing or mechanical seals. Normal applications are pumps, compressors, agitators and mixers.

An unbalanced style, mounted internally or externally, gives very satisfactory service up to 150 psi with reduced life at higher pressures. A balanced style, always mounted internally, is recommended for optimum service over 150 psi, and many industries standardize on balanced MECHANIPAK "75" for all pressure above 35 to 50 psi.

All seals have carbon faces and multiple spring arrangement to assure uniform face loading and the longest possible life. Metal parts are available in a variety of materials to gain chemical compatibility. Standard construction for the rotating unit is 316 stainless steel metal parts and alloy 20 springs. Secondary seals include nitrile (225°F.) and Viton A (450°F.) rubber "O" rings, and TFE-TV rings (500°F.) interchangeable with the "O" rings. Plain, clamped, or cooled seal seats are available in Ni-Resist, ceramic, stellite and tungsten carbide.

Seal repair service and replacement parts are available through your Garlock representative.

Specifications

Shaft Size	1/2" thru 6"
Maximum Temperature	500°F.
Maximum Pressure	250 PSI Unbalanced
	750 PSI Balanced
Maximum Vacuum	Full
Maximum SFM	5000

Ask for our separate catalog AD-210-7 for complete specifications.

FBW-055

Environmental controls for mechanical seals

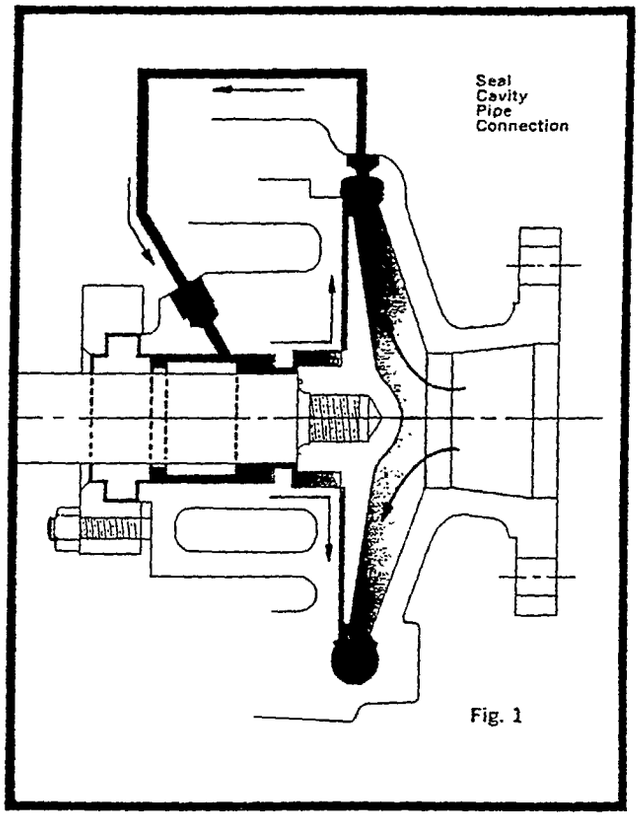


Fig. 1

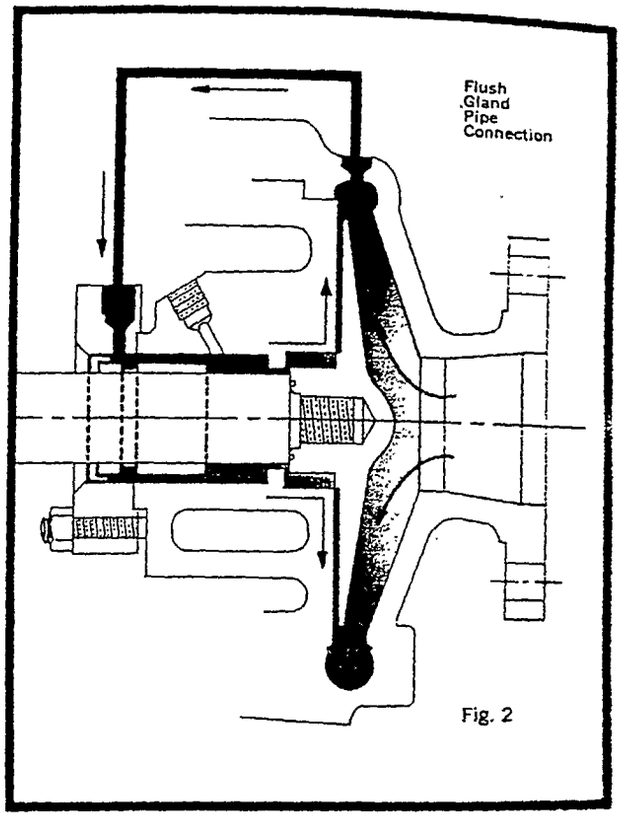


Fig. 2

Environmental Control is the use of exterior means to assure proper lubrication, cooling and cleanliness of mechanical seal faces.

Controls regulate temperature, pressure, rate of flow, filtering systems and source of supply for various liquid or gas media. The apparatus used is not considered part of the seal but is part of the pump or other equipment, although environmental control glands are considered an integral part of the seal.

Seal Cavity Pipe Connection. Although not generally considered an environmental control, the connection between pump discharge and seal cavity illustrated in figure 1 above has many advantages. It can start circulation in a dead-ended seal cavity, assist in washing out trapped abrasive particles, and cool the liquid. It can provide a liquid barrier to block entry of pumpage into the seal cavity when used with a throttle bushing.

Flush Glands are normally used with an internal mounted seal only. The plain flush gland permits injection of a clean liquid stream directly over seal faces, flushing away abrasive particles as illustrated in figure 2 above. Hot or cold liquid can also be injected to combat crystallization of the product at seal faces. Liquid injected by a flush gland always enters the product stream. Throttle bushings are used to control rate of product dilution.

Heating or cooling glands can be applied with both internally and externally mounted seals. Normally these glands are used to heat or cool the stationary member of the seal assembly. With them, viscosity of the fluid can be changed as required. They can also be used to correct crystallization and flashing.

Lubrication glands are used with both internally and externally mounted seals to inject lubrication between seal faces. Both dead-ended and recirculating methods are used. The recirculating installation will also cool between seal faces.

Vent and drain glands are used with both internally and externally mounted seals when leakage presents an extremely hazardous situation. Lethal gases can be vented and piped to a safe location for disposal. Liquids can be drained off to a safe area. This type of gland can also be used with a circulating liquid to smother leakage and more effectively carry it away.

The use of these special glands and pipe connections to the seal cavity and gland faces will assure proper lubrication, cooling, and cleanliness even for the most troublesome mechanical seal applications.

FBW-056

Maintenance tips for mechanical seals

1. Mechanical face seals are precision lapped and polished. Protect these finishes from scratches and dirt with reasonable care. Never place seal faces down on a rough or dirty surface or leave exposed to contaminated atmosphere.

2. Carefully inspect shafts, glands and the seal assembly before seal installation. All worn pump parts should be replaced and a complete new seal installed when necessary.

3. Seals with compression fits on the shaft or in the counterbore should never be assembled dry. The shafts and counterbores, plus the secondary seals, should be lubricated with soap and water, oil, grease, or petroleum jelly prior to seal assembly.

4. Be sure that all set screws, locking bolts, etc., are secure and properly tightened.

5. Seal faces should be lubricated with a light, clean oil or grease just prior to assembly. This serves as a lubricant until the pumpage performs this function.

6. Gland bolts should be taken up a little at a time to insure uniform loading of the gasket and that it is perpendicular to the shaft. This is particularly important with clamped ceramic seats which may be broken if improperly loaded.

7. Be certain, in all cases, that the seal is installed using the dimensions and tolerances supplied by the seal manufacturer. Maintaining the proper operating length of the seal assembly is particularly essential for efficient seal performance.

8. Seal start-up requires certain considerations...Turn the shaft several times by hand to assure no mechanical problems. When the equipment is installed in service, it is a good idea to jog start the pump prior to running continuously. Check to be sure that any flushing, cooling or other lines are open. It is not uncommon for new seals to show slight evidence of leakage. Normally, this situation disappears in 20 to 30 minutes. If not, the reason for leakage should be investigated.

Mechanical seal accessories

Glands. Glands are available in the full range of materials to achieve material compatibility. Many designs are available to suit existing pumps, and other equipment. However, it is always best to submit an inquiry data sheet to assure interchangeability for specific equipment.

All type glands such as plain, flush (one port), cool or quench (two ports), vent and drain (two ports) are available. All ports are tapped for piping connections. Normally, glands are supplied complete with gaskets or "O" rings although bolts, studs or nuts are not included.

A guide to the correct selection of glands is found under the discussion of environmental controls.

Throttle and restriction bushings. Both throttle bushings and restriction bushings are available and may be ordered from your Garlock representative. Throttle bushings may be used to control the flow of a pressurized fluid through the seal area into the product stream and to minimize product dilution. Restriction bushings may be used to prevent leakage along the shaft when a vent and drain gland is used with an internal seal. An auxiliary stuffing box may also be used for more positive sealing than the restriction bushing.

FBW-057

Advantages of standardizing on Garlock mechanical seals

When you specify Garlock as your source for mechanical seals you get the added benefit of our quality control . . . made possible by the fact that we manufacture so many of the seal components at our various factories. Our springs are manufactured at our Comerford Spring Division (see page 3), metal stampings are manufactured on continuous stamping presses at our main plant in Palmyra, TFE components come from our Plastics Division in Camden, New Jersey. Garlock manufactures more of its various mechanical seal components than any other company in this industry. So the possibility of delayed seal delivery due to supplier shutdowns is reduced and our demands for consistently high component quality can be enforced.

Contact your Garlock representative for a specific recommendation as to which of our mechanical seals is best for your application. He will also be able to supply you with literature on our various mechanical seals and other Garlock products.

Garlock industrial specialties

Here is a complete line of handy maintenance items, always useful, backed by Garlock quality. Where applicable, aerosol cans and convenient dispenser packages make them easy to use. These items are also easy to order. In addition to showing packaging information, we also show the applicable code numbers for each style in each package size. This will allow you further use of data processing equipment for order entry and disbursement.

Garlock 510 Enamel prepares, primes and protects in one application in less time, at lower cost.

Its special solvents prepare the surface by dissolving oil and moisture that are present. The low viscosity and detergent action of 510 allow penetration to the substrate and filling the pores of rusted areas, just as a primer does. And as it dries, 510 expels the oil and moisture it has absorbed, leaving a hard, firmly bonded protective coating.

No thorough degreasing needed. Just wipe off oil, dirt, water, or loose rust with a dry cloth.

No priming. Apply 510 Enamel over new, rusty or previously painted surfaces. Two coats are best for maximum exterior life.

Lasts longer. Reports by Lukens Laboratories, Inc., state: "From the results of our test work, it is clearly evident that Garlock 510 possesses the unique property of excellent adhesion to oily metal surfaces. Worthy of special note is the inherent film hardness and mar resistance of the Garlock even in the presence of a normal film-softening agent such as the oil." (Complete report supplied on request.)



No waiting. 510 Enamel dries to a hard gloss finish within 20 minutes. Equipment is ready for immediate use or for a second coat if needed.

Colors	Code Numbers			
	1 Gallon	5 Gallons	16 Oz.	55 Gallons
Green	03002-0004	03004-0004	03009-0004	03005-00[illegible]
Gray	03002-0009	03004-0009	03009-0009	03005-00[illegible]
Red	03002-0001	03004-0001	03009-0001	03005-00[illegible]
Blue	03002-0005	03004-0005	03009-0005	03005-00[illegible]
Orange	03002-0052	03004-0052	03009-0052	03005-00[illegible]
Yellow	03002-0063	03004-0063	03009-0063	03005-00[illegible]
White	03002-0008	03004-0008	03009-0008	03005-00[illegible]
Black	03002-0007	03004-0007	03009-0007	03005-00[illegible]
Caterpillar Yellow	03002-0083	03004-0083	03009-0083	03009-00[illegible]
School Bus Yellow	03002-0233	03004-0233	03009-0233	03005-02[illegible]

520 Reducer. Used to thin Garlock 510 Enamel for use in spray equipment. Also used in cleaning painting equipment, and when a first quality lacquer thinner is required.

Packaging	Code No.
1 Gal. Cans	03402-0000
5 Gal. Cans	03404-0000
55 Gal. Drums	03405-0000

TFE All-purpose Lube is the most universal lubricant in the Garlock line. It is chemically inert and is an effective lubricant from −400°F to +500°F. It has an extremely low coefficient of friction. It is not contaminated by dusty atmospheres and resists virtually all chemicals and solvents. May be used as an anti-stick or release agent and is ideal for applications where other lubricants will stain, run or congeal.

Code No.
Packaging
16 Oz. Aerosol Can 03309-[illegible]

Dry Graphite Lube is useful where petroleum products must be avoided. Will withstand continuous temperature of 400°F and to 850°F, intermittently, depending on load demands. It is a handy lubricant for bearings, conveyors, springs, hinges, die casting machines and for general preassembly lubrication of manufacturing equipment.

Code No.
Packaging
16 Oz. Aerosol Can

FBW-058

Chain Drive Lube is specially formulated to reduce wear and increase chain life. It contains a special MOLY S_2* additive which allows for maximum holding power because of its affinity for ferrous metals. Will withstand extremes in temperatures . . . will not fly off or break down.

Packaging	Code No.
16 Oz. Aerosol Can	03310-2671

Wire Rope and Gear Lube is a specially compounded lubricant designed to penetrate pores of metal. Heating is not necessary and black color is a guide to effective coverage. Will withstand severe temperature extremes, will not break down after repeated workings and has excellent rust-preventing qualities. Excellent outdoor lubricant, highly resistant to weathering.

Packaging	Code No.
16 Oz. Aerosol Can	03302-2671

Cutting Oil promotes maximum economy for metal cutting. The jet spray localizes this cutting compound exactly on work areas, reducing spillage and run-off. Will cling to curved surfaces. May be used for drilling, cutting, sawing and threading operations on the toughest stainless steels or softer metals such as aluminum.

Packaging	Code No.
14 Oz. Aerosol Can	03306-2671

Silicone Lubricant is a transparent film lubricant with excellent thermal and oxidation stability. It is non-corrosive and provides unique moisture repellent characteristics in such applications as locks, windows, instruments, latches and doors.

Packaging	Code No.
16 Oz. Aerosol Can	03305-2671

Silicone Mold Release provides a maximum release effect because of its extremely low surface tension. It is non-corrosive to most common metals even in the presence of oxygen. It cuts rejects, reduces marking, spotting or sticking of parts. Resists breakdown under mechanical shearing or heavy workload. Excellent electrical properties and high volume resistance makes it superior to petroleum products.

Packaging	Code No.
20 Oz. Aerosol Can	03312-2669

Moly-S_2 High Temp Lube is specially formulated from a concentrated dispersion of colloidal molybdenum disulfide. This unique dry lubricant provides unusually tight adhesion to practically all materials and is not affected by high pressure or temperatures up to 600°F. It is used typically during assembly and for run-in lubrication of new equipment, as a rubber mold release, as a wire drawing lubricant, and as a general maintenance lubricant.

Packaging	Code No.
16 Oz. Aerosol Can	03301-2671

*Garlock trademark for moylbdenum disulfide.



Belt Dressing increases power efficiency as much as 50 per cent. Will not glaze, collect dirt or dust, and cleans belts of residual build-up. It contains no resin or asphalt and will perform effectively under wet, outdoor conditions. Use on flat, round or V belts of leather, rubber or fabric.

Packaging	Code No.
16 Oz. Aerosol Can	03303-2671

Anti-rust and Demoisturant has extremely low surface tension and high capillary action. It forms a continuous molecular film that spreads evenly and penetrates surface pores. It is compatible with other lubricants. Excellent protection for dies, jigs and fixtures, generators, ignition systems and electrical circuits.

Packaging	Code No.
16 Oz. Aerosol Can	03307-2671

Degreaser quickly turns grease and dirt into a liquid which can be easily flushed away with water. The emulsification that takes place will carry away the contaminants leaving a clean surface. It is used on all types of machinery, tools, engines and small parts that will not effect insulation or paints.

Packaging	Code No.
16 Oz. Aerosol Can	03309-2671

Garlock industrial specialties

Vinyl Protective Coating provides maximum convenience in protecting precision components in storage or shipping. Once applied the coating may be peeled from the sprayed areas. No solvent is required for removal. May be applied to castings, dies, lenses or any critical surface of precision components. Additional coats will build up film to desired thickness. Protects against rust, corrosion and abrasion.

Packaging	Code No.
16 Oz. Aerosol Can	03300-2671

Penetrating Oil is a special light oil formulated to release corroded and rusted parts. Its aerosol jet spray provides fast penetration right at the point of trouble. Ideal for lubrication of tight-fitting parts. Will not harm painted surfaces.

Packaging	Code No.
12 Oz. Aerosol Can	03171-2946

Luball[r] is a general stuffing box lubricant with Moly-S_2 additive for water, steam and common chemical service from 32° up to 500°F. This completely waterproof lubricant paste contains no graphite, no soap or fillers to clog orifices. It maintains viscosity throughout its usable temperature range. It is insoluble in water and will not separate or break down.

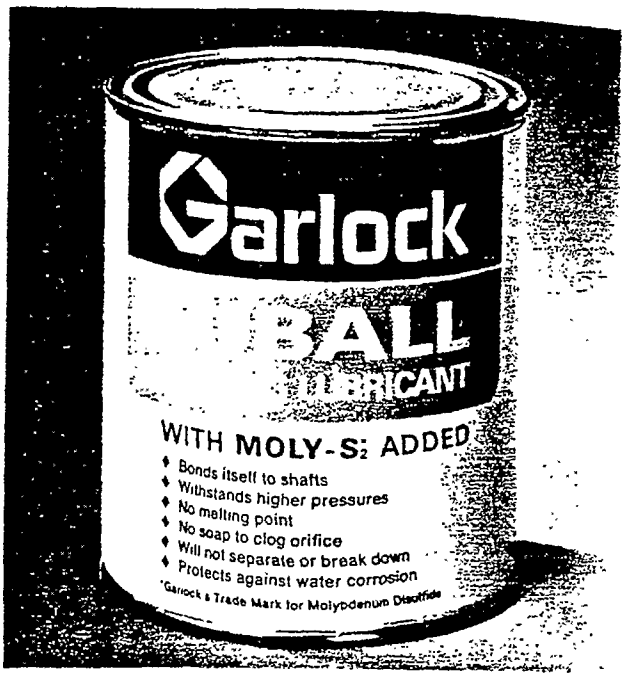
Packaging	Code No.
1 Lb. Can	02006-2671
4 Lb. Can	02006-2675
7½ Lb. Can	02006-5853
20 Lb. Pail	02006-5856
35 Lb. Pail	02006-5857
70 Lb. Pail	02006-5858

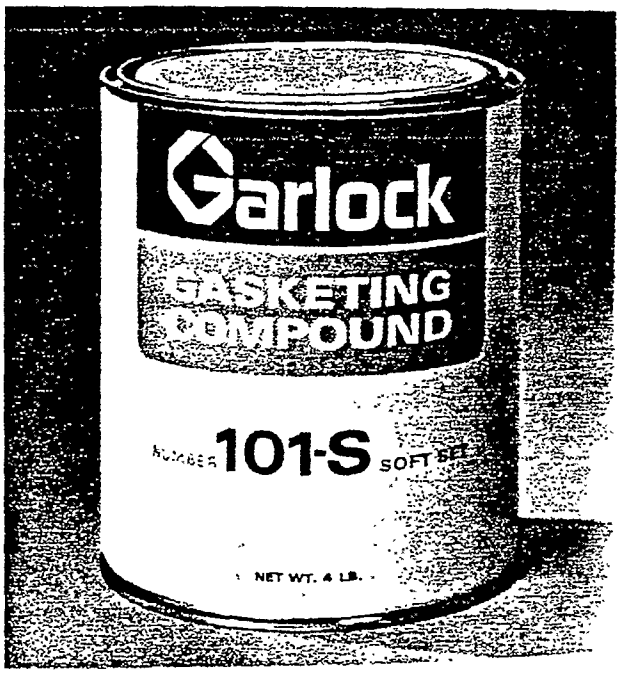
Tapping Compound is an all-purpose compound for use in drilling and tapping operations. It helps improve production and lowers costs, because it reduces the amount of torque required, permits higher speeds in metal machine operations, reduces tool breakage and work spoilage. Useful wherever there are boring, milling, reaming or lathe turning operations.

Packaging	Code No.
1 Lb. Can	02004-2671
2 Lb. Can	02004-2673
8 Lb. Can	02004-2677
40 Lb. Can	02004-2681

Lubricating Compound No. 2 is a specialized lubricant for use on rod packings, in stuffing boxes and on moving parts of die casting equipment. It has unusual heat resistance and wearing qualities.

Packaging	Code No.
20 Oz. Can	02002-2669
5 Lb. Can	02002-2676
10 Lb. Can	02002-2679
25 Lb. Pail	02002-2680
50 Lb. Pail	02002-2684
100 Lb. Pail	02002-2687





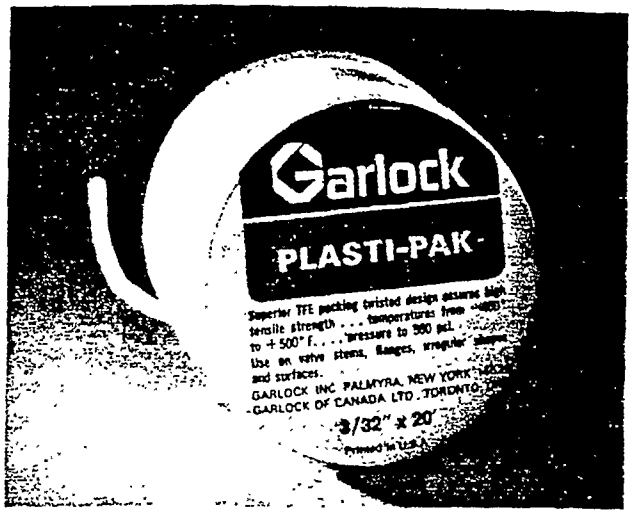
Gasketing Compound No. 101-S is a non-hardening plastic compound used as a surface leveler on flanged joints and for temporary repair of torn or blown gaskets. Joints on which it is used do not "freeze," and are easy to disassemble at any time. Recommended for use at temperatures ranging from below 0° to −500°F on pipelines or other equipment handling water, steam, air, oil, gasoline, gas, weak acids or alkalies.

Packaging	Code No.
11 Oz. Tube	02662-0644
4 Lb. Can	02662-2675
1 Lb. 5 Oz. Caulking Gun Cartridge	02662-0771

FBW-060

Plasti-Pak™ TFE twisted packing is superior to conventional fluorocarbon packings for sealing valve stems and flanges. It is made by a special manufacturing process that twists several ribbons of Garlock PLASTI-THREAD tape into a tough, fibrous TFE cord. This added strength prevents blowouts, provides greater resistance to cold flow and allows compressibility for a positive seal. It is chemically inert, self-lubricating and unaffected by temperature extremes. It may be used with chemicals, gasoline, acids, steam, solvents, oils, liquid oxygen.

Packaging	Code No.
Metal Spool with Plastic Cover (12 rolls per case)	
3/32" x 20"	03163-1320
3/32" x 50"	03163-1350
5/32" x 15"	03163-1515
5/32" x 35"	03163-1535
7/32" x 15"	03163-1715



Plasti-Thread® TFE tape is the quickest, neatest, cleanest way to seal a threaded joint. PLASTI-THREAD is 100% pure fluorocarbon in ribbon form; will seal threaded joints on any pipe including stainless steel, copper, plastic, brass, galvanized metal and aluminum. It is chemically inert and corrosion resistant. Withstands temperature extremes from −400° to +500°F.

New Convenient Self-Dispenser! Now PLASTI-THREAD comes in a convenient self-dispenser designed especially for Garlock. The amount of PLASTI-THREAD still available is easy to determine; the non-bulky package is easy to carry with you to your various work sites; and it's always clean and protected.

Packaging	Code No. *Cardboard Core (50 rolls per case)*	Code No. *Protective Dispenser*
1/2" x 260"	03164-1245	03164-1300
1/2" x 520"	03164-1237	03164-1301
1/2" x 1296"	03164-1238	03164-1302
3/4" x 260"	03164-1251	03164-1303
3/4" x 520"	03164-1242	03164-1304
3/4" x 1296"	03164-1243	03164-1305



Pipe Thread Compound provides permanently tight, threaded joints in pipelines and other equipment. Ready to apply as it comes from the can. Available in two types: Type A for use against steam, dry gas, water, alcohol, hot or cold heavy oils; Type B for use against gasoline, light oils, kerosene, carbon tetrachloride, benzol and solvents, except alcohol.

Packaging	Code No. *Type A*	Code No. *Type B*
1 Lb. Can	02007-2671	02008-2671
2 Lb. Can	02007-2673	02008-2673
4 Lb. Can	02007-2675	02008-2675
40 Lb. Pail	02007-2681	02008-2681
80 Lb. Pail	02007-2685	02008-2685

Garlock Flexible Packing Hooks. The flexible shafts of these sturdy, high-grade packing hooks make it much easier to remove old packing from cramped or hard-to-reach areas. The sharp point of the screw tip is easily inserted and anchored in the packing. And, should the tip become damaged, it can be easily unscrewed and replaced on the spot. Also, the threaded end of the flexible shaft may be used to remove tapped lanterns, bushings or other removal metal rings.

Packaging	Code No.
The complete set, "D" packaged in a strong metal box, includes:	49027-0001
Two No. 1 Flexible Hooks 7 3/4" long, with screw tip for packing spaces as small as 5/16". Screw thread size: 8-32	49027-0002
One Extra Screw Tip for No. 1 hook	49027-0004
Two No. 2 Flexible Hooks 10 5/8" long, with screw tip, for packing spaces from 7/16" up. Screw thread size: 1/4-20	49027-0005
One Extra Screw Tip for No. 2 hook	49027-0006
One No. 4 Solid Curved-End Hook with L-shaped handle	49027-0008
One No. 5 Solid Curved-End Hook with looped handle, 1/8" shank	49027-0012
One No. 6 Solid Curved-End Hook with looped handle, 5/16" shank	49027-0009
One Open End Wrench	

Extra screw tips for Nos. 1 and 2 may be purchased in sets of five using the above code numbers.

Steam table

Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.	Gauge Press. Lbs.	Temp. Deg. F.
5	228	30	274	55	302	80	324	110	344	160	370	210	391	259	409
6	230	31	275	56	303	81	324	112	345	162	371	212	392	261	409
7	233	32	277	57	304	82	325	114	346	164	372	214	393	263	410
8	235	33	278	58	305	83	326	116	348	166	373	216	394	265	411
9	237	34	279	59	306	84	327	118	349	168	374	218	394	267	411
10	240	35	281	60	307	85	327	120	350	170	375	220	395	269	412
11	242	36	282	61	308	86	328	122	351	172	376	222	396	271	413
12	244	37	283	62	309	87	329	124	352	174	377	224	397	273	413
13	246	38	284	63	310	88	330	126	353	176	378	226	397	275	414
14	248	39	285	64	311	89	330	128	354	178	378	228	398	277	415
15	250	40	287	65	312	90	331	130	355	180	379	230	399	279	415
16	252	41	288	66	312	91	332	132	356	182	380	232	400	281	416
17	254	42	289	67	313	92	332	134	357	184	381	234	400	283	416
18	255	43	290	68	314	93	333	136	359	186	382	235	401	285	417
19	257	44	291	69	315	94	334	138	360	188	383	237	401	295	420
20	259	45	292	70	316	95	334	140	361	190	384	239	402	305	423
21	261	46	293	71	317	96	335	142	362	192	384	241	403	355	437
22	262	47	294	72	317	97	336	144	363	194	385	243	403	375	442
23	264	48	295	73	318	98	336	146	364	196	386	245	404	385	444
24	265	49	297	74	319	99	337	148	365	198	387	247	405	405	449
25	267	50	298	75	320	100	338	150	366	200	388	249	405	455	460
26	268	51	299	76	321	102	339	152	367	202	388	251	406	510	472
27	270	52	300	77	321	104	340	154	368	204	389	253	407	560	481
28	271	53	301	78	322	106	341	156	368	206	390	255	407	585	486
29	273	54	302	79	323	108	343	158	369	208	391	257	408		

RPM/FPM conversion table approximate feet per minute

Shaft Dia.	RPM 100	300	500	1000	1500	1750	2000	2500	3000	3600	4000	4500	5000
½"	13	39	65	131	196	229	262	327	393	471	524	590	655
¾"	19	58	98	196	294	344	392	490	588	707	784	882	980
1"	26	78	131	262	392	458	524	655	785	942	1047	1178	1309
1¼"	32	98	163	327	490	573	654	817	981	1178	1309	1472	1636
1½"	39	118	195	393	589	687	785	976	1178	1414	1570	1717	1953
1¾"	45	137	229	458	687	821	916	1145	1374	1649	1832	2061	2290
2"	52	157	261	524	785	916	1057	1309	1571	1885	2094	2356	2618
2½"	65	196	327	655	982	1145	1309	1636	1963	2356	2618	2945	3271
3"	78	235	392	785	1178	1374	1571	1962	2355	2827	3141	3533	3925
3½"	91	275	458	916	1374	1604	1833	2290	2749	3299	3663	4121	4579
4"	104	314	523	1047	1570	1833	2094	2618	3141	3770	4186	4710	5233
5"	131	393	654	1309	1963	2291	2618	3272	3925	4712	5233	5890	6545
6"	157	471	785	1570	2356	2749	3141	3925	4710	5655	6280	7070	7850
7"	183	549	916	1832	2748	3207	3663	4579	5945				
8"	209	628	1047	2094	3141	3665	4187	5233					
9"	235	706	1178	2356	3533	4114	4710	5887					
10"	261	785	1309	2618	3925	4582	5233						

FBW-062

Fahrenheit and centigrade conversion table

Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.	Fahr.
0	32	205	401	405	761	605	1121	805	1481	1005	1841	1205	2201	1405	2561
5	41	210	410	410	770	610	1130	810	1490	1010	1850	1210	2210	1410	2570
10	50	215	419	415	779	615	1139	815	1499	1015	1859	1215	2219	1415	2579
15	59	220	428	420	788	620	1148	820	1508	1020	1868	1220	2228	1420	2588
20	68	225	437	425	797	625	1157	825	1517	1025	1877	1225	2237	1425	2597
25	77	230	446	430	806	630	1166	830	1526	1030	1886	1230	2246	1430	2606
30	86	235	455	435	815	635	1175	835	1535	1035	1895	1235	2255	1435	2615
35	95	240	464	440	824	640	1184	840	1544	1040	1904	1240	2264	1440	2624
40	104	245	473	445	833	645	1193	845	1553	1045	1913	1245	2273	1445	2633
45	113	250	482	450	842	650	1202	850	1562	1050	1922	1250	2282	1450	2642
50	122	255	491	455	851	655	1211	855	1571	1055	1931	1255	2291	1455	2651
55	131	260	500	460	860	660	1220	860	1580	1060	1940	1260	2300	1460	2660
60	140	265	509	465	869	665	1229	865	1589	1065	1949	1265	2309	1465	2669
65	149	270	518	470	878	670	1238	870	1598	1070	1958	1270	2318	1470	2678
70	158	275	527	475	887	675	1247	875	1607	1075	1967	1275	2327	1475	2687
75	167	280	536	480	896	680	1256	880	1616	1080	1976	1280	2336	1480	2696
80	176	285	545	485	905	685	1265	885	1625	1085	1985	1285	2345	1485	2705
85	185	290	554	490	914	690	1274	890	1634	1090	1994	1290	2354	1490	2714
90	194	295	563	495	923	695	1283	895	1643	1095	2003	1295	2363	1495	2723
95	203	300	572	500	932	700	1292	900	1652	1100	2012	1300	2372	1500	2732
100	212	305	581	505	941	705	1301	905	1661	1105	2021	1305	2381	1505	2741
105	221	310	590	510	950	710	1310	910	1670	1110	2030	1310	2390	1510	2750
110	230	315	599	515	959	715	1319	915	1679	1115	2039	1315	2399	1515	2759
115	239	320	608	520	968	720	1328	920	1688	1120	2048	1320	2408	1520	2768
120	248	325	617	525	977	725	1337	925	1697	1125	2057	1325	2417	1525	2777
125	257	330	626	530	986	730	1346	930	1706	1130	2066	1330	2426	1530	2786
130	266	335	635	535	995	735	1355	935	1715	1135	2075	1335	2435	1535	2795
135	275	340	644	540	1004	740	1364	940	1724	1140	2084	1340	2444	1540	2804
140	284	345	653	545	1013	745	1373	945	1733	1145	2093	1345	2453	1545	2813
145	293	350	662	550	1022	750	1382	950	1742	1150	2102	1350	2462	1550	2822
150	302	355	671	555	1031	755	1391	955	1751	1155	2111	1355	2471	1555	2831
155	311	360	680	560	1040	760	1400	960	1760	1160	2120	1360	2480	1560	2840
160	320	365	689	565	1049	765	1409	965	1769	1165	2129	1365	2489	1565	2849
165	329	370	698	570	1058	770	1418	970	1778	1170	2138	1370	2498	1570	2858
170	338	375	707	575	1067	775	1427	975	1787	1175	2147	1375	2507	1575	2867
175	347	380	716	580	1076	780	1436	980	1796	1180	2156	1380	2516	1580	2876
180	356	385	725	585	1085	785	1445	985	1805	1185	2165	1385	2525	1585	2885
185	365	390	734	590	1094	790	1454	990	1814	1190	2174	1390	2534	1590	2894
190	374	395	743	595	1103	795	1463	995	1823	1195	2183	1395	2543	1595	2903
195	383	400	752	600	1112	800	1472	1000	1832	1200	2192	1400	2552	1600	2912
200	392														

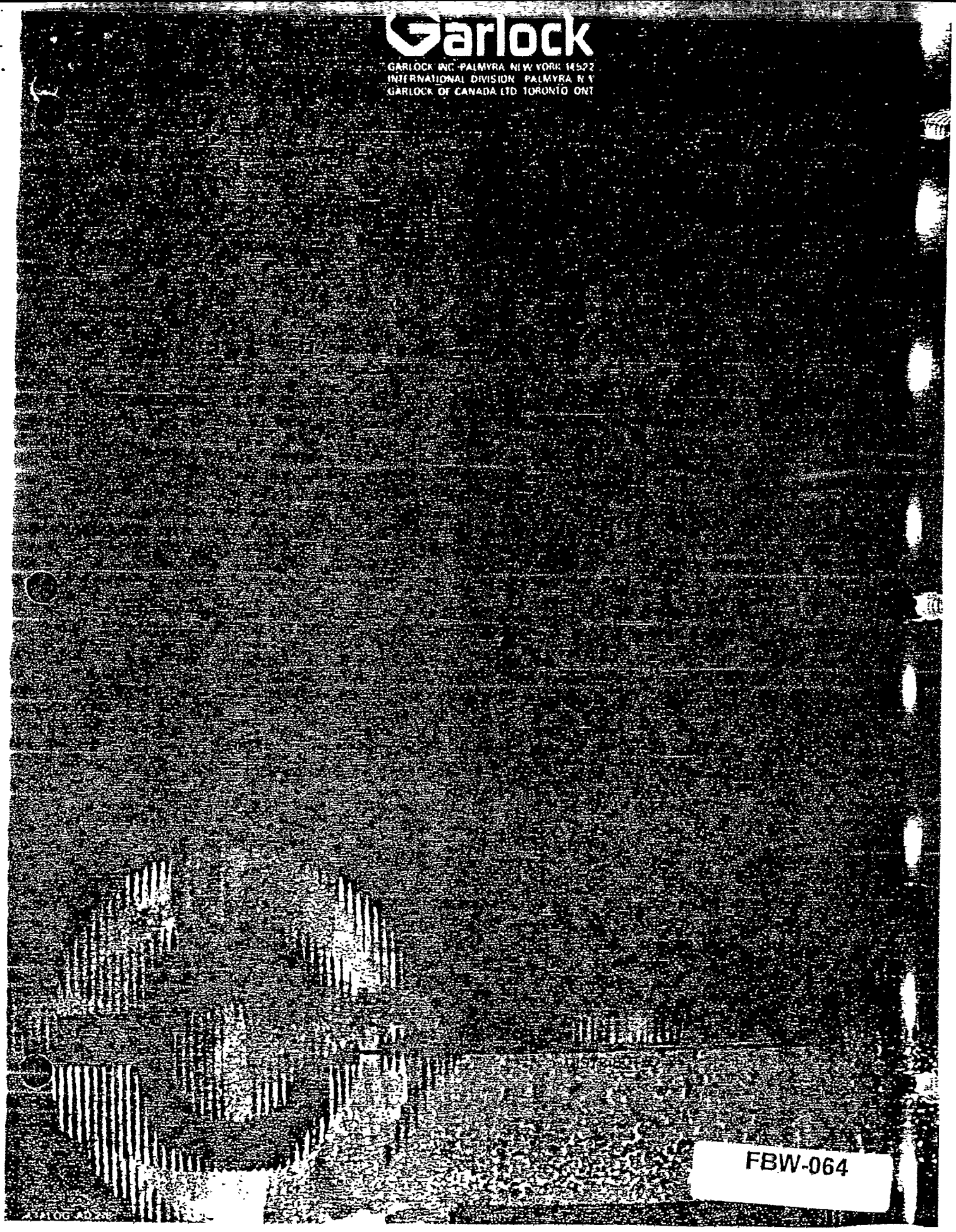
FBW-063

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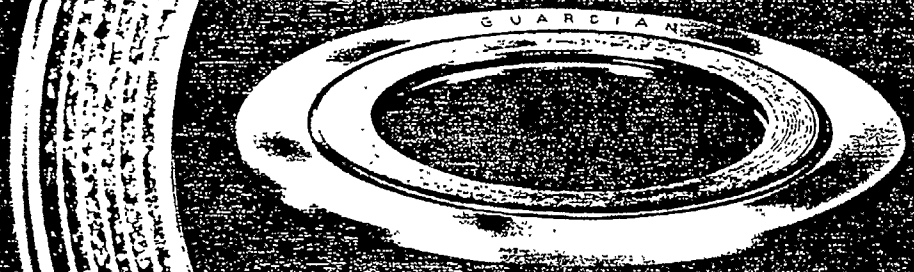
CATALOG NO. AD-276

GMD 100M—1-69

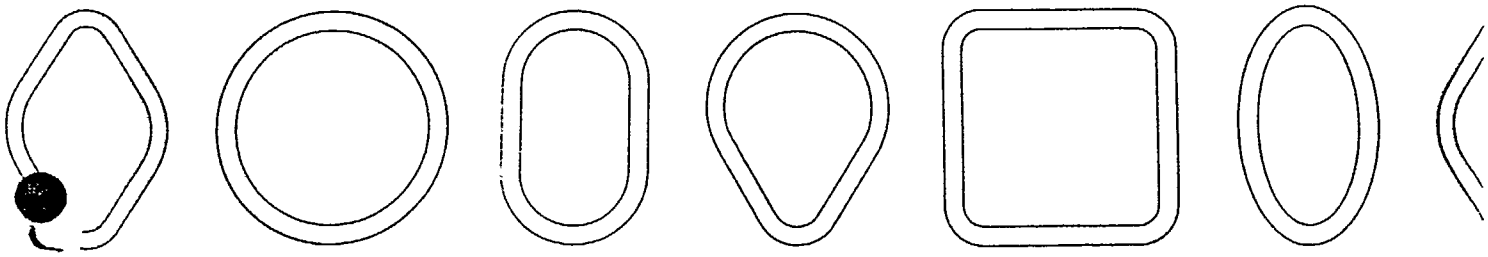

Garlock
GARLOCK INC -PALMYRA NEW YORK 14522
INTERNATIONAL DIVISION PALMYRA N Y
GARLOCK OF CANADA LTD TORONTO ONT
FBW-064

Garlock

GUARDIAN®

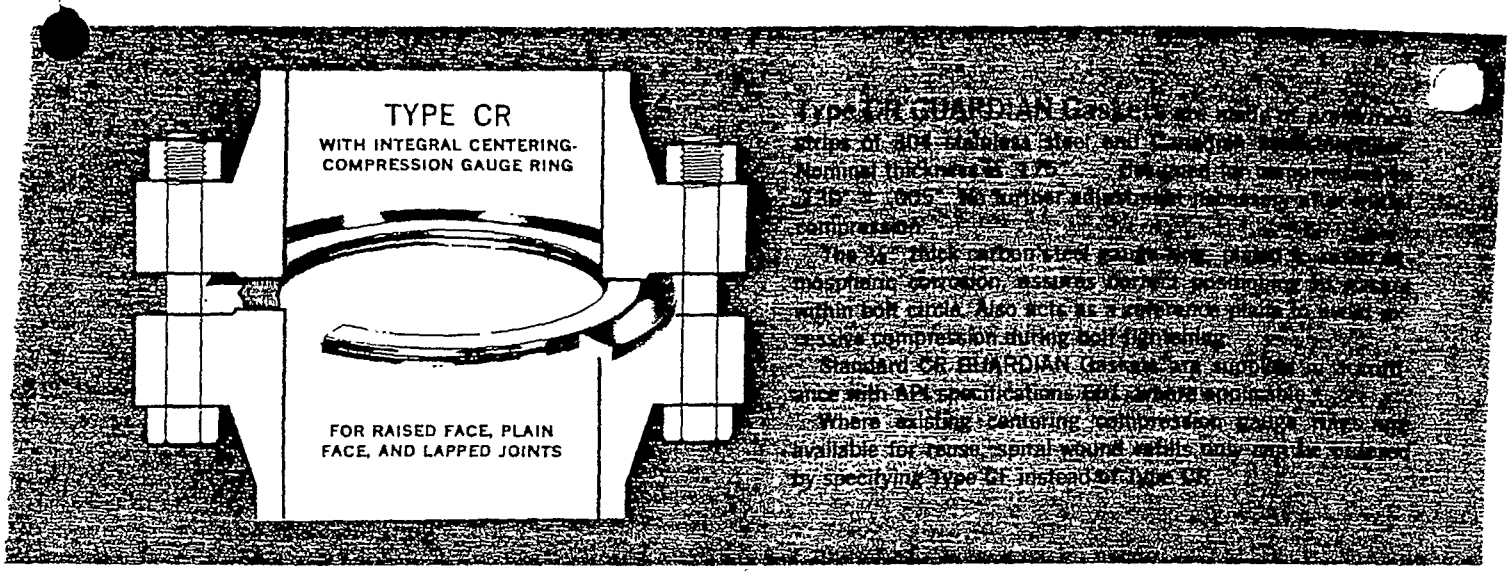


SPIRAL WOUND GASKETS



FBW-065

Garlock GUARDIAN® Spiral-Wound Gaskets . .

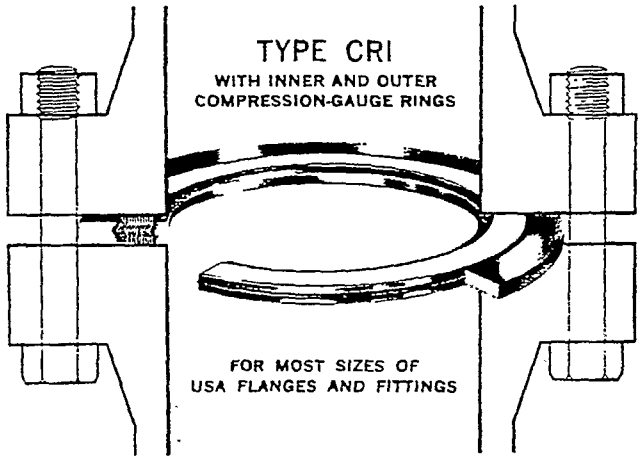


Type CR GUARDIAN Gaskets are made of [illegible] strips of 304 Stainless Steel and Graphite [illegible]. Nominal thickness is .175". Designed for compression to .125" ± .005". No further adjustment necessary after initial compression.

The 3/4" thick carbon steel gauge ring, plated to resist atmospheric corrosion, assures correct centering of gasket within bolt circle. Also acts as a compression plate to assure positive compression during bolt tightening.

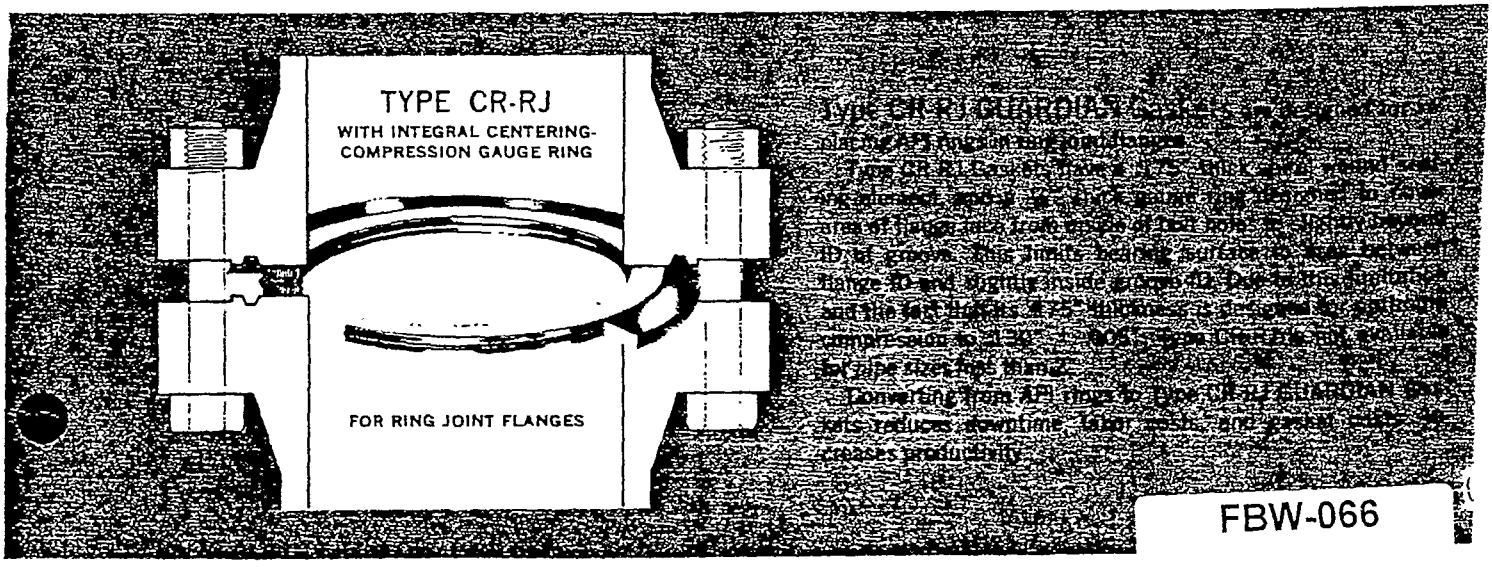
Standard CR GUARDIAN Gaskets are supplied in accordance with API specifications (API Standard 601).

Where existing centering compression gauge rings are available for reuse, spiral-wound gaskets may be ordered by specifying Type CI instead of Type CR.



Type CRI GUARDIAN Gaskets, basically, are Type CR Gaskets with the addition of a stainless steel or carbon steel inner ring. Outer ring and sealing element materials, ring and element thicknesses, and optimum compression are identical.

The addition of inner ring serves three functions: First, it fills flange recess to keep pipe line fluids away from gasket . . . prevents gasket movement under extremely high bolt loads . . . and minimizes turbulence. This triple action protects gasket from contamination by corrosive fluids. Second, inner ring supplements outer ring as a compression gauge. Third, the inner ring adds the benefits of a grooved flange. Does it without the expense of grooving a flange to obtain the safety of a wholly-contained gasket.



Type CR-RJ GUARDIAN Gaskets are made of [illegible] for API ring joint flanges.

Type CR-RJ Gaskets have a .175" thickness which is uncompressed and a .125" thick gauge ring which is the same [illegible] ID of groove. This limits bearing surface to area between flange ID and ring ID. Due to this [illegible] and the fact that the .175" thickness is designed to [illegible] compression to .130" ± .005", Type CR-RJ is not suitable for [illegible] flanges.

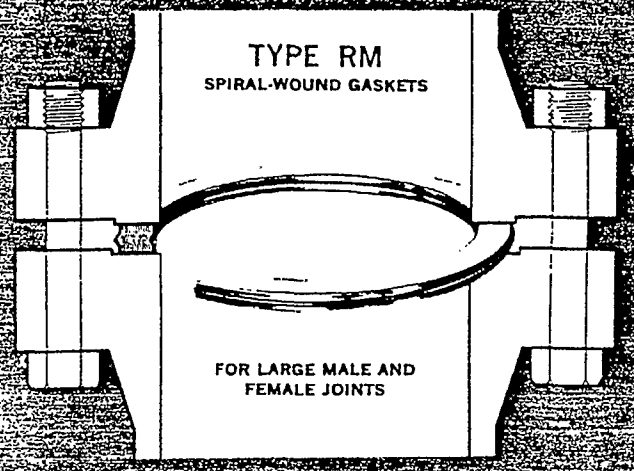
Converting from API rings to Type CR-RJ GUARDIAN Gaskets reduces downtime, labor costs, and gasket costs, and increases productivity.

When ordering gaskets for USA flanged joints, give type of gasket, nominal pipe size, pressure sizes and material specifications.

. . for pipe flanges, pressure vessels and process application

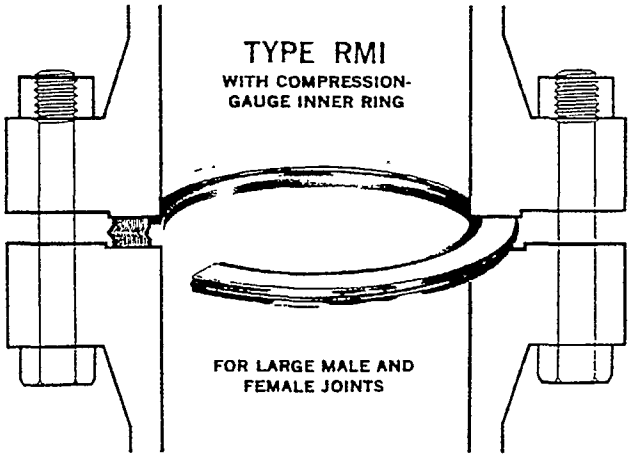
Type RM GUARDIAN Gaskets are directly related to standard female counter bore dimensions. Inside dimensions avoid overhanging into orifice of the joint.

Type RM Gaskets are .125" nominal thickness for ¼" standard depth recess. This facilitates alignment of male and female fittings during assembly. Gaskets compress from their .125" thickness to .100" ± .005". Gaskets .175" thick are available for special application. Densities are in balance with available bolt loading to provide maximum resiliency under compression.



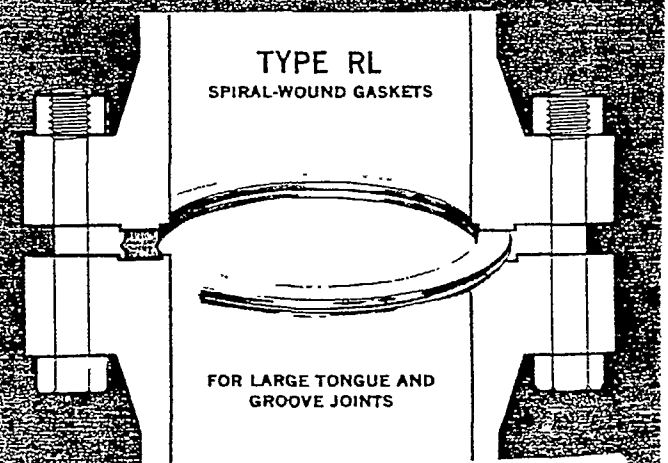
Type RMI GUARDIAN Gaskets are basically the same as Type RM in materials, female counter bore clearance, nominal thickness and optimum compression. They, too, are available in .175" thickness for special application.

The added feature of the Type RMI Gasket is a stainless steel or carbon steel inner ring. This ring functions in the same manner as the inner ring in Type CRI to protect the gasket from contamination. It also converts the female flange into a grooved flange. Provides the safety of a wholly-contained gasket, without the added cost and labor of grooving the flange.



Type RL GUARDIAN Gaskets have tongue and groove dimensions to allow for quick, positive seating of gasket in groove of joint.

They assure accurate alignment of tongue and grooved fittings during assembly. Standard Type RL Gaskets are made in nominal thicknesses of .125" for ¼" standard depth recess. Minimum compression is to .100" ± .005". Type RL Gaskets .175" thick are available for special application. Resiliency under compression is provided by variations in densities that are in balance with available bolt loading.



FBW-067

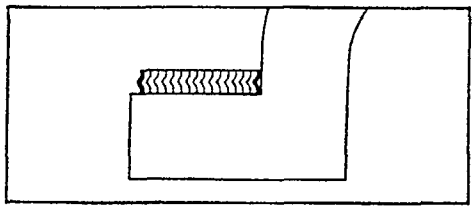
When ordering gaskets in other pressure/temperature ranges, in other thicknesses or larger diameters, see "SPECIAL GUARDIAN GASKETS" Section.

...s and for manholes, handholes, tubecaps

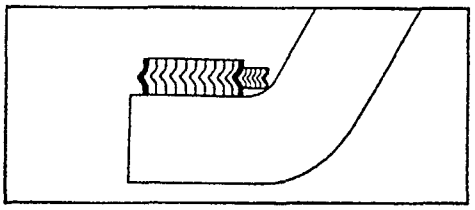


Type BM and BR for boiler manholes

GUARDIAN Gaskets are available in two types specifically designed for use on standard manhole cover assemblies.



Type BM GUARDIAN Gaskets are manufactured in oval, oblong and round shapes to fit manhole cover assemblies of all makes and sizes of boilers. Standard thicknesses are .175" (for use on seating surfaces in satisfactory condition), and .250" (for use on rough, pitted, worn or distorted seating surfaces).



Type BR GUARDIAN Gaskets consist of a sealing component and an inside spiral-wound centering ring. Available only in oval shape, for use on manhole cover assemblies containing a chamfer between shoulder and seating surface. The centering ring locates gasket accurately and eliminates pinching from radial displacement. Nominal thickness of sealing component is .250"; centering ring .175".

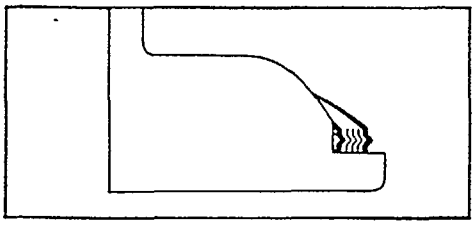
0-499 lbs.—0-999 lbs.—1000 lbs. & Above			
Type	Nominal I.D. Dimensions (Inches)	Thickness (Inches)	Flange Width (Inches)
BM-Oval	10x15	.175	13/16
BM-Oval	10x15	.250	13/16
BM-Oval	10x16	.250	13/16
BM-Oval	11x15	.250	13/16
BR-Oval	11x15	.250	13/16
BM-Oval	11x15	.175	3/4
BM-Oval	11x15	.175	13/16
BM-Oval	11x15	.175	1/2
BM-Oblong	11 1/16x14 7/8	.250	13/16
BM-Oblong	11 3/16x15 1/16	.250	13/16
BM-Oval	12x16	.250	13/16
BR-Oval	12x16	.250	13/16
BM-Oval	12x16	.175	1/2
BM-Oval	12x16	.175	3/4
BM-Oval	12x16	.175	13/16
BR-Oval	12 1/16x16 1/16	.250	13/16
BM-Oblong	14x16	.175	3/4
BM-Round	14	.175	3/4
BM-Round	16 1/16	.175	3/4

NOTE: When ordering gaskets specify type, dimensions, operating pressure, and temperature.



Type BH for handholes and tubecaps

Type BH GUARDIAN Gaskets are made in round, oblong, pear, square, oval, and diamond shapes to fit practically any tubecap and handhole assemblies. Standard thickness is .175", designed for cover assemblies having narrow seating surfaces and high bonding loads. Several sizes and shapes are also available in .250" thickness for cover assemblies with broad seating surfaces and low bonding loads.



HOW TO ORDER

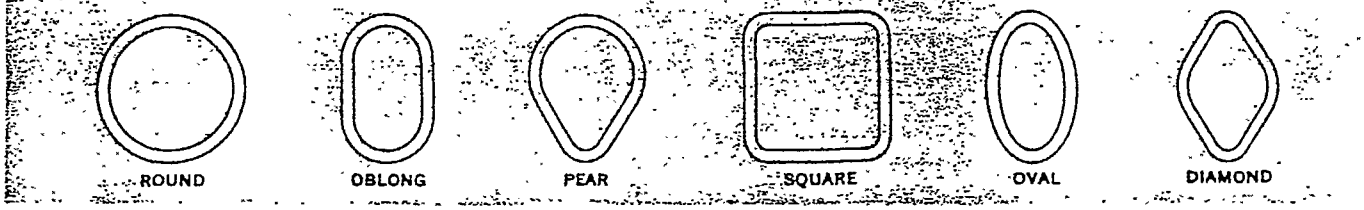
When ordering standard GUARDIAN Gaskets for handhole or tubecap assemblies, give following information:

1. Quantity
2. Name of equipment manufacturer (see list below)
3. Equipment manufacturer's gasket number
4. Gasket shape (see illustrations below)
5. Inside dimensions
6. Flange width
7. Gasket thickness
8. Type of metal desired
9. Operating pressure
10. Operating temperature

FBW-068

STANDARD MATERIALS for Types BM, BR and BH are: Plated low-carbon steel and asbestos—for 0-499 psi, temperatures to 500° F., Type 304 stainless steel and asbestos—for 0-999 psi and 1000 psi and up, temperatures to 850° F. Corrosion-resistant steels, types 316L, 347 or 309S, are recommended for temperatures above 850° F.

STANDARD SHAPES FOR BOILER MANHOLE, HANDHOLE AND TUBECAP GASKETS



GUARDIAN GASKETS FIT EQUIPMENT OF THE FOLLOWING BOILER MANUFACTURERS

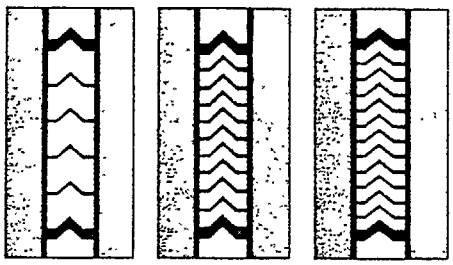
American Engineering	Bucyrus-Erie	Erie City	Hedges-Walsh-Weidner	Murray	Page	Superheater
Babcock & Wilcox	Casey-Hedges	Foster Wheeler	Heine	Oil City	Riley Stoker	Union
Badenhausen	Combustion Engineering	Franklin	International	Oil Well Supply	Seaboard	Vogt
Bros	Edgemoor	Gaery	Keeler	Pacific	Springfield	Ward

CONSTRUCTION

GUARDIAN Spiral-Wound Gaskets are manufactured under the most rigid engineering specifications and quality control standards in the industry. They are made of alternating plies of preformed, "V" shaped metals and asbestos or other fillers. This combination provides the resiliency and spring-like action necessary for automatic adjustment of the gasket to mechanical compression, internal pressure variations and temperature changes. Each metal edge creates a microscopic penetration of the gasket bearing surface. This effects a multiple seal with greater safety at comparatively light bolt loads. Also taken into consideration, to build up proper resiliency, are original make-up, relaxed and maintenance make-up loads.

GASKET DENSITY

Relationship of engineered "V" design of preformed metal plies to selected filler is varied according to the bolting of joint assembly to maintain gasket resiliency, and control gasket compressibility. Note, in illustration, there are more plies of metal and filler in a dense or "hard" gasket than in a less dense or "soft" one . . . although the inside and outside gasket dimensions remain the same.



MATERIALS

Standard GUARDIAN Spiral-Wound Gasket material for the preformed "V" plies is Type 304 stainless steel. Standard filler material is Canadian chrysotile asbestos, unadulterated with coloring contaminants.

Other available metals and alloys are: plated low carbon steel, Monel*, titanium, nickel, Inconel*, Hastelloy B**, phosphor bronze and stainless steel Types 309S, 316L and 347. Other filler materials include compressed asbestos with various binders and non-ferrous alloys. Also blue African asbestos, TFE and TFE-suspensoid-treated asbestos, which are recommended for chemical and process applications requiring a high degree of resistance to corrosion.

*International Nickel Company trademark
**Union Carbide Company trademark

SPECIFICATIONS

GUARDIAN Spiral-Wound Gaskets in standard materials are available for immediate delivery from Garlock warehouses for USA standard flanged fittings (U.S.A. B16.5), in nominal pipe sizes ¼" to 24" in all pressure series to 2500 psi. Also available in accordance with current Military Specifications.

SPECIAL GUARDIAN Spiral-Wound Gaskets can be designed and manufactured for special applications using other than standard flanged fittings. See information under "SPECIAL GUARDIAN GASKETS" below.

SPECIAL GUARDIAN® GASKETS

Garlock engineers design special gaskets for non-standard joints in piping systems and pressure vessels in which spiral-wound construction can be used. Special GUARDIAN Gaskets are used in a wide range of original equipment including aircraft, diesel, gas and rocket engines; boiler feed, centrifugal, condensate, reciprocating and vacuum pumps; gauge and sight glasses; centrifugal and reciprocating compressors; high pressure and soot blowers; hydraulic and molding presses; gas and steam turbines; heat exchangers; high voltage power transformers; all types of valves.

Special GUARDIAN Gaskets are available in .0625", .125", .175", .250" and .285" thicknesses, depending upon joint design . . . any practical pressure/temperature combination . . . vacuum to 10,000 psi . . . cryogenic to 1200° F line temperature . . . any practical diameter/thickness combination larger than gaskets for nominal 24" pipe size . . . any combination of metals and fillers listed under "MATERIALS."

When ordering or making inquiry for special GUARDIAN Gaskets, give complete information on operating conditions—pressure, temperature and confined fluid—and joint design and dimensional data. If available, attach rough sketch or engineer's drawing of joint design.

FBW-069

9999 Mercier Avenue
Dearborn, Michigan

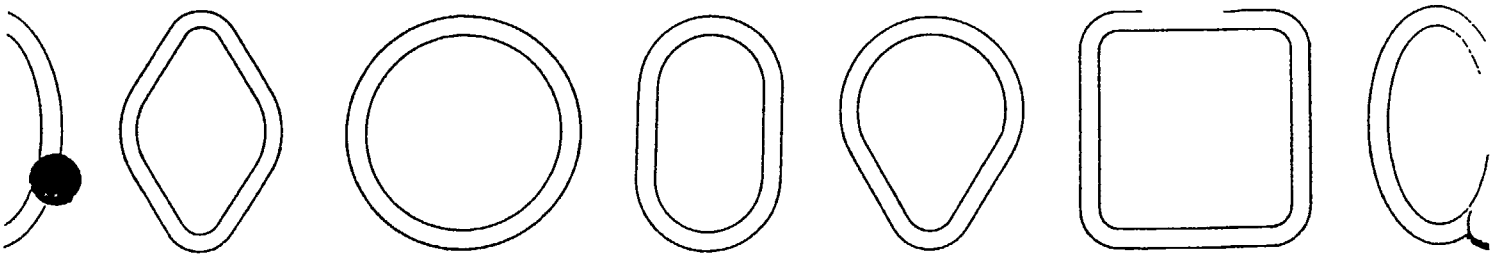
F. B. Wright Company

Telephone
VI. 3-8250

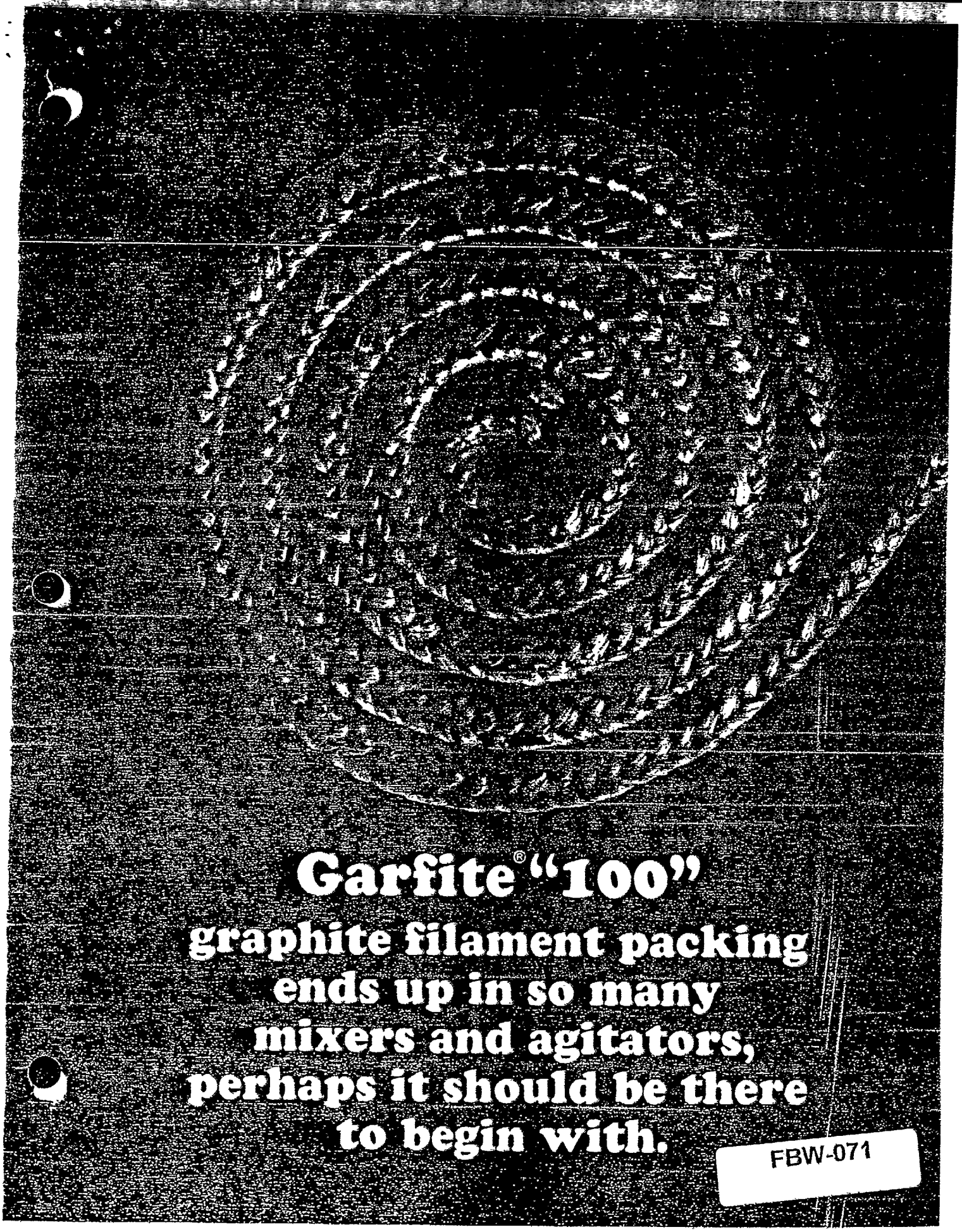
Garlock®

GARLOCK INC. PALMYRA, NEW YORK 14522
INTERNATIONAL DIVISION, PALMYRA, N.Y.
GARLOCK OF CANADA LTD. TORONTO, ONT.

FBW-070



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE


Garfite® "100"
graphite filament packing
ends up in so many
mixers and agitators,
perhaps it should be there
to begin with.
FBW-071

Technical report

GARFITE "100" graphite filament packing* contains graphite yarns which are 99% pure.

Inherent Lubricity

GARFITE "100" packing has the natural lubricity of graphite, which gives it exceptional dry run capabilities. Unlike other packings, no grease or oil is added as a lubricant. These are easily and usually squeezed or leached out in service, causing constant reduction in volume, leakage, and eventual dry-out. With GARFITE "100," the basic packing material is the lubricant.

Low Coefficient of Expansion

The coefficient of expansion of GARFITE "100" packing is compatible with that of ferrous metals. Therefore, fewer gland adjustments are required. This temperature stability is particularly advantageous where fluctuating temperatures occur.

High Heat Conductivity

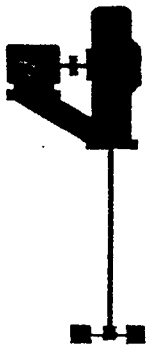
The thermal conductivity of GARFITE "100" is greater than that of other conventional soft packings. This means that heat generated at the shaft is rapidly transferred away to the housing, where it is dissipated.

Chemical Compatibility

GARFITE "100" packing is inert to most chemicals. Principal exceptions are strong oxidizing agents, dichromates, fuming nitric acid, and hot fuming sulphuric acid. It remains stable in the atmosphere to 650° F. and in steam to 1200° F.

Construction

GARFITE "100" packing contains graphite yarns which are 99% pure. The material can be worn away, but a new and identical sealing surface is presented. The wear characteristics can be compared to the brushes in an electric motor and carbon or graphite bushings; that is, a slow rate of wear but no degradation of the GARFITE "100" or its natural lubricity. GARFITE "100" packing is available in both cut rings and spools. Popular sizes from ⅛" to 1" are available from shelf stock. Special OEM dimensions on inquiry.



FBW-072

Benefits

The results obtained with GARFITE "100" are: greatly extended packing life, lower maintenance costs, less downtime, lower leakage rates (therefore, reduced product loss), less shaft and bearing wear, lower operating temperature, fewer gland adjustments, and greater reliability.

Consider that last item especially as you review the following. Consider what GARFITE "100" packing might mean to the reliability and salability of your units.

*U. S. Patent No. 3403595

Performance report

These are but a few of the many outstanding experiences that industry has reported since GARFITE "100" packing has been in use.

Nitrogen

In the production of polyether, a mixer is used with a 3½" shaft, at 84 rpm, 120°C., and 35 psi. Packing is 7 rings of ⅝". Nitrogen blanket is used to prevent any leakage of the flammable polyether. Conventional packing had to be adjusted every few days and changed every 2 or 3 weeks, despite regular pressure gun lubrication. Even with this attention, there was constant loss of nitrogen. The loss was enough so that the pressure of the blanket dropped an unsatisfactory amount during the five-day batch period.

GARFITE "100" graphite filament packing was installed. After a full month, without any external lubrication, *there was no detectable loss on the pressure gauge.* A second mixer, with 5" shaft running at 125 rpm, has also been converted to GARFITE "100" packing. It, too, has been sealed successfully.

Ammonia and Steam

Working in ammonia and steam, a top-entering mixer's 2½" shaft runs 100 rpm at 375°F., with vessel pressure of 425-450 psi. The sleeve takes seven rings of ½" packing. Conventional packing required an external lubrication system in which a nitrogen bottle pressurized a water bottle feeding the lantern ring. Since nitrogen pressure was controlled by a hand valve, the system was subject to error. Conventional packing had to be changed every month, and the 316 SS sleeve every two months.

The lubrication system was disconnected and GARFITE "100" packing installed. No leakage is permitted. When the GARFITE "100" packing was inspected *after two months, it showed no sign of deterioration, so the same set was reinstalled,* with no change in packing performance. And after nine months, the original set was still working fine.

Not only was there no wear on the shaft, but it appeared to have been *polished* by the packing. Five other mixers have since been upgraded with GARFITE "100."

H_2SO_4-NO-H_2 Mixture

A 20% H_2SO_4-NO-H_2 gas mixture is sealed in a mixer with a 6" shaft running 180 rpm at 200°F. 15/16" coil packing is used. The mixer runs continuously, 7 days a week. Conventional packing lasted 3 months, with several adjustments.

The problem area was the frictional heat caused by overtightening the packing to seal a gas. But not with GARFITE "100" packing. *It has been in service for 6 months,* and without additional adjustments.

Odor Additive

A distinctive odor additive, used to make natural gas leaks detectable, is processed in a mixer with a 1¼" shaft running 600 rpm (200 sfpm) at 250°F. Packing is 6 rings of ⅜". Product cannot be contaminated by packing lubricant. No leakage from mixer can be tolerated due to the strong odor of the product. TFE filament packing had to be changed with every batch of product. GARFITE "100" *packing has been in service for over 2 months.* No contamination, no odor.

Hydrogenation

Batch operations in a hydrogenation process include a 2" shaft mixer combining hydrogen, methanol, and toluene vapors at 2000 psi, 465°F., and 280 rpm. Unit has water-cooled stuffing boxes, and was equipped with two lantern glands for shaft lubrication. Conventional packing was lasting from a few days to a few weeks, at best.

One set of packing, made up of two Garlock No. 633 rings with a center ring of GARFITE "100," was installed in the bottom of the box. One 1⅜" lantern ring was installed for oil lubrication, followed by another set of two No. 633 rings and eight GARFITE "100" rings. GARFITE "100" *packing sets have already served over nine months, and are still in use.*

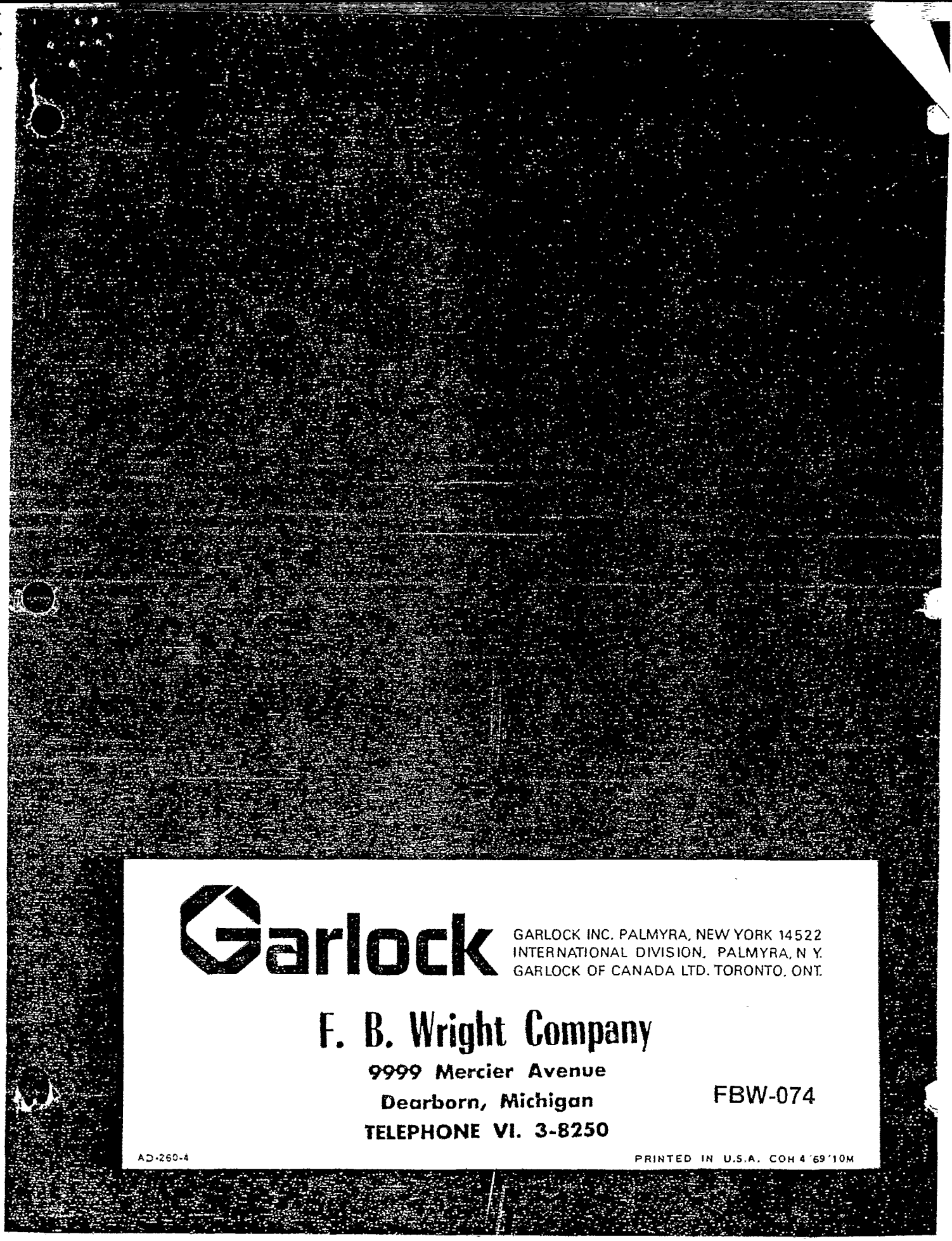
Maleic Anhydride and Steam

Maleic anhydride and steam are mixed at 80 rpm on a mixer with 316 SS shafts 4¾" in diameter. Operating temperature is 375°F. Mixer pressure is 50 psi. In the stuffing boxes, conventional packing failed after only 10 days. GARFITE "100" packing was installed in July; still running without leakage, in October.

GARFITE "100" graphite filament packing ends up in so many mixers and agitators, perhaps it should be there *to begin with.* For further details on the potential applications in your original equipment, contact your Garlock representative or write to: Garlock Inc., 410 Main Street, Palmyra, N. Y. 14522.

FBW-073

Garlock INC.



Garlock

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Industrial Products Catalog



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Table of contents

General

Style Number Index 1
This Is Garlock 2-3
Garlock Materials vs. Various Media Under Typical Conditions 4-5

Packing Recommendations for the Following Equipment

Accumulators & Intensifiers 6
Compressors . . .
Reciprocating 6
Rotary 6
Crystallizers 6
Cylinders . . .
Hydraulic 7
Pneumatic 7
Die Casting Machines 7
Digesters, Pulp Mill 7
Distillation Columns 8
Expansion Joints, Slip Type 8
Filters, Rotary 8
Grinders, Wood Pulp 8
Heat Exchangers, Floating Head 8
Homogenizers 9
Mixers & Agitators 9
Presses . . .
Baling 9
Extrusion & Forging 10
Hydraulic 10
Pumps . . .
Centrifugal 10
Reciprocating 10
Rotary 11
Soot Blowers 11
Steam Engines 12
Steam Hammers 12
Stern Tubes 12
Turbines, Hydraulic 12
Valves . . .
Bronze & Cast Iron 13
Forged & Cast Steel 13
Stainless & Special Alloys 13

Gaskets & Gasketing

Choosing The Right Gasket Material 14-17
Designing Your Gasket Correctly 18-19
Anti-Stick Compressed Asbestos Sheet 20-21
Homogeneous Rubber Sheet 22-23
Cloth Inserted Rubber Sheet 24
Woven Asbestos Cloth, Tape & Gaskets 25
Vegetable Fiber Sheet 26
Solid TFE Gaskets and TFE Sheet 27
TFE Envelope Gaskets 28-29
GYLON® Gaskets 30
GUARDIAN® Spiral Wound Gaskets 31-32

Garlock® Industrial Catalog

Expansion Joints and Pipe Connectors

Elastomeric Expansion Joints 33
GARFLEX® Molded Connectors 34
GUARDIAN® "200" FEP-Lined Expansion Joints & Pipe Connectors 35
GYLON® Molded All-TFE Expansion Joints & Flexible Couplings 36-37

Soft Packing Products

Types of Soft Packing 38
Graphite Filament Packing 39-40
Possible Causes of Soft Packing Failures 41
Compression Packing Maintenance Tips 41
Soft Packing Style No's.–
Description, fluids & temperatures for which they are recommended 42-45
Ordering Information . . .
sizes available & approximate weight and feet per box 46-48

Hydraulic Components Products

Style No's., description, fluids & temperatures for which they are recommended 49
Homogeneous "U" Cup Packing 50
GARTHANE® "U" Seals 51-52
GARTHANE® Rod Scrapers 53
CHEVRON® Packing 54-55
Cups 56-57
MARBLOCK® Wear Rings 58

Miscellaneous Garlock Maintenance Products

TFE All-Purpose Lube 59
Dry Graphite Lube 59
Chain Drive Lube 59
Wire Rope and Gear Lube 59
Cutting Oil 59
Silicone Lubricant 59
Silicone Mold Release 59
Moly-S_2 High Temp Lube 59
Belt Dressing 59
Anti-Rust and Demoisturant 59
Degreaser 59
Vinyl Protective Coating 60
Penetrating Oil 60
LUBALL® Packing Lubricant 60
Tapping Compound 60
Lubricating Compound #2 60
Gasketing Compound 101-S 60
PLASTI-PAK® Twisted Packing 61
PLASTI-THREAD® Seal Tape 61/63
Pipe Thread Compound 61
Flexible Packing Hooks 61
KWIK-TAPE® Hand Tool 62

Engineering Data

Steam Table 64
RPM/FPM Conversion Table 64
Fahrenheit & Centrigrade Conversion Table 65

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Style number index

Style No.	Product	Page No.
2	Lubricating Compound	60
19	Cloth-Inserted Rubber Sheet	24
22	Homogeneous Rubber Sheet	22
31	Regular Braid Packing	42
57	Homogeneous Cups	57
79	Rod Scraper	49/53
90	Regular Braid Packing	42
91	Homogeneous Rubber Sheet	22
G-100	Regular Braid Packing	39/42
101-S	Gasketing Compound	60
116	Penetrating Oil	60
117-B	Braid-over-Braid Packing	42
117-T	Twisted Packing	42
127	Graphite Coated Braided Jacket Packing	42
150	Rolled Packing	42
G-200	Graphite Filament Packing	40/42
200	Expansion Joints & Pipe Connectors	35
214	GYLON® Concentric Spool-type Coupling	36
215	GYLON Converted Spool-type Expansion Joint	36
230	GYLON Blue Asbestos Packing	42
233	Braid-over-Braid Packing	42
234	Regular Braid Packing	42
237	Regular Braid Packing	42
262	Laminated Packing	43
333	Laminated Packing	43
353	Homogeneous Rubber Sheet	22
432	CHEVRON® Packing	49/54
433	CHEVRON Packing	49/54
532	CHEVRON Packing	49/54
540	U-Cups	49/57
542	U-Cups	57
555	GUARDIAN® Spiral Wound Gaskets	31
604	Man Hole & Hand Hole Gaskets	25
605	Woven Asbestos Cloth	25
612	Folded Gasketing Tape	25
619	Cloth-Inserted Rubber Sheet	24
631	Twisted Packing	43
633	Twisted Packing	43
635	Twisted Packing	43
644	Regular Braid Packing	43
660	Vegetable Fiber Sheet	26
681	Vegetable Fiber Sheet	26
711	Laminated Packing	43
730	LATTICE BRAID® Packing	43
731	LATTICE BRAID Packing	43
733	LATTICE BRAID Packing	43
734	LATTICE BRAID Packing	44
735	LATTICE BRAID Packing	44
737	LATTICE BRAID Packing	44
740	LATTICE BRAID Packing	44
745	LATTICE BRAID Packing	44
751	LATTICE BRAID Packing	44
813	Cups & "U" Packing	49/56
900	Compressed Asbestos Sheet	21
908	Plastallic Packing	44
909	Plastallic Packing	44
5005	Braid-over-core Packing	44
5234	Regular Braid Packing	45
5298	Regular Braid Packing	45
5299	Regular Braid Packing	45
5300	Regular Braid Packing	45
5413	Regular Braid Packing	45
5501	Die-Formed Rings	45
5555	TFE Coated, Braided Jacket Packing	45
5862	LATTICE BRAID Packing	45
5876	LATTICE BRAID Packing	45
5888	LATTICE BRAID Packing	45
5889	LATTICE BRAID Packing	45
5898	LATTICE BRAID Packing	45
6023	Homogeneous Rubber Sheet	23
7006	Compressed Asbestos Sheet	21
7021	Compressed Asbestos Sheet	21
7130	Laminated Packing	45
7131	U-Cups	49/56
7228	Compressed Asbestos Sheet	21
7271	Cups & "U" Packing	49/56
7705	Compressed Asbestos Sheet	21
7735	Compressed Asbestos Sheet	21
7797	Homogeneous Rubber Sheet	23
7815	CHEVRON Packing	49/54
7819	Compressed Asbestos Sheet	21
7857	CHEVRON Packing	49/54
7904	CHEVRON Packing	49/54
7986	Homogeneous Rubber Sheet	23
7992	Cloth-Inserted Rubber Sheet	24
8048	CHEVRON Packing	49/54
8051	CHEVRON Packing	49/54
8100	GARFLEX® Molded Connectors	34
8136	Cups	49/56
8312	Homogeneous Rubber Sheet	23
8452	CHEVRON, Cups	49/54/57
8455	CHEVRON	49
8459	Homogeneous Rubber Sheet	23
8495	Homogeneous Rubber Sheet	23
8500	Homogeneous Cups	57
8571	Steel & Asbestos Filler for CHEMISEAL® TFE-jacketed Gaskets	29
8619	Cups	49/56
8639	Homogeneous Rubber Sheet	23
8656	Cups	49/56
8748	Compressed Asbestos Sheet	21
8752	Homogeneous Rubber Sheet	23
8764	CHEMISEAL Solid TFE Pipe Flange Gaskets	27
8764	TFE Sheet	27
8764	CHEMISEAL TFE-jacketed Gaskets	28
8764	CHEVRON, Cups	49/54/57
8798	Cloth-Inserted Rubber Sheet	24
9003	Wear Rings	49/58
9026	Asbestos Filler for CHEMISEAL TFE-jacketed Gaskets	29
9057	Compressed Asbestos Sheet	21
9122	Homogeneous Rubber Sheet	23
9166	Plastallic Packing	45
9188	CHEVRON Packing & Cups	49/54/57
9205	Cloth-Inserted Rubber Sheet	24
9210	CHEVRON, Cups	49
9220	"U" Seals	49/51
9511	"U" Cups	49/50
9659	Homogeneous Cups	57
35402	GYLON Gasket Material (Hydrofluoric Acid Service)	30
35404	GYLON Gaskets Material (Chemical Service)	30

FBW-077

This is Garlock

Since 1887, Garlock has supplied its products to, and served industry throughout the world. Our concentrated research and development program, intense quality assurance program, growing facilities, expansion of Authorized Distributor stocking points, and our trained representatives all have but one aim . . . to serve you better.

The manufacturing facilities of Garlock, Inc. presently include eight domestic plants and four production plants outside of the United States. The Company has over 1,000,000 square feet of floor space devoted to the efficient production and engineering of our many products.

1 Chromex, S.A. produces mechanical packings, gaskets, seals, rubber and plastic products for the European Common Market. The plant is located at Lardy, France.

2 Spring Division of Bristol, Conn. produces extension, compression and torsion springs, wire forms, metal stampings and screw machine products.

3 France Products Div., Philadelphia, Pa. manufactures metal packings, plastic piston rings and rider rings. Principal customers include both the manufacturers and users of engines; compressors; and high pressure, reciprocating power pumps.

4 Garlock Plastic Division in Camden, New Jersey manufacturers plastic packings, components for mechanical packings, gaskets, expansion joints and specialty products.

5 Garlock of Canada Ltd. produces mechanical packings, gaskets, oil seals, expansion joints, molded rubber goods and specialty products. The plant is located at Toronto.

6 Garlock de Mexico, Mexico City, manufactures a complete line of mechanical packings—braided soft packings, gaskets, seals and plastic products.

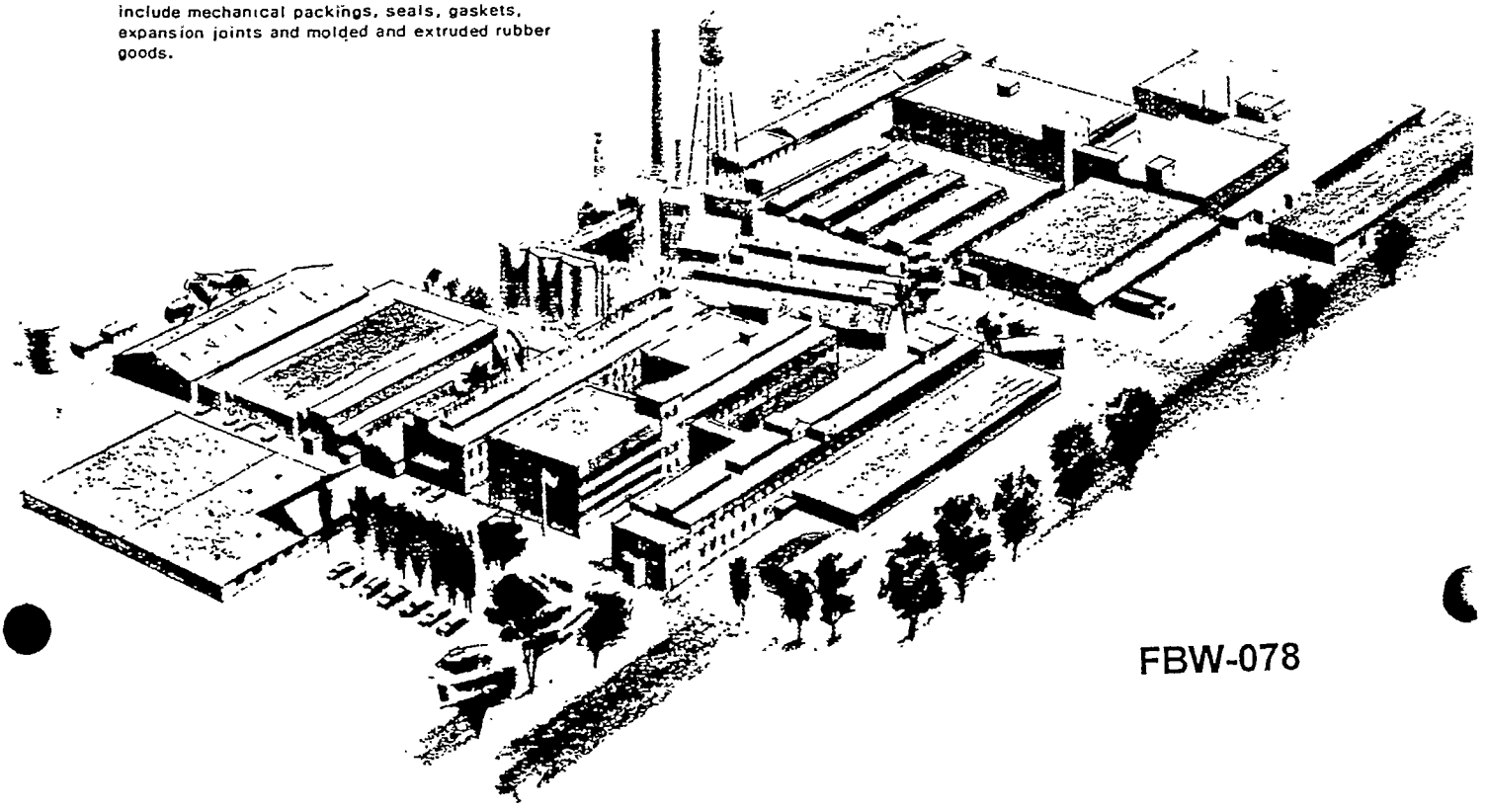
7 The Precision Seal Division of Garlock is located at Gastonia, N.C. This new, 100,000 square-foot plant produces oil seals to serve the transportation industry.

8 Garlock Bearing Division markets plastic-based bearings from this modern facility located at Cherry Hill, N.J.

9 Stemco Manufacturing Co., Inc. of Longview, Texas, produces hub seals and heavy duty mufflers for the truck and trailer industry, as well as leather products.

10 The Woodville Rubber Company Ltd. at Ross-on-Wye, England manufactures precision molded rubber products.

The principal manufacturing plant is located at Palmyra, New York. Within the 27 building complex are a rubber plant, a metal fabrication plant and a textile mill. Products produced here include mechanical packings, seals, gaskets, expansion joints and molded and extruded rubber goods.



FBW-078



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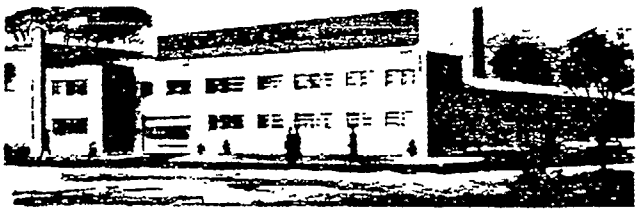
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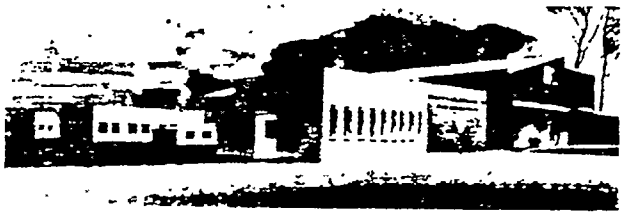
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FBW-079

Garlock Materials vs. various media under typical conditions

	MEDIUM	METALS	NATURAL RUBBER	SBR	NEOPRENE	NITRILE	SILICONE	POLY-URETHANE
GASES	Air	Satisfactory, except lead melts above 600°F.	Satisfactory but becomes tacky above 200°F.	Satisfactory but hardens above 250°F.	Satisfactory but hardens and decomposes above 250°F.	Satisfactory but hardens above 250°F.	Satisfactory but deterioration accelerated above 500°F.	Satisfactory to 200°F.
	Oxygen	Satisfactory, except lead melts above 600°F.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.
	Halogens (Chlorine, Bromine, etc.)	Satisfactory if free from water. Otherwise attacked.	Hardens on exposed surfaces.	Hardens on exposed surfaces.	Hardens on exposed surfaces.	Hardens on exposed surfaces.	Hardens on exposed surfaces.	Not recommended.
	Other Hot Gases or Dry Steam	Satisfactory below melting point. Hot compressed H_2 embrittles steel.	Satisfactory but becomes tacky above 200°F.	Satisfactory but hardens above 250°F.	Satisfactory but hardens and decomposes above 250°F.	Satisfactory but hardens above 250°F.	Satisfactory but decomposes in steam above 300°F.	Not recommended.
LIQUIDS	Water (including all neutral water-soluble salts, sugar solutions, etc.)	Satisfactory except for iron rusting.	Satisfactory but becomes tacky above 200°F.	Satisfactory but hardens above 250°F.	Satisfactory but hardens above 250°F.	Satisfactory but hardens above 250°F.	Satisfactory but decomposes above 300°F.	Satisfactory to 200°F.
	Alkaline Solutions	Satisfactory except lead, tin, zinc, aluminum and alloys.	Limited, depending on conditions, exposed surfaces become tacky.	Satisfactory but exposed surfaces swell.	Satisfactory but butyl rubber preferred.	Satisfactory but exposed surfaces swell.	Not recommended.	Not recommended.
	Weak Acid Solutions (including Acetic and other organic acids, sulphurous acid and low concentration of sulphuric acid and hydrochloric)	Copper, its alloys and stainless irons satisfactory; aluminum satisfactory in organic acids only and lead in all but acetic acid.	Satisfactory if free from acid-soluble fillers.	Satisfactory if free from acid-soluble fillers.	Satisfactory if free from acid-soluble fillers.	Satisfactory if free from acid-soluble fillers.	Not recommended.	Not recommended.
	Strong Acids Hydrochloric Acid	Not recommended except Hastelloy, gold and platinum.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory up to 150°F. if free from acid-soluble fillers.	Limited depending on conditions.	Not recommended.	Not recommended.
	Sulfuric Acid Dilute up to 50%	Not recommended except Duriron, lead, gold and platinum.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Not recommended.	Not recommended.
	Concentrated Sulfuric Acid	Limited depending on conditions.	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.
	Concentrated Acetic Acid (Glacial)	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Limited depending on conditions.	Not recommended.
	Nitric Acid	Not recommended except Duriron, gold and platinum. (Stainless Steel in concentrate but not dilute.)	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.
	Aqua Ammonia	Satisfactory except copper and its alloys.	Satisfactory but becomes tacky above 200°F.	Satisfactory but hardens above 250°F.	Not recommended.	Satisfactory but hardens above 250°F.	Satisfactory but deteriorates above 300°F.	Not recommended.
	Liquid Ammonia (Anhydrous)	Satisfactory except copper and its alloys.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Limited depending on conditions.	Not recommended.
	Liquid Chlorine, Bromine, etc.	Satisfactory if completely free from water. Otherwise attacks all metals.	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.	Not recommended.
SOLVENTS	Aliphatic (Gasoline, etc.)	Satisfactory.	Not recommended.	Not recommended.	Limited depending on conditions.	Satisfactory.	Limited depending on conditions.	Excellent.
	Aromatic Types (Benzol, etc.) or chlorinated Types (Carbontetra-chloride, etc.)	Satisfactory	Not recommended.	Not recommended.	Not recommended.	Limited depending on conditions.	Not recommended.	Excellent.
	Acetone	Satisfactory.	Limited depending on conditions. Butyl preferred.	Limited depending on conditions.	Limited depending on conditions.	Not recommended.	Limited depending on conditions.	Not recommended.
	Alcohol	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Limited depending on conditions.	Satisfactory except in oxygenated alcohol.
OILS		Satisfactory except high-sulphur hot oils attack copper, iron and alloys.	Not recommended.	Not recommended.	Limited depending on conditions and nature of oil.	Satisfactory except for some additive type oils.	Limited depending on conditions and nature of oil.	Satisfactory.

• This chart indicates the general suitability of basic materials commonly used in packings and gaskets against various media and is intended only for the general information of the packing user. Obviously the subject of the interaction of packing materials with the several liquids listed is too complex to be covered adequately in a few words. Although chemical considerations are important in the selection of packings, the mechanical properties of the packing itself usually are of greater importance. Packings rarely are fully exposed to the gas or liquid and, therefore, do not necessarily react in the same degree as indicated for the base material. For these reasons packings or gaskets should not be accepted or rejected for any application solely on the basis of chemical consideration.

GRAPHITE YARN	VITON* and FLUOREL**	PHENOLIC RESINS	TFE FLUORO-CARBON	WHITE ASBESTOS	BLUE ASBESTOS	COTTON, FLAX, VISCOSE RAYON	PAPER	LEATHER
Satisfactory to 650°F.	Satisfactory but hardens above 500°F.	Reinforcing fiber usually establishes limits.	Satisfactory but softens above 500°F.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens and embrittles above 200°F.	Satisfactory from cryogenics to +200°F.
Not recommended.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory but softens above 500°F.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Not recommended.	Satisfactory up to 225°F.	Satisfactory except for effect on reinforcing fibers.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory but hardens above 500°F. Not recommended in steam above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Satisfactory but decomposes above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Limited depending on conditions.	Satisfactory unless solutions are strong and above 200°F.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Limited depending on conditions.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Satisfactory. If used, reinforcing fibers should be acid resistant.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Limited depending on conditions.
Satisfactory.	Satisfactory if free from acid-soluble fillers.	Not recommended.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.
Not recommended above 100°F for concentrations above 25%.	Limited depending on conditions.	Not recommended.	Satisfactory.	Not recommended.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory but deteriorates above 300°F.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.
Satisfactory.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.
Not recommended.	Not recommended.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Not recommended.	Not recommended.	Not recommended.
Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shrinks and hardens.
Satisfactory.	Not recommended.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shrinks and hardens.
Satisfactory.	Not recommended.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shrinks and hardens.
Satisfactory.	Limited depending on conditions.	Limited depending on conditions.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but loses waxes, shrinks and hardens.
Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory.	Satisfactory but weakens above 200°F.	Satisfactory but weakens above 200°F.	Satisfactory but becomes porous and hardens above 200°F.

*DUPONT TRADEMARK

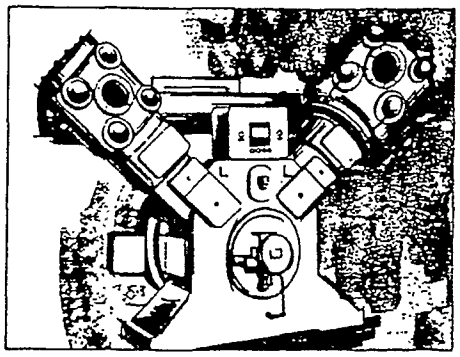
**JM TRADEMARK

Packing recommendations by equipment

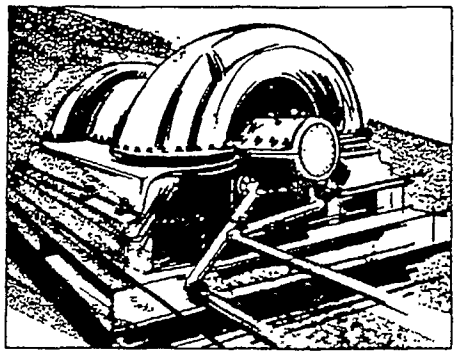
The recommendations shown here should only be considered as tentative until you have checked them out with *all* of the service conditions which exist in your particular application. When you take the basic factors which surround any application (fluid, temperature, pressure, speed, and type of motion) and add to them the age and condition of equipment, you can see that the variables are such as to make a concrete recommendation, based only on type of equipment and fluid involved, very difficult.

For most applications, we have made more than one packing recommendation. The first choice is the one which, in our opinion, will give the ultimate service under the most severe conditions. But other conditions, which only you can know, may make another recommendation preferable. For example, your equipment may be operating at temperatures well below those normally associated with the application.

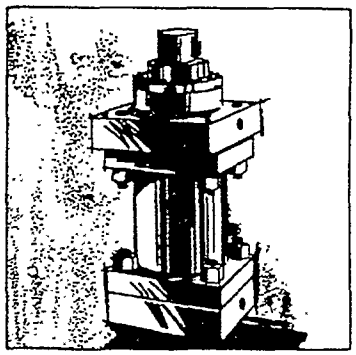
Reciprocating Compressor



Centrifugal Compressor



Hydraulic Cylinder



	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
ACCUMULATORS & INTENSIFIERS								432 5876 740	.7904 433 5862				432 5876 740		
COMPRESSORS, RECIPROCATING					532 432 631	*8764 5888 5889	*8764 5898 5780								*CHEVRON®
CENTRIFUGAL					100 631 5862	5889 5888	5898 5780								
CRYSTALLIZERS	100 5889 5862	*100 5889 5884	100 5889 5862	100 5889 5884									100 5889 5862	5889 5862 5876	*Except in strong oxidizers

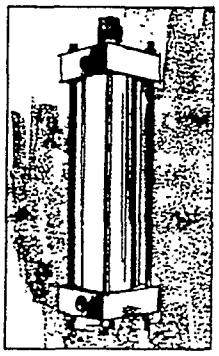
FBW-082

We suggest you use these pages as a starting point. Choose a style number and cross check it for other variables, plus a description of the product, on the Packing Description Pages. For those numbers printed in black, this information is contained on pages 39-42; for those printed in gray, refer to page 55.

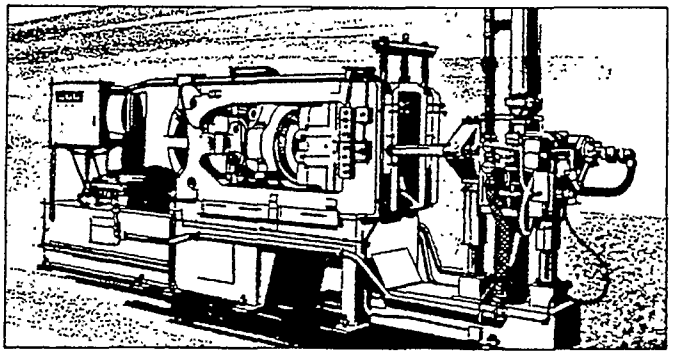
If no recommendation is shown, it only means that those fluids are not normally associated with the particular equipment. Garlock, of course, stands ready to make a recommendation upon receipt of full service condition information.

We recognize that many Garlock packings not shown have worked well in these applications for many years. However, this catalog is designed on the assumption that the user comes to it with a problem and in search of a solution. Packings shown here are those which have solved many similar problems.

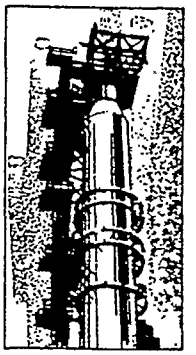
Air Cylinder



Die Casting Machine



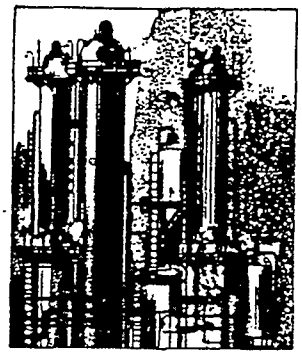
Washing Digester



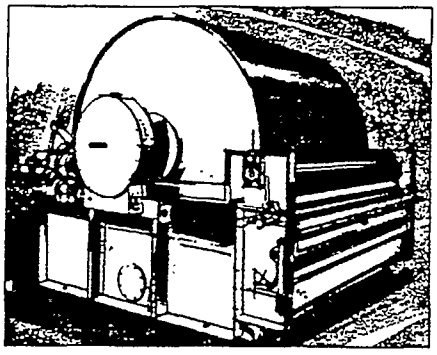
	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
CYLINDERS HYDRAULIC PISTON CUPS AND ROD CHEVRON								432 8452 7271 BITAN® Leather 432	433 7904 8764 9188 7904 433				540 8619 432		
CYLINDERS PNEUMATIC PISTON CUPS AND ROD CHEVRON					8764 8452 7131 8452 432										
DIE CASTING MACHINES								432	7904 433						
DIGESTERS CONTINUOUS AND LIQUOR PUMPS USED WITH BOTH BATCH AND CONTINUOUS SYSTEMS.	100 5889 5862	*100 5889 5884	100 5889 5884	100 5889 5884											*Except in strong oxidizers

Packing recommendations by equipment

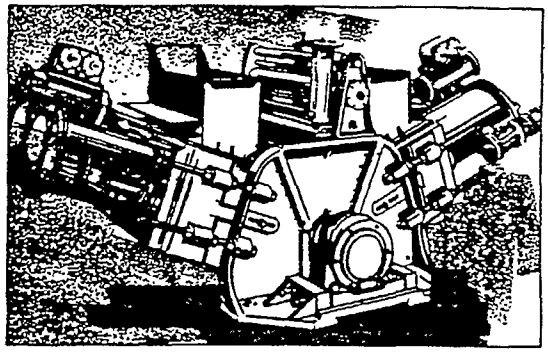
Petrochemical Plants



Paper Processing

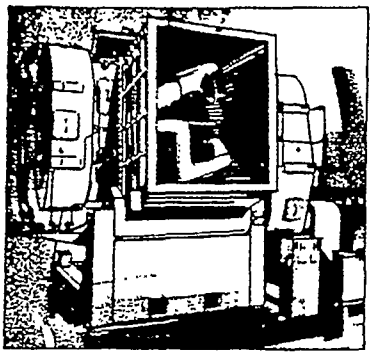


Wood Pulp Grinder

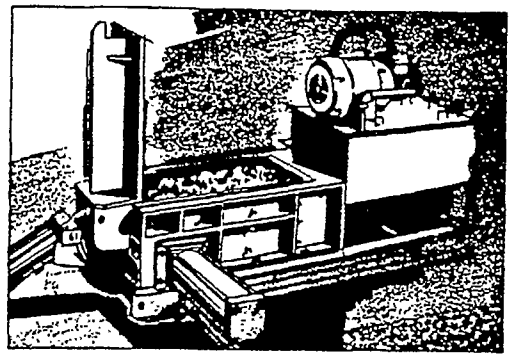


EQUIPMENT	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					COMMENTS:
	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	
DISTILLATION COLUMNS—	5005	5005	5005	5005				5005	5005	5005	5005				
TRAY OR BELL & SPIGOT JOINTS	5889 5555	5889	5889 5555	5889				5889 5555	5889 5555	5889 5555	5889 5555				
EXPANSION JOINTS	5862	5888	5862	5888	5862	5888	5898	127	127	127	127	127	127	5888	
SLIP TYPE	5876 731	5884 736	5876 731	5884 736	5876 127	5889	5780	5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	
FILTERS—	100	*100	100	100	100			100	100	100	100		100	5889	*Except in strong oxidizers
ROTARY	5862 5876	5889 5884	5862 5876	5889 5884	5862 5876			5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	5862 5876	
GRINDERS—PULP															
POCKET ROD													432 745 740		
PISTON													7131 BITAN Cups		
ROBERTS													100 5862 737		

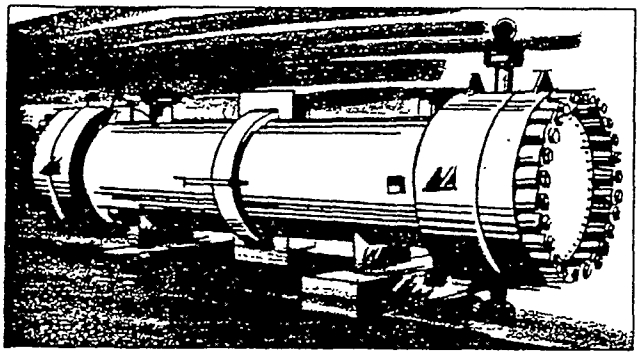
Vacuum Mixer



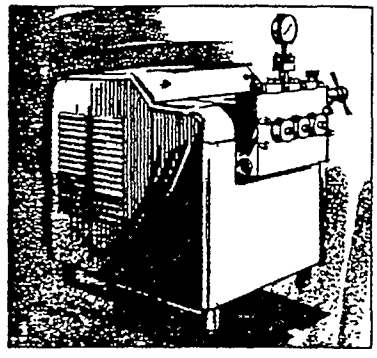
Baling Press



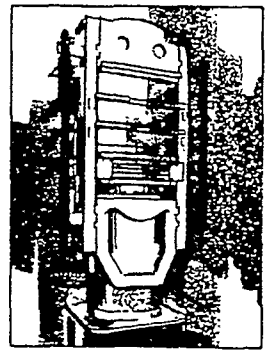
Heat Exchanger



Homogenizer



Side Plate Press

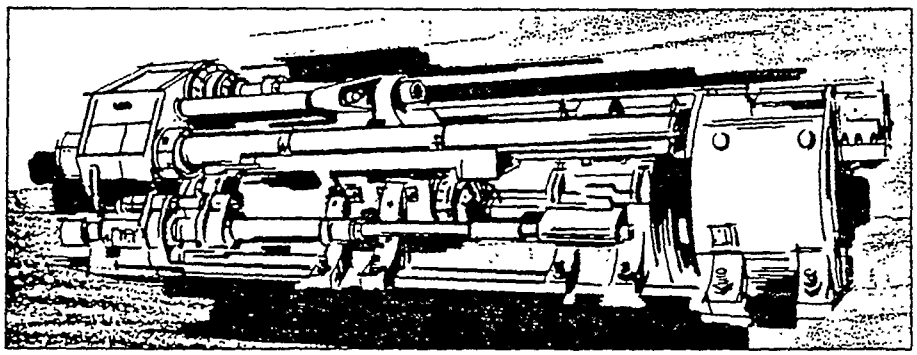


	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
HEAT EXCHANGERS FLOATING HEAD TYPE	5862 5876 731	5888 5884 736	5862 5876 731	5888 5884 736	5862 5876 731			5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5862 5876 127	5888 5862 737	
HOMOGENIZERS														8051	
MIXERS, AGITATORS	100 5889 5862	*100 5889 5884	100 5889 5862	100 5889 5884	100 5862 5876	5889 5888	5898 5780	100 5889 5862	100 5889 5862	100 5889 5862	100 5889 5862	100 5889 5862	100 5889 5862	5889 5862 5876	*Except in strong oxidizers
PRESSES BALING								7904 BITAN Leather 432	7904 BITAN Leather 433				7904 BITAN Leather 432		BITAN Leather will give best service if rams are scored.

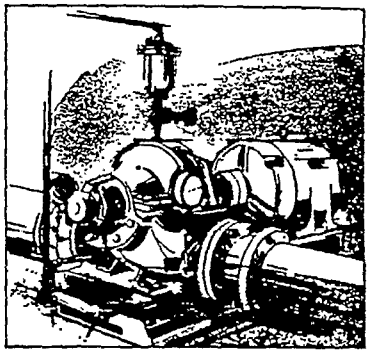
FBW-085

Packing recommendations by equipment

Extrusion Press



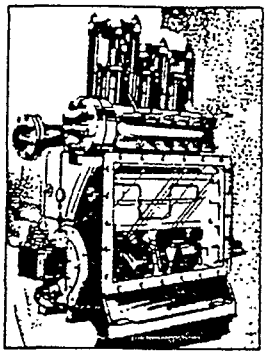
Centrifugal Pump



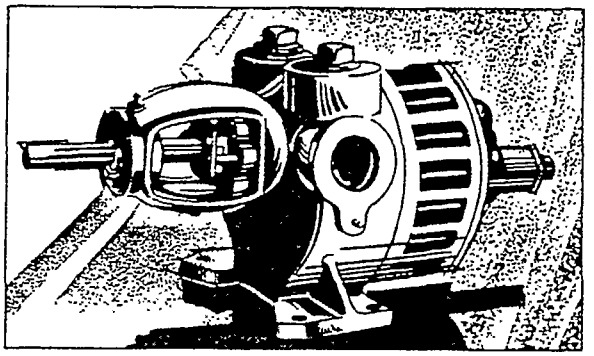
	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
PRESSES EXTRUSION & FORGING								7271 7904 432	 7904 433			 532	 7904 432		A high pressure application. Use R.H. top & bottom adapters and be sure gland followers give top ring good support.
HYDRAULIC								7904 432	7904 433				7904 432		
PUMPS CENTRIFUGAL	100 5862 733	*100 5889 5884	100 5862 737	100 5889 5884	100 5862 733	5889 5888	5898 5780	100 5862 733	100 5889 5862	100 5889 5862	100 5889 5862	100 5862 730	100 5862 733	5889 5862 737	*Except in strong oxidizers
RECIPROCATING RODS & PLUNGER	7904 5862 5876	7904 5888 5884	7904 5862 5876	7904 5888 5884				432 5862 5876	433 5888 5862	7904 5888 5862	7904 5888 5862	532 5888 5862	432 5888 5862	8051 5888 5862	
PISTONS								8136 Cups or *262 R.H.				813 540 Cups or *262 R.H.	540 Cups or *262		*Ring style No. is 261 or 261 R.H.

FBW-086

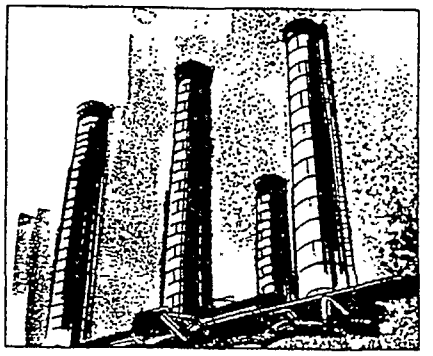
Reciprocating Pump



Rotary Pump



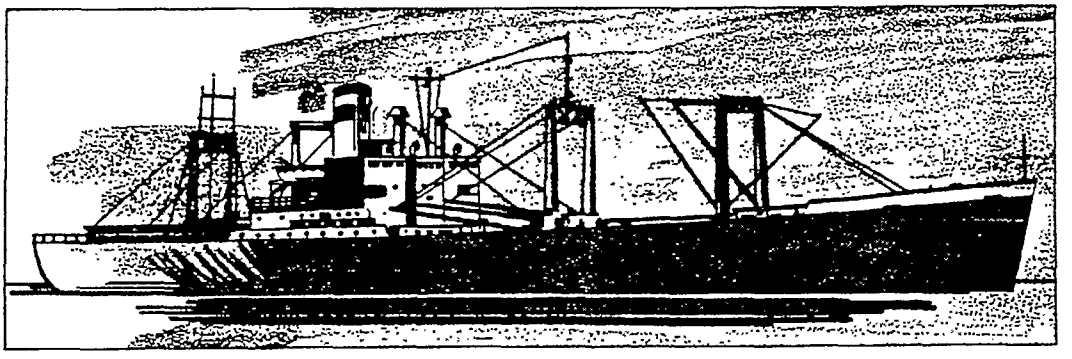
Power House



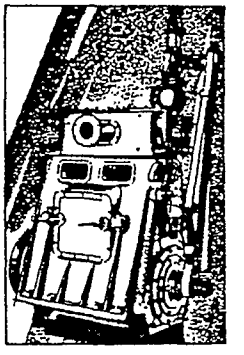
EQUIPMENT	ACIDS: MILD	ACIDS: CORROSIVE	ALKALIES: MILD	ALKALIES: CORROSIVE	GASES: AIR & DRY INDUSTRIAL GASES	GASES: BROMINE, CHLORINE	GASES: OXYGEN	OILS: PETROLEUM	OILS: SYNTHETICS	SOLVENTS: AROMATIC (BENZENE, ETC.)	SOLVENTS: ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
PUMPS															
ROTARY	100	*100	100	100	100	5889 5888	5898 5780	100	100	100	100		100	5889 5862	*Except in strong oxidizers
POSITIVE DISPLACEMENT	5862 733	5889 5884	5862 737	5889 5884	5862 733			5862 733	5889 5862	5889 5862	5889 5862		5862 733	737	
SOOT BLOWERS															
INSULATED FEED					*8534 XV 5501 5862							*8534 XV 5501 5862			*A carbon-graphite filled TFE
UNINSULATED FEED					5501 127 735							5501 127 735			

Packing recommendations by equipment

Marine Products



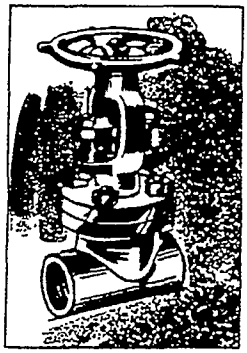
Steam Engine



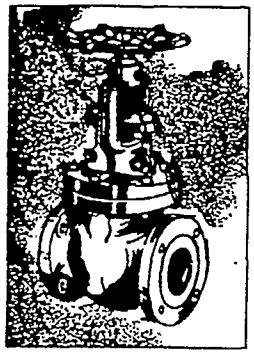
	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
STEAM ENGINES												7904 532 635			
STEAM HAMMERS												7904 532 150			
STERN TUBES													MARINEPAK® 5876 31		
TURBINES HYDRAULIC													5862 730 745		

FBW-088

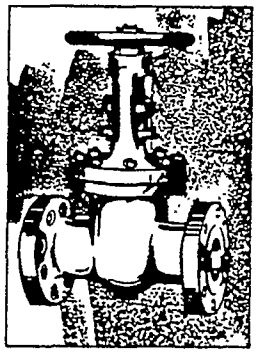
Forged Valve



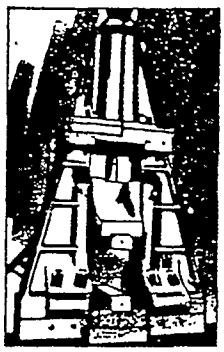
Cast Steel Valve



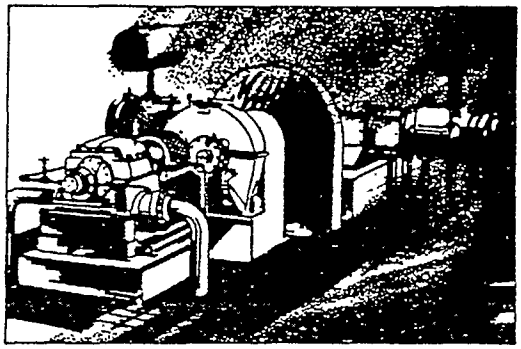
Stainless Valve



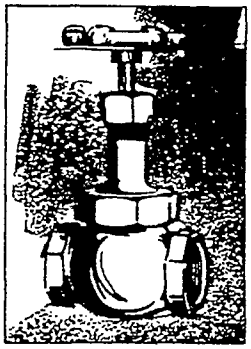
Steam Hammer



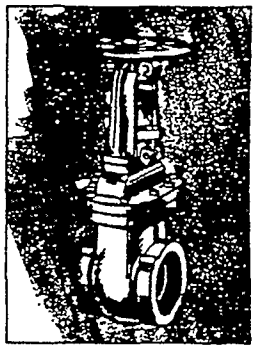
Hydraulic Turbine



Bronze Valve



Cast Iron Valve



	ACIDS		ALKALIES		GASES			OILS		SOLVENTS					
EQUIPMENT	MILD	CORROSIVE	MILD	CORROSIVE	AIR & DRY INDUSTRIAL GASES	BROMINE, CHLORINE	OXYGEN	PETROLEUM	SYNTHETICS	AROMATIC (BENZENE, ETC.)	ALIPHATIC (GASOLINE, ETC.)	STEAM	WATER & SALT SOLUTIONS	FLUIDS WHERE NON-CONTAMINATION REQUIRED	COMMENTS:
VALVES															
BRONZE & CAST IRON	5862 5876 731		5862 5876 127		127 5862 5876	5888 7130 5898	5898 5780	127 633 5862	127 633 5862	127 5862 5876	127 5862 5876	127 635 5862	127 5862 233	5888 5862 5876	
FORGED & CAST STEEL						5888 7130 5898		127 633 908	127 633 908	127 908 5862	127 908 5862	127 635 908	127 635 908		
STAINLESS & SPECIAL ALLOYS	*8764 5888 5862	*8764 5888 5884	*8764 5888 5862	*8764 5888 5884	*8764 5888 5862	*8764 5888 7130	*8764 5888 5780	*8764 5888 5862	*8764 5888 5862	*8764 5888 5862	*8764 5888 5862	5888		*8764 5888 5862	*CHEVRON®

FBW-089

Choosing the right gasket material

Every gasket material available to industry has certain inherent limitations that tend to restrict each material's range of applications. However, many of these limitations may be partially or wholly eliminated by several methods, including use of reinforcing inserts, combining with other materials, varying construction, or by the type of joint the material must seal.

Although mechanical factors are important to the design of the complete joint, primary selection of a gasket material is greatly influenced by two factors:

Temperature of fluid or gas contained

Nature of fluid or gas contained

Temperature

With very few exceptions, a material should never be used at temperatures higher than those recommended for its group.

Temperature ranges for rubber are: Natural—up to 200° F; SBR, Nitrile and Neoprene—up to 250° F; VITON*—up to 450°F; Silicone—up to 500° F.

Vegetable fiber sheet with glue-glycerine bond has a temperature range up to 250° F with synthetic rubber bond up to 300° F.

Woven asbestos cloth is effective up to 600° F; compressed asbestos up to 700° F.

Rubber used in most cloth-inserted sheets usually determines the material's temperature range.

However, you should never select or reject a gasket material solely on the preceding information as this is merely a general guide. To be sure, consult your nearest Garlock representative for more specific recommendations.

Fluid contained

By using the resistance chart on pages 15, 16 and 17, you can easily ascertain a material's reaction to a specific medium, and thereby determine its suitability in service. Four values appear throughout this chart. They are: G for good; F or fair; D for depends on conditions; and U for unsuitable. With the exception of symbol D, all values are self-explanatory. Where D is indicated, and no other material is suitable for your specific application, contact your Garlock representative. He'll gladly help you determine the material's suitability.

Although the above values are of extreme importance, various other factors should also be given due consideration as they directly influence the fluid con- ... effect on the gasket material.

Concentration of the corrosive agent can have a decided effect upon the gasket material selection. Full strength solutions are not necessarily more corrosive than those of dilute proportions. The reverse is often true.

Purity of corrosive agent or the absence of contaminating compounds is another factor involved. Example: dissolved oxygen in otherwise chemically pure water may cause rapid oxidation of high temperature steam generating equipment.

Temperature of corrosive agent, in addition to temperature effect on mechanical properties, will also influence the rate of corrosive attack.

Location of gasket can often influence its chemical resistance. For example, a gasket either in a partially filled line or one at or above the solution level may be more subject to attack than those below the surface.

Construction of gasket material decidedly affects its chemical resistance. It is generally poor economy to use an inferior material that can cause frequent gasket replacements. This ultimately results in extremely high maintenance costs. However, if it is necessary that a joint be opened frequently, a less expensive, less resistant material may be quite satisfactory. Where a joint is seldom opened, the most resistant material, regardless of cost, is usually the most economical in the long run.

Also, if a slight swelling of the gasket occurs due to reaction to fluid, the overall effect may be a more positive seal. Conversely, materials that shrink and dry out usually cause early gasket failure.

Other factors that may influence material selection are internal pressures, operating cycle and vibration. A highly resilient material and proper design is essential where sudden variations in operating conditions occur frequently.

Bolt relaxation, caused by thermal expansion and creep, is sometimes an important consideration. Expansion and contraction of line or gasket and excessive bending movements on the flange may also limit selection of gasket material and construction.

To summarize... if these considerations are all taken into account and properly evaluated and a suitable gasket material is selected from the resistance chart, the choice, in most cases, can be narrowed to a small number. Final choice, then, can usually be made on the basis of relative cost, availability or personal experience.

RESISTANCE RATINGS	HOMOGENEOUS RUBBER						CLOTH INSERTED RUBBER (GASKETING)				ASBESTOS										VEGETABLE FIBER		
											WOVEN					COMPRESSED						
G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Acetic Acid: ..... Crude	F	D	D	F	D	U	F	D	U	U	D	F	F	G	G	D	G	G	G	U	U	U
Pure	F	D	U	F	U	U	F	F	U	U	D	F	F	G	F	D	F	F	G	U	U	U
Vapors	F	D	U	F	U	U	D	F	D	U	D	F	F	G	G	F	G	G	G	U	U	U
150 psi, 400° F.	U	U	U	U	U	U	U	U	U	U	D	U	U	G	U	U	D	D	D	U	U	U
Acetic Anhydride	D	D	U	D	D	U	D	D	D	D	D	U	U	G	U	G	G	G	G	U	U	U
Acetone	F	U	U	F	F	U	F	F	U	F	F	U	F	G	U	U	F	G	G	G	U	D
Acetylene	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Air	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Ammonia Gas ..... cold	G	G	G	G	G	G	G	G	G	U	G	G	G	G	G	G	G	G	G	F	G	G
hot	D	D	D	D	G	G	D	G	D	U	G	F	F	G	F	G	G	G	G	U	U	U
Ammonium hydroxide	D	D	D	D	G	G	D	G	D	U	G	G	D	G	G	G	G	G	G	U	G	G
Ammonium phosphate: ... Monobasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Dibasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Tribasic	G	G	G	G	G	D	G	G	G	U	G	G	G	G	G	G	G	G	G	U	F	F
Amyl Acetate	F	U	U	U	U	U	U	U	U	U	U	D	F	G	D	D	D	D	D	G	F	F
Amyl Alcohol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	F	F
Aniline, aniline oil	U	U	U	U	U	U	U	U	D	U	U	D	U	G	D	D	F	D	U	G	F	F
Asphalt	U	F	F	U	U	F	U	U	F	U	U	F	U	G	F	G	G	U	U	F	G	G
Beer	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Beet sugar liquors	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Benzene, benzol	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	U	U	U	G	F	D
Benzene, petroleum ether naphtha ..	U	U	D	U	U	G	U	U	U	U	U	U	U	G	U	F	U	U	U	G	G	F
Black sulphate liquor	G	G	G	G	F	F	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Blast Furnace Gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	D	F	D
Bromine	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
Butane	D	G	G	D	U	G	U	D	F	U	D	G	F	G	G	G	G	F	F	D	G	D
Butyl acetate	F	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	U	F	F
Butyl alcohol, butanol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	F	F
Cane sugar liquors	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Carbon dioxide ..... dry	D	D	D	D	D	D	D	G	D	D	G	D	G	G	D	G	G	G	G	U	F	F
wet	D	D	D	D	D	D	D	G	D	D	G	G	G	G	D	G	D	D	G	U	F	F
Carbon bisulphide	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	D	U	U	U	F	D	D
Carbon monoxide, hot	D	D	D	D	G	G	D	G	D	D	G	D	D	G	D	G	G	G	G	U	D	D
Carbon tetrachloride	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	G	U	U	U	F	F	D
Castor oil	U	G	G	U	D	G	U	D	G	U	D	G	G	G	G	G	G	G	G	G	G	G
Chinawood oil, tungoil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	F	D	U	F	G	G
Chlorine ..... dry	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
wet	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	F	F	U	U	U
Chlorinated solvents	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	F	F	U	U	U	F	D
Chloroacetic acid	F	F	F	F	U	U	F	U	F	F	U	U	U	G	U	D	D	D	F	U	U	U
Chlorosulphonic acid	U	D	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	F	U	U	U
Chromic acid	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	D	D	D	F	U	U	U
Citric acid	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	F	F
Coke oven gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	D	F	D
Copper chloride	D	F	F	F	D	F	D	D	D	F	G	G	G	G	G	G	G	G	G	U	D	D
Copper sulfate	G	G	G	G	G	G	G	G	G	F	G	G	G	G	G	G	G	G	G	U	G	G
Corn oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	U	G	G	D	D	G	G	G
Cotton seed oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	D	F	G	D
Creosote ..... coal tar	U	D	D	U	U	G	U	U	U	U	U	F	U	G	F	G	D	U	U	D	D	D
wood	U	D	D	U	U	G	U	U	U	U	U	F	U	G	F	G	F	D	U	D	D	D
Cresols, cresylic acid	U	U	D	U	U	G	U	U	U	U	U	U	U	G	U	F	D	U	U	D	U	U
*Dowtherm A	U	U	U	U	U	D	U	U	U	U	U	F	U	G	F	F	F	U	U	U	U	U
*Dowtherm E	U	U	U	U	U	D	U	U	U	U	U	F	U	G	F	F	F	U	U	U	U	U

*TM—DOW CHEMICAL CO.

FBW-091

RESISTANCE RATINGS	HOMOGENEOUS RUBBER						CLOTH INSERTED RUBBER (GASKETING)				ASBESTOS										VEGETABLE FIBER		
											WOVEN					COMPRESSED						
G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Ethers	D	U	D	U	U	U	U	U	U	U	U	U	U	G	F	F	D	D	U	D	F	D
Ethyl acetate	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	U	G	F	D
Ethyl chloride	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	F	F	U	U	G	F	D
Ethylene glycol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Formaldehyde	G	D	G	G	U	U	G	U	D	D	U	F	G	G	F	G	G	G	G	U	G	G
Formic acid	G	F	G	G	D	U	F	D	D	D	D	D	G	G	D	G	G	G	G	U	U	U
*Freon 12	U	G	D	D	U	G	D	U	G	U	U	G	U	G	G	G	G	U	U	F	D	U
Fuel Oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	F
Furfural	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	F	F	U	U	F	F	F
Gasoline ... sour	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	U	U	G	G	G
refined	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	U	U	G	G	G
Gelatin	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Glucose	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Glue	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Glycerin, glycerol	G	G	G	G	F	G	G	F	G	G	F	G	G	G	G	G	G	G	G	U	G	G
Green sulphate liquor	G	G	G	G	D	G	G	D	G	G	D	G	G	G	G	G	G	G	G	U	F	F
Hydrobromic acid	U	D	D	D	U	U	D	D	D	U	D	U	U	G	U	F	F	F	F	U	U	U
Hydrochloric acid ... <150° F.	F	G	F	F	D	U	U	D	U	U	D	F	F	G	F	G	G	G	G	U	U	U
>150° F.	U	D	U	U	U	U	U	D	U	U	D	D	D	G	D	F	F	F	F	U	U	U
Hydrocyanic acid	F	F	F	F	F	F	F	F	F	D	G	F	F	G	F	G	G	G	F	U	U	U
Hydrofluoric acid ... cold <65%	D	G	D	D	D	G	U	D	U	U	D	D	U	G	D	D	F	F	F	U	U	U
>65%	U	U	U	U	U	D	U	U	U	U	U	D	U	G	D	F	F	F	F	U	U	U
hot <65%	U	U	U	U	U	G	U	U	U	U	U	U	U	G	D	D	F	D	F	U	U	U
>65%	U	U	U	U	U	D	U	U	U	U	U	U	U	G	D	U	D	U	F	U	U	U
Hydrofluorsilicic acid	G	F	F	F	U	D	U	U	U	U	U	U	U	G	D	U	D	U	F	U	U	U
Hydrogen gas ... cold	F	G	G	G	G	G	G	G	G	G	G	G	F	G	G	G	G	G	G	U	F	F
hot	F	G	G	G	G	G	D	D	D	D	D	G	F	G	G	G	G	G	G	U	U	U
Hydrogen sulphide ... dry, cold	D	G	G	G	F	G	D	D	G	D	D	G	D	G	G	G	G	G	G	U	F	F
hot	D	D	D	D	D	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	D	D
wet, cold	D	F	F	F	F	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	F	F
hot	D	D	D	D	D	G	D	D	D	D	D	D	D	G	D	G	G	G	G	U	D	D
Kerosene	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
Lacquers	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	G	F	D
Lacquer solvents	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	D	D	D	D	G	F	D
Lactic acid ... cold	D	G	G	G	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	U	G	G
hot	D	D	D	D	G	G	D	G	D	D	G	D	D	G	F	G	G	G	G	U	D	D
Linseed oil	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	F	D	D	G	F	F
Lubricating oils ... sour	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
refined	U	F	G	U	U	G	U	U	F	U	U	F	U	G	F	G	G	D	U	G	G	G
Magnesium hydroxide	G	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	G	G	G	U	G	G
Methyl alcohol, methanol	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Methyl chloride	U	U	U	U	U	U	U	U	U	U	U	D	D	G	U	D	D	D	D	D	D	U
Milk	G	G	G	G	G	G	G	G	G	U	G	G	G	G	G	G	G	G	G	U	G	G
Mineral oils	U	F	G	U	D	G	U	D	F	U	D	F	U	G	F	G	F	F	F	G	G	G
Natural gas	D	G	G	D	U	G	F	D	G	F	D	G	F	G	G	G	G	F	F	F	G	G
Nitric acid ... crude	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
diluted	U	U	U	U	D	U	U	D	U	U	D	U	U	G	U	D	D	D	D	U	U	U
concentrated	U	U	U	U	U	U	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	D	U	U	U	U	U	U	U	U	U	U	G	U	D	F	U	U	U	D	D
Oleic acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Oleum spirits	U	F	G	U	D	G	U	U	U	U	U	U	U	G	D	D	D	D	D	U	U	U
Oxalic acid	G	F	G	G	D	G	F	D	D	D	F	F	F	F	F	G	G	G	G	U	G	G

FBW-092

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G=Good F=Fair D=Depends on conditions U=Unsuitable	Natural	Neoprene	Nitrile	SBR	Silicone	Viton	SBR with cotton insert	Silicone with fiberglass insert	Neoprene with cotton insert	SBR with brass wire insert	White with Silicone binder	White with Neoprene binder	White with Natural binder	Blue with TFE impregnation	Blue with Neoprene binder	White with Nitrile binder	White with Neoprene binder	White with SBR binder	Blue with SBR binder	Glue-glycerine binder	Nitrile binder	SBR and Nitrile binder
Oxygen ..... cold	D	D	D	D	F	F	U	F	U	U	F	U	U	G	U	U	U	U	U	U	U	U
<500° F.	U	U	U	U	D	D	U	D	U	U	D	U	U	G	U	U	U	U	U	U	U	U
Ozone	D	G	D	D	G	G	D	G	F	D	G	F	D	G	F	D	D	D	D	U	F	F
Palmitic Acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Petroleum oils ..... crude, <500° F.	U	F	G	U	D	G	U	D	D	U	D	G	U	G	G	G	G	D	U	D	D	D
>500° F.	U	U	U	U	U	D	U	U	U	U	U	U	U	D	U	D	D	U	U	U	U	U
Phosphoric acid ..... crude	D	F	F	D	D	D	U	D	U	U	D	F	D	G	F	G	G	G	G	U	F	F
Pure, <45%	D	F	F	D	D	G	U	D	U	U	D	F	D	G	F	G	G	G	G	U	D	D
>45%, cold	D	F	F	D	D	D	U	D	U	U	D	F	D	G	F	G	G	G	G	U	D	D
hot	D	D	D	D	D	D	U	D	U	U	D	D	D	G	D	F	F	F	F	U	D	D
Potassium hydroxide	D	D	G	D	D	U	D	D	D	D	D	D	F	G	F	G	D	F	F	U	U	U
Producer gas	D	D	D	D	D	G	D	G	D	D	D	D	D	G	D	G	G	G	G	U	F	D
Propane	D	G	G	D	U	G	U	D	F	U	D	G	F	G	G	G	D	F	F	D	G	D
Sewage	D	F	G	D	D	G	D	D	F	D	D	F	D	G	F	G	G	D	D	U	D	D
Soap solutions	D	F	G	D	G	G	F	G	F	G	G	F	D	G	F	G	G	G	G	U	F	F
Sodium hydroxide	D	D	G	D	D	U	D	D	D	D	D	D	F	G	F	G	D	F	F	U	U	U
Sodium hypochlorite	F	F	F	F	G	D	D	G	D	D	G	F	F	G	F	G	G	G	G	U	F	F
Sodium silicate	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Soybean oil	U	G	G	U	D	G	U	D	G	U	D	G	U	G	G	G	G	D	U	G	G	G
Stannic chloride	D	F	F	F	D	D	G	D	G	G	D	G	G	G	G	G	G	G	G	U	G	G
Steam ..... <500° F.	U	U	D	D	U	G	U	U	U	D	U	F	G	G	F	G	F	G	U	U	U	U
500-1000° F.	U	U	U	U	U	D	U	U	U	U	U	U	D	U	U	D	U	D	U	U	U	U
Stearic acid	D	F	G	D	D	G	D	D	F	D	D	G	D	G	F	G	G	F	F	F	F	F
Sulphur	D	F	F	F	G	D	D	G	F	F	G	F	D	G	F	G	G	G	F	U	F	F
Sulphur chloride	U	D	D	U	U	D	U	U	D	U	U	D	U	G	D	F	F	F	F	D	D	D
Sulphur dioxide, dry	F	F	F	F	F	G	D	G	D	D	G	F	D	G	F	G	G	D	D	U	D	D
Sulphur trioxide, dry	D	D	D	D	D	G	D	D	D	D	D	F	D	G	F	G	G	D	D	U	D	D
Sulphuric acid ..... <10% cold	G	G	G	G	G	G	U	G	U	U	G	G	F	G	G	G	G	G	G	U	U	U
hot	F	F	F	F	U	G	U	U	U	U	U	F	F	G	F	G	G	G	G	U	U	U
10-75%, cold	D	D	D	D	D	D	U	U	U	U	D	D	D	G	D	D	D	D	F	U	U	U
hot	U	U	U	U	U	D	U	U	U	U	U	D	D	G	D	D	D	D	D	U	U	U
75-95%, cold	D	D	D	D	U	D	U	U	U	U	U	U	U	G	D	U	U	U	D	U	U	U
hot	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	U	U	U	D	U	U	U
fuming	U	U	U	U	U	D	U	U	U	U	U	U	U	G	U	U	U	U	U	U	U	U
Sulphurous acid	F	F	F	F	D	D	U	D	U	U	D	G	G	G	G	G	G	G	G	U	U	U
Tannic acid	F	F	F	F	D	F	F	D	F	F	D	G	G	G	G	G	G	G	G	U	F	D
Tar	U	D	G	U	F	G	U	F	D	U	F	G	U	G	G	G	G	D	D	D	F	F
Tartaric acid	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	F	F
Toluene	U	U	F	U	U	G	U	U	U	U	U	U	U	G	U	G	F	D	D	G	F	D
Trichloroethylene	U	U	U	U	U	G	U	U	U	U	U	U	U	G	U	F	D	D	D	F	D	D
Turpentine	U	U	G	U	U	G	U	U	U	U	U	U	U	G	U	G	D	D	D	F	F	F
Vinegar	F	G	G	G	G	G	G	G	G	D	G	G	G	G	G	G	G	G	G	U	G	G
Water, acid mine, containing oxidizing salt	G	G	G	G	D	G	D	D	D	D	D	G	G	G	G	G	G	G	G	U	F	F
no oxidizing salt	G	G	G	G	F	G	D	F	D	D	F	G	G	G	G	G	G	G	G	U	F	F
Water ..... fresh (tap, boiler, etc.)	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Distilled, lab. grade	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
return condensate	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Water, seawater	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Whiskey and wines	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	U	G	G
Zinc chloride	D	F	F	F	D	F	D	D	G	D	D	G	G	G	G	G	G	G	G	U	D	D
Zinc Sulphate	G	G	G	G	F	G	G	F	G	D	F	G	G	G	G	G	G	G	G	U	G	G

Designing your gasket correctly

Ideally, the designer should adapt flange construction to the existing gasket design. However, this is usually impossible as joint features are, in most cases, already fixed and cannot be changed as easily as the gasket.

But, regardless of whether you are designing flange to gasket or gasket to flange, the design principles are identical . . . only the approach is different. In order to achieve satisfactory gasket design and, consequently, prolonged trouble-free service from your gaskets, the following design information should be followed carefully.

Gasket yield stress—"y" factor

If a tight seal is to be effected, gasket material must be compressed sufficiently and flow into imperfections of the contact faces . . . filling all voids between mating flanges. If this flow doesn't take place a seal can't be effected without using gasket pastes or compounds.

"y" factor is the amount of force, expressed in p.s.i., that must be applied to the gasket contact area causing this essential flow. "y" factor is wholly independent of internal pressure. It is the minimum amount of stress needed if a gasket is to seal at all . . .even at very low pressures.

For example, soft rubber requires so little stress that it is considered self-yielding. Therefore, rubber of less than 75 durometer has a "y" value of 0 p.s.i. Most gasket materials and designs require relatively high initial stress if gasket is to seal properly. Once high initial stress is effected, however, gasket load may be sharply reduced without loss of efficiency. If such loss does occur, it is normally caused by bolt expansion, creep and relaxation.

Gasket factor—"m" factor

There are three forces that largely determine the "m" factor (see fig. 1). They are:

1. Bolt load—the force that squeezes the gasket into the face voids to form seal.

2. Hydrostatic end force—force that tends to separate flanges when internal pressure is applied.

3. Internal pressure—pressure that acts on the portion of the gasket exposed to the pressure side of the joint. Tends to blow gasket out of joint.

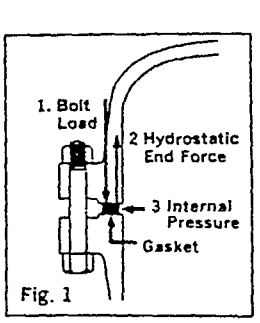


Fig. 1

"m" or gasket factor is the ratio of residual unit stress (bolt load minus hydrostatic end force) on gasket (p.s.i.) to internal pressure of the system. "m" factor usually remains constant throughout a wide range of pressure for a given gasket material and construction.

A gasket factor of 3.0, for example, would indicate that the residual stress of the gasket must be a minimum of three times the system's internal pressure if a proper seal is to be maintained.

Two basic steps

Step 1. First, designer must determine total force available: (a) to yield the gasket, and (b) to maintain a tight seal under service conditions. This force, usually supplied by bolts, will depend on the size and number of bolts in the flange and on the maximum allowable bolt stress. In turn, the maximum bolt stress will depend on the bolt material and operating temperature. Once this is obtained, total available bolt force can easily be determined by multiplying total bolt area by allowable stress.

Step 2. Next, an approximation of gasket dimensions should be ascertained. For some confined-joint facings, recess face dimensions limit gasket dimensions. On a full-face joint, a full-face gasket may be provided, reducing flange distortion. On other facings, considerable leeway is available. It is possible, then, to find "y" and "m" factors at the service pressure by determining the bolt force available and by having worked out a rough approximation of the gasket dimensions. By pairing these findings with a previous selection of materials, based on the recommendation chart and operating conditions, the proper gasket may be selected from a table of gasket factors and yield stresses (Tables 1 and 2).

Bolt load formulas

The initial bolt load required to seat a gasket sufficiently should be:

$Wm_2 = 3.14\,b\,GY.$

The required operating bolt load should be at least sufficient, under maximum operating conditions, to resist the hydrostatic end force and, in addition, to maintain a compression load on the gasket that experience has shown is sufficient, under maximum operating conditions, to resist the hydrostatic end force and, in addition, to maintain a compression load on the gasket that experience has shown is sufficient to assure a tight joint:

$Wm_1 = 0.785\,G^2P + (2b \times 3.14\,GMP)$

When determining number of bolts needed, use the greater of the two values Wm_1 or Wm_2.

Nomenclature for the two formulas are:

Wm_1 = required bolt load for maximum operating conditions in lbs.

Wm_2 = required initial bolt load without internal pressure in lbs.

G = outside diameter of gasket contact face less 2b.

P = maximum allowable working pressure in p.s.i.

b = effective gasket seating width in inches (see Table 1)

Note: $b = b_0$ when b_0 is equal to or less than 1/4"

$b = \frac{\sqrt{b_0}}{2}$ when b_0 is greater than 1/4"

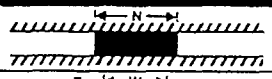
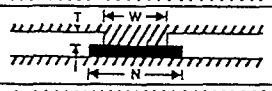
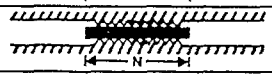
2b = effective gasket pressure width in inches

m = gasket factor (see Table 2)

y = gasket seating load in p.s.i. (see Table 2)

Note: This data applies only when the gasket is contained entirely within the inner edges of the bolt holes.

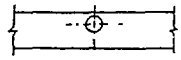
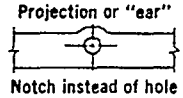
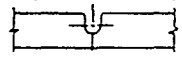
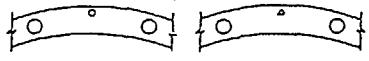
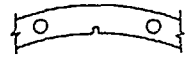
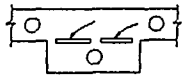
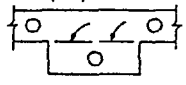
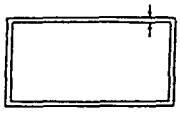
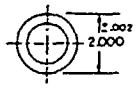
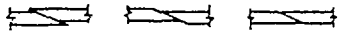
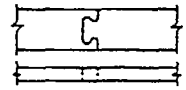
EFFECTIVE GASKET WIDTH—b (Table 1)

FACING LIMITS	GASKET SEATING WIDTH b
	$b = \frac{N}{2}$
	$b = \frac{W+T}{2}$ ($\frac{W+N}{4}$ maximum)
	$b = \frac{7N}{16}$
	$b = \frac{3N}{8}$

GASKET FACTORS (Table 2)

MATERIAL	"m"	"y"
Rubber		
Below 75 durometer	0.50	0
75 or higher durometer	1.00	200
Rubber with cotton fabric insert	1.25	400
Asbestos with a suitable binder for operating conditions:		
1/8" thickness	2.00	1600
1/16" thickness	2.75	3700
1/32" thickness	3.50	6500
Vegetable fiber	1.75	1100

COMMON FAULTS IN GASKET DESIGN AND SUGGESTED REMEDIES

DETAIL	WHY FAULTY	SUGGESTED REMEDY
Bolt holes close to edge 	Causes breakage in stripping and assembling	Projection or "ear"  Notch instead of hole 
Very small bolt holes or noncircular openings 	Require hand picking . . . easy to miss	Avoid hole sizes under 3/32-inch diameter. If small hole is for locating or indexing, change to notch 
Tear-away parts with open slots at attached edges 	Slots require hand picking, costly dies and die maintenance	Simple perforation 
Thin walls, delicate cross section in relation to over-all size 	High scrap loss; stretching or distortion in shipment or use. Restricts choice to high tensile strength materials	Have the gasket in mind during early design stages
Metalworking tolerances applied to gasket thickness, diameters, length, width, etc. 	Results in perfectly usable parts being rejected at incoming inspection. Requires time and correspondence to reach agreement on practical limits. Increases cost of parts and tooling. Delays deliveries	Most gasket materials are compressible. Many are affected by humidity changes. Try standard or commercial tolerances before concluding that special accuracy is required
Transference of fillets, radii, etc., from mating metal parts to gasket 	Unless part is molded, such features mean extra operations and higher cost	Most gasket stocks will conform to mating parts without preshaping. Be sure radii, chamfers, etc., are functional, not merely copied from metal members
Large gaskets made in sections with beveled joints 	Extra operations to skive. Extra operations to glue. Difficult to obtain smooth, even joints without steps or transverse grooves 	Die-cut dovetail joint 

FBW-095

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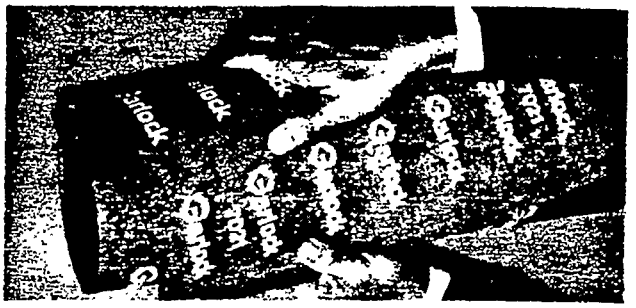
Anti-stick compressed asbestos sheet

Garlock's anti-stick releasing agent is blended into the surface of all compressed asbestos sheet, eliminating the need for graphited sheet.

Garlock Compressed Asbestos styles are made of either white or blue asbestos and several binders, including SBR, Neoprene or Nitrile. The asbestos and elastomeric binder are bonded under pressure and vulcanized into a homogeneous sheet.

All compressed sheet styles are ideal in applications employing rigid flanges with adequate bolting capacity. Garlock Compressed Asbestos sheet materials are excellent on such heavy-duty bolted and threaded joints as water and steam pipe fittings and manifold connections.

All styles are tough and durable with sufficient compressibility to provide a properly gasketed joint, but are resistant to plastic flow ordinarily encountered under heavy bolt loads.



Generally, white asbestos styles are suitable for service against hot oil, hot gases or steam. Blue asbestos sheet seals against hot or cold mineral acids, either alone or in conjunction with oils or organic solvents.

For more specific recommendations on all Garlock Compressed Asbestos styles see the Resistance Ratings Chart beginning on page 15. For technical information on each sheet, see the data on page 21.

Easy method for ordering compressed asbestos sheet packing

Now you can convert ordering data for Garlock compressed asbestos sheet packing into simple nine digit numbers . . . thus allowing further use of data processing equipment both for order entry and disbursements. To determine the correct nine-digit number, take the following steps:

1. First, make sure, by checking the following page, that the style number is available in the thickness you wish.
2. Use five digit number for the sheet style you wish to buy.
3. Follow this with the four digit number for the sheet size and thickness you wish.
4. In front of the resulting nine digit number, indicate the number of pounds or sheets you wish to buy.

Example:

2000# of Style 900 in 1/16'' x 60 x 63 sheets would read . . . 2000# 31038-2521

50 sheets of 7705 in 1/8'' x 60 x 126 sheets . . . 50 sheets 31064-2607

Style No.	Ordering No.
900	(31038-)
7021	(31042-)
7228	(31052-)
7705	(31064-)

Style No.	Ordering No.
8748	(31114-)
7819	(31595-)
9057	(31571-)
7006	(31417-)

SHEET SIZE AND THICKNESS NUMBER

Sheet Size	Sheet Thickness 1/64"	1/32"	1/16"	3/32"	1/8"	3/16"	1/4"
40 x 42''	2429	2471	2512	2554	2596	2680	2764
40 x 63''	2431	2473	2514	2556	2598	2682	2766
40 x 126''	2433	2475	2516	2558	2600	2684	2768
50 x 50''	1702	1704	1706	1708	1710	1714	1827
50 x 75''	1723	1727	1731	1735	1739	1747	1755
50 x 150''	1724	1728	1732	1736	1740	1748	1756
60 x 63''	2438	2480	2521	2563	2605	2689	2773
60 x 126''	2440	2482	2523	2565	2607	2691	2775
75 x 75''	1761	1765	1769	1773	1777	1785	1793
75 x 150''	1762	1766	1770	1774	1778	1786	1794
120 x 126''	2443	2485	2526	2568	2610	2694	2778
150 x 150''	1797	1799	1801	1803	1805	1809	1813

Compressed Asbestos	900/ 7735	7021	7228	7705	8748	7006 & 7819	9057
Material	White chrysotile asbestos with SBR binder	White chrysotile asbestos with SBR binder	White chrysotile asbestos with neoprene binder —no sulphur	Blue crocidolite asbestos with acid resisting SBR binder	White chrysotile asbestos with nitrile binder	White chrysotile asbestos with SBR binder	White chrysotile asbestos with neoprene binder —no sulphur
* Tensile strength: Across grain	3000 p.s.i.	3600 p.s.i.	3000 p.s.i.	2000 p.s.i.	4000 p.s.i.	2600 p.s.i.	4600 p.s.i.
Compressibility, under 5000 p.s.i. load Recovery	7-17% 40% min.	7-17% 40% min.	7-17% 40% min.	15—25% 40% min.	7-17% 40% min.	7-17% 40% min.	7-17% 40% min.
Oil resistance after 5 hrs. in: ASTM #3 oil @ 300° F. Thickness increase Tensile loss	30% 50%	30% 50%	20% 35%		5% 7%	30% 45%	15% 25%
Fuel resistance, after 5 hrs. in: ASTM Ref. Fuel B @ R.T. Thickness increase Weight increase	25% 20%	20% 25%	15% 20%		7% 15%	25% 25%	15% 15%
Flexibility	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 8X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking	Bends 180° around rod (diameter 12X thicker than sheet) without cracking
Density (per cubic inch)	.93 oz.	.90 oz.	.91 oz.	.83 oz.	.85 oz.	.97 oz.	1.0 oz.
Thicknesses available (inches)	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8 3/16 1/4	1/64 1/32 1/16 3/32 1/8	1/32 1/16 3/32 1/8	1/64 1/32 1/16 3/32 1/8	1/64 1/32 1/16 3/32 1/8	1/64 1/32 1/16 3/32 1/8
Sheet sizes (inches)	The following sizes are available in all style numbers 40x42 40x63 40x126 50x50 50x75 50x150 60x63 60x126 75x150 120x126 150x150						
Tolerances on thicknesses (inches)	1/64 +.005 —.002 1/64 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/64 +.005 —.002 1/64 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010 3/16 & 1/4 ±.015	1/64 +.005 —.002 1/64 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010	1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.015	1/64 +.005 —.002 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010	1/64 +.005 —.002 1/64 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010	1/64 +.005 —.002 1/64 CT ±.0015 1/32 ±.005 1/16 ±.006 3/32 ±.008 1/8 ±.010
Meets specifications	ASTM-D-1170-62T Grade P-1161A. MIL-G-12803A Grade P-1161A MIL-A-7021C Class II	HH-P-46C ASTM-D-1170-62T Grade P-1161A MIL-G-12803A Grade P-1161A MIL-A-17472B UL Approval	MIL-A-7021C Cl. I ASTM-D-1170-62T P-1151-A AMS-3232H		ASTM-D-1170-62T Grade P-1141A MIL-G-12803A Grade 1141A AMS-3232H	ASTM-D-1170-62T Grade P-1161A	ASTM-D-1170-62T Grade P-1151A SAE J90A Grade P-1151A
How branded	Style numbers 900, 7021, 7228 and 7705 are branded with Garlock name and style number thru 60". Over 60" std. is unbranded unless otherwise specified.				Garlock name only thru 60". Over 60" std. is unbranded unless otherwise specified	Unbranded	Unbranded

* Typical Physical Values

FBW-097

Garlock homogeneous rubber sheet SBR • NATURAL • NEOPRENE • NITRILE

Garlock offers a wide range of natural and synthetic rubbers, all having certain basic characteristics that allow the gasket designer infinite design possibilities.

Rubber is incompressible—It can easily be deformed, depending upon durometer and cross section, but can never be reduced in volume.

Rubber is extensible—This feature is extremely valuable when a gasket must be assembled over a projection or shoulder with the idea of having it "snap tight" within a groove. Rubber is one of the few materials capable of withstanding such treatment.

Rubber is highly impermeable—This feature applies when describing rubber's ability to serve as a tight barrier against the passage of gases or fluids.

Rubber is elastic—As a result, relatively little flange pressure is required to effect intimate contact with the face of the rubber gasket. Also, this elasticity allows a rubber gasket to move with flange surfaces without disrupting the seal.

Generally, rubber's unique properties are best utilized in applications where controlled deformation is desirable.

Other materials—such as viton and silicone are also available on request.

Easy order method for homogeneous rubber sheeting

Now you can convert ordering data for homogenous rubber sheet into nine-digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements. It can be used for all standard widths.

1. First, check to make sure the style number is available in the thickness you wish.
2. Use five digit number for the sheet style you wish to buy.
3. Follow this with the four digit number for the sheet thickness you wish.
4. In front of the resulting nine digit number, indicate the number of standard rolls you wish to buy. (For 1/32", a standard roll is 100#, for 1/16" and up, a standard roll is 200 pounds.)

Example: 2000# of 1/8 Style No. 353 would read: 10 rolls 31016-0118. (2000# of 31016-0118 would also, of course, be acceptable.)

Style No.

22	(31003-)	7797	(31072-)	9122	(31560-)
91	(31006-)	7986	(31082-)	8495	(31100-)
353	(31016-)	8312	(31090-)	8459	(31098-)
8023	(31041-)	8639	(31108-)	8752	(31859-)

Thickness					
1/32"	(-0095)	3/32"	(-0110)	3/16"	(-0133)
1/16"	(-0102)	1/8"	(-0118)	1/4"	(-0149)

Homogeneous Rubber Sheet	91	22	353
Material	SBR	SBR	SBR
Hardness (Shore A)	60 ± 5	80 ± 5	80 ± 5
Tensile strength (Min.)	2000 p.s.i.	1000 p.s.i.	1200 p.s.i.
Elongation (Min.)	400%	250%	150%
Compression set ASTM method B 25% deflection	22 hrs./158° F. 25% max.	22 hrs./158° F. 60% max.	22 hrs./158° F. 40% max.
Weight (lbs.-approx.)	1/16—3.3# sq. yd.	1/16—4.7# sq. yd.	1/16—4.4# sq. yd.
Volume change after immersion in: ASTM #1 oil, 70 hrs/212°F. ASTM #3 oil, 70 hrs/212°F.			
Thicknesses available (inches)	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater
Width available (inches)	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—42
Size of rolls available (approx.)	1/32"—100 lbs. 1/16" and over, 200 lbs.	1/32"—100 lbs. 1/16" and over, 200 lbs.	1/32"—100 lbs. 1/16" and over, 200 lbs.
Finishes available	Standard—cloth Special—smooth	Thru 1/8", cloth finish Over 1/8", smooth finish	Thru 1/8", cloth finish Over 1/8", smooth finish
Tolerances on thicknesses (inches)	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031
Meets specifications:	ASTM-D-735-SAE J 14 Grade R-615 B, F1, F2 ASTM-D-2000-SAE J 200 5AA620A13B 13B35F17 L14	HH-G-156-C Class C ASTM-D-1330 Grades 1 & 2 ASTM-D-2000 SAE J 200 2AA810A13 F17 L14	ASTM-D-735-SAE J 14 Grade R-810 ASTM-D-2000-SAE J 200 2AA810A13 F17 L14
How branded	Garlock name and style no.		

FBW-098

6023	8312	7986	8639	7797	9122	8495	8459	8752
Natural Rubber	Neoprene	Neoprene	Neoprene	Neoprene	Nitrile	Nitrile	Nitrile	CPE-Black
35 ± 5	50 ± 5	60 ± 5	70 ± 5	80 ± 5	60 ± 5	70 ± 5	80 ± 5	70 ± 5
3000 p.s.i.	1500 p.s.i.	2000 p.s.i.	1900 p.s.i.	1500 p.s.i.	2000 p.s.i.	2600 p.s.i.	2100 p.s.i.	1000 p.s.i.
600%	375%	350%	275%	125%	500%	450%	300%	225%
22 hrs./150° F. 25% max.	70 hrs./212° F. 35% max.	70 hrs./212° F. 35% max.	70 hrs./212° F. 65% max.	70 hrs./212° F. 75% max.	22 hrs./212°F 20% max.	22 hrs./212°F 40% max.	22 hrs./212°F 25% max.	22 hrs./302°F 45% max.
1/16—2.8 # sq. yd.	1/16—3.8 # sq. yd.	1/16—4.0 # sq. yd.	1/16—4.2 # sq. yd.	1/16—4.3 # sq. yd.	1/16—3.45 # sq. yd.	1/16—3.5 # sq. yd.	1/16—3.8 # sq. yd.	1/16—3.9 # sq. yd.
	−7 to 0% +60 to +90%	−4 to +3% +50 to +80%	0 to +10% +40 to +70%	−7 to 0% +45 to +60%	−10 to +5% 0 to +25%	−10 to +5% 0 to +35%	−5 to +5% +16 to +35%	−4 to +3% −60 to −40%
1/16 3/32 1/8 3/16 1/4 and greater	1/16 3/32 1/8 3/16 1/4 and greater	1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/32 1/16 3/32 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 1/8 3/16 1/4 and greater	1/16 3/32 1/8
Standard—36	Standard—36	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—42	Standard—36 Special—44	Standard—36 Special—44	Standard—36 Special—44	Standard—36 Special—42
200 lbs.	200 lbs.	200 lbs.	1/32"—100 lbs. 1/16" & over, 200 lbs.	1/32"—100 lbs. 1/16" & over, 200 lbs.	200 lbs. over 1/4-15 ft. lengths	200 lbs. over 1/4-15 ft. lengths	200 lbs. over 1/4-15 ft. lengths	200 lbs.
Smooth	Smooth	Smooth	1/32" & 1/16" cloth over 1/16" smooth	1/32" & 1/16" cloth over 1/16" smooth	Smooth	Smooth	Smooth	cloth
1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.012 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/32 ±.012 1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031	1/16 & 3/32 ±.016 1/8 ±.020 3/16 & 1/4 ±.031
HH-G-156C Class A ASTM-D-2000 - SAE J 200 4AA425A13 B33F17L14	ASTM-D-735- SAE J 14 Grade SC515 B, E1, E3, F1 ASTM-D-2000- SAE J 200 6BC515A14B14 C12E14E34G21	ASTM-D-735- SAE J 14 Grade SC612 B, E1, E3, F1 ASTM-D-2000- SAE J 200 6BC620A14 B14 E14	ASTM-D-735- SAE J 14 Grade SC720 E1, E3 ASTM-D-2000- SAE J 200 6BC715A14 B14E14E34G21	ASTM-D-735- SAE J 14 Grade SC815 E1, E3 ASTM-D-2000- SAE J 200 2BE815A14 E14E34	 ASTM-D-2000 SAE J 200 5BG620A14 B14B34E14 E34	ASTM-D-735- SAE J 14 Grade SB 720A MIL-D-3377 Type I ASTM-D-2000- SAE J 200 3BG725B14 E14	ASTM-D-735- SAE J 14 Grade SB820 E1 MIL-D-3377 ASTM-D-2000- SAE J 200 6BG820A14 B14E14E34	ASTM-D-2000- SAE J 200 2CE710A16B15
Garlock name and style no.					1/16 x 1/8—Garlock name and style no. Others—Garlock name only	Garlock name only		Unbranded

FBW-099

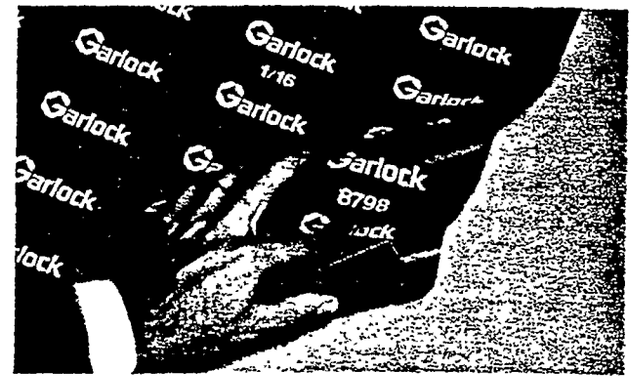
Cloth inserted rubber sheet for gasketing or diaphragm service

In the manufacture of rubber diaphragm sheet, Garlock utilizes the elasticity and extensibility features of rubber and the tough construction of a fabric insert. The result: a sturdy diaphragm sheet that has an extremely high burst strength and, yet, has the flexibility so vital in diaphragm service.

Each Garlock diaphragm style is specially compounded, using various combinations of rubbers and fabric inserts, to meet specific sets of service conditions.

For example, Garlock offers for normal service, where temperatures are low, SBR or neoprene rubbers with either cotton sheeting, hose duck or tire duck inserts. Nylon insert is combined with neoprene where higher pressure and temperature diaphragm service is encountered.

When selecting diaphragm sheet material, extreme care should be exercised. Such factors as pressures, fluids, required stroke, and life expectancy deserve careful consideration.



Detailed information provided in the chart below can give you valuable assistance in this selection process.

However, we suggest that before you make your final choice of diaphragm sheet, you contact your nearest Garlock sales representative. He will gladly help you in determining a diaphragm material's suitability for your particular needs.

Cloth-Inserted Rubber	19	619	7992	8798	9205
Material	SBR rubber with 5 oz. cotton sheeting in 1/32" thickness as fabric insert, 12 oz. cotton chafer in all others	SBR rubber with 22 oz. tire duck fabric insert	Neoprene with 22 oz. tire duck fabric insert	Neoprene with 13 oz. nylon fabric insert	Nitrile with 4.5 oz. nylon fabric insert
Hardness (Shore A)	80	50	50	50	50
Burst Test across 2" diameter opening		270 p.s.i.g. (1/8"—1 ply)	270 p.s.i.g. (1/8"—1 ply)	1000 p.s.i.g. (1/8"—1 ply)	350 p.s.i. (1/32" or 1/16"—1 ply)
Number of plies	1/32 1/16 3/32—1 ply 1/8—2 ply 3/16—3 ply 1/4—4 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/16 3/32 & 1/8—1 ply 3/16—2 ply 1/4—3 ply	1/32 & 1/16—1 ply
Weight (lbs. per square yard)	1/32"— 2.1 1/16"— 4.1 3/32"— 5.8 1/8"— 7.6 3/16"—11.4 1/4"—15.2	1/16"— 3.4 3/32"— 5.1 1/8"— 6.8 3/16"—10.1 1/4"—13.5	1/16"— 3.6 3/32"— 5.6 1/8"— 7.5 3/16"—11.1 1/4"—14.8	1/16"— 3.7 3/32"— 5.8 1/8"— 7.6 3/16"—11.4 1/4"—14.9	1/32"—2.06 1/16"—4.13
Thicknesses available (inches)	1/32, 1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/16, 3/32, 1/8, 3/16, 1/4	1/32, 1/16
Width available (inches)	44	44	44	56	44
Finish available	Smooth	Smooth	Smooth	Smooth	Smooth
Tolerances on thicknesses	1/32, 1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16, 3/32 ±.012 1/8 ±.016 3/16, 1/4 ±.031	1/16 ±.016 1/32 ±.012

Garlock name and style no.

FBW-100

Easy ordering method for cloth-inserted rubber sheet

Now you can convert ordering data for cloth-inserted rubber sheet into nine-digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements.

1. First, check the chart on page 24 to make sure the style number is available in the thickness you wish.

2. Use five digit number for the sheet *style* you wish to buy.

3. Follow this with the four digit number for the sheet *thickness* you wish.

4. In front of the resulting nine digit number, indicate the number or standard rolls you wish to buy. (For 1/32" a standard roll is 100#, for 1/16" and up, a standard roll is 200 pounds.)

Style No.	Ordering No.
19	(31002-)
619	(31026-)
7992	(31180-)
8798	(31119-)
9205	(31136-)

Thickness*	Ordering No.
1/32"	(-0247)
1/16"	(-0254)
3/32"	(-0261)
1/8"	(-0270)
3/16"	(-0285)
1/4"	(-0301)

*Different for Style 8798 - Please Inquire.

Woven asbestos gasketing cloth style 605

Garlock 605 is woven from white asbestos yarn which has been reinforced with brass wire. It is impregnated with a high temperature-resistant natural rubber cement. Garlock 605 was specially designed for use against steam, gases and aqueous solutions other than strong mineral acids.

Easy ordering method for woven asbestos gasketing cloth style 605.

Now you can order style 605 Gasketing Cloth by nine-digit code number . . . thus allowing further use of data processing equipment for order entry and disbursements.

1. The five digit code number for all 605 cloth is 31018.

2. Follow this number with the four digit number for the thickness desired.

3/64" (-0327)
1/16" (-0330)
1/8" (-0346)
3/16" (-0361)
1/4" (-0377)

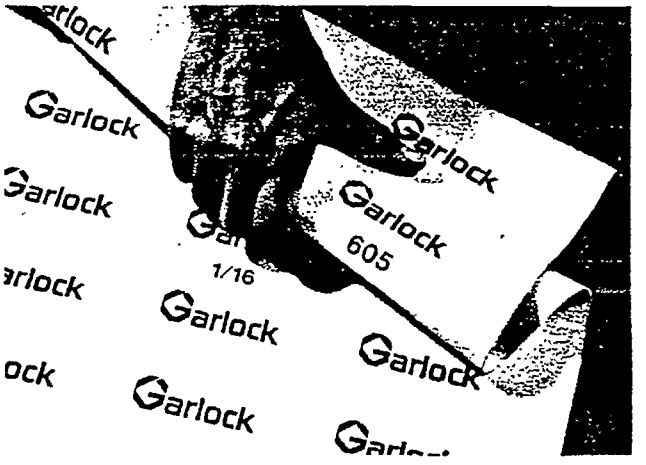
3. In front of the resulting nine digit number, indicate the number of rolls or pounds desired. 3/64" thickness comes in 100# rolls and 1/16" and up comes in 200# rolls.

How to order style 604 gaskets.

See current price pages for sizes of manhole and handhole gaskets.

How to order style 612 folded tape.

This tape is available in a large variety of widths and thicknesses. See current price pages for ordering information.



Woven Asbestos Cloth, Tape and Gaskets	605
	Asbestos Cloth with brass wire insertion, impregnated with a high temperature resistant rubber cement
Thicknesses available (inches)	1/64 1/16 1/8 3/16 1/4
Width available (inches)	48
Size of rolls	1/64" 100 lbs. 1/16" and up 200 lbs.
Also available in folded gasket form under style 604 and folded tape under style 612	

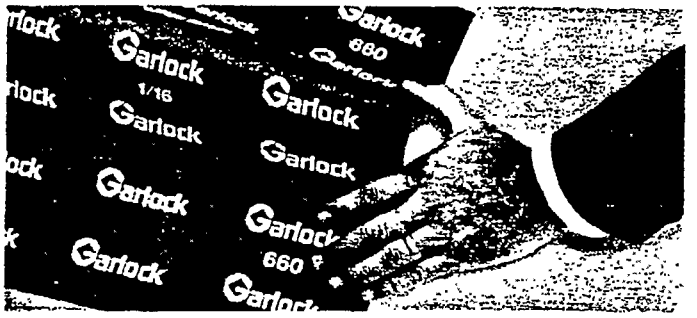
FBW-101

Vegetable fiber sheet

Garlock furnishes high-quality Vegetable Fiber sheets compounded with a glue-glycerine binder.

Garlock 660 is made of a combination of vegetable fiber, cork and glue-glycerine. It is suitable against oils, solvents, aromatic and non-aromatic fuels up to 250° F. Garlock 660 is a highly compressible sheet . . . especially useful where lightweight sheet metal flanges are involved.

Garlock 681 is a vegetable fiber sheet with a glue-glycerine binder. It is suitable against the same media as 660.



Easy ordering method for vegetable fiber sheet

Now you can convert ordering data for vegetable fiber sheet into nine digit code numbers . . . thus allowing further use of data processing equipment for order entry and disbursements.

The code numbers can be used for both standard rolls and standard sheets.

Thicknesses

Standard rolls: .006" thru .021" ..... 100 lineal yards
1/32" & 3/64" ..... 50 lineal yards
1/16" thru 1/8" .... 25 lineal yards

Standard sheets: 3/16" & 1/4" ..... 36" x 36"

1. First check to make sure the style number you wish is available in the thickness you wish.

2. Use five digit number for the sheet *style* you wish to buy.

3. Follow this with the four digit number for the sheet *thickness* you wish.

4. In front of the resulting nine digit number indicate the number of standard rolls or sheets you wish to buy.

Example:

5 rolls of 1/16" Style 660 would read 5 rolls 31029-0102.

Style No.	Ordering No.
660	(31029-)
681	(31035-)

Style No.	Ordering No.
.006"	(-0077)
.010"	(-0084)
1/64"	(-0087)
.021"	(-0091)
1/32"	(-0095)
3/64"	(-0099)
1/16"	(-0102)
3/32"	(-0110)
1/8"	(-0118)
3/16"	(-0133)
1/4"	(-0149)

Vegetable Fiber Sheet	660	681
Material	Vegetable fiber and cork granules with glue-glycerine binder	Vegetable fiber with glue-glycerine binder
Tensile strength (minimum)	1000 p.s.i.	2000 p.s.i.
Compressibility under 1000 p.s.i. load Recovery	40%—55% 40% (minimum)	25%—40% 40% (minimum)
Oil Resistance after 22 hours in: ASTM #3 oil at 70°-85° F. Thickness increase Weight increase	5% (maximum) 30% (maximum)	5% (maximum) 15% (maximum)
Fuel Resistance after 22 hours in: Fuel B at 70°-85° F. Thickness increase Weight increase	5% (maximum) 30% (maximum)	5% (maximum) 15% (maximum)
Water Absorption after 22 hours in: Distilled water at 70°-85° F. Thickness increase Weight increase	30% (maximum) 100% (maximum)	30% (maximum) 90% (maximum)
Thicknesses available (inches)	.010 1/64 .021 1/32 3/64 1/16 3/32 1/8 3/16 1/4	.006 .010 1/64 .021 1/32 3/64 1/16 3/32 1/8 3/16 1/4
Widths available (inches)	Standard 36" Special 48" in following thicknesses 1/32 1/16 3/32 1/8 3/16 1/4	Standard 36"
Tolerances on Thicknesses	.010 1/64 ±.0035" .021 1/32 3/64 ±.005" 1/16 ±.008" 3/32 & greater ±.016"	.010 1/64 ±.0035" .021 1/32 3/64 ±.005" 1/16 ±.008" 3/32 & greater ±.016"
Meets Specifications	ASTM-D-1170-62T Grade P-3415-A SAE J90 Grade P-3415-A	ASTM-D-1170-62T Grade P-3313-B SAE J90 Grade P-3313-B
Now Branded	Garlock name and style number	

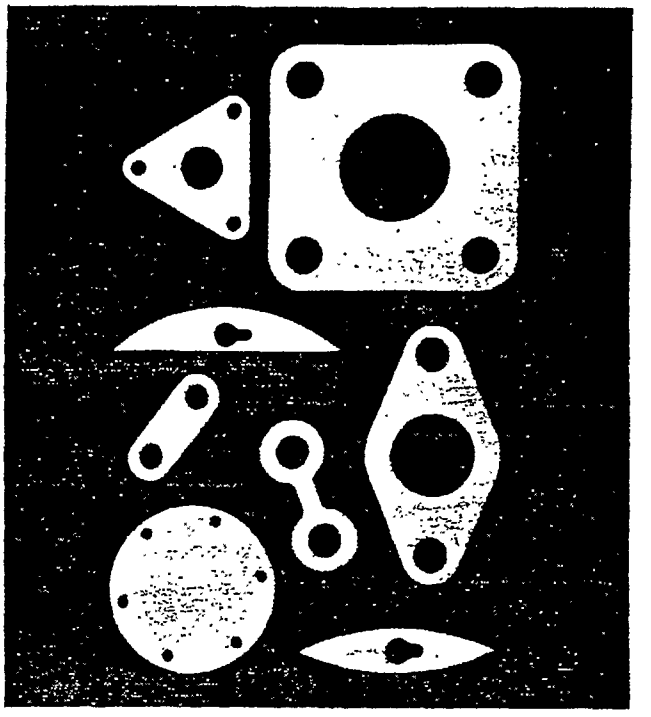
Garlock CHEMISEAL® solid TFE pipe flange gaskets

Corrosion-resistant non-contaminating wide temperature range (—450° F. to +500° F.)

Garlock gaskets of solid 8764 TFE fluorocarbon resin are used throughout industry wherever resistance to chemical attack or product non-contamination are important considerations. Generally, solid TFE fluorocarbon gaskets: (1) are serviceable against any material except molten alkali metals and fluorine under pressure—eliminating change of gaskets to suit medium; (2) have outstanding non-adhesive properties eliminating gasket sticking where joints are opened frequently.

Solid TFE CHEMISEAL gaskets are available in either ring, full face, or special-shaped forms.

Style 8764 TFE gaskets for standard pipe flanges are now "skin-packed" for added cleanliness, protection from damage and for convenience in storage. 1/16" thick gaskets are put up ten per pack and 1/8" thick are offered five per pack.



Standard Sizes Garlock 8764 Pipe Flange Ring Gaskets—Class 150 Pound Flange

PIPE SIZE (inches)	OLD STANDARD I.D.	OLD STANDARD O.D.	USA STANDARD* I.D.	USA STANDARD* O.D.
1	1	2⅝	1⅛	2⅜
1¼	1¼	3	1 13/32	3
1½	1½	3⅜	1 39/32	3⅜
2	2	4⅛	2⅜	4⅛
2½	2½	4⅞	2⅞	4⅞
3	3	5¾	3½	5⅞
3½	3½	6¾	4	6¾

*Non-Metallic Gaskets for Pipe Flanges USA B16.21—1951.

PIPE SIZE (inches)	OLD STANDARD I.D.	OLD STANDARD O.D.	USA STANDARD* I.D.	USA STANDARD* O.D.
4	4	6⅞	4½	6⅞
5	5	7¾	5⅝	7¾
6	6	8¾	6⅝	8¾
8	8	11	8⅝	11
10	10	13⅜	10¾	13⅜
12	12	16⅛	12¾	16⅛

NOTE: USA standard size will be shipped unless "old standard" is specified on order.

Garlock 8764 TFE sheet

Garlock 8764 TFE Sheet, per United States Department of Commerce Standard CS-239-63 Grade B, is available for cutting gaskets in your plant to fill emergency needs for either standard or non-standard flanged joints. TFE Sheet is available in three standard sheet sizes: 24 in. x 24 in., 36 in. x 36 in. and 48 in. x 48 in. and twelve standard thicknesses shown in chart below. Standard sheet size tolerances are +.250 in. —.000 in.

THICKNESS (inches)	THICKNESS TOLERANCES (inches)	APPROX. WEIGHT (lb./sq. ft.)
1/32	+.015 —.005	0.40
*1/16	+.015 —.005	0.75
3/32	+.020 —.005	1.12
*1/8	+.016 —.008	1.45
3/16	+.022 —.011	2.17
1/4	+.030 —.015	2.89

THICKNESS (inches)	THICKNESS TOLERANCES (inches)	APPROX. WEIGHT (lb./sq. ft.)
3/8	+.038 —.019	4.32
1/2	+.046 —.022	5.73
5/8	+.054 —.027	7.16
3/4	+.070 —.035	8.60
1/8	+.078 —.039	10.00
†1	+.087 —.043	11.45

*48 in. x 48 in. sheets available in these thicknesses per United States Department of Commerce Standard CS-239-63 Grade C.
†Thicknesses greater than 1 in., per United States Department of Commerce Standard CS-239-63 Grade B, available in standard sheet sizes on special order.



Johns-Manville

Greenwood Plaza • Denver, Colorado 80217

Sales Offices in Principal Cities

FBW-104

PK-337 8-75

Litho in USA

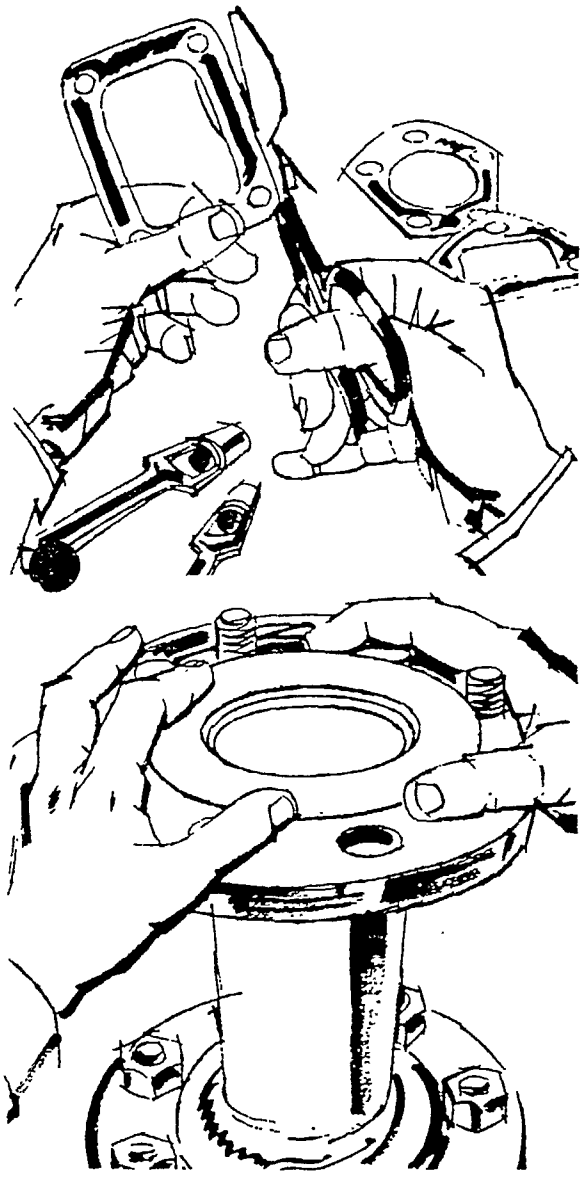
Flood Control Gasket Materials

Johns-Manville JM

FBW-105

Johns-Manville

Provide



CUT GASKETS

Many customers ask J-M to furnish cut gaskets. Your local J-M Sales Office can suggest the best facility to meet your individual needs.

This catalog presents the latest developments in Johns-Manville gasket materials. Additionally, it features sealing materials for special applications . . . materials which for many years have had the reputation as "standards" in the industry.

Machine designers are well aware of the important role gaskets play in their equipment. For this reason, many equipment manufacturers specify J-M gaskets as original standard parts in their units. This helps assure long, efficient and dependable equipment operation. Users of those units who will be buying relacement parts and are concerned with getting continued top performance from equipment investments will be interested in this fact.

Your local Johns-Manville Packing Distributor or J-M Representative will be glad to discuss any sealing problem with you. They have extensive technical information available . . . are trained to recommend packing and gasket materials best suited to your specific applications. They can offer many helpful suggestions to simplify problems and thus help keep your costs low.

The high temperatures and pressures and extreme corrosive conditions that accompany many of today's equipment requirements and industrial process systems, make

FBW-106

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Johns-Manville Corp.

Gasket Materials

superior performance.

the gasket play an increasingly important role as a medium for confining liquids and gases.

Johns-Manville research and development engineers have kept pace with industrial progress. They have produced new and improved sheet and gasketing products to meet these special requirements.

To most users, uniformity is the most important consideration in any sheet packing . . . uniformity of composition, resilience, density and resistance to deterioration. Without complete control of these factors, it is impossible to calculate with any degree of accuracy the dependability or length of service of gaskets made from that material.

Johns-Manville exercises extreme care during every stage of manufacture to guard the uniformity of the finished sheet. Rigid manufacturing processes are set up and a highly trained quality control group constantly checks production for conformance to those specifications.

As a result, all J-M gasket materials provide a high degree of uniformity and dependability under the particular service conditions for which they are recommended.

Complete information on Johns-Manville gasket materials and other sealing elements is given on the following pages.

FBW-107

CONTENTS

ALPHABETICAL LISTING

	PAGE
Chempac	
TFE* Asbestos	15
Compressed Asbestos	
Styles & Description	8, 9, 10
Specifications	6, 7
Felted Asbestos	11
Firewall Fabric	16
Material Selection	5
Parting Agent	8
Rubber Sheet	12, 13
Specifications	
Rubber Sheet	14
TAMP Procedure	4
Woven Asbestos Cloth	15

*TFE (Tetrafluoroethylene)

NUMERICAL LISTING

STYLE NO.	TYPE	PAGE
52	Compressed Asbestos	10
60	Compressed Asbestos	8
61	Compressed Asbestos	8
70	Compressed Asbestos	9
70C	Compressed Asbestos	9
71	Compressed Asbestos	9
76	Compressed Asbestos	9
78	Compressed Asbestos	10
83B	Felted Asbestos Sheet	11
86A	Compressed Asbestos Sheet	9
88	Firewall Sheet	16
89	Firewall Sheet	16
91	Asbestos TFE* Sheet	15
95	Firewall Sheet	16
96	Firewall Sheet	16
100	Woven Asbestos Sheet	15
101	Woven Asbestos Sheet	15
103C	Neoprene Rubber Sheet	12
104C	Neoprene Rubber Sheet	12
105	Neoprene Diaphragm Sheet	13
106R	Neoprene Diaphragm Sheet	13
107	Red Rubber Sheet	12
109	Cloth-Inserted Rubber Sheet	12
110	Black Rubber Sheet	12
111	Neoprene Rubber Sheet	12
112	Black Oil-Proof Rubber Sheet	12
113	Natural Rubber Sheet	13
114C	Black Rubber Sheet	13
115	Rubber Diaphragm Sheet	13
126	Nitrile Rubber Sheet	13
127	Nitrile Rubber Sheet	13
219	Felted Asbestos Sheet	11
711	Plant Fiber, Seigelite	11

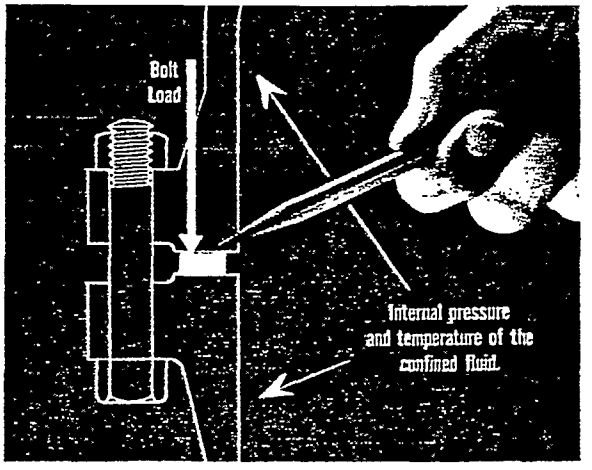
Specification Compliance Table	17
Metric Conversion Tables	18
Conversion Tables	19

How to Use the TAMP Procedure for Selecting Gasket Materials...

1. Determine P x T factor by multiplying operating pressure (P, psi) by operating temperature (T, °F).
2. Refer to Table B. Locate P X T factor (column a). If value falls between listed values, use next higher value.
3. Check maximum temperature (column b) to insure basic type of material (column c) will withstand service temperature. If service temperature exceeds listed value, select the material having higher temperature resistance.
4. Refer to application and media (column d) for specific service conditions. Select style number (column e).

Other Factors to Consider When Selecting Gaskets By TAMP Method

1. Is material selected readily available; is it in stock?
2. Does customer have a preference for particular type of material?
3. Is price a factor?



For service at low to medium temperature and pressures: As a rule of thumb, if multiplying the operating pressure (psi) by operating temperature (°F) results in a product not exceeding 320,000, a gasket of a quality compressed asbestos sheet material can usually be used with complete safety.

For service at temperatures approaching 850F: A P x T factor of 250,000 should be considered the limit for use of compressed asbestos gaskets.

If corrosive fluids are encountered: The best solution to the constant attack of chemicals and solvents is a gasketing material, such as chemically inert J-M Chempac Sheet.

The question is frequently asked: "What are the important points to remember in considering gasket materials so we can avoid costly failure?" Gasket engineering is a complex study, but there are certain simple answers to this commonly asked question. Three factors, or variables, must be considered:

a The nature of the fluid to be sealed
b Internal pressure and temperature
c The available bolt force on the gasket

The tables, shown here, chart these variables and suggest material styles which might fill the need. Obviously, the material must be impervious to the action of the confined fluid. Then, bolt force must always exceed the internal pressure and temperature forces that work against gasket closures. And bolt force must be adequate to meet the sealing stress requirements needed to cause a gasket material to flow properly so as to effect the seal.

When extreme pressures and temperatures act on the gasket: If internal pressures reach 1200 psi or temperatures exceed 850 F, safe practice calls for a sturdy metal gasket that offers the high resiliency needed to follow expanding and contracting movements of flanges. A wide variety of durable, resilient corrosion resistant metallic gaskets for high temperature and high pressure service are described in the J-M Catalog on Metallic Gaskets.

c Seating Stress Requirements for J-M Sheet Materials

J-M Style No.	Thickness Inches	Gasket Seating Stress† Minimum, psi	J-M Style No.	Thickness Inches	Gasket Seating Stress Minimum, psi
71	1/64	2250			
	1/32	1500			
	1/16	1200			
	1/8	900			
60, 61, 78	1/64	3000	83B	1/16	1000
	1/32	2000	91	3/32	1600
	1/16	1600			
	1/8	1200	100	All	2500
			104C	1/32 & up	175
76,86A	1/64	3750	107	1/32 & up	200
52	1/32	2500	117	2 ply	2500
	1/16	2000		3 ply	2100
	1/8	1500		4 ply	1800
			711	All	750

†These minimum seating stresses are based on J-M experience and are minimum values required to flow the material and effect a seal.

FBW-108

ⓐ The Nature of the Fluid

J-M SHEET MATERIAL STYLE NUMBERS Compatible with various MEDIA

MEDIA ▶ ▼ MATERIAL	Aliphatic Hydrocarbon	Aromatic Hydrocarbon	Weak Acids and Salts	Strong Acids and Salts	Weak Bases	Strong Bases	Solvents	Vegetable and Animal Oils	Food	Dielectric Resistance	Hot Oil	Freon Types
Compressed Asbestos Pages 6, 7, 8, 9, 10	60 76 78	76 78	60 76	86A	60	60	76 78	60 78	61	71	76 78	76 78
	For high bolt loading, smooth flanges, high pressure (1200 psi maximum) and high temperature (850 F maximum, except 750 F maximum for Style 76).*											
Rubber, Vegetable and Soft Asbestos Pages 11,12,13,14, 15	104C 107	104C 127	107 104C	83B	104C 107	107	711 104C	104C 107	113	—	—	—
	For low bolt loading, imperfect flanges, low pressure (200 psi maximum, except 250 psi maximum for Style 711 and 20 psi maximum for Style 83B), and medium temperature (300 F maximum, except 250 F maximum for Style 711 and 400 F maximum for Style 83B).*											
Fabric Page 16	100	—	100	—	100	—	—	100	100	—	—	—
	For medium-low bolt loading, rough flanges, medium pressure (500 psi maximum) and medium temperature (100F minimum, 450 F maximum).*											
Chempac Fabric Page 15	91	91	91	91	91	91	91	91	91	—	—	—
	For medium bolt loading, smooth flanges, maximum fluid resistance and low swell, medium pressure (500 psi maximum) and medium temperature (550 F maximum, except 400 F maximum for food service).*											

*Maximum figure should be considered for one condition only—not in combination or both.

ⓑ Internal Pressure and Temperature

(a) P x T Max.	(b) TEMP. °F Max.	(c) BASIC TYPE OF MATERIAL	(d) APPLICATION AND MEDIA	(e) J-M STYLE NO.
15,000	300	Rubber	General Service Oil & Petroleum Solvents	107 104C
40,000	250	Vegetable Fiber	General Service	711
75,000	500	TFE	Chemical Service	91
125,000	400	Rubberized Asbestos Cloth	General Service Gas, Oil	100 101
250,000 320,000	850 700	Compressed Asbestos	General Service Oils & Petroleum Solvents Strong Acids and Salts Controlled Swell Dielectric Properties	60 78, 76 86A 52 71

GLOSSARY OF RUBBER COMPOUND TERMS USED IN THIS BOOK

ASTM Reference	Composition	Former Designation Reference
SBR	Styrene-butadiene rubbers	GR-S or Buna S
CR	Chloroprene rubbers	Neoprene
NR	Isoprene rubber, natural	Natural rubber
IR	Isoprene rubber, synthetic	Natural Synthetic
NBR	Nitrile-butadiene rubbers	Buna N or Nitrile rubber
IIR	Isobutylene-isoprene rubbers	Butyl
ABR	Acrylate-butadiene rubbers	Polyacrylic rubber

FBW-109

J-M **Compressed** Physical Properties anc

	STYLE **60, 61**	STYLE **70**	STYLE **70C**
MATERIAL COMPOSITION	White Chrysotile Asbestos with SBR binder	White Chrysotile Asbestos with SBR binder	White Chrysotile Asbestos with Modified SBR Binder
COLOR	Style 60 is Slate Gray Style 61 is Egg Shell White	Slate Gray	Gray/Black
SPECIAL FEATURE	Style 60 General Service Conditions Style 61 For Food Service	Hot Oil Resistance Dense, Harder Than 60	Excellent Hot Oil Resistance
TENSILE STRENGTH Longitudinal Transverse Average	 5500 psi 2500 psi 4000 psi	 4500 psi 2500 psi 3500 psi	 6000 psi 3000 psi 4800 psi
COMPRESSIBILITY	11%	8%	9%
RECOVERY	55%	55%	50%
LOSS OF TENSILE (#3 OIL)	55%	55%	30%
THICKNESS INCREASE (#3 OIL)	35%	25%	20%
WEIGHT INCREASE (FUEL B)	20%	16%	13%
THICKNESS INCREASE (FUEL B)	15%	18%	13%
SHEET SIZES	40" x 42" 40" x 126" *50" x 50" *60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"	*40" x 63"	40" x 42" 40" x 126" 50" x 50" 60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"
THICKNESSES	1/64", 1/32", 1/16", 1/8", 3/16", 1/4"	1/64", 1/32", 1/16", 1/8", 3/16", 1/4"	1/64", 1/32", 1/16", 1/8"
NOMINAL WEIGHTS IN LBS. PER SQ. YD.	1/64" (1.36 lbs.), 1/32" (2.67 lbs.), 1/16" (5.35 lbs.), 1/8" (10.2 lbs.), 3/16" (15.1 lbs.), 1/4" (20.0 lbs.)	1/64" (1.3 lbs.), 1/32" (2.6 lbs.), 1/16" (5.2 lbs.), 1/8" (10.0 lbs.), 3/16" (14.8 lbs.), 1/4" (19.7 lbs.)	1/64" (1.36 lbs.), 1/32" (2.73 lbs.) 1/16" (5.45 lbs.), 1/8" (10.5 lbs.) 1/4" (19.7 lbs.)
SPECIFICATIONS MET — ASTM	D1170-P1161A	D1170-P1161A	D1170-P1151A
SAE	J90a-P1161A	J90a-P1161A	J90a-P1161A
Federal	HH-P-46C	HH-P-46C	HH-P-46C
Military	Mil-A-17472B MIL-G-12803A	Mil-A-17472B MIL-G-12803A	Mil-A-17472B —
Other	UL Guide 143A7 —	UL Guide 143A7 —	— —

*(Denotes sizes normally stocked in thickness up to and including 1/8")

**Except for tensile strength loss after immersion.

FBW-110

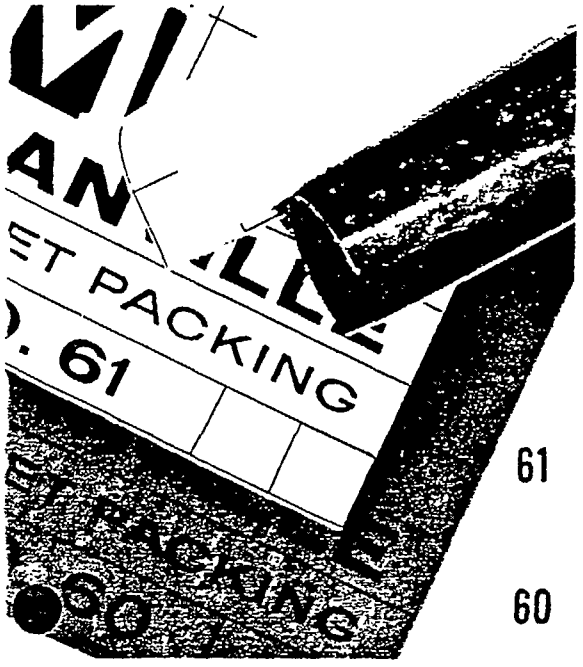
Asbestos Sheets
Specification Data†

	STYLE 71	STYLE 76	STYLE 78	STYLE 86A	STYLE 52
	White Chrysotile Asbestos with specially formulated binder	White Chrysotile Asbestos with CR Binder	White Chrysotile Asbestos with NBR Binder	Asbestos and specially formulated binder	Asbestos and specially formulated binder
	Gray	Black	Gray/Black	Blue-Gray	Tan
	Dielectric properties	Will Handle Refrigerants and Hot Oils	A low compressibility sheet with outstanding tensile properties and excellent for oil solvent service.	Acid Resistant	Controlled Swell
	4700 psi 2300 psi 3500 psi	5500 psi 2500 psi 4000 psi	7300 psi 4100 psi 5700 psi	6000 psi 2500 psi 4300 psi	7000 psi 3000 psi 5000 psi
	17%	9%	9%	14%	10%
	49%	65%	57%	45%	50%
	—	30%	12%	—	—
	—	20%	6%	—	75%
	—	13%	10%	—	—
	—	18%	8%	—	40%
	40" x 42" 40" x 126" *60" x 63" 60" x 126" 120" x 126"	40" x 42" 40" x 126" 50" x 50" 60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"	40" x 42" 40" x 126" 50" x 50" *60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"	40" x 42" 40" x 126" 50" x 50" 60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"	40" x 42" 40" x 126" 50" x 150" 60" x 63" 60" x 126" 75" x 75" 75" x 150" 100" x 150" 120" x 126" 150" x 150"
	1/64", 1/32", 1/16", 1/8", 3/16", 1/4"	1/64", 1/32", 1/16", 1/8"	1/64", 1/32", 1/16", 1/8"	1/64", 1/32", 1/16", 1/8"	1/64", 1/32", 1/16", 1/8", 3/16", 1/4"
	1/64" (1.0 lbs.), 1/32" (2.0 lbs.), 1/16" (4.0 lbs.), 1/8" (8.1 lbs.), 3/16" (12.1 lbs.), 1/4" (16.1 lbs.)	1/64" (1.6 lbs.), 1/32" (2.9 lbs.), 1/16" (5.8 lbs.), 1/8" (11.5 lbs.)	1/64" (1.4 lbs.), 1/32" (2.8 lbs.), 1/16" (5.6 lbs.), 1/8" (11.2 lbs.)	1/32" (2.6 lbs.), 1/16" (5.3 lbs.), 1/8" (10.7 lbs.)	1/32" (2.8 lbs.)
	— — — — — — —	D1170-P1151A J90a-P1151A — Mil-A-7021B Class I** MIL-G-12803A UL Guide 143A7 AMS 3232J	D1170-P1141A J90a-P1141A — Mil-G-18498B Mil-G-12803A — AMS 3232J	Not a "Specification" Sheet, but a functional design	

FBW-111

†Certification requirements must be stated in order.
The values given herein are average typical values obtained in accordance with accepted test methods and should not be used as a basis for specifications.

Johns-Manville

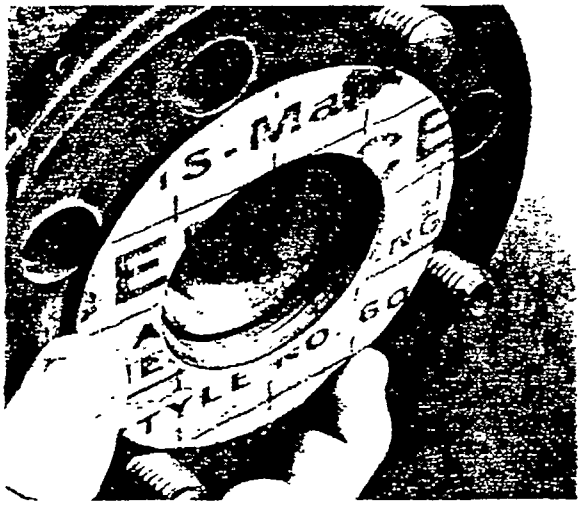


This rugged, compressed asbestos material is noted throughout industry for stability and versatility. Now available with parting agent applied to both sides.

J-M 60 Service Sheet makes sturdy, efficient seals, suitable for almost universal application against a wide range of conditions. Especially recommended for high pressure and high temperature use, Service Sheet is effective in general industrial processes and in refining and chemical processes. It seals superheated steam, air, gas, water, oil, ammonia, some acids and chemicals, and many other fluids and gases. Tough and durable, yet extremely pliable, it seats readily to form a tight seal, and retains its resiliency over a long period of time.

Easy to handle and cut, Service Sheet is carefully compounded from long-fiber asbestos, SBR synthetic rubber binder, fillers and curatives. It is then calendered and cured under heat and pressure. Possessing exceptional anti-aging characteristics and excellent stability, it does not dry out in storage.

J-M 61 Service Sheet contains all the attributes of Style 60, and is suitable for applications where color contamination may be obectionable.



J-M Non-Stick Parting Agent—The new non-stick parting agent is a clean surface lubricant coating applied to both sides of a compressed asbestos sheet. It prevents gaskets cut from our compressed asbestos sheets from sticking to flange faces and permits easy disassembly of the metal parts. J-M Parting Agent consists of a combination of non-stick substances applied to both sides of the sheet by precision equipment. It is regarded by authorities as a significant step forward towards upgrading the quality of sheet packings in the industry.

J-M Parting Agent is uniquely effective, but so sparingly applied that thickness tolerances are unaffected. The Parting Agent does not interfere with the excellent sealing qualities of J-M sheet packing – nor adversely affect gasket stress relaxation.

Users are not required to perform any additional treatment, such as coating with oil, etc. Simply install dry for best performance.

FBW-112

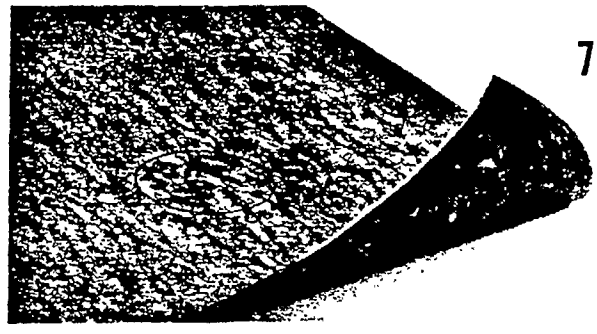
Compressed Asbestos Sheet

Sheets available for sealing those "Problem Areas"

J-M 70 Asbestos Sheet for critical services where a sheet harder and denser than Style 60 is required.

It is similar in construction to No. 60, except for hardness, density and treatment to improve resistance particularly to hot oil. Furnished only in 40" x 63" sheets in 1/64" thickness and up. Slate gray color.

Temperatures to 850 F.



J-M 70C – Similar to styles 60 and 70 but binder modified to give superior hot oil resistance than style 70. Style 70C is available in a full range of sheet sizes in thicknesses from 1/64" thru 1/8". *Gray-Black* in color.

Temperatures to 850 F.

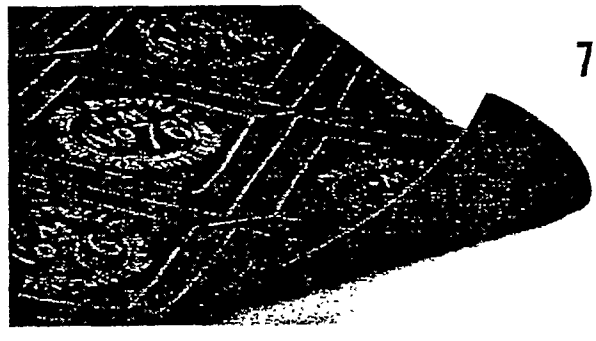
J-M 71 Asbestos Sheet for Electric Service is a high dielectric strength material. It is particularly efficient in service on heavy-duty transformers, electromagnets and similar applications where a firm but compressible gasket and voltage isolator combination is needed. This sheet has excellent general gasket characteristics with especially good sealing qualities because of softness. Also has excellent tensile strength properties.

Temperatures to 800 F.



J-M 76 Asbestos Neoprene-Bonded Sheet is a high tensile strength sheet for both high and low temperatures at low, medium and high pressures. It will handle hot oils, petroleum solvents, refrigerants such as Freon, animal and vegetable oils, carbon tetrachloride, etc. and is used extensively for aircraft applications.

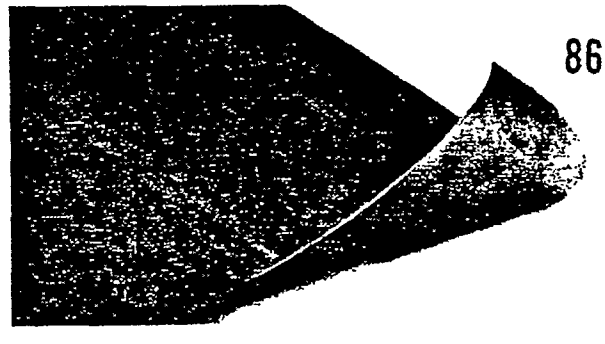
Temperatures to 750 F.



J-M 86A Acid-Resistant Sheet is a compressed asbestos sheet composed of long asbestos fibers combined with a special binder specifically formulated to resist attack by many acids and alkalies found in the chemical industry.

J-M Research tests showed the material to be highly resistant to attack after exposure to various concentrations of acids (nitric, hydrochloric, sulfuric).

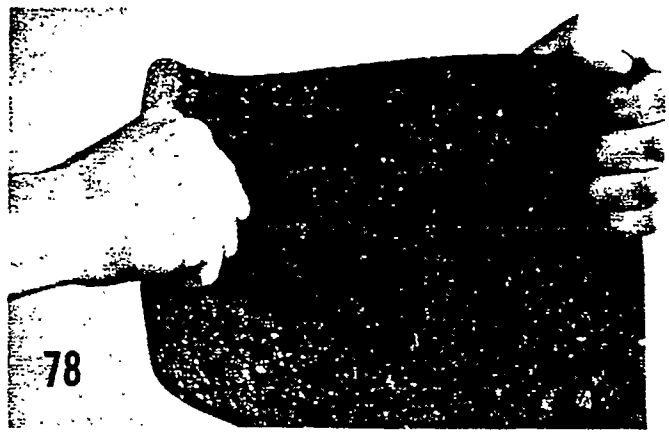
Temperatures to 850 F.



FBW-113

J-M **Compressed Asbestos** Sheet (continued)

Additional Sheet Styles for sealing those "Problem Areas"



J-M 78 Sheet provides improved oil resistance and increased tensile strength. New Buna-N Blend compressed Asbestos Sheet Packing is designed for sealing "problem areas" which previously required more costly packings. Style 78 offers higher-than-average resistance to many oils and solvents. It will handle hot oils, petroleum solvents, various refrigerants, animal, vegetable and hydraulic oils, carbon tetrachloride, fuel oils, and is highly suited for aromatic services.

J-M 78 is tough and strong, offering tensile strength 2 times greater than many Industry Specifications. It is particularly suitable to operations requiring a solvent-resistant material, great strength and low stress-relaxation. It offers valuable *PREMIUM* features, beyond the range of the excellent, versatile J-M Style 60.

Available with special J-M Parting Agent on request.

J-M 52 Sheet has controlled high swell characteristics to take advantage of the fluid being sealed and assist in forming a more nearly perfect seal. As the sheet swells it conforms to any irregularity on the surfaces being sealed without degrading in service. This material is unique compared to normal compressed asbestos sheets.

GENERAL NOTES

The figures given here can be used as a general guide in determining whether J-M Service Sheet gaskets might meet particular requirements. Actually, Service Sheet has been used effectively at temperatures higher than 850° F under certain conditions. Refer to discussion on Page 4, for added information on correct gasket selection.

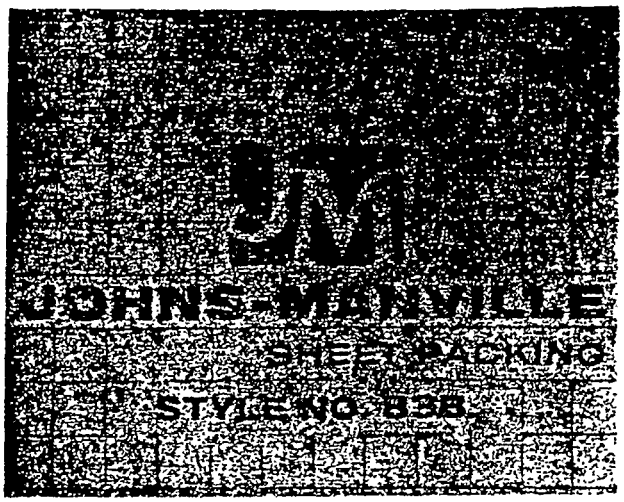
Temperature vs. Pressure	
65 F	2500 psi
250 F	1250 psi
400 F	800 psi
650 F	500 psi
850 F	300 psi

Compressed Asbestos Sheet Packings usually contain an asbestos fiber content of 65 to 75%, 10 to 20% rubber binders with the remaining percentages consisting of filler material and curatives.

FBW-114

J-M **Felted Asbestos** Sheet Packing

Soft, conformable sheet for severe conditions



J-M 219 Sheet is a felted sheet packing for sealing flanges, and other parallel surfaces on equipment handling hot combustion gases and similar media, where temperatures may reach 1000 F.

Made from long fiber asbestos, J-M 219 is a thoroughly felted asbestos millboard bonded with a special heat-resistant, rubberless binder. Formed on a wet machine compressed while wet, then dried properly under pressure, it is much stronger and more durable than ordinary felted sheets. It conforms readily, and is easily handled and worked. Natural white color.

Temperatures to 1000F, and higher (1500-1800F) in many special applications. Consult with your J-M Engineering Representative.

J-M 83B Acid-Resistant Sheet is a soft, conformable felted material. Used to seal lightly bolted, low-pressure flanges or assemblies, it can handle most acids. It is especially suitable for glass and glass-lined equipment. For higher pressures, see Chempac, p. 15.

Made of white Chrysotile asbestos, felted together and bonded with an acid-resistant compound.

Temperatures to 400F; pressures to 20 psi.
Blue-gray color.

FELTED ASBESTOS — Sizes, Approximate Weights and Method of Packaging

Style No.	Sheet size, inches	Approximate weight, lbs. per sheet									Form of Package
		1/32"	1/16"	3/32"	1/8"	5/32"	3/16"	1/4"	3/8"	1/2"	NOTE: Weights here are per sheet
83B	44" x 51"	—	4.3	—	8.6	—	—	—	—	—	
219	42" x 48"	2.1	3.9	6.2	8.2	10.2	12.0	15.7	23.1	30.3	Sheets furnished in standard carton quantities

J-M **Plant Fiber** Sheet Packing

• Economical general purpose materials for sealing petroleum products, hot or cold water.

J-M 711 Seigelite® plant fiber sheet is a strong, dense material impregnated with glue glycerine compound for sealing flanges handling gasoline, benzine, oil, greases and hot or cold water. It is also widely used for gaskets on automotive applications such as fuel pumps and oil filters where conditions do not demand the higher quality compressed asbestos materials.

Because of Seigelite's solvent resistance, it is preferred to rubber sheets or cloth-inserted rubber materials in many applications. Tough and resilient, it handles well, cuts cleanly, and can be used in minimum thicknesses. *Tan* color.

Temperatures to 250 F. At cold temperatures readily handles pressures to 500 psi.



PLANT FIBER — Sizes, Approximate Weights and Method of Packaging

Style No.	Sheet or Roll Size (inches)	Approximate weight, lbs. per square yard						Form of Package
		.010	1/64"	.020	1/32"	1/16"	1/8"	
711 Seigelite	Rolls 36" wide Sheets 36" x 48"	.36	.56	.70	1.1	2.15	4.40	Available in 1/8" thickness as 36" x 48" sheets, or in 25 linear yard rolls.
			—	—	—	—		

FBW-115

Johns-Manville

GENERAL PURPOSE SHEET STYLES

J-M 107 Liberty Red Rubber Sheet is an excellent grade rubber material for general service. It is non-staining and non-marking. It is suitable for medium pressure hydraulic applications such as hot and cold water, air and saturated steam. A relatively light weight material that remains soft and pliable, yet does not extrude in joints.

J-M 107 Liberty Sheet is made from a special heat-resistant SBR rubber compound. Using selected materials, it is calendered and vulcanized under careful control to assure uniformity. Has fine cloth imprint finish.

J-M 107 meets ASTM D-2000. AA805. D-1330 Gr.1.2.

Durometer hardness, 70-85. Temperature to 180°F.

J-M 109 Cloth-Inserted Rubber Sheet is particularly suited for general service against low-pressure cold water and where the additional strength of the cloth-inserted (C.I.) rubber is needed on narrow flanges employing high bolt forces. The cloth-inserted SBR rubber is specially compounded to retain resiliency and pliability when exposed to cold water conditions. Press vulcanized to a plate finish. *Black* color.

J-M 109 meets ASTM D-2000. AA805. D-1330 Gr.2.

Durometer hardness of rubber compound without fabric, 70-85. Temperature to 180°F.

J-M 110 Black Rubber Sheet is a hard general purpose sheet compounded of blended SBR rubber, and pressed to a smooth finish. It is a standard material intended for medium-pressure hydraulic applications such as hot and cold water, air, and saturated steam.

J-M 110 meets ASTM D-2000. AA805. D-1330 Gr. 2.

Durometer hardness, 70-85. Temperature to 180°F.

NEOPRENE SHEET STYLES

J-M 103C Neoprene Sheet is a high-grade sheet packing which resembles J-M 104C, but can be used where softer Neoprene packing is desired for light bolting or rough flanges. Press vulcanized to plate finish.

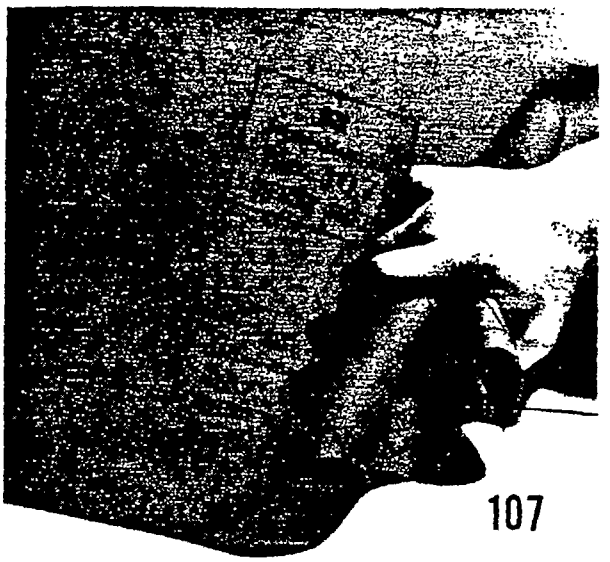
J-M 103C meets ASTM D-2000. 2BC405, A14 and MIL-R-3065C. SC-405.

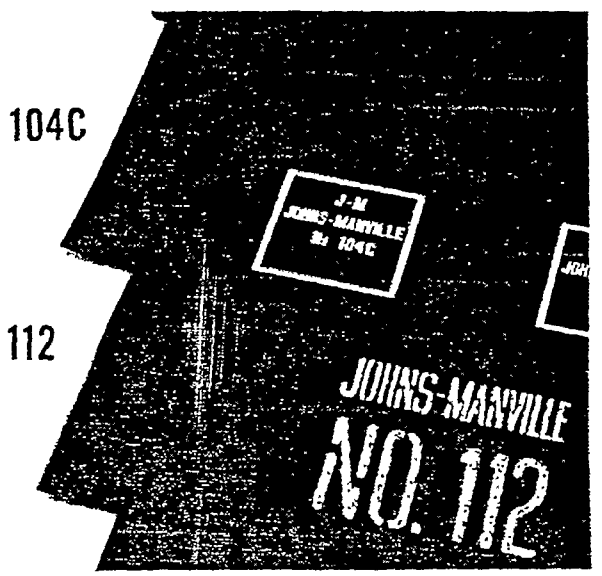
Durometer hardness, 35-45. Temperature to 250°F.

J-M 104C Neoprene Sheet is especially well suited for sealing oil, gasoline, and petroleum solvents. Compounded of CR (Neoprene) rubber that is relatively impermeable to gases, it effectively seals propane, butane, hydrogen, etc. (Neoprene is not recommended for chlorinated and aromatic solvents such as benzol and carbon tetrachloride.) Physically, J-M 104C has excellent tensile strength. Press vulcanized to a plate finish. *Black* color.

J-M 104C meets ASTM D-2000. 3BC605. A14 and MIL-R-3065C. SC-605.

Durometer hardness, 55-65. Temperature to 250°F.





J-M 111 Neoprene Sheet is a commercial grade Neoprene sheet with good oil-resisting qualities. Compounded of CR (Neoprene), it is the same as J-M 112 sheet packing but somewhat softer.

J-M 111 meets ASTM D-2000. 2BC505. A14 and MIL-R-3065C. SC-505.

Durometer hardness. 45-55. Temperature to 250° F.

J-M 112 Black-Oil Proof Rubber Sheet is a long-established oil-resisting sheet material. Made of a commercial grade CR (Neoprene), it is suitable for services not requiring the exceptional resistance of J-M 104C Neoprene Sheet to oil or gasoline. Press vulcanized to a plate finish.

J-M 112 meets ASTM D-2000. 3BC705. A14 and MIL-R-3065C. SC-705.

Durometer hardness. 65-75. Temperature to 250 F.

Rubber Sheet Packing

Rubber Styles

A complete range of materials in natural or synthetic rubber.

DIAPHRAGM SHEET STYLES

J-M 105 Neoprene Diaphragm Sheet is a high-grade, general purpose, diaphragm material with broad application in oil and gasoline service such as fuel pumps, control valves and similar uses. It contains high quality insertions of square-woven, medium-weight duck to give uniform structural strength over the entire diaphragm area. Press vulcanized to a plate finish. *Black* color.

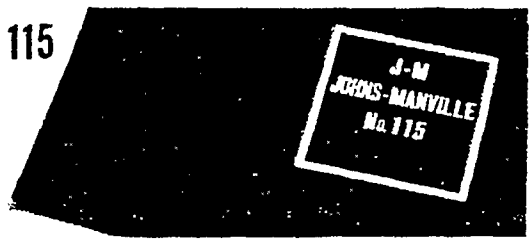
J-M 105 meets ASTM D-2000, 3BC710, A14, E34 and MIL-R-3065C, SC-710, AIE3.

Durometer hardness of rubber compound without fabric, 65-75. Average burst rating over 2-inch opening: 1-ply – 185 psi, 2-ply – 285 psi; 3-ply – 375 psi; 4-ply – 425 psi. Temperature to 250° F.

J-M 106-R Neoprene Diaphragm Sheet is a premium-grade, general-purpose material. Uses double-woven, nylon cloth insertion to provide great strength and good flexibility. It is recommended for diaphragm service in high-pressure systems. *Black* color.

J-M 106R meets ASTM D-2000, 3BC710, A14, E34 and MIL-R-3065C, SC-710, AIE3.

Durometer hardness of rubber compound without fabric, 55-65. Average burst rating over 2-inch opening: 1-ply – 900 psi; 2-ply – 1400 psi. Temperature to 250° F.



J-M 115 Rubber Diaphragm Sheet is an excellent grade SBR material with a cotton duck insertion. Gives outstanding service on damper regulators, control valves, etc.

The SBR rubber compound used in J-M 115 offers maximum resistance to air, water, and steam. Not recommended for oil. The duck insertion is square woven, of medium sensitivity, and supplies the correct response and a balanced structural strength over the entire diaphragm area. Press vulcanized to a plate finish. *Black* color.

J-M 115 meets ASTM D-2000, 4AA615, A13, B13 and MIL-R-3065C, RS615.

Durometer hardness of rubber compound without fabric, 55-65. Average burst rating over 2-inch opening: 1-ply – 150 psi; 2-ply – 230 psi; 3-ply – 320 psi; 4-ply – 350 psi. Temperature to 180° F.

SBR and NATURAL RUBBER STYLES

J-M 113 Natural Rubber Sheet is a tan, full-floating, pure gum, non-staining rubber which resists most inorganic salts, ammonia, acids and alkalies. Made of the best quality NR (natural rubber), J-M 113 deforms easily and recovers readily on doors, closures and rough flanges, such as refrigeration applications, marine service, and general industrial gasket.

J-M 113 meets ASTM D-2000, 4AA430, A13 and MIL-R-3065C, RN430A.

Durometer hardness, 35-45. Temperature to 200° F.

J-M 114C Black Rubber Sheet is an SBR material which can be used in service against mild acid. Also suited for hot and cold water, air, and saturated steam. It is a medium-hard, high-grade rubber with a plate finish.

Durometer hardness, 55-65. Temperature to 180°F.

NITRILE SHEET STYLES

J-M 126 Nitrile Rubber Sheet is a soft, high-grade sheet packing recommended as gasketing material for solvents and aromatic fuels. NBR (Nitrile, Buna N) is resistant to the effects of sunlight, and has low water absorption characteristics.

J-M 126 meets ASTM D-2000, 5BG415, A14, B14, E34, F19, and MIL-R-3065C, SB415, A, B, E3, F2, MIL-R-15624E, Class III and MIL-R-6855C, Class I, Grade 40.

Durometer hardness, 35-45. Temperature to 250° F.

J-M 127 Nitrile Rubber Sheet is a firm, high-grade NBR (Nitrile, Buna N) sheet similar to J-M 126, but has higher durometer.

J-M 127 meets ASTM D-2000, 5BG615, A14, B14, E34, F19 and MIL-R-3065C, SB615, A, B, E3, F2 and MIL-R-6855C, Class I, Grade 60.

Durometer hardness, 55-65. Temperature to 250° F.

FBW-117

J-M **Rubber Sheet** Packings

DATA and SPECIFICATIONS

Style No.	Durometer	Elastomer	Temp. & Press. Limits	Roll Width	Approximate Weights lbs. per sq. yd.					Specifications Met	
					1/32"	1/16"	1/8"	3/16"	1/4"	ASTM	Military
103C	35-45	Neoprene	250°F 150 PSI 50 PSI Steam	36"	2.0	4.0	8.2	12.3	16.4	D-2000 2BC405,A14	SC-405
104C	55-65	Neoprene	250°F 200 PSI 50 PSI Steam	36"	2.1	4.2	8.4	12.6	16.8	D-2000 3BC605,A14	SC-605
105	65-75	Neoprene Diaphragm (Duck Insertion)	250°F 185 PSI Burst Rating 1-Ply	50"	—	3.8	8.4	13.3	15.2	D-2000 3BC710,A14,E34	MIL-R-3065C SC-710, AIE 3
106R	55-65	Neoprene Diaphragm (Nylon Insert)	250°F 900 PSI Burst Rating 1 Ply	56"	—	4.0	8.5	12.0	16.0	D-2000 3BC710,A14,E34	MIL-R-3065C SC-710 AIE 3
107	70-85	SBR	180°F 200 PSI 50 PSI Steam	36" (72" special)	2.6	5.2	10.5	15.7	21.0	D-2000 AA 805 D 1330 GR 1 & 2	—
109	70-85	Black Rubber- (Duck Insert)	180°F 500 PSI	36" (72" special)	—	3.7	10.0	11.1	14.8	D-2000 AA 805 D 1330 GR 2	—
110	70-85	SBR	180°F 200 PSI 50 PSI STEAM	36"	2.5	5.0	10.0	15.0	20.0	D-2000 AA 805 D 1330 GR 2	—
111	45-55	Neoprene	250°F 150 PSI 50 PSI Steam	36"	—	3.9	8.1	11.7	15.6	D-2000 2BC505,A14	MIL-R-3065C SC-505,
112	65-75	Neoprene	250°F 200 PSI	36"	—	4.2	8.5	12.6	16.8	D-2000 3BC705,A14	MIL-R-3065C SC-705,
113	35-45	Natural Rubber	200°F 150 PSI	36"	1.5	2.9	5.8	8.7	11.6	D-2000 4AA430,A13	MIL-R-3065C RN-430 A
114C	55-65	SBR	180°F 200 PSI	36"	—	4.4	7.2	10.8	15.0	—	—
115	55-65	SBR Diaphragm (Duck Insert)	180°F 150 PSI Burst Rating 1 Ply	54"	—	3.8	7.8	11.4	15.2	D-2000 4AA615,A13,B13	RS 615
126	35-45	Nitrile	250°F 150 PSI	36"	—	3.5	7.0	10.5	14.0	D-2000 5BG415,A14,B14, E34,F19	MIL-R-3065C SB415,A,B, E3,F2 MIL-R-15624E Class III MIL-R-6855C Class I Grade 40
127	55-65	Nitrile	250°F 200 PSI	36"	—	3.5	7.0	10.5	14.0	D-2000 5BG615,A14,B14, E34,F19	MIL-R-3065C MIL-R-6855C Class I Grade 60

NOTES: All Rubber Sheet Materials Are Sold in Roll Form in the Widths Indicated Above. Roll Sizes Are: Styles 103C, 104C, 111, 112, 113, 114C, 115, 126, 127 – 50 yd. rolls – 1/32" thick. 100 lb. rolls – 1/16", 3/32", 1/8" thick. 27 ft rolls – 3/16" thick. 40 ft. rolls – 1/4", 3/8" thick. 20 ft. rolls – 1/2" to 2" thick. Styles 105, 106R, 107, 109, 110 – 100 lb. rolls – 72" wide. 200 lb. rolls. Thicker sizes are available in many styles and made to order. Consult your J-M Representative.

FBW-118

J-M **Kearsarge**® Sheet Material

Rubberized woven asbestos material for sealing rough, pitted or warped surfaces.

Strong asbestos fabric unsurpassed for service in combustion engines.

J-M 100 Kearsarge Asbestos Brass Wire Inserted Sheet is a flexible, woven sheet packing for use against steam, water and air. Its adaptable but sturdy construction helps make a tight seal against low, medium or high pressures between rough or warped flanges where other materials do not seal effectively.

J-M 100 is made of tightly twisted and woven brass wire inserted asbestos yarns. The material is impregnated and coated with a heat-resistant SBR rubber compound. White color.

It is recommended that flanges using J-M 100 gaskets should be retightened 1-3 hrs. after installation at temperatures over 100F. Internal pressure during this period should be as low as possible.

Temperatures to 450 F; pressures to 500 psi.

J-M 101 Mobilene Sheet is especially recommended for gas, gasoline and diesel engine service. The original "Red and Black" sheet packing Mobilene has, for over 50 years, been unsurpassed for gasketing rough cast flanges such as exhaust manifold flanges, water jacket connections, and some cylinder head applications. It has many applications in marine equipment.

Mobilene 101 is a woven, brass-wire inserted asbestos sheet with special red SBR rubber compound impregnation to withstand temperatures and pressures encountered in services indicated. Heavy graphite coating on one side permits opening a joint without destroying the gasket.

Temperatures to 400 F; manifold appl. to 800 F; pressures to 500 psi.

WOVEN ASBESTOS—Sizes, Approximate Weights and Method of Packing

Style No.	Width of Rolls	Approximate weight, lbs. per square yard					Form of Package
		Nominal Thickness					
		1/32"	1/16"	1/8"	3/16"	1/4"	
100 101	48" wide (3/16" and 1/4" thicknesses in 48" x 48" sheets only)	4.1	5.8	11.5	17.5	23.0	100 lb. and 250 lb. rolls. One or more rolls per carton. Exception 3/16" and 1/4" sheets crated flat.

J-M **Chempac**® Sheet Material

- resist most solvents, caustics and acids

Chempac is the Johns-Manville trade name applied to a range of J-M Asbestos-TFE materials. Each style provides the excellent sealing and heat resistant qualities of asbestos, plus the immunity of TFE to almost all chemical and solvent action. These high density sheets are designed for use on conventional metal flanges where strong solvents, caustics and acids must be contained.

Chempac Sheet consists of asbestos cloth impregnated with TFE suspensoid and carefully plied. It is free from cracks, flaws or porosity. The finished sheet offers greater mechanical strength than TFE alone and seals effectively at low bolt stresses. It exhibits no cold flow, withstands a wide range of pressures, and the asbestos offers added protection against blow-out.



J-M 91 Chempac Sheet is a high density, low porosity material primarily for solvent and caustic service but also may be satisfactory in weak or dilute acid conditions. It is made from white asbestos cloth and treated with TFE suspensoid. Excellent for Liquid Oxygen (LOX) and cryogenic services. All white color.
Temperatures —320F to 500F; pressures to 750 psi.

CHEMPAC — Style No 91

Sheet Size	20" x 20", 40" x 40"	Approximate weight, lbs per sheet	
Nominal Thickness	3/32"		
Actual Thickness	style 91 . . . .084" ± .010.	Style 91	20" x 20" 2.39
			40" x 40" 9.55

FBW-119

Flexible Asbestos Firewall Fabric

- light, flexible aircraft firewalls that resist flame, vibration and oil — meet requirements of Aircraft and Missiles.

J-M Coated Asbestos Firewall Sheets are widely used on all classifications of civil and military aircraft. Their fire-proofing applications include use as local fire barriers to seal off engine areas; as boots, bellows, or expansion joints; as binding on mating edges of metal parts; and other firewall uses. The materials also adapt to similiar industrial services where a light, flexible flameproof sheet material is required.

J-M Firewall Sheets consist of fabric made from Commercial or AA Grade white asbestos yarns, plain or wire-reinforced. The cloth is impregnated and coated on both sides with a flameproof compound. The end product is a non-porous, non-fraying sheet offering exceptional flame resistance despite long exposure to oils and vibration.

Fireproof materials must pass the most severe test, *Fire-Resistant* materials next, and down through *Flame-Resistant* to *Flash-Resistant* materials. Reference Civil Aeronautics Manual dated September 1962 4b.1(g)(1) Fireproof; 4b.1(g)(2) Fire Resistant; 4b.1(g)(3) Flame Resistant; 4b.1(g)(4) Flash Resistant.

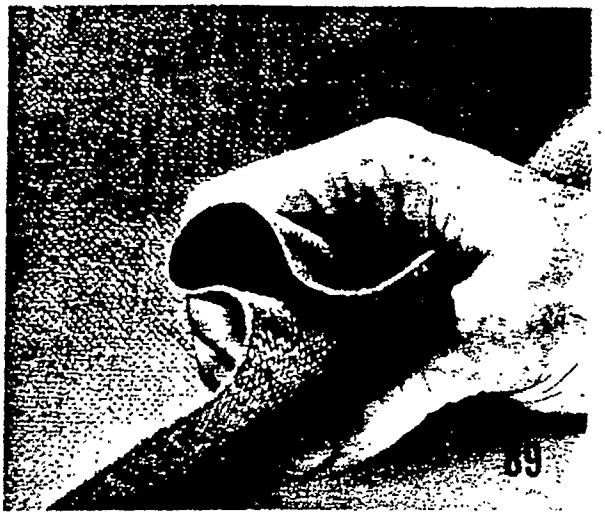
J-M 95 Firewall Sheet is made of plain, commercial grade, asbestos cloth without wire insertion. It is impregnated and coated with a Johns-Manville flameproof compound containing neoprene. Meets MIL-C-7637 Type I requirements.

Withstands 2000 F flame for at least 15 minutes; constant operating temperatures to 250 F.

J-M 96 Firewall Sheet is made of commercial grade asbestos cloth, woven from yarn containing brass wire insertion. It is impregnated and coated with a Johns-Manville compound containing neoprene. Meets MIL-C-7637 Type II requirements.

J-M 96 is the basic firewall material developed by Johns-Manville, for the Aviation Industry, to handle the many area fireproofing requirements found on aircraft. Strips and pieces are also used as a flame and fuel-resistant cushion between light metal framework flanges.

Withstands 2000 F flame for at least 15 minutes; constant operating temperatures to 250 F.



J-M 89 Firewall Sheet was developed to meet aircraft manufacturers' requirements for a firewall sheet with the lightest possible weight. Meets FAA fireproof requirements.

J-M 89 is made from AA Grade (90-94%) white asbestos cloth, each yarn having a fine Inconel wire reinforcement. The cloth is coated and impregnated with the same J-M flameproof compound used in Styles 95 and 96.

Withstands 2000 F flame for at least 15 minutes; constant operating temperatures to 250 F.

J-M 88 Firewall Sheet meets the need for a sheet with increased resistance to solvents, hydraulic liquids and other fluids. Meets FAA fireproof requirements.

J-M 88 is made from AA Grade (90-94%) white asbestos cloth, each yarn having a fine Inconel wire reinforcement. It is then impregnated and coated with a flameproof, fluoro-elastomer compound.

Withstands 2000 F flame for at least 15 minutes; constant operating temperatures to 400 F.

For special aircraft and missile requirements, Johns-Manville furnishes asbestos fabrics treated with Silicone cements and rubbers, TFE, flameproof aluminum cements and various new high-temperature sizings.

ORDERING INFORMATION: SIZES, APPROXIMATE WEIGHTS

STYLE NO.	ROLL OR SHEET SIZES, INCHES	APPROX WT., LBS. PER SQ. YARD		
		3/64"	1/16"	1/8"
95	3/64" and 1/16" thick - 50 yard rolls, 36" wide		4.9	10.0
96			5.1	10.5
89	1/8" thick - 25 yard rolls, 36" wide	3		
88		3¼		

FBW-120

Specification Table

J-M Gasket Materials

SPECIFICATION	J-M STYLE NO.
ASTM	
D-2000 (Replaces D735)	
4AA430, A13	113
4AA615, A13, B13	115
AA805	107,109,110
D1330 GRADE 1 & 2	107
5BG415, A14, B14, E34, F19	126
5BG615, A14, B14, E34, F19	127
2BC505, A14	111
3BC710, A14, E34	106R
3BC705, A14	112
3BC710, A14, E34	105
D1170	
GRADE P1141A	78
P1151A	76, 70C
P1161A	60, 61, 70
P3313B	711
D1330	
GRADE 2	109, 110
SAE	
J90a	
GRADE P1141A	78
P1151A	76, 70C
P1161A	60, 61, 70
P3313B	711
FEDERAL	
HH-P-46C	60, 61, 70, 70c
HH-P-0096F	
TYPE I	711

SPECIFICATION	J-M STYLE NO.
MILITARY	
MIL-A-7021C	
CLASS I	76**
MIL-A-17472B	60, 61, 70, 70c
MIL-G-12803A	60, 61, 70 76, 711*
MIL-G-18498B	78
MIL-R-3065C (MIL-STD-417)	
CLASS RN430A	113
SB615,A,B,E3,F2	127
SB415,A,B,E3,F2	126
SC-405	103C
SC-710, A1E3	105, 106R
SC-605	104C
MIL-R-6855B	
CLASS I GRADE 40	126
CLASS II GRADE 60	127
MIL-R-15624E	
CLASS III	126
UNDERWRITERS LABORATORY	
GUIDE 143A7	60, 61, 70, 76, 711
OTHER	
AMS-3232J	76, 78

Certification requirements must be stated on order. Consult your J-M representative for detailed information.

*Doesn't meet all thickness tolerances and fungus resistance test.

**Except corrosion requirement.

PRODUCT WARRANTY

All Products sold are subject to the following warranty: J-M warrants for a period of one year from date of delivery to the original retail purchaser that the Product is free from defects in materials and workmanship. SELLER MAKES NO OTHER REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION, THE WARRANTY OF MERCHANTABILITY OR THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. The limit of J-M's liability for failure of its Product to meet the foregoing warranty shall be, at J-M's sole option, repair or replacement of the defective Product and shall exclude any damage covered by misuse or abuse of the Product during installation. IN NO EVENT SHALL J-M BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

The physical properties herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check the Johns-Manville district office to assure current information.

MEMBER
FLUID SEALING ASSOCIATION

FBW-121

Metric Conversion Tables

Centigrade	Fahrenheit
−80	−112.0
−70	− 94.0
−60	− 76.0
−50	− 58.0
−40	− 40.0
−30	− 22.0
−25	− 13.0
−20	− 4.0
−15	+ 5.0
−10	14.0
− 5	23.0
0	32.0
5	41.0
10	50.0
15	59.0
20	68.0
25	77.0
30	86.0
35	95.0
40	104.0
45	113.0
50	122.0
55	131.0
60	140.0
65	149.0
70	158.0
75	167.0

Centigrade	Fahrenheit
80	176.0
85	185.0
90	194.0
95	203.0
100	212.0
105	221.0
110	230.0
115	239.0
120	248.0
125	257.0
130	266.0
135	275.0
140	284.0
150	302.0
160	320.0
170	338.0
180	356.0
190	374.0
200	392.0
210	410.0
220	428.0
230	446.0
240	464.0
250	482.0
260	500.0
270	518.0
280	536.0

Centigrade	Fahrenheit
290	554.0
300	572.0
310	590.0
320	608.0
330	626.0
340	644.0
350	662.0
360	680.0
370	698.0
380	716.0
390	734.0
400	752.0
410	770.0
420	788.0
430	806.0
440	824.0
450	842.0
460	860.0
470	878.0
480	896.0
490	914.0
500	932.0
510	950.0
520	968.0
530	986.0
540	1004.0
550	1022.0

$°F = 9/5(°C + 32)$ $°C = 5/9(°F - 32)$

INCHES TO MILLIMETERS			
In.	Mil.	In.	Mil.
1	25.4	51	1295.4
2	50.8	52	1320.8
3	76.2	53	1346.2
4	101.6	54	1371.6
5	127.0	55	1397.0
6	152.4	56	1422.4
7	177.8	57	1447.8
8	203.2	58	1473.2
9	228.6	59	1498.6
10	254.0	60	1524.0
11	279.4	61	1549.4
12	304.8	62	1574.8
13	330.2	63	1600.2
14	355.6	64	1625.6
15	381.0	65	1651.0
16	406.4	66	1676.4
17	431.8	67	1701.8
18	457.2	68	1727.2
19	482.6	69	1752.6
20	508.0	70	1778.0
21	533.4	71	1803.4
22	558.8	72	1828.8
23	584.2	73	1854.2
24	609.6	74	1879.6
25	635.0	75	1905.0
26	660.4	76	1930.4
27	685.8	77	1955.8
28	711.2	78	1981.2
29	736.2	79	2006.6
30	762.0	80	2032.0
31	787.4	81	2057.4
32	812.8	82	2082.8
33	838.2	83	2108.2
34	863.6	84	2133.6
35	889.0	85	2159.0
36	914.4	86	2184.4
37	939.8	87	2209.8
38	965.2	88	2235.2
39	990.6	89	2260.6
40	1016.0	90	2286.0
41	1041.4	91	2311.4
42	1066.8	92	2336.8
43	1092.2	93	2362.2
44	1117.6	94	2387.6
45	1143.0	95	2413.0
46	1168.4	96	2438.4
47	1193.8	97	2463.8
48	1219.2	98	2489.2
49	1244.6	99	2514.6
50	1270.0	100	2540.0

MILLIMETERS TO INCHES			
Mil.	In.	Mil.	In.
1	0.039370	51	2.007874
2	0.078740	52	2.047244
3	0.118110	53	2.086614
4	0.157480	54	2.125984
5	0.196850	55	2.165354
6	0.236220	56	2.204724
7	0.275591	57	2.244094
8	0.314961	58	2.283465
9	0.354331	59	2.322835
10	0.393701	60	2.362205
11	0.433071	61	2.401575
12	0.472441	62	2.440945
13	0.511811	63	2.480315
14	0.551181	64	2.519685
15	0.590551	65	2.559055
16	0.629921	66	2.598425
17	0.669291	67	2.637795
18	0.708661	68	2.677165
19	0.748031	69	2.716536
20	0.787402	70	2.755906
21	0.826772	71	2.795276
22	0.866142	72	2.834646
23	0.905512	73	2.874016
24	0.944882	74	2.913386
25	0.984252	75	2.952756
26	1.023622	76	2.992126
27	1.062992	77	3.031496
28	1.102362	78	3.070866
29	1.141732	79	3.110236
30	1.181102	80	3.149606
31	1.220472	81	3.188976
32	1.259843	82	3.228346
33	1.299213	83	3.267717
34	1.338583	84	3.307087
35	1.377953	85	3.346457
36	1.417323	86	3.385827
37	1.456692	87	3.425197
38	1.496063	88	3.464567
39	1.535433	89	3.503937
40	1.574803	90	3.543307
41	1.614173	91	3.582677
42	1.653543	92	3.622047
43	1.692913	93	3.661417
44	1.732283	94	3.700787
45	1.771654	95	3.740157
46	1.811024	96	3.779528
47	1.850394	97	3.818898
48	1.889764	98	3.858268
49	1.929134	99	3.897638
50	1.968504	100	3.937008

FBW-122

NEED INFORMATION ON OTHER J-M PRODUCTS & SYSTEMS?



Finding out about them could save you time and money.
Call the new Johns-Manville
PRODUCT INFORMATION CENTER
at (303) 770-1000, Ext. 2745. Give us a buzz soon!



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FBW-123

PK 132A Rev. 9-74

Litho in US

Johns-Manville 12 packings for pumps and valves that cover 95% of industry needs



Index

STYLE NUMBER	PAGE
CW1	3
CW2	3
CG1	3
CF1	3
CP1	3
CX1	3
CT1	3
VG1	4
VT1	4
VX1	4
RG1	5
PG1	5

TABLE A

STYLE NUMBER CODE EX.

C X 1

- C — Centrifugal Pump Pkg.
- X — Acid Service
- 1 — First Recommendation

TABLE B

APPLICATION OR EQUIPMENT SYMBOLS

- C—Centrifugal pump
- V—Valves, Expansion joint
- R—Reciprocating rods
- P—Pistons

TABLE C

SERVICE CLASSIFICATION SYMBOLS

	Media pH Range
G—General	4 to 10
T—Caustic	10 to 14
P—Pulp and paper	4 to 10
F—Food	4 to 10
W—Water	6 to 8
S—Solvents	4 to 10
X—Acids	0.1 to 2
T—Any service above except strong acids pH 0 to 2	

PRODUCT WARRANTY

J-M Products are warranted free from defects in workmanship and in raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

"The physical (or chemical) properties of Johns-Manville pump and valve packings represent typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check the Johns-Manville district office to assure current information."

EQUIPMENT / MEDIA BEING SEALED	SIMPLIFIED PACKING SELECTION								
	ACIDS	CAUSTICS	GENERAL	PULP & PAPER	FOODS	COLD WATER	STERN TUBES	STEAM	SOLVENTS
(MEDIA SYMBOLS)	X	T	G	P	F	W	W	G	S
CENTRIFUGAL	CX1	CT1	CG1	CP1	CF1	CW1	CW2		CT1
RECIPROCATING & EXPANSION JOINTS		VT1	RG1		VT1	RG1		RG1	
VALVES	VX1	VT1	VG1	VG1	VT1	VG1		VG1	VG1
PISTONS			PG1			PG1			

FBW-125

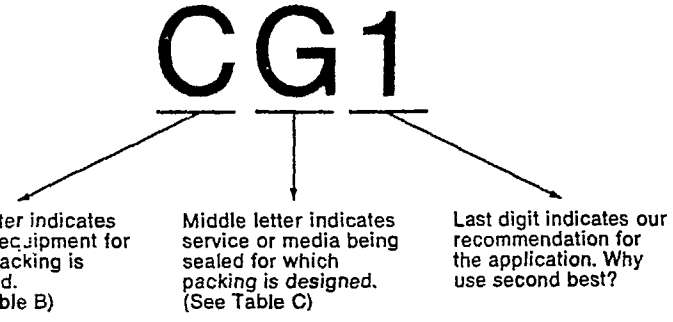
Johns-Manville Simplified Packing Procedures

Twelve styles are all you need

1. The 12 styles of mechanical packing shown in this catalog will handle 95% of industrial sealing requirements and are designed to avoid duplication of inventories.

2. To back up your distributor and his inventory, J-M maintains over half a million dollars on-the-shelf stock of the items in this book. This assures that all your packing requirements will be met without delay.

Selecting the right style of packing



Further simplification if desired

1. Styles with "T" as the middle letter (ex CT1) are suitable for any service or media shown in Table C except for aggressive acids with a pH from 0.1 to 2.

The following styles could service many industries:

a. CT1—Centrifugal pumps

b. VG1—Valves

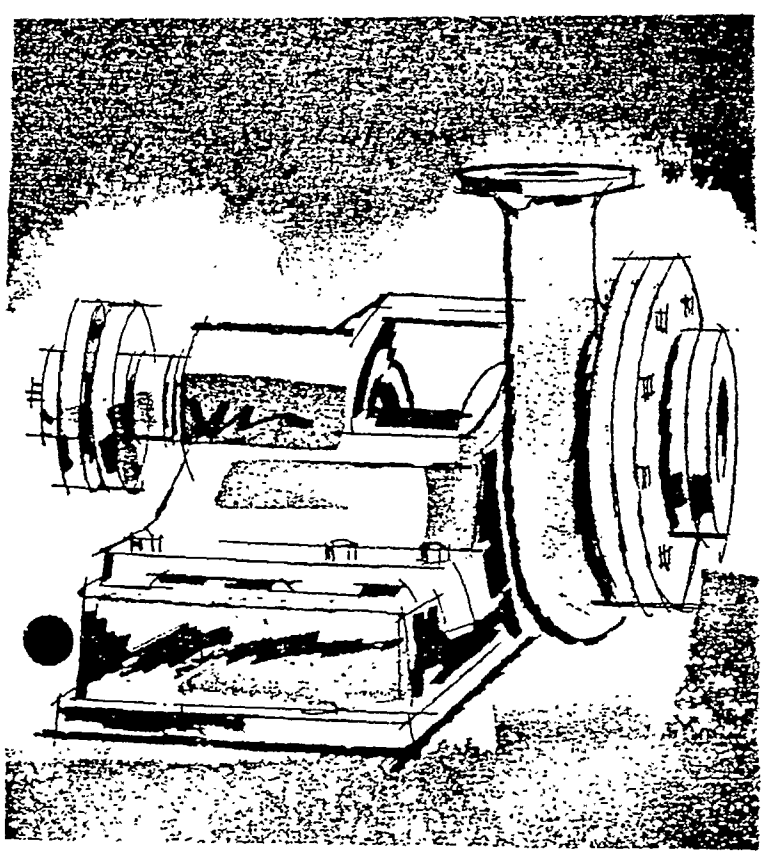
Johns-Manville

Centrifugal Pump Packings

CENTRIFUGAL PUMPS

Styles	Base Material	Impregnation or Lubricant	Finish Treatment	Temp. Limit	pH Range	Service
CW1	Ramie	Petroleum base oils & waxes	None	200°F.	6 to 8	Cold water
CW2	Flax	Petroleum base oils, waxes and animal fat	None	100°F.	6 to 8	Cold water
CG1	Asbestos	Petroleum base wax	Graphite	500°F.	4 to 10	General Service
CF1	Asbestos	Non toxic compounds and oils and a special inert grease	Mica	300°F.	4 to 9	Foods
CP1	Asbestos	Petroleum base waxes & oils—no graphite	None	500°F.	4 to 10	Pulp and Paper
CX1	White Teflon Yarns	Teflon suspensoid & inert oil	None	500°F.	0 to 14	Acid
CT1	Asbestos	Teflon Suspensoid & Low friction Lubricant	None	500°F.	2 to 13	Any service except strong acids pH 0 to 2

MANY CUSTOMERS STANDARDIZE WITH STYLE CT1 as it is compatible with all media except strong acids within the pH range of 0.1 to 2.



Service Classification Symbols

G—General

T—Caustic

P—Pulp and paper

F—Food

W—Water

S—Solvents

X—Acids

T—Any service above except strong acids pH .1 to 2

Valve Stem Packings

VALVES

Styles	Base Material	Impregnation or Lubricant	Finish Treatment	Temp. Limit	Pressure Range	Service
VG1	Asbestos Jacket Inconel wire inserted over plastic core	Corrosion inhibitor	Graphite	1200°F	Up to 5000 psi	General service
VT1	Asbestos	Teflon Suspensoid	None	500°F	400 psi	Chemical service ph 2 to 13
VX1	Teflon Yarn	None	None	500°F	400 psi	Acid Service (X)

Service Classification Symbols

G—General

T—Caustic

P—Pulp and paper

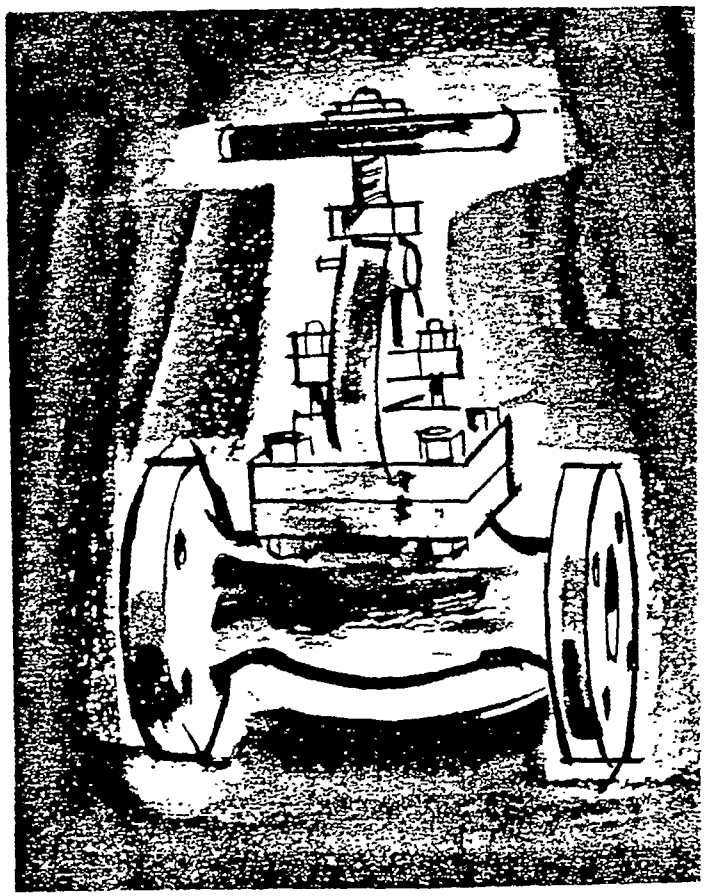
F—Food

W—Water

S—Solvents

X—Acids

T—Any service above except strong acids pH .1 to 2



Other Applications

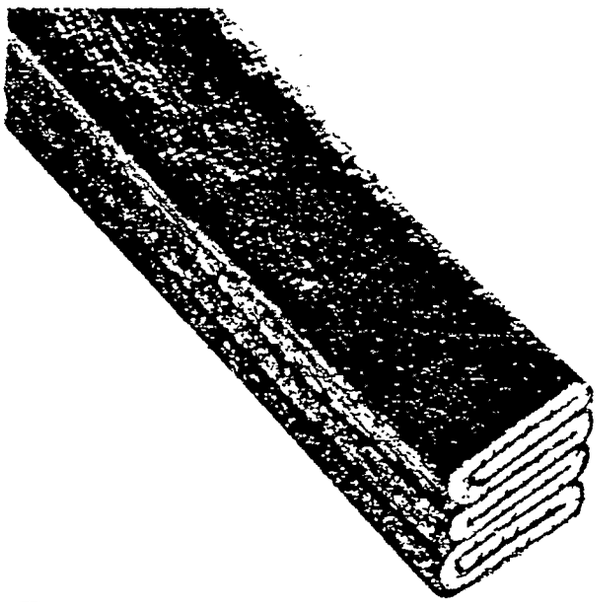
RECIPROCATING PUMPS

Styles	Base Material	Impregnation or Lubricant	Finish Treatment	Temp. Limit	Service
RG1	Resilient core wrapped with asbestos cloth	Vegetable oil	Graphite	500°F.	Air, steam, water

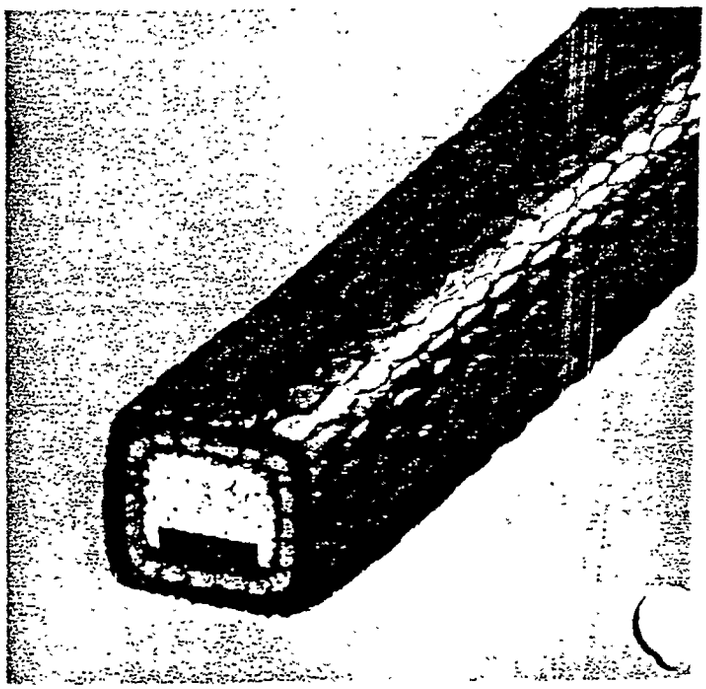
PISTONS

PG1	Neoprene treated folded asb. cloth and duck. Bonded with neoprene base cement	None	None	350°F.	Weak caustics and acids, brine, air, water, petroleum prod.

PG1 Pistons



RG1 Reciprocating Rods



FBW-129

Helpful suggestions on handling packings

HOW TO GET THE BEST RESULTS FROM PACKINGS

There are four main factors that influence the life and performance of packings in service. Give careful attention to all these factors and the most satisfactory service will be assured.

Quality of Packing Used—Packing costs far less than the labor and lost production time of re-packing. The use of poor quality packing can sometimes result in damage to equipment. The best quality packing is the cheapest.

The Right Style for the Service—The recommendations in this book are based on Johns-Manville's research plus practical field service. For special cases, consult your J-M Packing Distributor or J-M Sales Engineer.

Mechanical Condition of Equipment—It pays to use high quality equipment that is properly maintained. If bearings, shafts, sleeves or guides are in bad condition, the result is poor sealing, short packing life.

Packing Installation and Lubrication—Properly installed and lubricated, packings help equipment operate efficiently. The suggestions below have been found helpful.

HOW TO PACK STUFFING BOXES

Pumps and Agitators

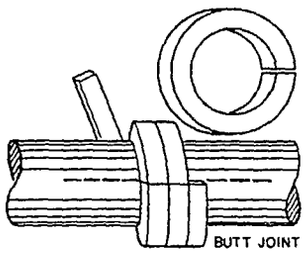
1. Remove all old packing from the stuffing box. Clean the box and shaft thoroughly and examine shaft for wear or scoring. Replace shaft or sleeve if wear is excessive. Check bearing by lifting shaft up and down; do not expect the packing to act as a bearing.

2. Use the right size of coil packing, to be sure the packing will fit and can compensate for shaft wear, if any. To determine the correct coil packing size, measure the diameter of the shaft (inside the stuffing box area if possible) and then measure the inside diameter of the stuffing box itself (to give you the O.D. of the ring). Subtract the I.D. measurement (the shaft diameter) from the O.D. measurement and divide by two. The result is the required size.

Except for special precision molded packings, all standard shaft packings are made up in increments of 1/16" from the smallest size available and up. For most applications if the calculated size figures under a 16th of an inch it is generally best to use the next size greater. Thus, if the shaft measures 2-1/2" and the inside of the stuffing box 3-7/16", the size of coil packing to use would be 1/2" rather than 7/16".

3. Cut packing into rings. Never wind packing into a stuffing box. For pumps and agitators cut rings with a butt (square) joint; it is easier and you can do a better job.

The best way to cut packing rings is to cut them on a mandrel the same diameter as the shaft in the stuffing box area. If there is no shaft wear, they can be cut on the shaft itself outside the stuffing box if there is room. Hold the coil packing tightly and firmly on the mandrel but do not stretch it excessively. Cut the ring and try it in the stuffing box to make certain that it fills the packing space properly with no gap in the joint at the O.D. of the ring.


BUTT JOINT

Each successive ring 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 rings are cut on a flat surface be certain that the *side* of the master ring, and not the O.D. or I.D. surface is laid on the rings to be cut; this is necessary so that the slight bevel at the ends of the rings be reproduced. Remember that the O.D. circumference of the ring is greater than the I.D. circumference.

4. To cut rings from a packing that is unusually soft or that has a tendency to fray excessively, some mechanics apply a small piece of tape at the point where the cut is to be made, then cut through the tape. If the tape is thin, it can be left right on the ring.

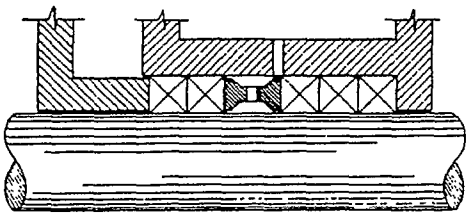
5. Install one ring at a time. Make sure it is clean, and has not picked up any dirt in handling before installing it. If clean oil is available it is well to lubricate each ring thoroughly; some mechanics also lubricate the shaft and the inside of the stuffing box.

Joints of successive rings should be staggered and be kept at least 90° apart. Each individual ring should be firmly seated with a tamping tool. When enough rings have been individually seated so the nose of the follower will reach them, the individual tamping should be supplemented by the follower. Never depend on the follower entirely to seat a set of rings properly—this practice will jam the last rings installed but leave the front rings loose in the box. The result is excessive and rapid wear of rear rings; erratic packing performance; sometimes, twisting and tearing of the front rings because they are loose in the stuffing box.

6. After last ring is installed, take up bolts finger tight. 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 follower as the packing seats until the leakage is about 2 drops per second on a 1″ shaft at 3600 RPM. Allow proportionately more as the shaft size increases. For speeds lower than 3600 RPM, less leakage is permissible. It will take about one working day to break in a set of packing to a point where the leakage is stabilized at a uniform acceptable rate. Never try to stop leakage entirely. Start the pump and take up bolts until leakage is decreased to no more than 2 drops per second. Stopping leakage entirely at this point will cause the packing to burn up.

7. If at all possible provide, through a lantern ring, means of lubricating the shaft and packing by supplying grease, oil, water, or the liquid handled in the pump. Fittings for this purpose are standard on most pumps.

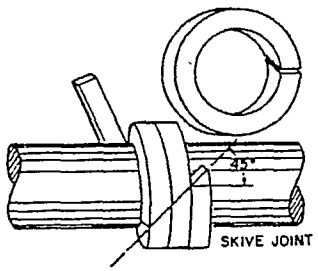


8. If the stuffing box has a lantern ring, make sure the lantern ring, as installed, is slightly behind the lubricant fitting so it will move under the fitting as follower pressure is applied. Replace packing when leakage cannot be controlled by further take-up on the follower.

Valves and Expansion Joints

The function of a Valve Stem Packing is like a gasket function rather than pump packing, which must both seal and carry lubricant for a turning shaft. Valve Stem Packings must provide a dense structure that will not permit movement of the liquid or gas through the body of the packing itself. The packing under follower pressure must be able to flow sufficiently to seal along the stem and along the stuffing box wall. Maintaining low friction will permit easy movement of the stem. To pack valves:

1. Carefully perform all the operations outlined under steps 1, 2, 3, 4 and 5, as given for pumps and agitators. Rings used on valves and expansion joints should be cut with a skive joint.



In preparing skive cut (45 degree bevel) rings, be sure the first ring is carefully cut and then tested on the shaft. It can then be used as a master for cutting other rings on a flat surface to insure that the additional rings are cut precisely at the correct angle.

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 wrench 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. If it is leaking at all, tighten the follower until there is no leakage.

TROUBLE SHOOTING PACKING FAILURES

Carefully examine packing removed from a stuffing box, as it often gives clues to the condition of the equipment and may be the means of solving packing problems. The following clues and possible troubles were found by examining sets of packing which had seen service:

Clue: Excessive reductions in the cross-section of the packing directly beneath the rod, shaft or plunger.

Possible trouble: Low bearings with shaft or rod riding on packing. In service early leakage occurs around the top of the shaft or rod.

Clue: Excessive reduction in the thickness of the packing directly over or on either side of rod or shaft.

Possible trouble: Rod or plunger out of alignment. In the case of the rod or shaft, the bearings may be badly worn causing whipping of the shaft.

Clue: One or more rings missing from set.

Possible trouble: Bottom of stuffing box badly worn with packing being extruded into system. Considerable difficulty, such as packing getting into the valves, traps or contaminating the fluid handled may result.

Clue: Wear on outside diameter of the packing.

Possible trouble: Rings rotating with shaft or loose in the box.

Clue: Bulge in the side of one or more rings.

Possible trouble: Adjacent rings cut too short causing packing under pressure to be forced into the open space.

Clue: Rings next to gland followers badly deformed with bottom rings in fair condition.

Possible trouble: Improper installation of packings and excessive gland pressure used.

Clue: Packings showing tendency to sheet out or extrude between rod or shaft and the gland follower.

Possible trouble: Excessive pressure or, more likely, too great a clearance between the rod or shaft and the gland follower.

Clue: Wearing face of rings dried and charred with rest of packing in good condition.

Possible trouble: High temperatures with lack of lubrication.

How to select packing for media handled

Most Packing selections can be made using the Equipment Recommendations given on page 1. However, if the liquid you are handling is corrosive or critical in some other way, then you can choose the exact style by reference to the Chemicals listed on these pages.

Listed are hundreds of liquids commonly used in the Process Industries.

At the *right* of each is a symbol indicating Packings constructed of materials which should handle the liquid.

Styles designated "T" will also handle conditions designated "G", "C", "P", "S" or "F" to the pressure and temperature assigned to the style.

Service Classification Symbols

G—General
T—Caustic
P—Pulp and paper
F—Food
W—Water
S—Solvents
X—Acids
T—Any service above except strong acids pH– 0 —► 2

CHEMICALS/PACKINGS

Acetaldehyde ..... TS
Acetate solvents ..... S
Acetates, esters & petroleum derivatives ..... S
Acetic acid ..... T
Acetic acid, glacial ..... T
Acetic acid (hydroxy crude) ..... T
Acetic anhydride ..... T
Acetone ..... T-S
Acetophenone ..... T-S
Acetyl chloride ..... T
Acetylene ..... G
Acetylene gas ..... G
Acetylene with water ..... G
Acetylene gas with water or liquid H. C. ..... G
Acid sludge ..... X-T
Acrylonitrile ..... S
Alcohol, ethyl ..... S-G
Alcohol & lub. oil ..... S
Alcohol methyl ..... G
Aldehyde ..... T-S
Alkanes ..... T-G
Alkyl arylsulphonic acid ..... T
Alkyl benzene ..... T-S
Alkylate light ..... S
Allyl acetone ..... T-S
Allyl amine ..... G
Allyl chloride ..... G
Alpha Picoline ..... G
Alum solution ..... G
Aluminum chloride ..... G
Aluminum hydroxide ..... G
Amine: Diethanol amine ..... T-S
Amine: Monoethanol amine ..... T-S
Amine-fat condensate ..... S-G
Amines ..... T-S
Ammonia, anhydrous ..... G
Ammonia, aqua ..... G
Ammonia gas ..... G
Ammonia, liquid ..... G
Ammonia, liquors & oil ..... G
Ammonium acid phosphate ..... G
Ammonium bifluoride ..... X-G
Ammonium bicarbonate ..... G
Ammonium bromide ..... G
Ammonium carbonate ..... G
Ammonium chloride ..... G
Ammonium fluosilicate ..... G
Ammonium hydroxide ..... G
Ammonium nitrate ..... G
Ammonium nitrate, molten ..... G
Ammonium oxalate ..... G
Ammonium persulphate ..... G
Ammonium phosphate, dibasic ..... G
Ammonium phosphate, monobasic ..... G
Ammonium phosphate, tribasic ..... G
Ammonium sulfate ..... G
Ammonium sulphite, to boiling ..... G
Ammonium thiocyanate ..... G
Ammonium thiocyanide ..... G
Amyl acetate ..... T-S
Amyl acid phosphate ..... S-G
Amyl alcohol ..... S-G
Amyl chloride ..... S-G
Amyl nitrate ..... S-G
Aniline ..... T
Aniline dyes ..... T-G
Aniline Hydrochloride ..... T
Antibiotic fermentation broth— no solvent ..... G
Antibiotic fermentation broth— with solvent ..... S
Anti-freeze water & alcohols or glycols ..... G
Antimony trichloride ..... T
Aqua regia X
Argon gas ..... G
Aroclor ..... T-S
Aroclor 1242 ..... T-S
Aroclor 1248 ..... T-S
Aroclor 1254 ..... T-S
Aromatic fuels ..... T-S
Asphalt-emulsified ..... S
Barium chloride solution 0-20% ..... G
Barium hydroxide ..... G
Barium nitrate solutions ..... G
Barium sulphide ..... G
Beer ..... T
Beer and beer mash ..... T
Beer wort ..... T
Beet sugar liquors ..... F
Benzaldehyde ..... T-S
Benzene (Benzol) ..... T-S
Benzene & gas mixtures ..... T-S
Benzene (petroleum ether) ..... T-S
Benzoic acid solution ..... G
Benzonitrile ..... G
Benzyl alcohol ..... S-G
Benzyl chloride ..... T-S
Bichloride of mercury ..... G
Bittern ..... G
Black liquor C
Black sulphate liquor, to boiling C
Blood ..... F
Boiler feed water ..... G
Bonderite solution ..... S-G
Borax solution ..... G
Boric acid ..... F-G
Boron trichloride ..... T
Boron trifluoride ..... T
Brine (acid) ..... G
Brine, calcium chloride ..... G
Brine, copper chloride ..... G
Brine, sea water ..... G
Brine, sodium ..... G
Bromine ..... T
Bromobenzene ..... T
Bunker "C" fuel oil ..... S
Butadiene ..... T-S
Butane ..... T-S
Buttermilk ..... F
Butyl acetate ..... T-S
Butyl alcohol ..... S-G
Butyl chloride ..... T-S
Butyl ether ..... T-S
Butyl sebacate ..... T-S
Butylene ..... G
Butylamine ..... T-S
Butyric acid ..... G
Butyric acid, to 150F ..... G
Calcium bisulfide ..... G
Calcium bisulfite ..... G
Calcium carbonate slurry ..... G
Calcium chloride ..... G
Calcium hydroxide ..... F
Calcium hypochlorite ..... G
Calcium phosphate slurry ..... G
Calgon ..... F
Camphene ..... S
Candelilla wax & varsol mixture ..... G
Cane sugar liquors & cane juice ..... F
Carbinol ..... S-G
Carbitol acetate ..... S
Carbolic acid ..... T
Carbon bisulfide ..... T-S
Carbon dioxide (dry) ..... G
Carbon dioxide (wet) ..... G
Carbon disulfide ..... T-S
Carbon tetrachloride wet ..... T-S
Carbon tetrachloride, anhydrous ..... T-S
Carbonic acid ..... G
Carbon monoxide ..... G
Castor oil ..... G
Caustics C
Cellosolve acetate ..... S
Chinawood oil ..... G
Chlorex C
Chlorextol ..... T
Chloric acid ..... T
Chlorinated hydrocarbons ..... T
Chlorinated polyphenyl ..... G
Chlorinated toluene ..... T-S
Chlorinated water ..... F
Chlorine, anhydrous liquid ..... T
Chlorine (dry) ..... T
Chlorine (wet) ..... T
1-Chloro-1-nitropropane ..... S
Chloroacetic acid ..... T
Chlorobenzene ..... T
Chlorobenzene, to boiling ..... T

Chloroethane ..... T
Chloroform ..... S
Chloromethyl ether ..... T-S
2-Chloropropane ..... T-S
Chlorosulfonic acid ..... T

Chlorotoluene ..... T-S
Chlorotrifluoroethylene ..... T
Chrome alum ..... G
Chromic acid ..... T
Citric acid ..... F

Clay slurries ..... G
Coca-Cola syrup ..... F
Cocoa butter ..... F
Cocoanut, fatty acid ..... F
Coffee, to boiling ..... F

Copper cyanide ..... T-G
Copper nitrate ..... G
Copper sulfate (blue vitrol) ..... G
Copperas (Greene) ..... G
Core oils ..... G

Cottonseed oil ..... G
Creosote ..... T
Cresol, meta ..... S
Cresylic acid ..... S
Cuprous ammonia acetate ..... S

Cupric chloride ..... G
Cyanide ..... T-S
Cyanogen chloride ..... G
Cyanohydrin ..... F
Cyclohexane ..... S

Cyclohexanone ..... S
DDT Solutions (kerosene solvent) ..... S
DDT Solutions (toluene solvent) ..... S
DNC (Dinitrochloro benzene) ..... T
De-Butanizer reflux ..... S-G

De-Ethanizer charge ..... S
De-Propanizer reflux ..... S
Developer Solution ..... T
Diacetone ..... S-G
Dibutyl cellosolve adipate ..... S-G

Dibutyl phthalate ..... S
Dibutyl sebacate ..... S
Dichlorobutane ..... T-S
Dichloroethane ..... S
Dichloroethyl ether ..... T-S

Dichlorohexafluorocyclobutane ..... T-S
Dichloropropylene ..... S
Dichlorotoluene ..... S
Dicyclopentadiene ..... S
Diesel fuel ..... S-G

Diethanolamine ..... S-G
Diethyl carbitol ..... S
Diethyl carbonate ..... S
Diethyl cellosolve ..... S
Diethylamine ..... S

Diethylene glycol ..... S-G
Diethylenetriamine ..... S
Dimethyl formaldehyde ..... S-G
Dimethyl hydrazine ..... S-G
Dinitrochloro benzene & styrene ..... T-S

Dinitrochlorobenzene ..... T-S
Dioctyl amine ..... S
Dioctyl phthalate ..... S
Dioxane ..... S-G
Diphenyl ..... T

Diphenyl, chlorinated ..... T
Disobutyl ketone ..... T-S
Doctor solutions ..... T
Dow Corning silicone fluid ..... G
Dowtherm "A" ..... T

Dowtherm "E" ..... T
Dyewood liquors ..... G
Embalming fluid ..... G
Ester type plasticizer ..... T
Ethane ..... S

Ethanol ..... G
Ethanolamine ..... S-G
Ether ..... S
Ethyl acetate ..... S
Ethyl acrylate ..... S

Ethyl alcohol ..... G
Ethyl chloride ..... S
Ethyl ether ..... S
Ethyl formate ..... S
Ethyl mercaptan ..... S

Ethyl-n-butyrate ..... S
Ethyl bichloride ..... S
Ethyl propionate ..... S-G
Ethyl sulphate ..... S-G
Ethylene chloride ..... T-S

Ethylene chlorohydrin ..... S
Ethylene dichloride ..... T
Ethylene glycol ..... G
Ethyl pyridine ..... S-G
Fatty acids ..... G

Ferric chloride ..... G
Ferric nitrate ..... G
Ferric sulfate ..... G
Ferrous sulfate (Green Copperas) ..... G
Ferrous sulphate & lime ..... G

Film dope ..... S-G
Fish oils ..... S
Formaldehyde or formalin ..... S-G
Formic acid ..... S-G
Freon 11 ..... S-G

Freon 12 ..... S-G
Freon 121 ..... S-G
Freon 12 and refrigeration oil ..... S-G
Freon 22 and refrigeration oil ..... S-G
Freon 113 and 114 ..... S-G

Freons-liquids ..... S-G
Fruit juices ..... F
Fuel oil ..... S
Furfural ..... S-G
Furan ..... S-G

Gallic acid ..... S-G
Gas oil ..... S
Gasoline ..... S
Gasoline (aromatic) ..... S
Gasoline (automotive grades) ..... S

Gasoline (bronze) ..... S
Gasoline (ethyl) ..... S
Gasoline (100 Octane) ..... S
Gasoline (Hi-test) ..... S
Gasoline with mercaptan ..... S

Gasoline with H_2S ..... S
Gelatin ..... F
Ginger ale ..... F
Glacial acetic acid ..... T
Glaubers salt ..... G

Glue ..... G
Glue (acid) ..... G
Glue sizing ..... G
Glucose ..... F
Glycerine (glycerol) ..... G-F

Grain mash ..... G-F
Grease ..... G
Green liquor ..... T
Halowax 1000 ..... G
Heptane ..... S

Hexachloro acetone ..... S
Hexane ..... S
Hexone (mik) ..... T-S
Hollingshead H-2 ..... G
Hydrofluoric acid ..... T

Hydrobromic acid ..... T
Hydrocarbons (light) ..... S
Hydrochloric acid ..... T
Hydrocyanic acid ..... T-S
Hydrofluoric acid (anhydrous) ..... T

Hydrofluosilicic acid ..... T-S
Hydroformic acid ..... T-S
Hydrogen ..... G
Hydrogen cyanide ..... T-S
Hydrogen fluoride X

Hydrogen peroxide ..... T-S
Hydrogen sulfide ..... S
Hydrogen sulfide & organic sulfur compounds ..... S
Hydrogen & water ..... G
Hydroquinone ..... G

Hydroxy—acetic acid ..... T
Ink ..... G
Insecticides ..... G
Iodoform ..... S-G
Iodoform ..... S

Iso-butane ..... S
Iso-butyl methyl ketone ..... T-S
Iso-butylene ..... S
Iso-pentane ..... S
Iso-propyl-acetate ..... S

Iso-propyl alcohol ..... S-G
Iso-propyl amine ..... S-G
Iso-propyl ether ..... S
Kerosene ..... S
Ketchup ..... F

Lacquer in ketone solvents ..... T-S
Lacquer solvents ..... T-S
Lacquers, hot ..... S
Lactic acid ..... F
Lard ..... F

Latex ..... G
Lead nitrate ..... G
Lime slurries ..... T
Lime-sulfur ..... G
Lime water (milk of lime) ..... G

Lindol (tricresol phosphate) ..... S
Linseed oil ..... S
Liquid cyanide ..... T-S
Liquid latex & gaseous butadiene ..... T-S
Liquor, black ..... T

Liquor, green ..... T
Liquor, lime ..... T
Liquor, steep ..... T
Liquor sulphate ..... T
Liquor, white ..... T

Lithium bromide brine ..... G
Lithium chloride ..... G
Lubricating oils, hot ..... S
Lye, caustic ..... T
Lysol ..... T-S

Magnesium chloride ..... G
Magnesium hydroxide ..... G
Magnesium oxychloride ..... G
Magnesium sulfate (epsom salts) ..... G-F
Maleic acid ..... T

Maleic hydrazide ..... T-S
Malt beverages ..... T-F
Manganese chloride ..... G
Mash ..... T
Mayonnaise ..... F

Meat products ..... F
Melamine resins ..... G
Mercaptan ..... G
Mercuric chloride ..... G
Mercury ..... G

Mercury salts ..... G
Mercurious nitrate ..... G
Mesityl oxide ..... T-S
Methanol ..... S-G
Methyl acetate ..... S-G

Methyl acrylate ..... S-G
Methyl alcohol ..... S-G
Methial ..... T
Methallyl chloride ..... T-S
Methyl alcohol ..... G

Methyl bromide ..... T
Methyl cellosolve ..... S-G
Methyl chloride ..... S-G
Methyl chloro-silanes ..... S
Methyl ether ..... S

Methyl ethyl ketone ..... T
Methyl formate ..... S-G
Methyl iso-butyl ketone ..... T-S
Methyl methacrylate ..... T-S
Methyl propionate ..... S

Methylamide (hot) ..... S
Methylene chloride ..... S-G
Milk ..... F
Mineral oil ..... S
Mineral spirits ..... S

Miscellas ..... T
Mixed acids ($HNO^3+H^2SO^4$) X
Molasses ..... F
Mono ethanolamine (with copper sulphate) ..... S-G
Monochloro-benzene ..... S

Mustard ..... F
Naptha ..... S
Naptha, sour or gasoline (trace H_2S) ..... S
Naptha, Vmp ..... S
Napthalene sulphonic acid ..... T-S

Napthalene ..... S
Napthalenic acid, to hot ..... T-S
Natural gas ..... S
Nickel chloride ..... G
Nickel sulfate ..... G

Nicotine sulfate ..... G
Nitrating acids X
Nitric acid X
Niter cake (fused) ..... G
Nitric acid fuming X

Nitro methane ..... T-S
Nitrobenzene ..... T-S
Nitroethane ..... T-S
Nitrogen ..... S
Nitrogen gas ..... G

Nitromethane ..... S
Nitropropane ..... S
Nitrous acid ..... T
Oakite ..... G
Oil, air corps hydraulic ..... T-S

Oil, apiezon ..... S-G
Oil, asphalt base ..... S-G
Oil, Bunker C fuel ..... S
Oil, Chinawood (tung) ..... S-G
Oil, cocoanut ..... S-G

Oil, cotton seed ..... S
Oil, crude (asphalt base) ..... S
Oil, crude (corrosive) ..... S
Oil, crude (paraffin base) ..... S
Oil, crude (sweet) ..... S

Oil, cutting (soluble) ..... S
Oil, Diesel ..... S
Oil, domestic fuel ..... S
Oil, fuel & gas ..... S
Oil, #6 fuel ..... S

Oil, fuel ..... S-G
Oil, hydraulic ..... S
Oil, hydraulic (mineral base) ..... S
Oil, kerosene ..... S
Oil, linseed ..... S

Oil, lubricating ..... S
Oil, mineral ..... S
Oil, mineral seal ..... S-G
Oil, nut ..... S-G
Oil, palm ..... S-G

Oil, paraffin base ..... S
Oil, peanut ..... S-G
Oil, quenching ..... S
Oil, rapeseed ..... S-G
Oil with refrigerants ..... S-G

Oil, rich ..... S-G
Oil, silicone ..... S
Oil, soya bean ..... S-G
Oil transformer ..... T-S
Oil vegetable ..... S

Oil and Freon (11 & 12) ..... T-S
Oil and Freon (22) ..... T-S
Oil and methylene chloride ..... S-G
Oil and sulphur dioxide ..... T-S
Oleic acid ..... S-G

Olefin (crude) ..... S
Oleum X
Oxalic acid ..... T-S
Oxygen X
Ozone ..... G

Palmitic acid ..... G
Paracymene ..... G
Paraffin, hot ..... G
Paraffin Wax 60% ..... G
Paregoric Compound ..... F

Pectin liquor ..... F
Penicillin ..... F
Pentachloroethane ..... S
Pentachlorophenol ..... S
Pentane ..... S

Pentasol ..... F
Perchlorethylene ..... T
Perchlorethylene & filter aid ..... T-S
Perfume ..... T-S
Perchloric acid ..... T-S

Perfluorothiethylamine ..... S
Peroxide of hydrogen ..... G
Petroleum ether ..... T-S
Phenol ..... T-S
Phenol, formaldehyde mix ..... T-S

Phenolic sulphonate ..... S
Phenylacetic acid ..... T
Phenylethylmalonic ester ..... S
Phosgene ..... T-S
Phosphoric acid ..... T-S

Phosphoric acid, crude ..... T-S
Phosphoric anhydride ..... T-S
Phosphorus (liquid) hot ..... T-S
Photographic developers ..... T-S
Phthalate esters ..... T-S

Phthalic anhydride ..... S
Picric acid ..... S
Picric acid, molten ..... S
Pine gum (hot) ..... G
Pineapple juice ..... F

Piperidine ..... G
Plasticizer (liquid dibutyl) ..... S
Plating solutions ..... S
Polyglycols ..... G-S
Polyvinyl acetates ..... S

Potash alum ..... G
Potassium bitartrate, to boiling ..... G
Potassium bromide ..... G
Potassium bicarbonate ..... F
Potassium carbonate ..... G

Potassium carbonate, to boiling ..... G
Potassium chlorate ..... G
Potassium cyanide ..... G
Potassium dichromate, to boiling ..... G
Potassium ferricyanide, to boiling ..... G

Potassium hydroxide C
Potassium hypochlorite ..... G
Potassium iodide ..... G
Potassium nitrate ..... G
Potassium ferrocyanide ..... G

Potassium perfluoro-acetate ..... T
Potassium permanganate ..... G
Potassium phosphate ..... G
Potassium phosphate, di- or tri- ..... G
Potassium sulfate ..... G

Potassium sulfide ..... S
Producer gas ..... S
Propane ..... S
Propionaldehyde ..... T-S
Propionic acid ..... S-G

Propylene ..... S-G
Propylene chloride ..... S
Propylene dichloride ..... S
Propylene glycol ..... F
N-propyl acetate ..... S

N-propyl ether ..... S
N-propyl formate ..... S
N-propyl propionate ..... S
Propylene glycol ..... F
Propylene oxide ..... S

Propylene polymer ..... S-G
Pulp stock ..... P
Pyridine ..... S
Pyroligneous acid ..... T-S
Pyronol ..... S

Quinine bisulphate ..... S
Quinine sulphate ..... S
Resins, hot ..... G
Rosins ..... G
Sal ammoniac ..... G

Salt cake ..... T-G
Santicizer 8 ..... S-G
Santicizer B-16 ..... S-G
Santicizer E-15 ..... S-G
Santicizer M-17 ..... S-G

Santolube 31 ..... S-G
Sea water ..... G
Sewage ..... G
Silicone fluid ..... S
Silicon tetrachloride ..... T

Silver bromide ..... S
Silver chloride ..... T
Silver nitrate ..... G
Slop, brewery ..... G
Slop, distillers ..... G

Sludge acid ..... T-S
Soap ..... T
Soda ash (sodium carbonate) ..... G
Soda, caustic ..... T
Soap liquor ..... T

Sodium acetate ..... S
Sodium aluminate ..... G
Sodium aluminate lime ..... G
Sodium bicarbonate or baking soda ..... F
Sodium bichromate ..... G

Sodium bisulfate ..... T-S
Sodium bisulfite ..... T-S
Sodium bromide ..... G
Sodium carbonate ..... G
Sodium chloride ..... G

Sodium glutamate ..... F
Sodium cyanamide ..... T-S
Sodium cyanide ..... T-S
Sodium dichromate ..... G
Sodium dichromate & water ..... G

Sodium ethylate ..... T
Sodium fluoride ..... G
Sodium hydrosulfite ..... T
Sodium hydrosulfide ..... T
Sodium hydroxide ..... T

Sodium hydroxide (Doctor's Solution) ..... T
Sodium hydroxide over 180F ..... S
Sodium hypochlorite ..... G
Sodium lactate ..... G
Sodium metaphosphate ..... G

Sodium nitrate ..... G
Sodium oleate ..... G
Sodium perborate ..... T
Sodium peroxide ..... T-S
Sodium peroxide solution ..... G

Sodium phosphate (D1) ..... G
Sodium phosphate (mono) ..... G
Sodium phosphate, to boiling ..... G
Sodium phosphate (tri) ..... G
Sodium polysulfide ..... G

Sodium plumbite ..... G
Sodium resinate ..... G
Sodium salicylate ..... S
Sodium silicate ..... G
Sodium sulfate ..... G

Sodium sulfide ..... G
Sodium sulfite ..... G
Sodium tetraborate (Borax) ..... G
Sodium thiosulphate ..... G
Sodium thiosulfate or "Hypo" ..... G

Solvasol ..... S
Sorbitol ..... S-G
Stannic chloride ..... S-G
Stannous chloride ..... G
Starch slurry ..... G

Starch, to boiling ..... F
Steam ..... G
Stearic acid ..... G
Stearic & oleic acid ..... G
Stoddard Solvent ..... S

Styrene ..... S
Styrene & dinitrochloro benzene ..... S
Sugar liquors & solutions ..... F
Sulfate liquors, kraft ..... T-P
Sulfur molten ..... T

Sulfur chloride ..... T
Sulfur dioxide (wet) ..... T
Sulfur dioxide, anhydrous liquid ..... T
Sulfur trioxide ..... T
Sulfuric acid X

Sulfurous acid ..... T-S
Sulphite pulp ..... P
Sulphonated fatty alcohol ..... S-G
Sulphonated vegetable oils ..... G
Sulphur (molten) ..... G

Sulphur chloride ..... T
Sulphur dioxide & water vapor ..... T-S
Syrup (high sugar) ..... F
Tallow ..... P-G
Tannic acid ..... G

Tanning liquors (veg) ..... G
Tar ..... S
Tartaric acid ..... G
Terephthalic acid (water slurry 10% N. acid) ..... T-S
Tetrachloroethylene ..... T-S

Tetrachlorethane ..... T-S
Sym-tetrachlorethane ..... T-S
Tetrahydrofuran ..... T-S
Tetraethyl lead ..... T-S
Thiamin solution ..... F-S

Titanium tetrachloride ..... T-S
Toluene or toluol ..... T-S
Tomato juice ..... F
Trichloropropane ..... S
Trichlorethylene (dry) ..... T-S

Trichlorethylene (wet) ..... T-S
Trichloro ethane ..... T-S
Tricresyl phosphate ..... S
Thiethylamine ..... S
Trisodium phosphate ..... G

Turpentine ..... S
Ucon Hydrolubes ..... G
Urea ..... S
Urea & Phenolic resins ..... S-G
Urine ..... S

Varnish ..... S
Vegetables, juices ..... F
Vegetables, oils ..... F
Vinegar ..... F
Vinyl acetate ..... S

Vinyl chloride ..... S
Vinyl chloride gas ..... S
Vinyl pyridine ..... T-S
Vinylidine chloride ..... T
Vitrol, oil of X

Water (acid, mine, nonoxidizing) ..... T-S
Water (acid, mine-oxidizing) ..... T-S
Water (boiler feed) ..... G
Water (brackish) ..... G
Water (chilled air, washing) ..... G

Water (chilled condenser service) ..... G
Water (cooling tower) ..... G
Water (de-ionized) ..... G
Water (detergent) ..... G
Water (distilled) ..... G

Water (grit, carrying, cool) ..... G
Water (fresh, clean, cool) ..... G
Water (soapy) ..... G
Water(to boiling) ..... G
Water (with soluble oil) ..... G

Wax, hot ..... G
Wax, slurry ..... G
Whey ..... F
Whiskey ..... F
White liquor ..... P

Wine ..... F
White water ..... P
Wort ..... T
Xylene or xylol ..... T-S
Zein ..... G

Zeolite, treated water ..... G
Zinc chloride ..... G
Zinc cyanide ..... G
Zinc nitrate ..... G
Zinc sulfate ..... G

Zinc sulphate (to boiling) ..... G

FORMS FURNISHED

Styles	Forms		1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 3/8	1 1/2	2
CW1 and CW2	Coils in Flat boxes	Coils per box			4	4	4	4	4	4	4	3	3	2				
		Feet per box			150	125	109	93	80	66	60	36	33	19				
	Spools		1/8 & 3/16 on 1 lb. spools 1/4 to 1" on 25 or 50 lb. spools 1" and up on 50 lb. spools															
RG1 (12½ Ft. Lengths)	Coils	Lengths per box			8	6	5	4	4	3	3	3	2	2	2	2	2	2
		Feet per box			100	75	62	50	50	37	37	37	25	25	25	25	25	25
		Weight per box			4.5	5.4	6.3	6.8	8.8	8.4	10	14	11.6	14.5	20.5	24	27	42
	Spiral	Lengths per box			2	2	1	1	1	1	1	1	1	1	1	1	1	1
		Feet per box			25	25	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
		Inside diameter of spiral			1 1/16	1 1/16	1 5/8	1 7/8	1 7/8	2 3/8	2 3/8	3 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4.5	4.5
		Weight per box			1.1	1.8	1.8	1.7	2.2	2.8	3.3	4.6	5.8	7.2	10.5	11.9	13.6	21.2
PG1 (12 Ft. Lengths)	Coil	Number length per box			8	6	5	4	4	3	3	3	2	2				
		Feet per box			96	72	60	48	48	36	36	36	24	24				
	Spiral	Feet per box			12	12	12	12	12	12	12	12	12	12				
		Inside diameter of spiral			1 5/8	2	2	2 1/2	2 1/2	3	4	5	5	5				
All Other Styles	Spools		Up to ½"—1 lb. spools All sizes—5, 10, 25 and 50 lb. spools															

FBW-135

APPROXIMATE WEIGHTS · POUNDS PER 100 FEET

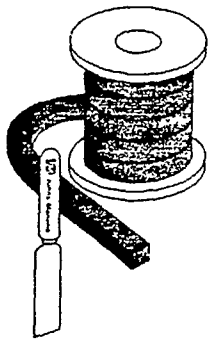
	SIZES													
Style	Min. Size	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	Max. Size
CG1	3/32	1	3½	4½	7	10	14	18	21	24	32	46	65	1⅜
CF1	1/8	—	2¼	4	7	9¼	12	20	26	36	50	60	—	2
CP1	1/8	1	2¼	4½	7	10	14	18	21	24	32	46	65	1⅜
CX1	1/8	1½	3½	5½	8½	12½	16½	21½	27	32½	45	58½	75	—
CT1	1/4	—	—	4⅓	7½	10¼	14	17	21	25	35	56	68	1⅜
VG1	1/8	1½	3½	5	7¾	11	14	17	21	24	34	45	55	1
VT1	1/8	1	2	3¾	5½	8	9½	11	17	22	31	40	50	2½
VX1	1/8	1½	3½	6	8¾	11	15	18	21	24	30	—	—	2½
RG1	1/4	—	—	4½	7	10	13	17	22	26	37	46	58	2
PG1	1/4	—	—	4½	7½	10	14	18	20	24	36	45	60	1½

	SIZES													
Style	Min. Size	1/4	3/8	1/2	5/8	3/4	1	1¼	1⅜	1½	1⅝	1¾	2	Max. Size
CW1	1/8	3	6⅜	12	18	26	47	73	89	106	124	142	186	2
CW2	1/8	3½	7½	12	20	28	48	73	88	102	117	132	160	2

FBW-136

THEN

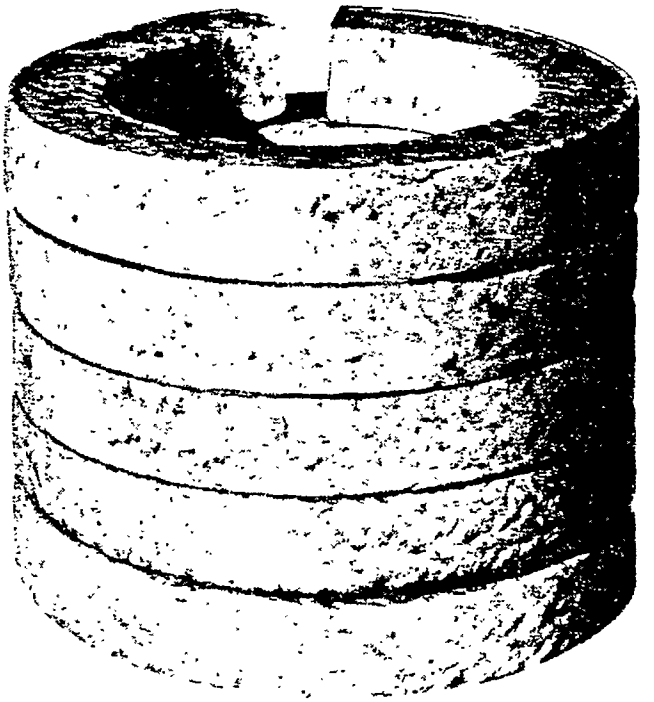
Time was you had to uncoil packing from spools, measure and cut to fit. The result: loss of time, less precise fit, and wasted material.



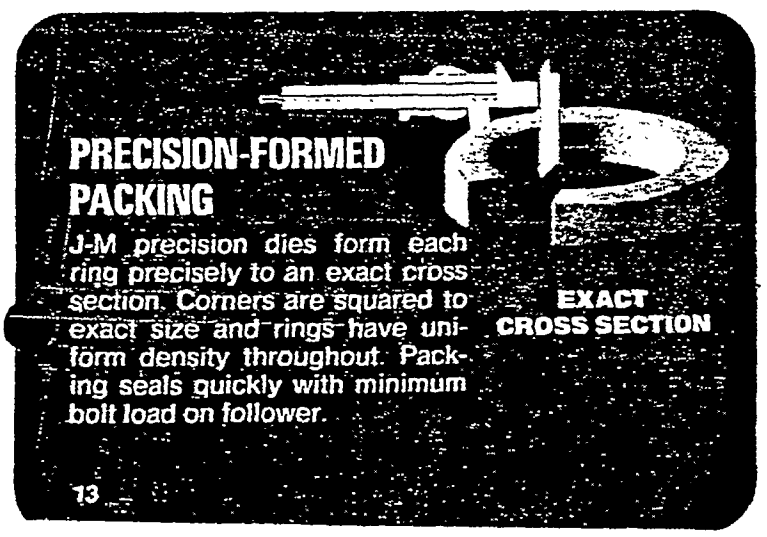
NOW J-M PRE-FORMED PUMP PACKING!

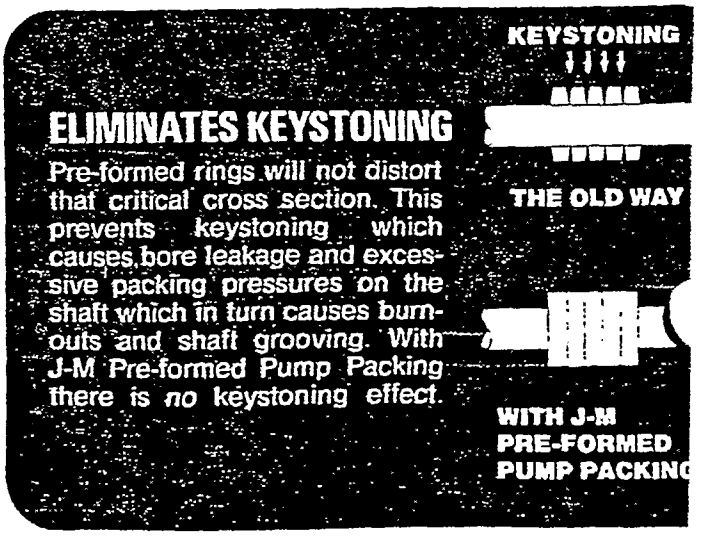
Johns-Manville adds a new twist to a reliable old product.

Pre-formed Pump Packing comes in five standard sizes to pack most pumps. It saves you labor and money. Pre-formed Pump Packing is a more efficient way to do the packing job.



FBW-137





PRE-FORMED PUMP KIT DATA • STANDARD STYLES

Style	Base Material	Impregnation or Lubricant	Finish	Temp. Limit	pH Range	Service
R-CT	Asbestos	Teflon Suspensoid plus lubricant	None	500	2 to 13	Any service except strong acids
R-CP	Asbestos	Petro base lubricant	None	500	4 to 14	Pulp & paper stocks
R-CG	Asbestos	Petro base oil and graphite	Graphite	500	4 to 10	General

PRE-FORMED PUMP KIT DATA
STANDARD KITS

Packing Size	Max. Shaft Diameter	Rings Per Kit	No. Kits Per Carton	Approx. Wt. Per Carton
¼	1¾	5	8	1.0
5/16	2 1/16	5	8	1.0
⅜	2½	5	8	3.2
7/16	2¾	5	8	5.0
½	3¾	5	8	8.0

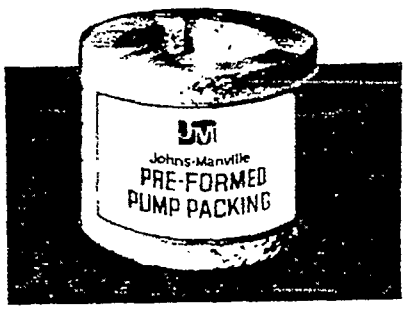
Fits a wide variety of sizes.

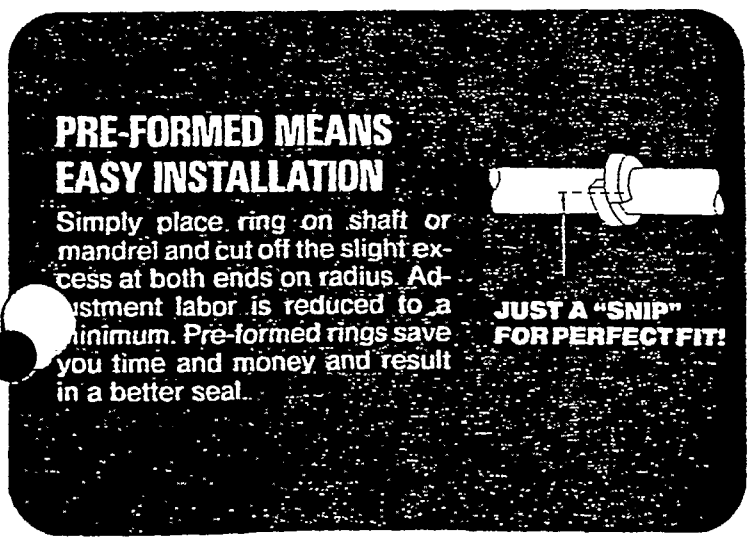
J-M Pre-formed Pump Packing is pre-formed and pre-packed . . . ready to go when you've a job to do. The old method was sticky and time-consuming. Now Johns-Manville engineers have come up with a far better way to pack those pumps. If one of our standard rings isn't an exact fit, you can take "just a snip" for a perfect fit and the job is done.

FBW-138

Packaged five rings to a kit.

Dust-free plastic container is clearly labeled and prevents abrasive materials from contaminating rings. Packing stays clean from factory to pump.







For information on other J-M Products and Systems call Product Information Service at (303) 978-[illegible] Ext. 2565



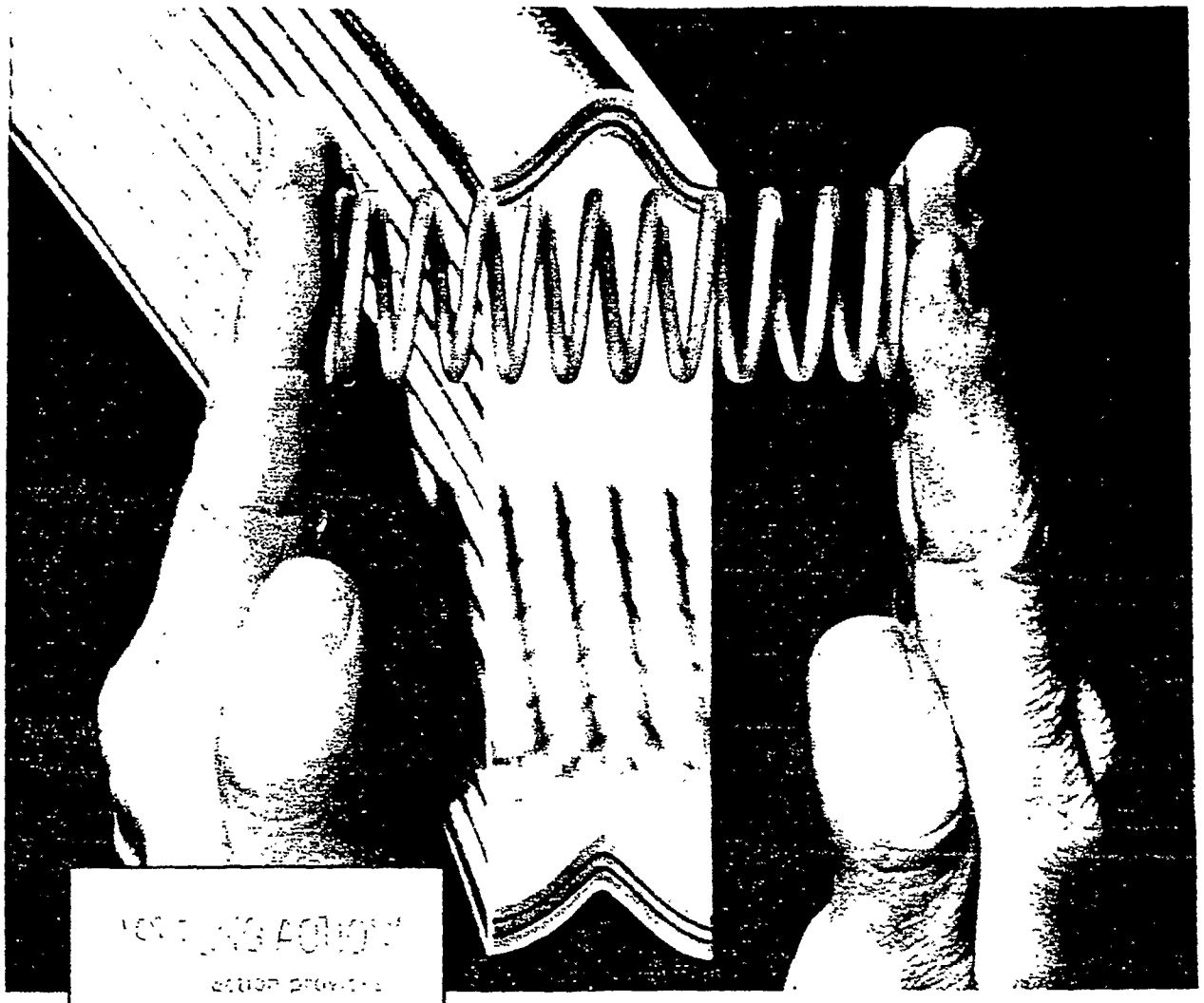
Johns-Manville

Greenwood Plaza • Denver, Colorado 80217

Sales Offices in Principal Cities

Also available in Canada and Overseas
Cable: JOHNMANVIL

FBW-139



[illegible]
[illegible] provides
[illegible] dependable
[illegible] against
[illegible] requirements

- Varying stresses
- Temperature changes
- Minor flange separations
- Continuous vibration
- Uneven mating surfaces

Johns-Manville

SPIROTALLIC® GASKETS

STYLE 913

assure constant, leakproof sealing on pipe flanges

FBW-140

F. B. WRIGHT COMPANY

9999 Mercier Avenue, Dearborn, Michigan

TELEPHONE VI. 3-8250

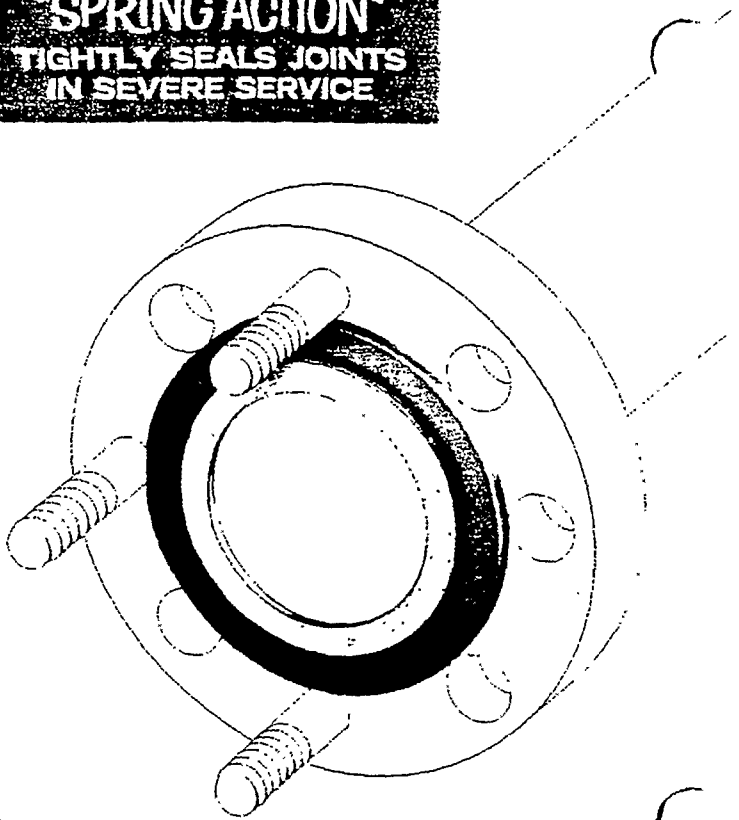
Johns-Manville
SPIROTALLIC GASKETS

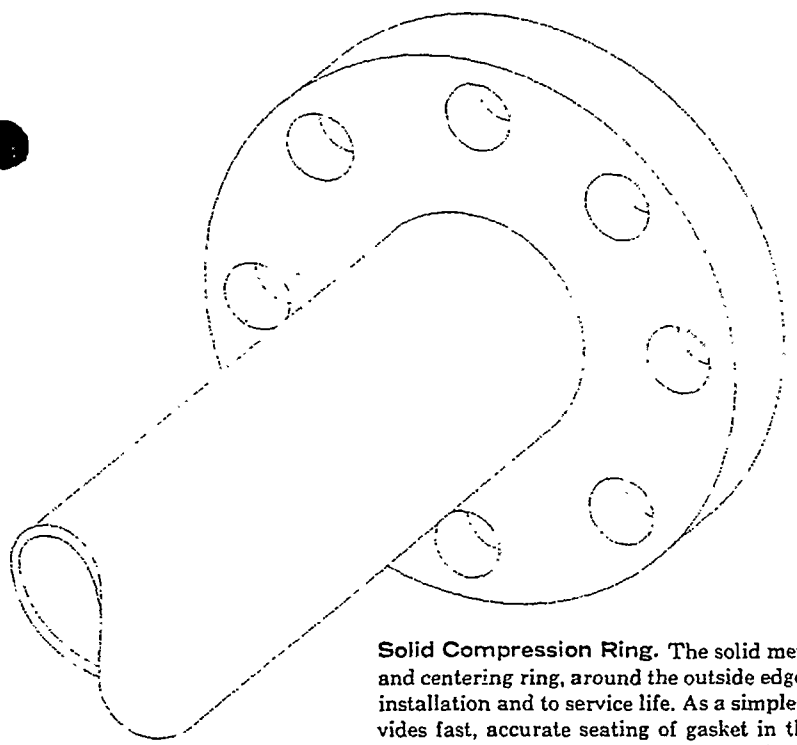
HERE'S HOW "SPRING ACTION" TIGHTLY SEALS JOINTS IN SEVERE SERVICE

DESCRIPTION

"Spring Action" does just what it says! It provides a resilient seal between metal flanges subject to heat, stress, jolts, vibration, pressure and chemical corrosion. It can be designed to fit many sizes and shapes for a tremendous variety of equipment, depending on your requirements.

J-M Style 913 is standard in many industries, offers excellent service life for standard piping, withstanding wide variations in pressure and temperature, but also gives equally good performance in many other closures. It is readily available in a great many Stock Sizes, in a wide variety of pressure and temperature ranges, for convenience and cost-saving. For special sizes and uses, your J-M Distributor or Representative will help you select exactly the right gasket for the job.

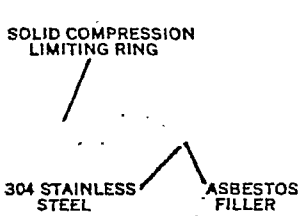




CONSTRUCTION

"Spring Action" is built right into every J-M Spirotallic Gasket. Special spring-like metal strips, formed into a "V" shape, are alternately spirally wound with an asbestos filler by a special method to assure a full-surface, leakproof seal. The asbestos does the sealing . . . the "V" shape provides the "spring." This combination of the yield and flow of the metal and soft filler plies compresses to its predetermined thickness under bolting pressure, conforming to surface irregularities and preventing leakage within the limits of its specified pressure and temperature ranges.

Solid Compression Ring. The solid metal compression limiting and centering ring, around the outside edge, adds to easier, quicker installation and to service life. As a simple centering device, it provides fast, accurate seating of gasket in the flange. During "bolt-up," it prevents crushing the gasket beyond the predetermined thickness. In operation, it eliminates excess strain on studs. The cross-section (at right) illustrates how the ring limits over-compression of the "V" shaped metal strip during bolting. In addition its solid nature resists radial pressure, retaining the spirally-wound area from pressure blow-out.



FBW-141

SPECIFICATIONS

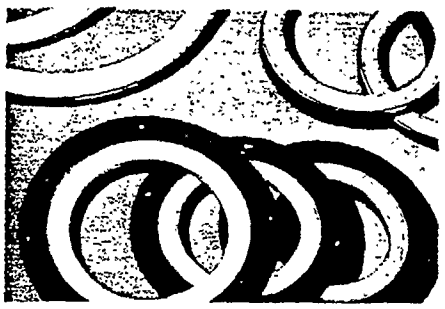
J-M Style 913 is constructed with gasket thickness of 3/16" nominal (.175" actual); the solid steel compression and limiting ring is 1/8" (.125") around the outer edge. Standard material for "V" shaped metal strip is #304 Stainless Steel; standard material for the compression limiting ring is Carbon Steel. Other materials are available to your specifications.

STANDARD SIZES

Johns-Manville SPIROTALLIC GASKETS
STYLE 913

(Dimensions based on ASA Raised Face, Lap Joint/Van-Stone and Flange Fittings . . . meet API Standard 601)

J-M Style 913 Spirotallic Gaskets are used for a multitude of industrial applications. As the tables below indicate, standard sizes range from ¼" to 24" diameter. *Many of the most popular sizes are quickly available for fast, convenient delivery.*



Pipe Size (Inches)	150, 300 lb. I.D.	150, 300 lb. O.D.	150 lb. Guide O.D.	300 lb. Guide O.D.	400, 600 lb. I.D.	400, 600 lb. O.D.	400 lb. Guide O.D.	600 lb. Guide O.D.	Pipe Size (Inches)
¼	½	⅞	1¾ •	1¾ •	½	⅞	1¾ •	1¾ •	¼
½	¾	1¼	1⅞ •	2⅛ •	¾	1¼	2⅛ •	2⅛ •	½
¾	1	1 9/16	2¼ •	2⅝ •	1	1 9/16	2⅝ •	2⅝ •	¾
1	1¼	1⅞	2⅝ •	2⅞ •	1¼	1⅞	2⅞ •	2⅞ •	1
1¼	1 23/32	2⅜	3 •	3¼ •	1 23/32	2⅜	3¼ •	3¼ •	1¼
1½	1 31/32	2¾	3⅜ •	3¾ •	1 31/32	2¾	3¾ •	3¾ •	1½
2	2¾	3⅜	4⅛ •	4⅜ •	2¾	3⅜	4⅜ •	4⅜ •	2
2½	3⅛	3⅞	4⅞ •	5⅛ •	3⅛	3⅞	5⅛ •	5⅛ •	2½
3	4	4¾	5⅜ •	5⅞ •	4	4¾	5⅞ •	5⅞ •	3
3½	4½	5¼	6⅜ •	6½ •	4⅛	5¼	6⅜ •	6⅜ •	3½
4	5	5⅞	6⅞ •	7⅛ •	4¾	5⅞	7 •	7⅝ •	4
4½	5½	6½	7	7¾	5 5/16	6½	7⅝	8¼	4½
5	6⅛	7	7¾ •	8½ •	5 13/16	7	8⅜ •	9½ •	5
6	7 3/16	8¼	8¾ •	9⅞ •	6⅞	8¼	9¾ •	10½ •	6
8	9 3/16	10⅜	11 •	12⅛ •	8⅞	10⅜	12 •	12⅝ •	8
10	11 5/16	12½	13⅜ •	14¼ •	10 13/16	12½	14⅛ •	15¾ •	10
12	13⅜	14¾	16⅛ •	16⅝ •	12⅞	14¾	16½ •	18 •	12
14	14⅝	16	17¾ •	19⅛ •	14¼	16	19	19⅜ •	14
16	16⅝	18¼	20¼ •	21¼ •	16¼	18¼	21⅛	22¼ •	16
18	18 11/16	20¾	21⅝ •	23½ •	18½	20¾	23⅜	24½ •	18
20	20 11/16	22¾	23⅞ •	25¾ •	20½	22¾	25½	26⅞ •	20
24	24¾	27	28¼ •	30½ •	24¾	27	30¼	31⅛ •	24

Pipe Size (Inches)	900 lb. I.D.	900 lb. O.D.	900 lb. Guide O.D.	1500, 2500 lb. I.D.	1500, 2500 lb. O.D.	1500 lb. Guide O.D.	2500 lb. Guide O.D.	Pipe Size (Inches)
¼	—	—	—	—	—	—	—	¼
½	¾	1¼	2½ •	¾	1¼	2½ •	2¾	½
¾	1	1 9/16	2¾ •	1	1 9/16	2¾ •	3 •	¾
1	1¼	1⅞	3⅛ •	1¼	1⅞	3⅛ •	3⅜	1
1¼	1 9/16	2⅛	3½ •	1 9/16	2⅜	3½ •	4⅛	1¼
1½	1⅞	2¾	3⅞ •	1⅞	2¾	3⅞ •	4½	1½
2	2 5/16	3⅜	5⅜ •	2 5/16	3⅜	5⅜ •	5¾ •	2
2½	2¾	3⅞	6½ •	2¾	3⅞	6½ •	6⅝	2½
3	3¾	4¾	6⅝ •	3⅝	4¾	6⅞ •	7¾	3
3½	4⅛	5¼	7½	4⅛	5¼	7⅝	—	3½
4	4¾	5⅞	8⅛ •	4⅝	5⅞	8¼ •	9¼	4
4½	5 5/16	6½	9¾	5 5/16	6½	9⅛	—	4½
5	5 13/16	7	9¾ •	5⅝	7	10 •	11	5
6	6⅞	8¼	11⅜ •	6¾	8¼	11⅛ •	12½	6
8	8⅞	10⅜	14⅛ •	8½	10⅜	13⅞ •	15¼	8
10	10 13/16	12½	17⅛ •	10⅝	12½	17⅛ •	18¾	10
12	12⅞	14¾	19⅝ •	12¾	14¾	20½	21⅝	12
14	14¼	16	20½ •	14¼	16	22¾	—	14
16	16¼	18¼	22⅝	16¼	18¼	25¼ •	—	16
18	18¼	20¾	25⅛ •	18¼	20¾	27¾	—	18
20	20¼	22¾	27½	20¼	22¾	29¾	—	20
24	24¼	27	33 •	24¼	27	35½	—	24

• Indicates Factory Stock in Type 304 Stainless Steel and white Canadian asbestos filler. Compression Limiting Ring is Carbon Steel. J-M Color Code identification for Type 304 Stainless Steel is Yellow.

NOTE: Sizes inside shaded areas indicate same size, interchangeable gaskets. No duplicate Stock is required.

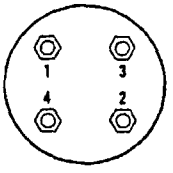
Other metals, fillers and sizes are available for special services. Consult your J-M Distributor.

FBW-142

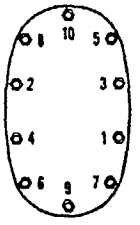
Johns-Manville
SPIROTALLIC GASKETS

GOOD INSTALLATION PRACTICES

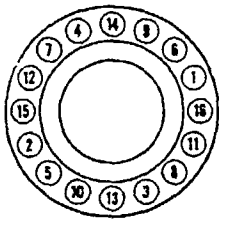
THE CORRECT SEQUENCE OF BOLT TIGHTENING



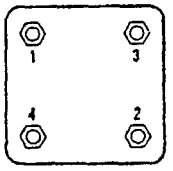
CIRCULAR FOUR-BOLT



NON-CIRCULAR MULTI-BOLT



CIRCULAR MULTI-BOLT



SQUARE FOUR-BOLT

Do not snug-up bolts on first go around. This can tilt flanges out of parallel. If using an impact wrench, set the wrench at about ½ final torque for first go around. Pay particular attention to the hard-to-reach bolts.

If initial go around in bolting-up is done correctly in the proper sequence, final go around need not follow any set pattern. *All important* is that final tightening be uniform with each bolt pulling the same load. This will almost guarantee a trouble-free joint. If not uniform, the joint may leak—particularly after it has been in hot service.

For best joint performance in high-temperature service, remember to hot-tighten the bolts after 24 hours and again a week later.

PRODUCT WARRANTY

J-M products are warranted free from defects in workmanship and in raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

Johns-Manville

22 East 40th Street • New York, N.Y. 10016

Sales Offices in Principal Cities

FBW-143

PK-259A 9/68*

Litho in U.S.A

JM

Here's Big News from

JOHNS-MANVILLE

...an Important Advancement in

PACKINGS for Pumps

F. B. WRIGHT COMPANY
9999 Mercier Avenue, Dearborn, Michigan
TELEPHONE VI. 3-8250

FBW-144

LOKLUBE

is the name applied to a wholly new approach to the design and construction of soft mechanical packings as used in rough, tough, general service. This LOKLUBE process† effectively combines pre-lubricated asbestos yarns saturated with new lubricating materials that can withstand higher temperatures and more severe mechanical abuse.

Moreover, these yarns and lubricants are skillfully blended in J-M's patented unique Interlocked® structure.

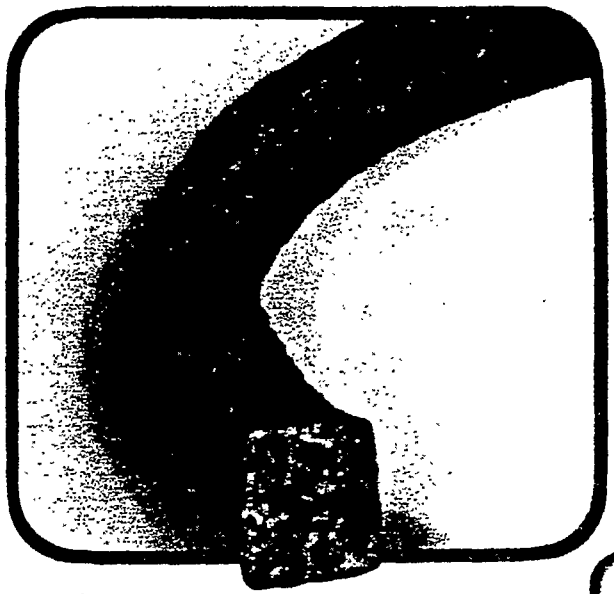
This integrally-formed resilient braiding captures and retains lubricant in a reservoir-like arrangement engineered to extend the life of the packing.

Johns-Manville

†Patent applied for

LOKLUBE RED

for HOT WATER SERVICE
ranging to 500F



- Specifically designed for Boiler Feed Pump applications
- Will also handle cold water, brine, oils, weak acids, weak caustics
- PV limit 1,000,000 if header and follower are used
- pH range 4-10
- No graphite

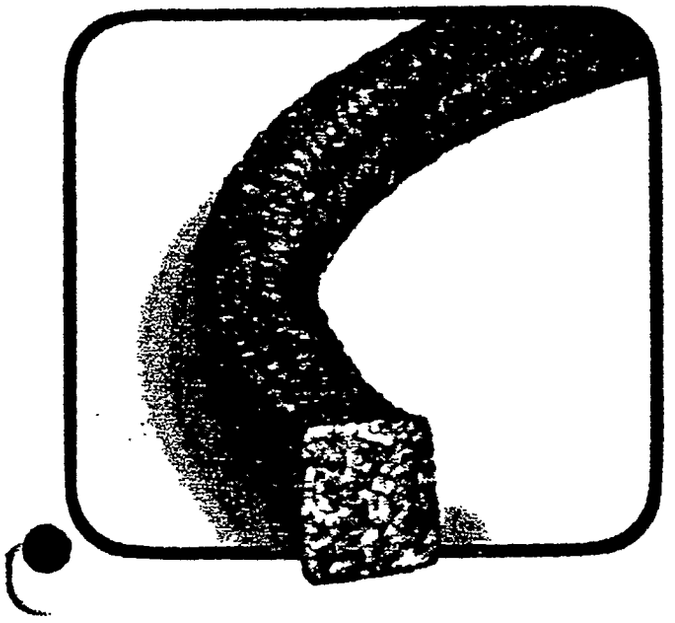
STYLE 1050R

FBW-145

4 NEW STYLES—THEY'RE COLOR CODED!

LOKLUBE AMBER

for PAPER MILL SERVICES
pH range 4-10

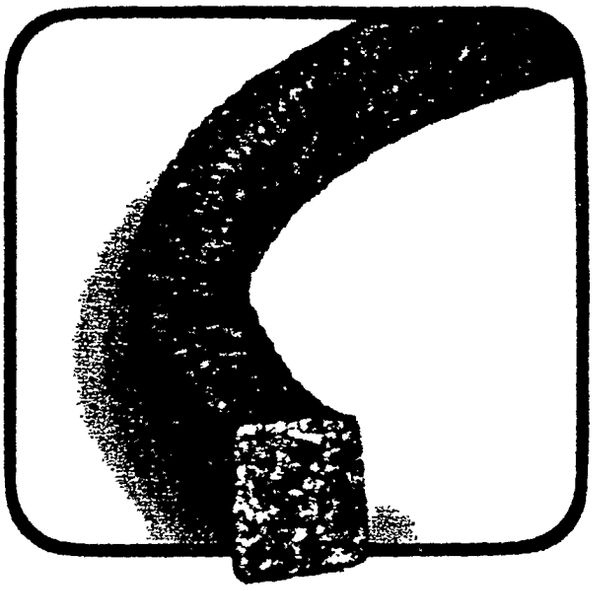


- Specifically designed for centrifugal pumps, Jordans, refiners and other rotary services in paper mills
- No graphite content
- Speeds to 3600 rpm.
- Temperatures to 500F
- PV limit 650,000

STYLE 1009A

LOKLUBE BLUE GRAY

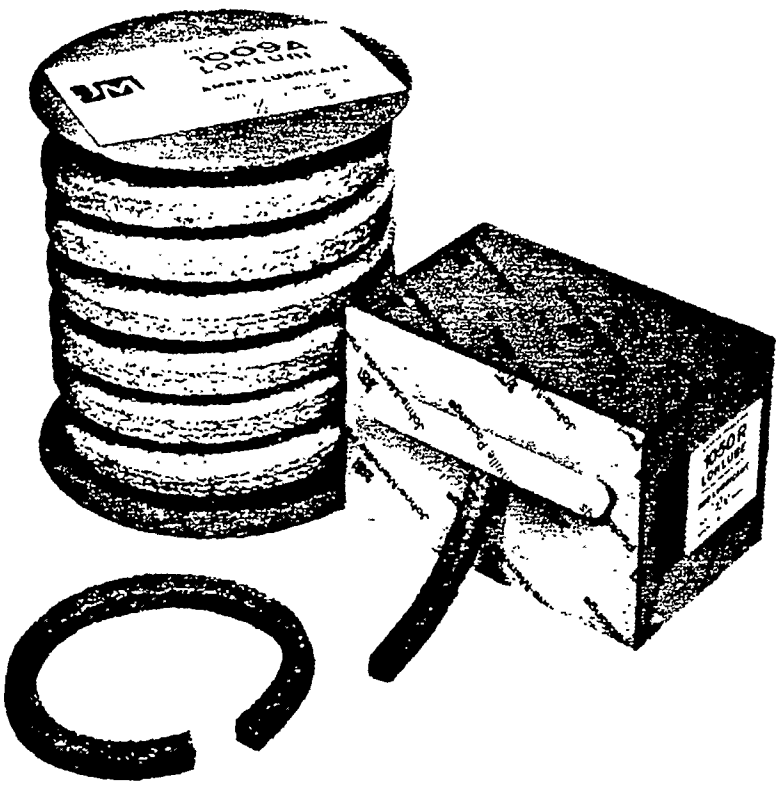
for ALUMINUM & STEEL
MILL SERVICES



- Heavily treated inside, and externally finished with Molydisulphide. This, plus heavy concentration of selected new lubricant, and Interlocked construction creates a packing of special appeal to many primary metal producers
- Temperatures to 500F
- pH range 4-10. PV limit 650,000

STYLE 1012M

FBW-146



Convenient Packaging

Johns-Manville Loklube Packings are furnished to you in easy-to-measure spools, hand-cut rings or in sets of rings. This means no tangling, waste or soilage problems. One-pound spools are shipped in self-dispenser cartons for on-the-spot packing jobs for your convenience.

PRODUCT WARRANTY

J-M products are warranted free from defects in workmanship and raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

COMPREHENSIVE TECHNICAL DATA ON LOKLUBE PACKINGS AVAILABLE ON REQUEST.

Johns-Manville

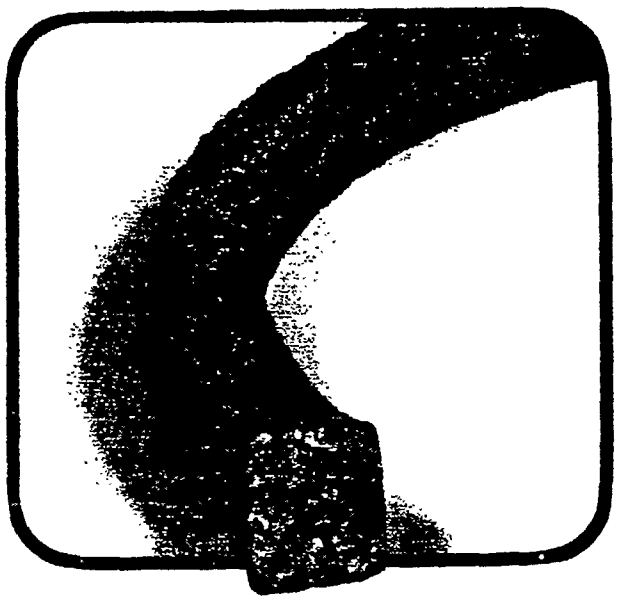
22 East 40th Street · New York, N.Y. 10016

Sales Offices in Principal Cities

FBW-147

LOKLUBE BLACK

for PULP MILL SERVICE



- Rich with special new lube and heavily graphited throughout. Plus graphite finish
- New Loklube process saturates the Interlocked structure in a manner designed to satisfy the preferences of mill superintendents
- Speeds to 3600 rpm. Temperatures to 500F
- pH range 4-10. PV limit 650,000

STYLE 1003G

Exciting New Features

- **Special high temperature lubricants**
- **Pre-lubed Asbestos Yarns**
- **Four styles fill many needs**
- **New high PV factors**
- **Broad pH ranges**
- **Sturdy Interlocked construction**
- **Pliable, installs cleanly and easily**

Assure Valuable Benefits

- **Long trouble-free life**
- **Fewer gland adjustments**
- **Less wear of shafts/sleeves**
- **More lubricant retained**
- **Added safety against washouts**
- **Color-coded to aid identification**
- **Handles pleasantly, easily**

FBW-148

Announcing

JOHNS-MANVILLE

LOKLUBE* PACKINGS

WITH PRE-LUBRICATED ASBESTOS YARNS

- New High Temperature Lubricants
- New High PV factor—to 650,000
- Broad pH range—4 to 10
- Extended life cuts expense; improves pump performance
- MODERATE . . . NOT PREMIUM PRICES!

*J-M TRADEMARK

FBW-149

TECHNICAL BULLETIN JM

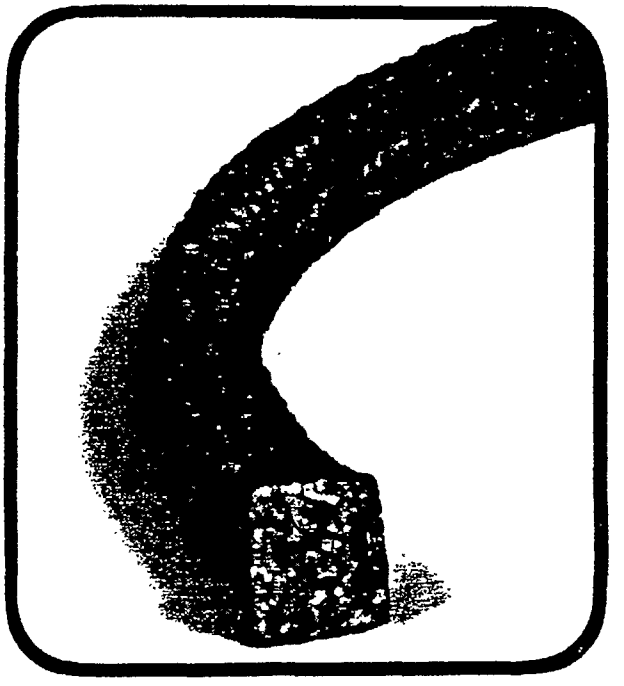
Johns-Manville

LOKLUBE* Packings

offer unique features and benefits for service in centrifugal and rotary pumps

DESCRIPTION

Johns-Manville LOKLUBE Packings are designed for general service in a wide range of applications. New improved ingredients and production methods have been incorporated to increase performance levels and packing life, thereby reducing the frequency of gland take-ups and repacking. This assures positive, demonstrable savings in packing costs, down-time and labor. J-M LOKLUBE Packings are specifically designed to provide extra efficiency in performing particular operations.



ADVANTAGES

- Moderately priced
- High-Temperature Lubricants protect against burn-outs
- LOKLUBE Processt pre-lubricates each strand before braiding to resist fluid wash-out of lubricant
- Interlocked® Construction seals better, lasts longer
- Easier handling for quicker installation
- Speeds to 3600 rpm. Temperatures to 500F
- pH range 4 to 10. PV limit—650,000

FOUR STYLES COLOR-CODED FOR SPECIFIC SERVICES

▶ RED LOKLUBE STYLE 1050R

For hot water service such as boiler feed pumps. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc. PV limit on this Style may be increased to 1,000,000 by using Header and Follower Rings of J-M 393 Lead or J-M 392 Aluminum.

▶ AMBER LOKLUBE STYLE 1009A

For Paper Mills. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc. Contains no graphite, will not discolor fluid media.

▶ GRAY-BLUE LOKLUBE STYLE 1012M

For aluminum, steel and other primary metal plants. Molydisulphide throughout, molydisulphide finish. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc.

▶ BLACK LOKLUBE STYLE 1003G

For Pulp Mills and other services where Graphite is desirable. Graphited throughout, graphite finish. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc.

†Patent applied for

* Johns-Manville Trademark

Detailed Data will be found on the following pages.

FBW-150

F. B. WRIGHT COMPANY

9999 Mercier Avenue, Dearborn, Michigan

TELEPHONE VI. 3-8250

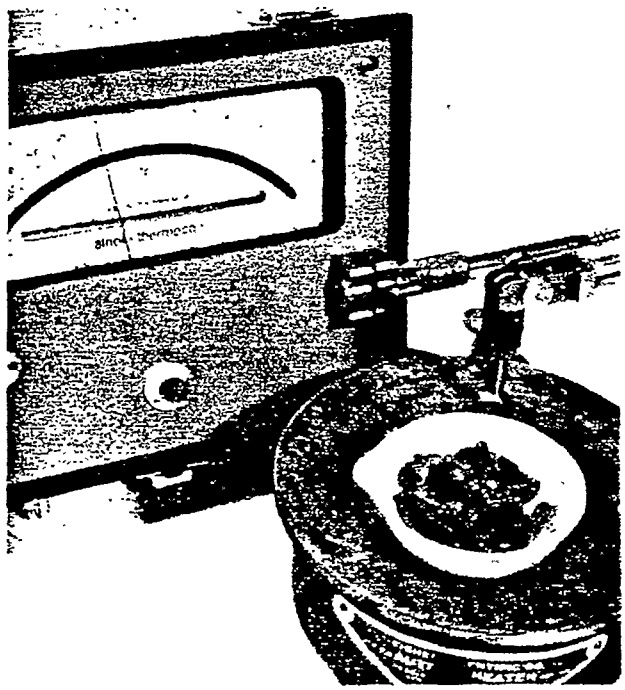
Johns-Manville LOKLUBE Packings

HIGH-TEMPERATURE LUBRICANTS PROTECT AGAINST BURN-OUTS

J-M LOKLUBE lubricants are special-purpose types, developed particularly for pump packings. Their performance and service life are far superior to lubricants used by the Industry in general service packings. Their unusual heat resistance (up to 500F) insures they remain stable at high temperatures, so that the combination of heat and pressure does not force them out of the packings.

Ordinary lubricants, which melt at 160-190F, "ooze" out—either in routine operations, or if the gland has been tightened too much. For instance, when new packings are installed, and adequate leakage has been allowed for during the break-in period, another maintenance man often follows and tightens the gland excessively to stop the leakage. The temperature rises—the lubricant melts and is forced out of the packing, which shrinks and fails.

J-M LOKLUBE Packings retain their full lubrication and continue their sealing and protective functions even when operating temperatures are higher than normal. This means less friction, longer packing life, fewer repacks and less shaft/sleeve wear.



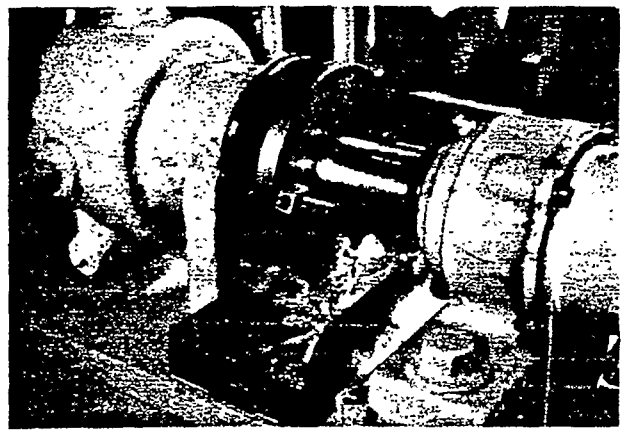
J-M LUBRICANTS REMAIN FIRM AT 500F
Long-lasting protection of both packing and shaft is assured...saving on initial packing costs, labor, downtime and preventing shaft/sleeve wear. This safety factor allows time to readjust a too-tight gland for normal operation.

LOKLUBE PROCESS RESISTS FLUID WASH-OUT

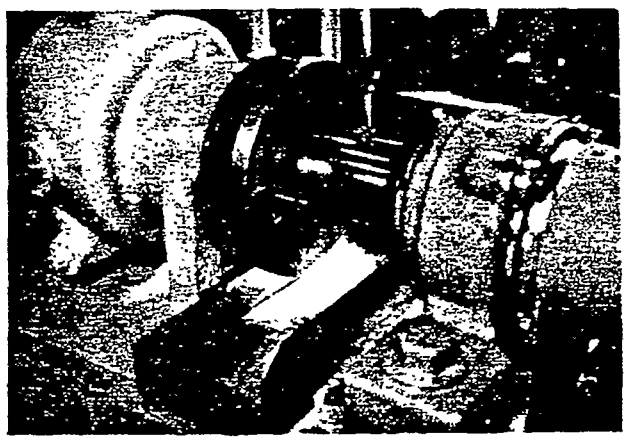
Johns-Manville has developed an entirely new, different and inventive production method which pre-lubricates each asbestos strand prior to braiding. The lubricant is locked integrally into the structure of the packing, insuring a constant supply of lubricant throughout the life of the packing.

Most packings are lubricated by dipping the finished product into the lubricant. In operation, the lubricant washes out, leaving the bare strands to seal the shaft. This leads to overheating, premature packing failure and shaft wear.

Long after lubricants in ordinary packings have washed away, J-M LOKLUBE Packings retain their efficiency, preventing overheating and wear on both the shaft and the packing. You save on the costs of the packings, labor, downtime and shaft/sleeve replacement.



These identical Rotary Rod Test Units were used to evaluate packings under conditions which would be encountered in actual pump operations...2" shaft, 2000 rpm, cold water, 40 psi, 100 hrs. The one on the top was equipped with standard packings. Note the amount of lubricant which washed into the drip pan. The unit at the bottom, equipped with J-M LOKLUBE Packings, was run simultaneously under identical conditions. Note the clean drip pan. The lubricant remained inside the packing. Here is graphic proof that J-M LOKLUBE resists fluid washout.

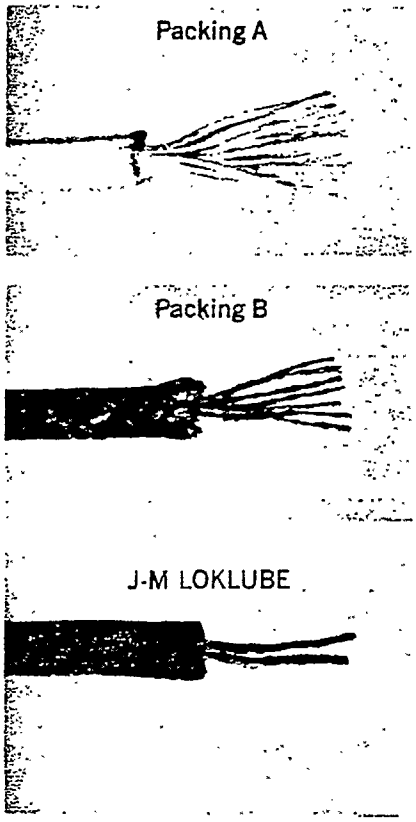


FBW-151

INTERLOCKED® CONSTRUCTION WEARS LONGER, WON'T RAVEL

Johns-Manville Interlocked Construction in all LOKLUBE Packings uses only one or two strands in the center to "lead" the braiding process. This produces a firm, long-wearing packing. Lubricant loss remains at a minimum, reducing friction and shaft wear—less adjustment and longer life before repacking.

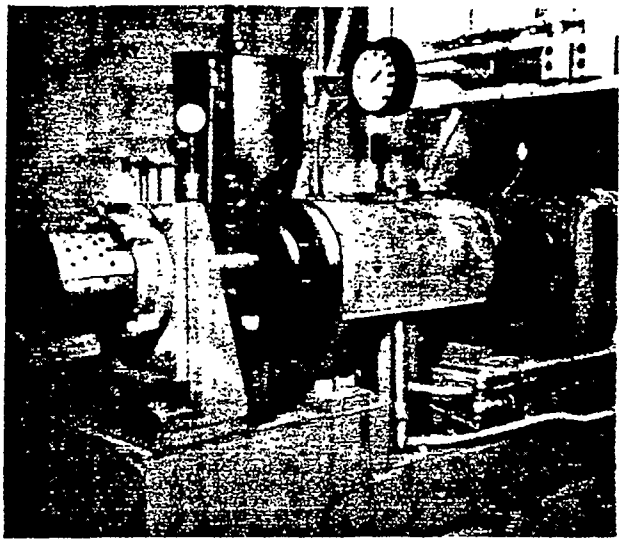
Some packings use multiple single strands of asbestos in the center to build up the required bulk to make the correct size. The result is a weaker, less resilient structure which tends to ravel in installation, requires more compression to obtain a seal, and needs more frequent adjustment. It packs down, squeezing out the lubricant, causing faster wear.



This illustrates the difference in the number of center strands used in the same size packings. J-M LOKLUBE employs a minimum number, thereby providing a stronger, longer-wearing packing.

WIDE pH RANGE FOR VERSATILE APPLICATIONS IN MANY OPERATIONS

J-M LOKLUBE Packings are designed for general service media ranges—pH from 4 to 10. This permits handling a broad range of fluids—hot and cold water, brine, oils, weak acids, weak caustics, etc. This versatility allows you to standardize on J-M LOKLUBE Packings and reduce your inventory requirements.



HIGHER PV LIMITS EXTEND PACKING LIFE IN SEVERE SERVICE

Many modern general service pumps are designed to operate under conditions previously impossible without the use of special, costly packings. Johns-Manville developed LOKLUBE Packings which withstand these extreme requirements and still remain in the moderately priced category.

To test and prove the efficiency of these new packings, J-M Engineers designed a special PV Test Unit to duplicate the requirements of these high-performance pumps. Illustrated above is the PV Test Unit which subjected the packings to a combination of high pressures, speeds and temperatures. Out of these tests came J-M LOKLUBE Packings which perform efficiently under these demanding specifications. Some of these tests reached 1,000,000 PV (pressure times shaft velocity in feet/min) and temperatures of 450F. Specifically, J-M Style 1050R (RED) performs effectively on hot water pumps in the range of 400 psi—450F—3600 rpm on 3" shafts using Header and Follower Rings of J-M 393 Lead or J-M 392 Aluminum.

This original and extensive research by J-M Engineers has developed moderately priced packings which meet high-performance requirements for safe, long service life, which promise you substantial savings in packing costs, labor, down-time and plant production.

PRODUCT WARRANTY

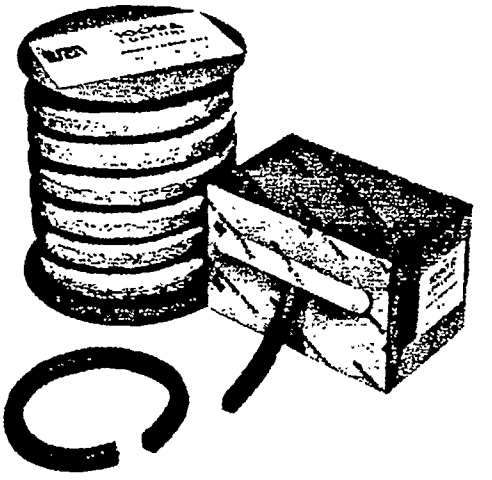
J-M products are warranted free from defects in workmanship and in raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

Johns-Manville LOKLUBE Packings

EASIER TO HANDLE AND INSTALL

J-M LOKLUBE Packings are even and smooth. They fit into stuffing boxes without preliminary pounding to size. Easy to cut, easy to pack without forcing or keystoning, they require less compression and less gland take-up to maintain a seal.

IMPORTANT: Use normal, good installation practices. Remove all old packing, clean the stuffing box, use the right packing size, cut rings properly, install one ring at a time. Pay particular attention to the following step: After the last ring is installed, take up the bolts finger-tight. Start the pump and take up the bolts until the leakage is decreased to an acceptable minimum. Allow packing to leak freely when starting up; allowing generous leakage during the first hour of operation results in better break-in. Take up gradually on the bolts until the leakage is tolerable. Never try to stop leakage entirely. Your J-M Representative will be glad to provide you with complete, detailed Installation Procedures.



CONVENIENT PACKAGING

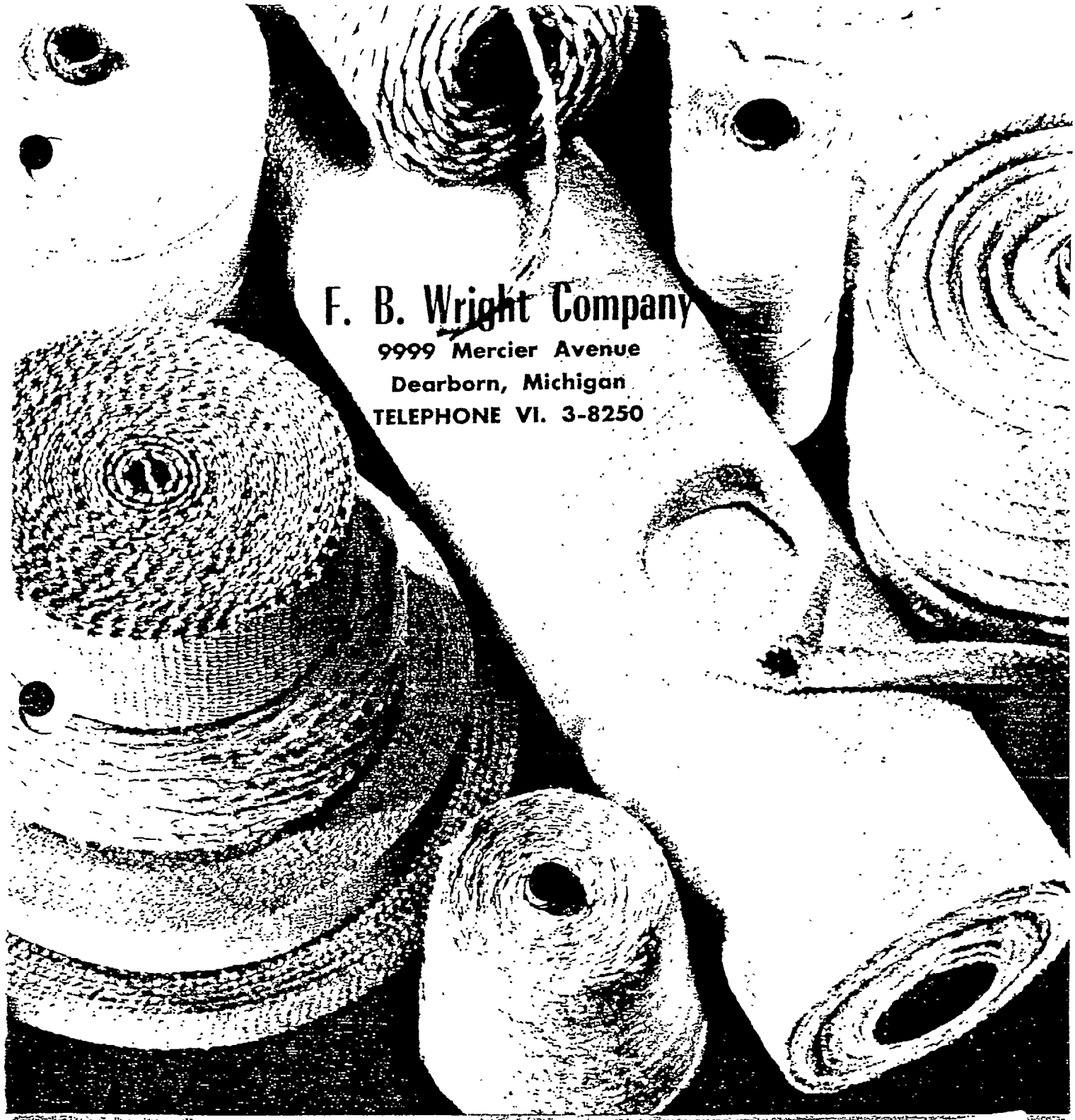
Johns-Manville LOKLUBE Packings are furnished to you in easy-to-measure spools and hand-cut rings. This means no tangling, waste or soilage problems. One-pound spools are shipped in self-dispenser cartons for on-the-spot packing jobs for your convenience.

Johns-Manville

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Sales Offices in Principal Cities

JM



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9999 Mercier Avenue
Dearborn, Michigan
TELEPHONE VI. 3-8250

FBW-154

JOHNS-MANVILLE

Asbestos Packings

FOURTH PRINTING



This Asbestos (Canadian Chrysotile) is dense as the rock in which it occurs. Heavy as stone in their original state, after mechanical treatment J-M SILKSTONE fibres are light as thistledown.



CONTENTS

LAP	4
ROVING	5
YARN	6
CLOTH	8
TUBING	13
ROPE	14
CORD	14
TAPE	15

FBW-155

PRODUCT WARRANTY

J-M products are warranted free from defects in workmanship and raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

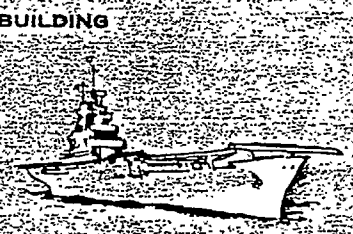
WHY J-M ASBESTOS TEXTILES IMPROVE SAFETY, REDUCE COSTS

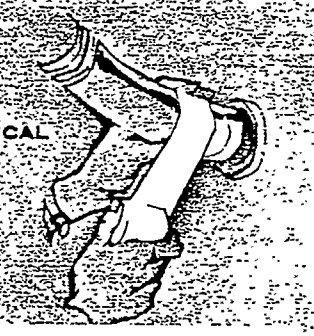
Johns-Manville Asbestos Textiles serve in friction facings and linings for industrial equipment, insulations for electrical wires and cables, paddings for laundry presses, beltings for conveying hot materials, covering for heat insulation and high temperature piping, diaphragms used in electrolytic processes, fire-fighting emergency blankets and protective clothing, fire protection for airplane parts, tin and galvanizing wipers, vacuum bags in cleaning and conveyor systems, mailbags, expansion joints, packings and gaskets, chemical and hot gas filters and many other products.

New uses and applications are being discovered and developed constantly. The resistance of asbestos to many chemicals and acids, its proven incombustibility and its flexibility and fineness of fibre are earning for these textiles an ever-widening field of usefulness in product design.

With a background of over 75 years experience in the manufacture of Asbestos Textiles . . . the free world's largest asbestos mine . . . four manufacturing plants with complete facilities for the development and fabrication of Asbestos Textiles of every description, Johns-Manville is especially qualified to help adapt to your needs one or more of the products described in this book.







GRADES OF ASBESTOS

In the asbestos textile industry, the standard grades and percentages of asbestos in the finished product are established by the American Society for Testing Materials (A.S.T.M.) as shown below.

Grade	Asbestos Content by Weight In the Finished Product
Commercial	75% up to but not including 80%
Underwriters'	80% up to but not including 85%
"A"	85% up to but not including 90%
"AA"	90% up to but not including 95%
"AAA"	95% up to but not including 99%
"AAAA"	99% up to and including 100%

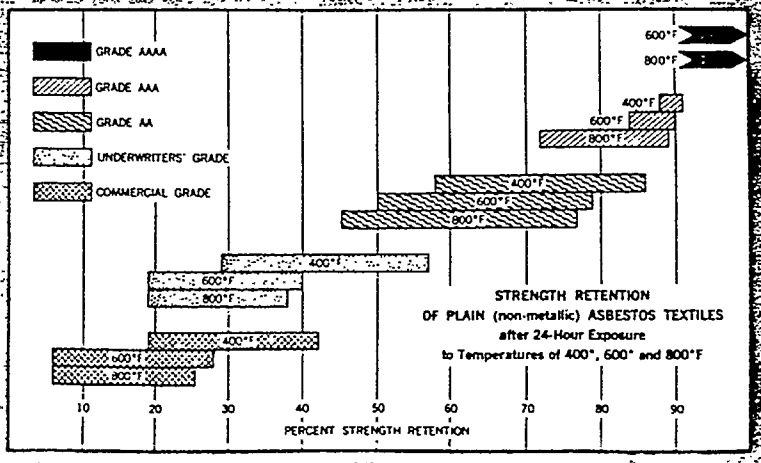
SERVICE TEMPERATURES*

In general, the approximate service temperatures for each grade are as follow:

Commercial Grade	up to 400°F
Underwriters' Grade	up to 450°F
Grade A	up to 550°F
Grade AA	up to 600°F
Grade AAA	up to 750°F
Grade AAAA	up to 900°F

STRENGTH RETENTION*

Strength Retention of Plain (non-metallic) Asbestos Textiles after 24-hour exposure to temperatures of 400°, 600° and 800°F.



*To further extend the temperature serviceability range, use wire-inserted cloths.

FBW-156

Johns-Manville Asbestos Lap is a fire-resistant, untwisted, felted form of carded asbestos fibres, which have been blended with organic fibres (cotton, rayon, etc.). It is furnished in two styles —a single ribbon-like formation of felted asbestos fibres, and a paralleled assemblage of the first style.

Like J-M Asbestos Roving, it is used extensively by the electrical wire and cable industry as an insulation for electrical conductors such as heater cords, fixture wires and cables. Asbestos Lap is applied to the wire in successive, veil-like webs of asbestos, which are continuously wrapped around the wire, assuring a uniformly thick coverage at all points. In this application, Johns-Manville Asbestos Lap, because of its high resistance to the destructive effects of fire and heat, provides durable and lasting protection. It completely encloses the wire or cable and contributes to the useful life of the conductor.

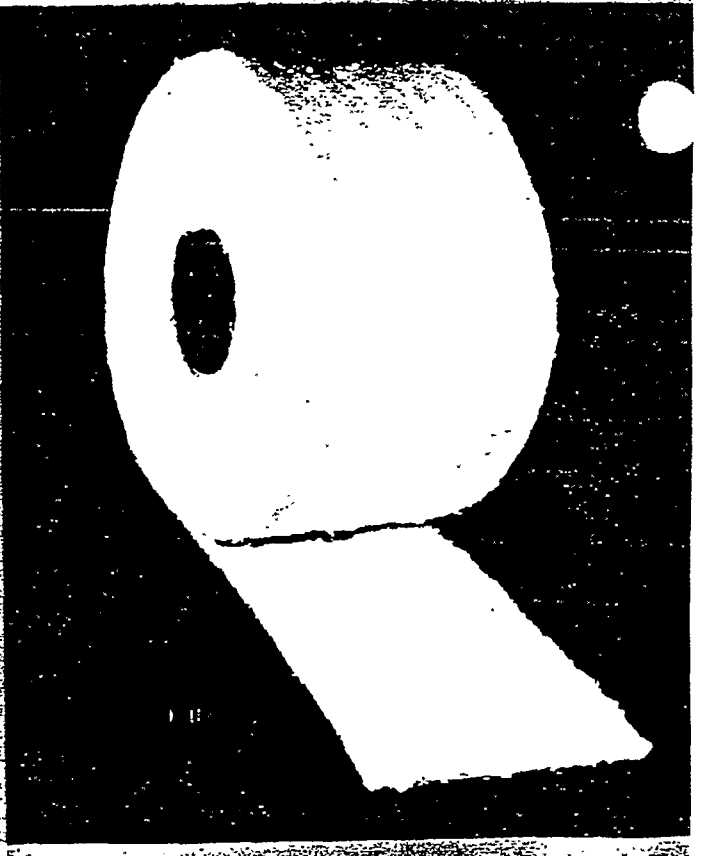
Johns-Manville Asbestos Lap is furnished in roll form, on paper tubes, in widths of 3 to 8 slivers. A sliver of asbestos fibre as it comes from the carding machine is approximately 1¼" wide. Standard sizes for shipping are 3¼", 6½", and 8¾" wide and approximately 14" O.D. Weight of Lap is 250 to 2000 grains per linear yard, depending upon the width of tube.

Johns-Manville Asbestos Lap is available in three standard ASTM grades—Underwriters', "A" and "AA". Underwriters' grade is the most commonly used. Asbestos Lap is manufactured as ferrous or non-ferrous.

STANDARD CLASSIFICATIONS FOR ASBESTOS TEXTILES

	Magnetic Rating Maximum
A.S.T.M. Spec. D1061-58	
Non-Ferrous	
Underwriters' Grade	0.75
Grades A and AA	1
Ferrous	3
A.S.T.M. Spec. D2100-T	
Type II	0.75
Type IV	2
Type VI	4

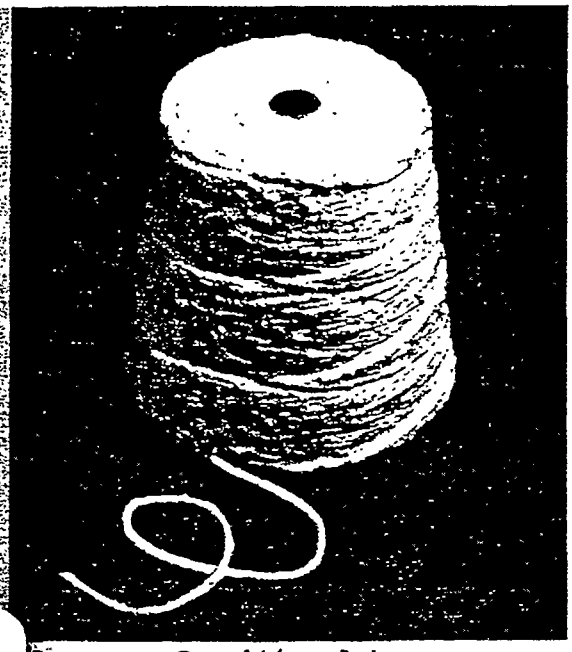
Ferrous and non-ferrous varieties are used according to the application. Non-ferrous is used where the chief insulation is dependent on asbestos. Ferrous is used where another insulation element is more predominant.



Typical Asbestos Lap Roll

FBW-157

J-M ASBESTOS ROVING



Cone of Asbestos Roving.

Johns-Manville Asbestos Roving is a fire-resistant textile product of carded asbestos fibre and an organic fibre (cotton, rayon, etc.), mechanically rubbed into a soft, bulky, untwisted strand. Johns-Manville produces roving in various degrees of density from a soft, fluffy roving to a firm compacted one, to meet specific requirements. Soft-rubbed roving gives maximum coverage while hard-rubbed or compacted roving produces more efficient serving machine operation.

Roving is used extensively by the wire industry as electrical insulation for electrical conductors such as heat-resisting fixture wires, flexible cords or heater cords, cables and numerous electrical heating elements. Strands of Asbestos Roving are wrapped individually by automatic machinery to make a relatively soft, complete wrap over the wire.

Asbestos Roving is available in two types: PLAIN, asbestos fibre blended with cotton or other organic fibres, carded and mechanically rubbed, producing a uniform roving of maximum strength; REINFORCED, plain Asbestos Roving with a core of cotton or other thread for added tensile strength. Also it is classified as ferrous or non-ferrous.

Furnished in three A.S.T.M. grades—Underwriters', "A", and "AA"—Johns-Manville Asbestos Roving meets practically any requirement. The most widely used grade is Underwriters'.

SIZES are 5-cut thru 14-cut. The "cut" number multiplied by 100 gives the approximate yards per pound. (Example: 7-cut runs about 700 yds. per lb.) Standard cut numbers with yards per pound and permissible variations are shown in the table (left).

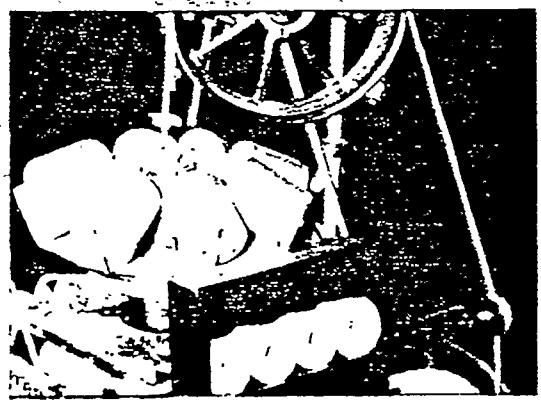
PACKAGING: *Cones:* Two standard sizes; Large — 1-7/8" I.D. at base by 8-3/4" long, wound 5-1/2" O.D. at base by 2" O.D. at top by 6" traverse; Small—1-7/8" I.D. at base x 4-1/2" long, wound 4" O.D. at base by 2" O.D. at top x 4-1/4" traverse. *Tubes:* Paper tubes 3" to 8-1/2" long by 5/8" I.D., wound 2-3/4" to 8" traverse by up to 5" O.D.

Tubes and cones of various sizes are supplied to meet individual requirements and wound with traverse and diameter specified.

REQUIREMENTS FOR YARDS PER POUND OF STANDARD ASBESTOS ROVING*

Cut Number	Nominal Yds./lb.	Permissible Variations in Average Yards Per Pound
5-cut	500	460 to 540
6-cut	600	552 to 648
7-cut	700	644 to 756
8-cut	800	736 to 864
9-cut	900	828 to 972
10-cut	1000	920 to 1080
12-cut	1200	1104 to 1296
14-cut	1400	1288 to 1512

*ASTM Designation D-375



Hard rubbed or compacted roving promotes more efficient serving machine operation. Such a machine

FBW-158

J-M ASBESTOS YARN

Johns-Manville Asbestos Yarn is composed of Asbestos Roving which has been mechanically spun or twisted to give it tensile strength. It is furnished in a wide range of grades, "cuts" (sizes) and plies, either plain, metallic or reinforced, to meet the qualifications or specifications necessary for any purpose for which it is intended. Yarn is used in the manufacture of Asbestos Cloth, Tape, and Tubing; for sewing Asbestos Cloth; as core and wrapping for electrical resistance wires; socking for flexible metal hose; wire wiping in galvanizing plants; for fireproofing electrical cables; and, reinforced with wire, is used for weaving into brake linings and clutch facings and many other products.

Grades—Commercial, Underwriters', "AA", "AAA", and "AAAA".

"Cuts" (Sizes)—8, 10, 12, 14, 16 and 18 cut.

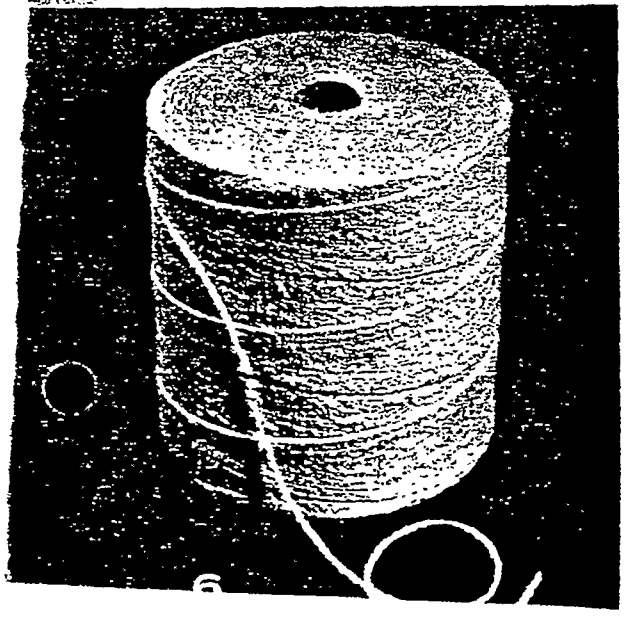
To determine yds. per lb.—Take cut number or size, multiply by 100 which equals number of yds. per lb.

For multi-ply yarn, decrease single ply yardage by 5% and divide by number of plies.

(The yardage per lb. of metallic asbestos yarn is less than that of plain yarn of the same "cut" in proportion to the weight of the inserted wire.)

Ply—Single or multi-ply. Multi-ply is made up of two or more strands twisted together. There are five basic classes of asbestos yarns:

Asbestos Yarn wound on paper tube.



Class A—*Plain* (non-metallic) consists of asbestos fibre or a blend of asbestos and other fibres.

Class B—*Metallic* is asbestos yarn with wire insertion. Wire diameter and metals can be varied.

Class C—*Organic Reinforced* is plain asbestos yarn with an organic yarn insertion.

Class D—*Inorganic Reinforced* is plain asbestos yarn with a non-metallic inorganic yarn insertion.

Class E—*Combination Yarns* are asbestos yarns constructed of two or more of the yarns described in Classes A thru D.

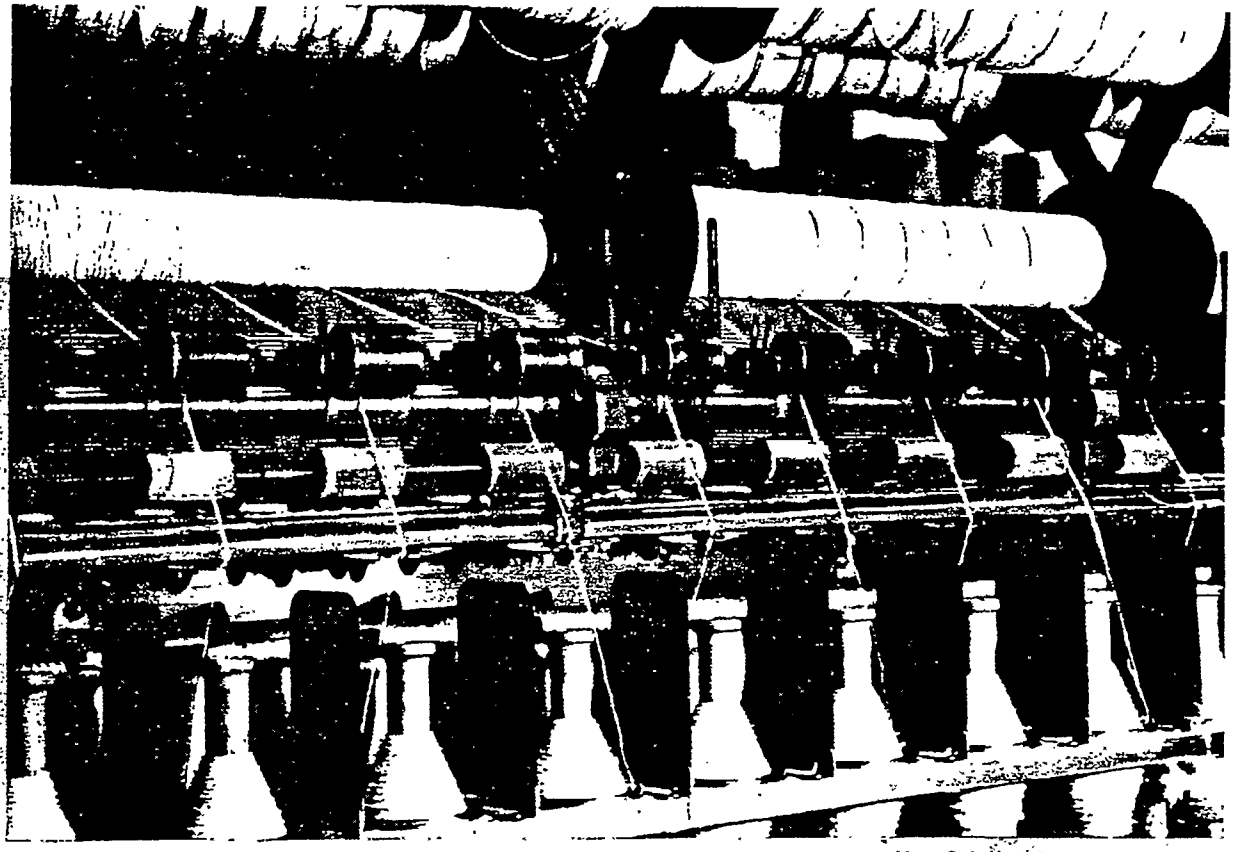
Asbestos yarn classifications A through E are consistent with A.S.T.M. Specification D-299 under revision in 1967.

YARN NUMBERS: In the asbestos textile industry, the yarn numbering system used designates the cut, number of plies, and whether the yarn is plain or metallic. In a four digit figure, the first two digits indicate the cut, the next digit indicates the number of plies and the final digit indicates the number of metallic strands. If the final digit is a zero, it indicates a plain (non-metallic) yarn. For example, No. 1022 is a 10-cut, 2-ply metallic yarn containing two wires, and No. 1430 is a 14-cut, 3-ply plain yarn. In a three digit figure, the first digit only indicates the cut. Thus No. 810 is an 8-cut single ply plain yarn.

REQUIREMENTS FOR YARDS PER POUND OF STANDARD SINGLE ASBESTOS YARNS*

Cut Number	Nominal Yds./lb.	Permissible Variations in Average Yards Per Pound	Permissible Variations in Yards Per Pound of Single 30-yd. Skein
5-cut	500	460 to 540	425 to 575
6-cut	600	552 to 648	510 to 690
7-cut	700	644 to 756	595 to 805
8-cut	800	736 to 864	680 to 920
9-cut	900	828 to 972	765 to 1035
10-cut	1000	920 to 1080	850 to 1150
12-cut	1200	1104 to 1296	1020 to 1380
14-cut	1400	1288 to 1512	1190 to 1610
16-cut	1600	1472 to 1728	1360 to 1840
18-cut	1800	1656 to 1944	1530 to 2070

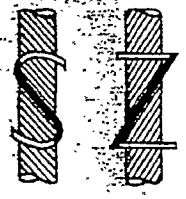
*As prescribed in the latest A.S.T.M. D-299



Yarn-Spinning Frame

YARN TERMINOLOGY:

- *Endless Yarn or Knotless*—plied yarn in which splices are made without any change in the yarn diameter.
- *Ends-Up*—refers to the number of strands of yarn wound parallel on a tube.
- *Cord Construction*—Asbestos Yarn with 6 or more plies of single yarn.
- *Wire*—A wire insertion frequently used is brass .007" or .008" in diameter. Other types of wire used are copper, zinc, stainless steel, Inconel, etc.
- *Direction of Twist*—There are two types of twists, known as "S" twist and "Z" twist. A yarn or cord is said to have "S" or "Z" twist if, when held in a vertical position, the spirals in the yarn conform in direction of slope to the central portion of the letter. Unless otherwise specified, single-ply yarns will be furnished with "Z" twist and multi-ply yarns with "S" twist.



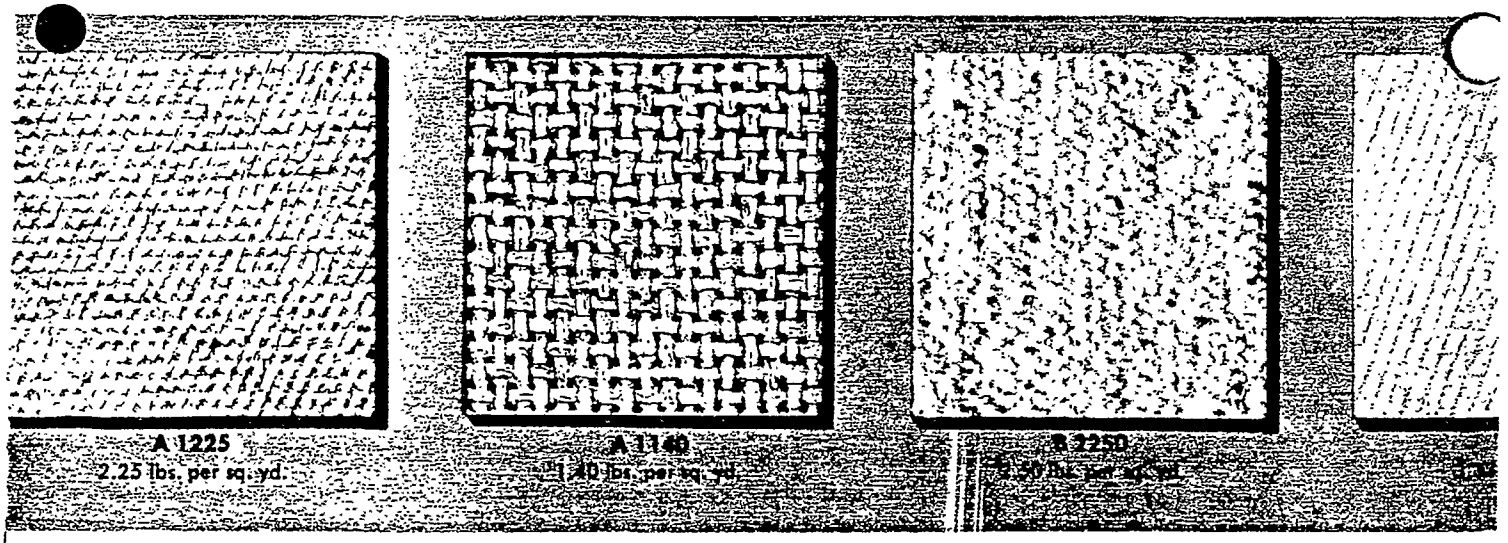
- *Treating or Sizing:* For special purposes, Asbestos Yarns are also coated or impregnated with various compounds to increase tensile strength, lay the fibres, or impart certain qualities of the compound. These are known as treated or sized yarns and are produced to customer specifications.
- *Packaging*—Supplied on paper tubes with Universal Winding.
- *Sizes:* Paper tubes 3" to 8-1/2" long x 5/8" I.D., wound 2-3/4" to 8" traverse x up to any desired O.D.
- *Tubes* of various sizes are supplied to meet individual requirements, and wound with traverse and diameter specified.



J-M ASBESTOS CLOTH

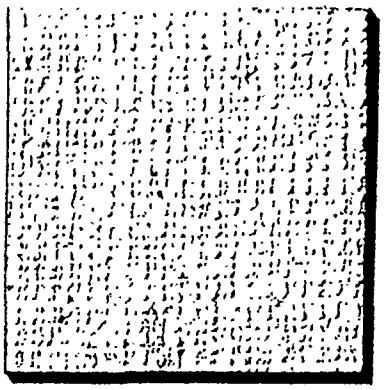
Asbestos Cloth is Asbestos Yarn woven into a fabric to form a pliable, mineral textile with high tensile strength and high resistance to heat, flame, chemicals and weather. It is available in a wide range of textures, from light-proof to open weave, in all standard grades with or without wire insertions, and in thicknesses and weights suitable for every purpose.

Made from the longer "spinning fibres" of asbestos, Asbestos Cloth is used in the manufacture of annealing and fire-smothering blankets, belts for conveying heated objects through ovens and in dryers such as blueprint machines, covers for rollers on laundry flat-work ironers, for laminating cloth in plastic parts, covering heat insulation, curtains for dryers, glass lehrs or welding booths, shields to protect workmen from fire, all types of safety clothing, electrolytic cells, filter cloths, forge furnace hoods, mill scale fenders, wrapping for sheet glass and conveyor rollers and countless other products.



Federal specifications, particularly those of the United States Navy, require pipe insulation above 500° F to be protected by an outside jacket of asbestos cloth. Many maritime, industrial and utility power plant specifications also require asbestos cloth to serve as a permanent protection and fireproof jacket over pipe and boiler insulation. Underground and overhead piping, both steam and refrigeration are often protected by a jacket of asbestos cloth.

FBW-161

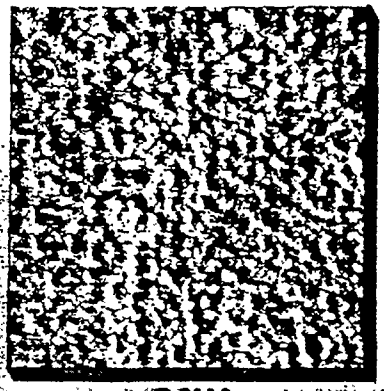


A 2075
0.75 lbs. per sq. yd

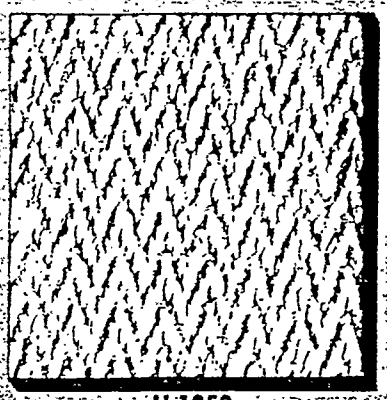
Light Weight Asbestos Cloth is particularly suitable in many of these same applications when weight limitations, good "drape" and ability to conform to irregular shapes are major considerations. In the plastics field, the cloth's light weight and conformability provide a reinforcement material that is compatible with manufacturing operations. This use of Asbestos Cloth results in finished plastic products having great strength and high resistance to heat.

Asbestos Cloth of unexcelled quality is assured by Johns-Manville's many years of experience in the manufacture of Asbestos Textiles coupled with their vast research and quality control facilities. Details of styles of Johns-Manville Asbestos Cloth are given in the tables on pages 10-12.

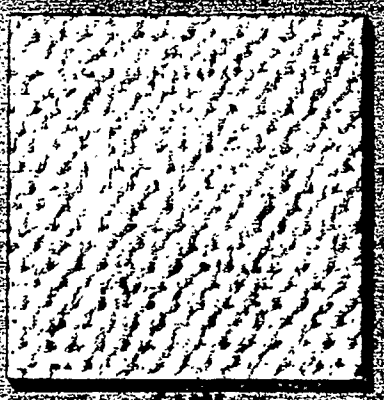
Asbestos Clothing as made by leading Safety Clothing Fabricators provides safety for industrial workers. Light in weight and remarkably pliable, Asbestos Clothing is a chemically-resistant and fire-resistant textile product. It is valuable in providing protection to members of services responsible for fighting and making rescues through fires and extreme heat.

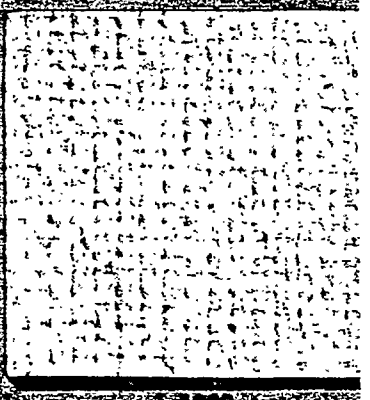


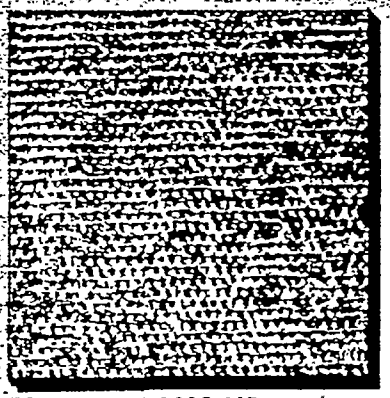
D 2110
1.10 lbs. per sq. yd.



H 1250
2.50 lbs. per sq. yd.







A 1225-ALF
2.40 lbs. per sq. yd.

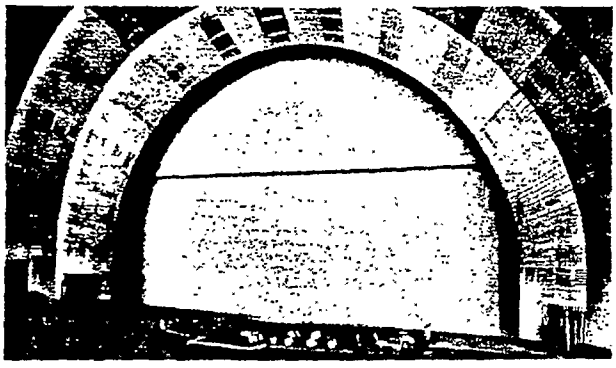
Aluminized Asbestos Cloth is designed to combat heat in radiant form. Made by laminating aluminum foil to an Asbestos Cloth backing, this material is effective in reflecting 90% of all radiant heat, helps to improve worker efficiency.

Asbestos-aluminum laminate retains a great degree of strength at temperatures up to 1400°F, over long periods of time. Used wherever flame and radiant heat must be controlled—as blankets, shields, hoods, covers and curtains—it helps to reduce flame and heat hazards. Refer to Specifications, page 12, for those cloths which can be aluminized.

FBW-162

APPLICATIONS

J-M ASBESTOS CLOTH



Asbestos Safety Curtain Photo Courtesy Radio City Music Hall, New York City.

Asbestos Safety Curtains made from Asbestos Cloth, provide effective fire-stops and thereby protect theater audiences from the damaging effects of back-stage and wing fires. J-M Asbestos Safety Curtains and Blankets are also used to check radiant heat and hot metal splash, and in mines, buildings, ships, air-conditioning ducts . . . in fact, wherever flexible "fire-walls" are needed to reduce the hazards of property damage or loss of life. Johns-Manville Asbestos Safety Curtains and Blankets are custom-made to comply with any municipal regulation.

RECOMMENDED APPLICATIONS FOR J-M ASBESTOS CLOTH

Uses	Style Number
Blankets	
Annealing	A 1225
Fire Smothering	A 1225
Belts—Blueprint Machines	A 1250; A 1225
Clothing, Safety	A 1225; A 1250 T 1250; A 4250; T 2120 ALF
Covering Insulation—Diesel Exhaust Pipes	A 1225
Curtains	
Dryers	A 1225; I 1301
Glass Lehrs—Welding	A 1225; A 1258
Shields for Workmen, Fire Protection	A 1225; A 1225 ALF
Electrolytic Cells	T 5300; T 5333
Filter Cloths	T 5333; T 5300
Hoods, Forge Furnaces	A 1225; I 1301; A 1225 ALF
Insulating Covers	A 1225 ALF
Glass Conveying	A 1225
Jackets over Insulation	
Temp. to 350 F.	A 1225
Temp. above 350 F.	C 5240
Laundry Cloth	C 4225; A 1225 ALF; A 2075
Mill Scale Fenders	A 1225
Motion Picture—Portable Booths	A 1225; A 1250
Plastics, reinforced	A 2165; A 1165 A 2225; A 1225
Wrapping	
Sheet Glass	A 1225; A 1250
Conveyor Rollers	I 1301

The following information explains the breakdown of the J-M Asbestos Cloth style numbers, and gives other helpful information pertaining to the J-M Asbestos Non-Metallic and Metallic Cloth Specifications—listed on the next two pages.

EXPLANATION OF CLOTH STYLE NUMBERS

Letter Prefix: Denotes weave and type.

- A—plain weave
- B—plain weave, safety cloth
- C—plain weave, MIL (Govt.) Specification
- D—plain weave, glass and asbestos
- E—plain weave, 2 ply
- H—herringbone weave
- J—plain weave, brass wire inserted yarns
- K—plain weave, nickel wire inserted yarns
- L—plain weave, monel wire inserted yarns
- M—twill weave, lead wire inserted yarns
- N—plain weave, Inconel wire inserted yarns
- R—plain weave, blue asbestos yarns
- T—broken twill weave or twill weave
- W—plain weave, stainless steel inserted yarns

First Numerical Digit: Denotes grade.

1 Commercial	4 "AA"
2 Underwriters	5 "AAA"
	6 "AAAA"

Last Three Numerical Digits: Denotes approximate weight per square yard, in pounds and decimals of pounds.

Example: A-1250 Asbestos Cloth

A—plain weave
1—commercial grade
250—approx. 2.50 lbs. /sq. yd.

ASBESTOS CONTENT and TEMPERATURE RANGES (Conforms to ASTM Specifications)

ASTM Grades	Asbestos Content (by Weight)	Approx. Service Temperature Limits*
Commercial	75% up to but not including 80%	Up to 400F
Underwriters	80% up to but not including 85%	Up to 450F
A	85% up to but not including 90%	Up to 550F
AA	90% up to but not including 95%	Up to 600F
AAA	95% up to but not including 99%	Up to 750F
AAAA	99% up to and including 100%	Up to 900F

*For higher temperatures, cloth with wire insertion is sometimes employed.

TOLERANCES for ASBESTOS CLOTH

Conforms to ASTM Standards for Asbestos Textiles

Weight (per square yard): Shall not vary by more than 7% over or under specified weight.

Width: Shall not vary by more than 0.5" over or under specified width.

Roll Length: Standard rolls of 50 yards and 100 yards plus or minus 5 linear yards.

Construction: Number of warp and filler yarns shall not vary by more than one over or under count specified.

Asbestos Content: Shall come within the percentage range specified.

FBW-163

NON-METALLIC ASBESTOS CLOTH

NEW J-M Style Number	OLD J-M Style Number	Weight per sq. yd., lbs.	Approx. Thickness, inches	Warp Yarn	Filler Yarn	Warp Ends per in.	Filler Ends, per in.	Maximum Width,* inches
Commercial Grade								
A 1109††		1.09	.050	1020	1210	10	7½	72
A 1120††		1.20	.040	1020	1210	10	10	72
A 1140	DE 808	1.40	.055	1020	1020	8	8	72
A 1165††		1.65	.048	1420	1420	14	14	72
A 1170††		1.70	.060	1020	1020	10	9	72
A 1175††		1.75	.065	1220	1210	21	11	72
A 1187	FE 3010	1.80	.058	1420	1420	20	10	72
A 1200††		2.00	.066	1020	1220	18	7½	72
A 1225 ◀	444 ◀	2.25	.070	1020	1020	18	9	72
A 1228	444A	2.25	.070	820	820	16	6	72
A 1250	1067	2.50	.075	1020	1020	20	10	72
A 1258	1067A	2.50	.075	820	820	16	8	72
H 1250	FE 4914	2.50	.070	1420	1420	29	12	48
A 1272††		2.72	.080	1020	1030	18	9	60
E 1400	DE 8516	4.00	.125	1020	1020	25	15	48
E 1426††	DEC 8516	4.20	.125	1020	1020	30	14	48
E 1450††		4.50	.125	1020	1020	30	15	48
E 1485		4.85	.140	1020	1020	36	15	48
Underwriters' Grade								
A 2070††	11 P 42	.70	.033	4220	4220	19	18	60
A 2075	12 P 42	.75	.022	4220	4220	21	18	60
D 2082††		.82	.034	1411G•	1411G•	18	9	60
A 2094ALF ◀		.94	.025	4220	4220	21	18	40
A 2109††		1.09	.050	1020	1210	10	7½	72
D 2110†	4411	1.10	.040	1012G•	1012G•	13	9	72
A 2120††		1.20	.040	1020	1210	10	10	72
T 2120ALF ◀		1.20	.025	3020	3010	27	18	40
A 2140		1.40	.055	1020	1020	8	8	72
C 2140**† ††		1.40	.055	1620	1620	19	10	72
D 2140†	3767	1.40	.043	1012G•	1012G•	18	9	72
C 2150**††		1.50	.062	1020	1020	9	9	72
A 2165††		1.65	.048	1420	1420	14	14	72
A 2170††		1.70	.060	1020	1020	10	9	72
A 2175††		1.75	.065	1220	1210	21	11	72
A 2180		1.80	.053	1620	1620	24	10	60
C 2183**††	6190X	1.83	.055	1020	1010	16	10	72
A 2187††	FE 3010X	1.80	.058	1420	1420	20	10	72
C 2187**††	FE 3010X	1.80	.058	1420	1420	20	10	72
A 2200††		2.00	.066	1020	1220	18	7½	72
A 2225	DE 2909X	2.25	.070	1020	1020	18	9	72
C 2225*†		2.25	.066	1020	1020	18	9	72
H 2225††		2.25	.070	1420	1420	25	10	48
A 2250	DE 3010X	2.50	.075	1020	1020	20	10	72
C 2252**††	DE 3010X	2.50	.075	1020	1020	20	10	72
H 2250**†		2.50	.080	1420	1420	29	12	48
A 2272††		2.72	.080	1020	1030	18	9	60
E 2400	DE 8516X	4.00	.125	1020	1020	25	15	48
E 2426††	DEC 8516X	4.20	.125	1020	1020	30	14	48
E 2450††		4.50	.125	1020	1020	30	15	48
E 2485**††	DE 10616X	4.85	.140	1020	1020	36	15	48
E 2525††		5.25	.187	1020	1040	30	13	48
AA GRADE								
C 4140**††	PE 1215	1.35	.045	1620	1620	12	15	72
C 4187**††	DE 3010	1.80	.058	1420	1420	20	10	72
A 4225††	ME 2909	2.25	.070	1020	1020	18	9	72
C 4225**†	ME 2909	2.25	.070	1020	1020	18	9	72
A 4250††	ME 3010	2.50	.075	1020	1020	20	10	72
C 4250**	ME 3010	2.50	.075	1020	1020	20	10	72
E 4450††		4.50	.125	1020	1020	30	15	48

• 'G' denotes Glass Yarn.
* Standard Widths: 36", 40", 60"
** Meets Spec. MIL-C-10316B
† Meets Spec. SS-C-00466e
†† Not stocked. Consult your J-M Sales Office.

Any B Style (Safety Weave) Cloth can be treated in colors white, green, blue, orange.
Order colored safety cloth with the prefix SW, SG, SB or SO.

CONTINUED ON FOLLOWING PAGE ▶

SPECIFICATIONS (continued)

NEW J-M Style Number	OLD J-M Style Number	Weight per sq. yd., lbs.	Approx. Thickness, inches	Warp Yarn	Filler Yarn	Warp Ends, per in.	Filler Ends, per in.	Maximum Width,* inches
AAA GRADE								
C 5140**††		1.40	.055	1620	1620	19	10	72
C 5210**††	VE 2808	2.05	.065	1020	1020	16	8	72
C 5225**† ◂	VE 2909 ◂	2.25	.070	1020	1020	18	9	72
C 5240**	912	2.40	.065	1220	1220	20	11	72
C 5250††		2.50	.075	1020	1020	20	10	72
T 5300**	WE 5011	3.00	.075	1220	1220	30	11	48
T 5333		3.33	.098	1020	1020	30	9½	48
T 5350††	UE 4807	3.50	.085	820	820	26	8	48
T 5388††	WI 4809	3.90	.085	1230	1230	24	9	48
E 5450††		4.50	.125	1020	1020	30	15	48
AAAA GRADE								
C 6225††		2.25	.070	1020	1020	18	9	72
ASBESTOS SAFETY CLOTH – Commercial Grade‡								
B 1225		2.25	.070	1020	1020	18	9	72
B 1228††		2.25	.070	820	820	16	6	72
B 1230††		2.30	.068	1120	1120	20	10	72
B 1235		2.35	.075	1020	1120	18	10	72
B 1250		2.50	.075	1020	1020	20	10	72
B 1258††		2.50	.075	820	820	16	8	72
ASBESTOS SAFETY CLOTH – Underwriters' Grade‡								
B 2200		2.00	.066	1020	1220	18	7½	72
B 2225		2.25	.070	1020	1020	18	9	72
H 2225††		2.25	.070	1420	1420	29	10	48
B 2230††		2.30	.068	1120	1120	20	10	72
B 2250		2.50	.075	1020	1020	20	10	72
H 2250		2.50	.080	1420	1420	29	12	48
ALUMINIZED ASBESTOS CLOTH								

◂ The arrow indicates style numbers that are also available as Asbestos-aluminum laminates. An increase in weight of approximately 1.10 ounces per square yard should be allowed for Aluminized Asbestos Cloth.

METALLIC (wire-inserted) ASBESTOS CLOTH

NEW J-M Style Number	OLD J-M Style Number	Weight per sq. yd., lbs.	Approx. Thickness, inches	Warp Yarn	Filler Yarn	Warp Ends, per in.	Filler Ends, per in.	Maximum Width,* inches
Commercial Grade – Brass Wire Inserted								
I 1166††		1.66	.055	1011	1011	18	9	60
I 1181**††		1.80		1421	1421	13	13	60
I 1183††		1.83	.060	1021	1021	10	8	60
I 1266		2.66	.075	1021	1021	16	9	60
I 1275††		2.75	.080	1021	1021	18	8	60
I 1289**	189	2.80	.070	822	1021	14	10	60
I 1301	CQ 2810	3.00	.075	822	811	16	10	60
Underwriters' Grade – Brass Wire Inserted								
I 2166††		1.66	.055	1011	1011	18	9	60
I 2183††		1.83	.060	1021	1021	10	8	60
I 2266		2.66	.075	1021	1021	16	9	60
I 2275††		2.75	.080	1021	1021	18	8	60
I 2301	CQ 2810X	3.00	.075	822	811	16	10	60
AA Grade – Brass Wire Inserted								
I 4237††	OO 3010	2.37	.047	1421	1411	20	10	60
I 4275††		2.75	.080	1021	1021	18	9	60
I 4276**††		2.75	.075	1421	1421	20	10	60
I 4300††		3.00	.085	1022	1021	18	9	60
I 4311**††	MP 2909	3.10	.065	1021	1021	18	9	60
I 4325	MP 3010	3.25	.072	1021	1021	20	10	60
AAA Grade – Wire Inserted								
J 5259† ††	VP 2909N	2.60	.070	1021	1021	18	9	60
I 5275**	UQ 2711	2.75	.065	822	811	14	11	60
K 5275†††	VP 2909M	2.75	.070	1021	1021	18	9	60
K 5310	VS 2710	3.10	.062	1022	1022	14	10	60
K 5350†	VS 2909	3.50	.087	1022	1022	18	9	60
I 5401**	VR 3111	4.00	.065	1022	1021	22	10	48
AAAA Grade – Wire Inserted								
K 6350††		3.50	.087	1022	1022	18	9	60

◂ 'G' denotes Glass Yarn.

* Standard Widths: 36", 40", 60"

** Meets Spec. MIL-C-10316B

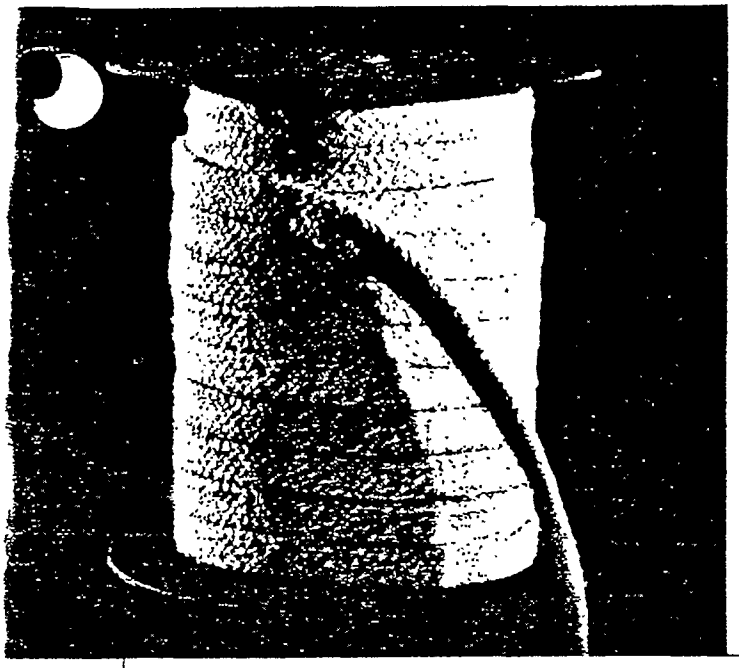
† Meets Spec. SS-C-00466e

†† Not stocked. Consult your J-M Sales Office.

‡ Any Style B (Safety Weave) Cloth can be "Fireproof" treated – 36" and 40" only.

Any B Style (Safety Weave) Cloth can be treated in colors white, green, blue, orange.

Order colored safety cloth with the prefix SW, SG, SB or SO.



J-M ASBESTOS

TUBING

DIMENSIONAL DATA J-M ASBESTOS TUBING*

STYLE NUMBERS	Commercial Grade—Ferrous—Non-Metallic (Wall Thickness: approximately 1/16")																	
	16-64	16-32	16-16	16-18	16-316	16-14	16-38	16-12	16-916	16-58	16-34	16-78	16-1	16-118	16-138	16-112	16-2	16-212
I.D. inches	1/64	1/32	1/16	1/8	3/16	1/4	3/8	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 3/8	1 1/2	2	2 1/2
O.D. inches	1/8	5/32	3/16	1/4	5/16	3/8	1/2	5/8	11/16	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 5/8	2 3/16	2 11/16
Approx. flat width, inches	R'nd	R'nd	R'nd	5/16	7/16	1/2	9/16	3/4	7/8	7/8	1	1 3/16	1 5/8	1 1/2	1 3/4	2	2 1/2	3 5/16
Approx. feet per lb.	175	100	85	70	57	47	26	23	20	19	16.5	14	12	12	9	8	4	3 1/8
For use over B&S Wire Gauge No.	17	10	8	5	4	2	0											

*As prescribed in the latest A.S.T.M. D-628.

Johns-Manville Asbestos Tubing is made from selected Asbestos Yarn braided into fireproof, heat-and-chemically-resistant flexible sleeving for insulating electrical wires and cables (to protect them against failure of adjoining cables). It is used as a gasketing material. It also covers the rods of thermocouples. In the glass industry, it is used as sleeving over tongs to prevent pressure marks on soft, hot glass.

Johns-Manville Asbestos Tubing is available in sizes from 1/64" through 2-1/2" inside diameter. Larger diameters are available on special order. Wall thickness is approximately 1/16" thick. All tubing is furnished with plain finish. However, tubing may also be supplied with a sizing if desired.

In the table above are given data relative to the various sizes, weights, etc., of the standard styles of J-M Asbestos Tubing. Besides these standard styles, Johns-Manville is in a position to furnish tubing of other grades up to "AAA", with wall thicknesses 2" less or greater than 1/16" and with wire insertions if desired.

Because braided asbestos tubings are so flexible, the diameters given in the tables are for tubings expanded to normal size. The width given for 3/4" I.D. and larger can be varied as much as 1/4" narrower or wider by manipulation.

FBW-166



J-M

THERMO-PAC

ASBESTOS AND REFRACTORY ROPES

Johns-Manville Thermo-Pac Ropes are used by many industries where stable high-temperature resistance is needed. All Thermo-Pac Ropes are made of Asbestos except for two styles, #2300 and #2700, which are used only when temperatures exceed 1000° F. These are made of special J-M Refractory Fibers to withstand these ultra-high temperatures.

Thermo-Pac is furnished in sizes from ⅛" to 2" diameter.

Thermo-Pac is a popular sealing element in manufacturing equipment handling heat such as furnaces, boilers, high temperature instruments.

In power plants, Thermo-Pac is a basic maintenance item used for general boiler service, such as caulking, filling, expansion joints, between boiler walls and brick work, and on steam and exhaust lines.

Thermo-Pac is an excellent emergency substitute for packings, gaskets and groove packing where other materials are not available or where less pliable, less adaptable materials cannot be used.

BASE FIBER USED IN JOHNS-MANVILLE THERMO-PAC ROPE

The Style Number indicates the top temperature limit that the style will handle. This will prove most economical for the job.

THERMO-PAC 500—Commercial Grade White Chrysotile Asbestos Fiber
THERMO-PAC 750—AAA (95/98%) White Chrysotile Asbestos Fiber
THERMO-PAC 1000—Pure (98/100%) White Chrysotile Asbestos Fiber
THERMO-PAC 2300—Refractory Alumina-Silica Fiber
THERMO-PAC 2700—Refractory Alumina-Silica-Chromia Fiber
THERMO-PAC BLUE—Pure blue African Crocidolite Asbestos Fiber

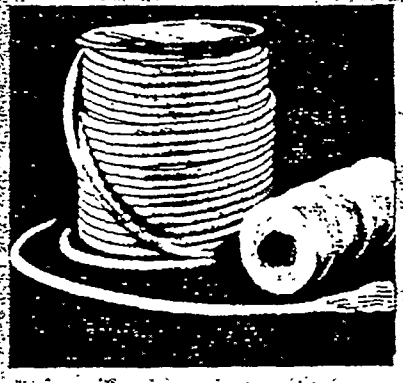
J-M BRAIDED ASBESTOS ROPE

A companion line to J-M Thermo-Pac Twisted Rope is Braided Rope. These ropes consist of one or more braided jackets over twisted cores, or solid braid-over-braid patterns. They are used where a more compact, dense, abrasion-resistant structure is required, such as in partial grooves in furnace or oven doors where the rope is not entirely contained. Depending on requirements, these ropes can be furnished in either round or square cross-section. Certain styles can be furnished in rectangular shape. Asbestos purities range from Commercial to AAA Grade.

J-M SPECIFICATIONS

		ASBESTOS ROPE	
Style No.	Grade	Type	Size
566	Commercial	Braided Round	⅛" and up
702			
788	AAA		
857			
733	Commercial	Braided Square	⅛" and up
787			
869	AAA		
870			
580	Commercial	Plaited	¼" and up
581	Commercial Wire-Inserted		

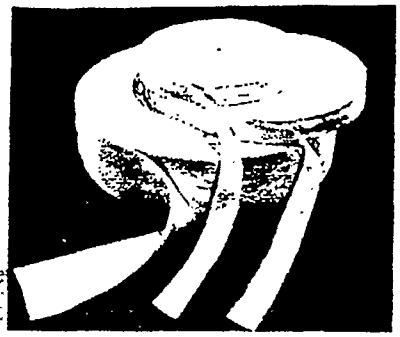
Furnished in 10, 25 and 50 lb. spools.



J-M ASBESTOS CORD

Johns-Manville Asbestos Cord is made from strands of strong 1, 2 or 3-ply yarns tightly twisted together into a hard-finished, even-diameter cord of the required size. It has wide application in the electrical industry, is serviceable in glass and chemical works where high heat resistance is a requirement, is used in the joints and seams of melting and heat-treating furnaces, and in elements in electrical pads and blankets. J-M Asbestos Cord is furnished plain unless treated cord is specified.

J-M ASBESTOS TAPES



J-M ASBESTOS TAPE

Johns-Manville Asbestos Tape is a fireproof, flexible tape woven from various grades of Asbestos Yarn that will not unravel in service. Because of their excellent electrical and heat insulating qualities as well as their high tensile strength, J-M asbestos woven tapes are used for insulating wires, coils, cables and other electrical conductors. Also for insulating small steam pipes and bends; as a flexible gasket material and to form flexible connecting couplings where high temperature service is involved; and as wicking in oil-burning apparatus.

The thermal stability of Johns-Manville asbestos tape also makes it particularly suitable for use as a conveyor belt for carrying hot materials. For electrical purposes, thinner tapes in Underwriters' grade are standard.

Asbestos tapes may be made from the five classes of asbestos yarn (see page 6), classes A through E. In accordance with asbestos tape A.S.T.M. Specification D-315. This produces tapes in the same five classes dependent on the yarn used.

SPECIFICATION OF J-M ASBESTOS TAPE

New J-M Style No.	Old J-M Style No.	Thickness —inches	Grade	Width—inches													
				½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	5½	6
				Approximate Feet per Pound													
2010	10	0.010	Underwriters'	366	258	198	159	132	102	—	—	—	—	—	—	—	—
2015	15	0.015	Underwriters'	291	204	159	129	111	78	—	—	—	—	—	—	—	—
2020	1055	0.020	Underwriters'	227	133	121	95	73	56	—	—	—	—	—	—	—	—
2025	1064	0.025	Underwriters'	170	113	88	72	62	49	—	—	—	—	—	—	—	—
2030	1065	1/32	Underwriters'	182	118	93	73	61	52	—	—	—	—	—	—	—	—
1031	1073	1/32	Commercial	135	88	66	51	44	34	—	—	—	—	—	—	—	—
1061	1091	1/16	Commercial	81	55	41	33	29	22	18.2	14.6	12.6	10.9	9.9	9.1	8.2	7.1
1062	1096	1/16	Commercial	74	52	37	29	24	19	15.3	12.7	11.0	9.3	7.8	7.1	6.6	6.2
1061W	1091 Wire Inserted	1/16	Commercial	68	43	32	27	21	16	13.6	10.5	9.5	8.2	7.5	6.8	6.3	5.6

NOTE: Standard length rolls — 100 ft.

In addition to the asbestos tapes shown in the above table, we can furnish asbestos paper tapes to meet Military Specification MIL-T-4117A of 2-12-60. These tapes are furnished in types V through XXII.

No. 55 Cable Fireproofing Tape, made of silicone-impregnated asbestos, provides maximum burn-out protection available in a cable wrapping tape.

This durable and economical tape is high in water repellence; low in water absorption; resistant to flame, heat, oil, fungus and mold; non-corrosive to cables; non-sagging; and abrasive resistant. Edges of the tape are selvaged so that the threads cannot pull out.

Used by leading electrical utilities and industries to protect cables in circuits with fast-acting breakers.

J-M 55 Tape goes on faster because it is applied dry, and it wraps easily even in confined spaces. J-M 55 is easy to carry and store, and will protect cables for years under manhole conditions.

J-M 55 Tape is available in 25' and 100' rolls, in 1", 1½", 2", 2½" and 3" widths. Furnished in 1/16" thickness.

■ *Asbestica tape*—a silica impregnated cable wrapping tape, is recommended where less severe service conditions prevail.

FBW-168

Johns-Manville

22 East 40th Street - New York, N.Y. 10016

Sales Offices in Principal Cities

FBW-169

TX-17A 4/69

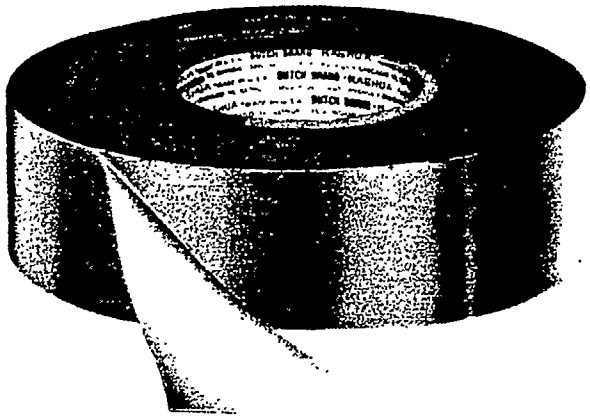
LITHO IN U.S.A.

NASHUA

DUCT CLOSURE TAPES

TYPE 357 DUCT CLOSURE TAPE

#357 TAPE IS USED TO SEAL AND ASSEMBLE ALL AIR HANDLING SYSTEMS



- SHEET METAL DUCT
- FIBROUS DUCT SYSTEMS
  - RIGID ROUND DUCT
  - FLEXIBLE ROUND DUCT
  - PLASTIC FACED DUCT
- SLAB DUCT
- AIR POLLUTION COLLECTION SYSTEMS
- EXHAUST VENTS
- DRYER VENTS
- DUCT INSULATION

NASHUA DUTCH BRAND WATERPROOF CLOTH TAPE SAVES TIME AND REDUCES COSTS IN EVERY APPLICATION FOR FORMING, HOLDING, AND SEALING AIR HANDLING SYSTEMS IN HEATING. VENTILATING AND AIR CONDITIONING WORK.

POLYETHYLENE FILM LAMINATED TO A STRONG CLOTH BACKING MAKES SEAMS AIRTIGHT AT JOINTS AND OVERLAPS. #357 TAPE HELPS SYSTEMS MAINTAIN MAXIMUM EFFICIENCY FOR YEARS.

NASHUA DUTCH BRAND POLY-CLOTH TAPE HAS VERSATILITY OF APPLICATION IN TEMPERATURE RANGES FROM 25° F. TO 200° F.

#357 TAPE SATISFIES FEDERAL SPECIFICATION PPP-T-0060C FOR WATERPROOF PACKAGING TAPE

FBW-170

OTHER COLORS: WHITE, OLIVE DRAB, BLACK, AND RED.

9999 Mercier Avenue
Dearborn, Michigan

F. B. WRIGHT CO.

TELEPHONE
VI. 3-8250

AC - 3

SPECIFICATIONS:

#357 TAPE (SILVER, BLACK, WHITE, OLIVE DRAB AND RED)

Thickness, Mils:	14
Adhesion To Steel. Oz. Per In.:	45
Unwind, Lbs. Per In.:	3.5
Water Penetration Rate:	1.9 gms./24 hrs./100 in.
Water Vapor Transmission Rate:	.85 gms./24 hrs.
Appearance After Weathering:	No separation from test panel
Bursting Strength:	75 p.s.i.
Backing:	Polyethylene laminated to cloth
Adhesive Mass:	Rubber - resin base
Roll Length:	60 yds.
Core Size:	3" I.D.
Packing:	Bulk case - four separate stacks - compartmentized box

#357 Tape Satisfies PPP-T-0060C

NOTE: All performance figures are averages.

PRODUCT WARRANTY

NASHUA'S products are warranted free from defects in workmanship and in raw materials of our own manufacture. *These products are not guaranteed as to performance under any specific service condition* nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.



F. B. Wright Company

9999 Mercier Avenue

Dearborn, Michigan

TELEPHONE VI. 3-8250

FBW-172



Johns-Manville

The designers of machines are keenly aware of the vital roles which Mechanical Packings play in their equipment. For this reason, countless equipment builders specify Johns-Manville Packings as original standard parts in their units to assure long, efficient and dependable operation.

This should be of special interest to users of those units who will be buying replacement parts and who are concerned with preventive maintenance and gaining optimum economy per packing dollar invested. They must recognize that premature failure of inferior materials quickly runs up costly repacking charges to say nothing of needless downtime on machines.

Your local Johns-Manville Packing Distributor or J-M Representative will help you select the J-M Mechanical Packings best suited for your applications.

Ask him to show you how the new Chempac and Thermocore Packing line can deliver several times the life of ordinary materials—tell you how they combine the strength and heat resistant characteristics of asbestos with the sealing action and chemical resistance of TFE* and Graphite.

Let him demonstrate how versatile Chempac and Thermocore will simplify your inventory problem . . . why a stock of these two universal styles will serve for countless applications, thus eliminating costly practice of carrying a variety of styles for various services.

PRODUCT WARRANTY

J-M products are warranted free from defects in workmanship and in raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F.O.B. our plant or other shipping point, full freight allowed to prior destination.

FBW-173

* Such as DuPont Teflon and Imperial Chemical Industries Fluon.

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Johns-Manville Corp.

Mechanical Packing

THREE BASIC FACTORS *assure long packing life and trouble-free service*

1. MATERIALS used in the manufacture of mechanical packings are determined by the liquid being handled and the temperature at which it must be sealed.

2. DESIGN and CONSTRUCTION of the packing are determined by *pressures* and *motions* which are found in the equipment.

3. INSTALLATION and MAINTENANCE must be carried out by mechanics who understand that the time spent in applying packing *properly* will prove well spent in gaining longer, better packing service.

SELECTED ASBESTOS YARNS and FABRICS

All Johns-Manville Mechanical Packings are made from materials proved by long experience to be most satisfactory in the service for which they will be used.

The asbestos yarn used in the production of J-M packings is high quality roving which has been mechanically spun or twisted to give it tensile strength. It is prepared in a wide range of grades, sizes, and plies, either plain, metallic or reinforced, to meet rigid specifications. From the mine to the user every step is carefully controlled.

These yarns form pliable mineral fabrics, ropes, cords, tapes and tubings having high strength and resistance to chemicals and abrasion.

Unless otherwise indicated in descriptions of specific styles, the packings discussed in this catalog are made of commercial grade white asbestos yarns. This represents an asbestos content of 75% to 80% by weight in the finished yarn to meet A.S.T.M. standards. Some styles utilize even greater asbestos content.

Blue asbestos fiber is used in some packings. Yarns made of blue fiber are more abrasive than white asbestos but provide necessary resistance to action of the most severe acids.

TEMPERATURE LIMITS OF ASBESTOS IN SERVICE

The service temperature limits of asbestos vary depending on whether the heat in the line bears directly on the asbestos, is somewhat diverted, or is actually separated as in the case of most stuffing boxes. A general table for guidance follows:

GRADE	DIRECT HEAT	CAULKING SERVICE	PUMP & VALVE STUFFING BOXES
Commercial—75/80% Asbestos	400F	500F	600F
Underwriters—80/84% Asbestos	450F	Not Used	Not Used
A 85/89% Asbestos	550F	Not Used	Not Used
AA—90/94% Asbestos	600F	Not Used	800F
AAA—95/98% Asbestos	750F	850F	1000F
AAAA—99/100% Asbestos	900F	1000F	1200F

SEE NEXT PAGE FOR 3

CONTENTS

PACKING STYLES	PAGE
Chempac	6
Loklube	8
Interlocked	10
Centripac	12
Ramie, Flax	14
Thermocore	16
Braided	18
Metallic	20
Fabric	22
Rubber & Duck	24
Piston	25
Cumpac	26
Conepac	26
Special Sets	27
Groove	28
Thermo-Pac Rope—Twisted	30
Rope—Braided	31
Wick	32
Tape	34
Tadpole	36
Twisted	39
Cord	39
Sheet Packing	40
Mechanical Seals	41
Die Formed Rings	42
Chemical Tables	45
Weights	49
Index	55

FBW-174

J-M RECOMMENDATION CHART

How to simplify Packing Selection

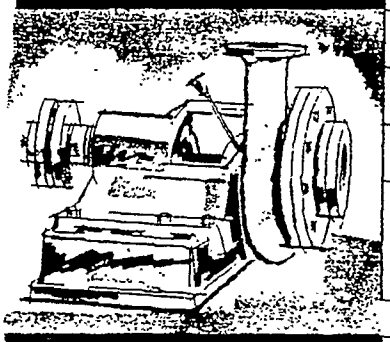
FOR EFFICIENT, ECONOMICAL PERFORMANCE

Most packing requirements fall in two classifications: pumps, and valves. Thus, the chart given below will help you locate the correct answer to most packing questions.

The chart is arranged so as to indicate the best recommendation for standard applications. Note that Chempac (TFE) styles are first choice in a number of cases. Second and succeeding choices are based on long and successful experiences of countless operating men who have come to prefer particular constructions and will continue to use them. Interlocked®, in particular, is the favorite packing of many of these experts. Centripac® styles are also popular choices.

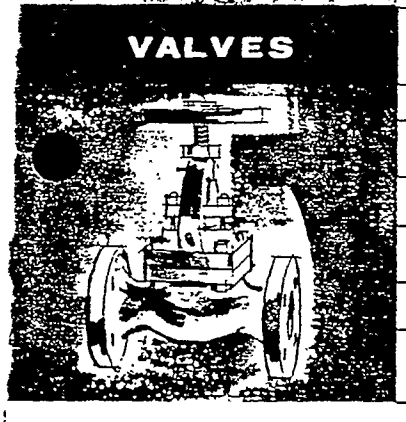
General Utility Packing recommendations are given at the bottom of this page. In case of any doubt, consult your J-M Packing Distributor or Service Representative to assist in a study of requirements and let him make specific recommendations.

PUMPS



TYPE	J-M RECOM-MENDATION	Pg.	SECOND CHOICE	Pg.	THIRD CHOICE	Pg.	FOURTH CHOICE	Pg.
Centrifugal 1800 rpm	Chempac 2009 or 2012	6	Loklube 1050R or 1003G	8	Interlocked 255 or 253	10	Centripac 4 or 7	12
Centrifugal 3600 rpm	Chempac 2009 or 2012	6	Loklube 1050R or 1003G	8	Interlocked 255 or 253	10	Centripac 4 or 7	12
Gear & Rotary 1000 rpm	Chempac 2009 or 2012	6	Loklube 1050R or 1003G	8	Interlocked 255 or 253	10	Centripac 4 or 7	12
Reciprocating Steam Rods Work Rods Valve Rods Work Pistons	 Fabric 166 Chempac 2011 Chempac 2011 Piston 182	 22 6 6 25	 Chempac 2011 Rbr. & Duck 171 Loklube 1003G	 6 24 8	 Loklube 1050R Loklube 1003G Loklube 1003G	 8 8 8	Interlocked 255	10

VALVES



TYPE†	J-M RECOM-MENDATION	Pg.	SECOND CHOICE	Pg.	THIRD CHOICE	Pg.	FOURTH CHOICE	Pg.
500 F	Chempac 2011	6	Loklube 1050R	8	Braided 10	18		
750 F	Thermocore 397 or 398	16						
1000 F	Thermocore 397 or 398	16						
1200 F	Thermocore 397	16						
Faucets	Chempac 2011	6	Chempac Valve Stem Packing	6				
Control	Chempac 2012	6	Chempac Loklube 2012-1050R	6 8				

GENERAL UTILITY PACKINGS		J-M RECOMMENDATION	Pg.	SECOND CHOICE	Pg.
Accumulators	Hydraulic	Ramie 245	15	Flax 240	15
Agitators	500 rpm	Chempac 2009 or 2012	6	Loklube 1003G	8
Autoclaves	Bolted Doors Quick Opening Doors	Groove Groove	28 28	Depends on Application	
Expansion Joints	500 F 750 F & Up	Chempac 2011 Thermocore 397	6 16	Loklube 1050R	8
Filters	Covers	Groove	28	Depends on Application	
Furnaces & Ovens	Doors Dampers Grooves Soot Blowers General & Caulking	Groove Tadpole Rope Special Sets Rope	28 36 30 27 30	Tadpole Groove Groove Thermocore Wick	36 28 28 16 32
Marine Service	Stern Shafts	Ramie 175	14	Flax 188	15
Reactors, Chemical	Covers	Groove	28	Rope	30
Nuclear Service	Control Rods Valves Grooves	Special Sets Special Groove	27 28		

FBW-175

This Simple Three-Step Procedure

ASSURES LONGER PACKING SERVICE

CHEMICAL SELECTION TABLE starts on page 45

Experts find this selection procedure gives them the right packing for the job

Selecting the right packing depends upon the following factors:

- Shaft size, in.
- Shaft speed, rpm.
- Pressure on the stuffing box, psi.
- Fluid temperature on the stuffing box, °F.
- pH of the fluid to be sealed.

Step 1: Use of PV Table – Each packing construction (material, braid pattern and lubrication) has its theoretical limit of strength in service, which can be correlated with the "PV function." The latter can be defined as the product of the pressure to be sealed at the stuffing box in psi, times the shaft speed in feet per minute.

Let us consult the table below to find out what packing to use for a boiler feed-pump having a 2½-in. shaft rotating at 3,600 rpm. – the pressure to be sealed being 350 psi., and the fluid temperature about 430 F. The PV value would be $350 \times 2\frac{1}{2} \times \pi/12 \times 3{,}600$, which equals 824,250. From this Table, we see that a packing of twisted lead rings alternated with Loklube rings would be a logical selection.

Selecting packings by means of PV Table

Braid Construction	Material	General Lubrication	Tentative PV Limit	Temperature Limit, F.
1. Plaited	Flax	Oils and waxes	175,000	100
2. Plaited	Ramie	Oils and waxes	200,000	200
3. Plaited	Asbestos	Oils and waxes	325,000	500
4. Braid-over-braid	Asbestos	Oils and waxes	400,000	500
5. Interlocked	Asbestos	Oils and waxes	525,000	500
6. Braid-over-braid	Asbestos	TFE and oil	650,000	500
7. Interlocked	Asbestos	TFE and oil	650,000	500
8. Loklube	Asbestos	Special grease	650,000	500
9. Plaited	Lead-asbestos	Oils and waxes	725,000	450
10. Twisted lead rings alternated with Loklube rings			1,000,000	450
11. Twisted aluminum rings alternated with Loklube rings			1,250,000	500

It is suggested that pressure-balanced mechanical seals be used for PV values of 1,250,000 or above.

Step 2: Use of Temperature Limits – In the second step, you eliminate certain packings because of temperature restrictions.

Step 3: Use of the pH Limitations – In the third step, you eliminate those packings that are unsuitable for the degree of acidity or alkalinity of the particular liquid.

Tentative pH ranges for various packing materials (basic fiber plus lubrication) are given below:

Material	Lubricant	pH Range
Flax and ramie	Oils and waxes	6 to 8
White asbestos	Oils and waxes	4 to 10
White asbestos	Loklube grease	4 to 10
White asbestos	Caustic-resistant lubricant	10 to 14
Blue asbestos	Acid-resistant lubricant	5 to 2
Blue asbestos	TFE	2 to 1 & 12 to 13
Teflon filament	TFE	14 to 0
White asbestos	TFE	12 to 2

Theory Behind Packing Performance

A set of packing installed in a stuffing box generates a resistance to the rotating shaft. Thus, work must be done to turn the shaft. When you perform work, you generate heat. For a typical stuffing box, consider the following items:

W = work necessary to turn the shaft, ft.-lb./min.
P = fluid pressure on the stuffing box, psi.
L = depth of the stuffing box, in.
d = shaft diameter, in.
V = shaft speed, ft./min.
f = coefficient of friction, dimensionless.
Q = heat expressed in BTU/min.

The work required to turn the shaft is:

$$W = PLdVf \qquad (1)$$

To change work to heat, we use the first law of thermodynamics, which states $Q = W/J$, where J = mechanical equivalent of heat, 778 ft.-lb./BTU. Thus, the heat generated in a stuffing box can be stated as:

$$Q = PLdVf/J \qquad (2)$$

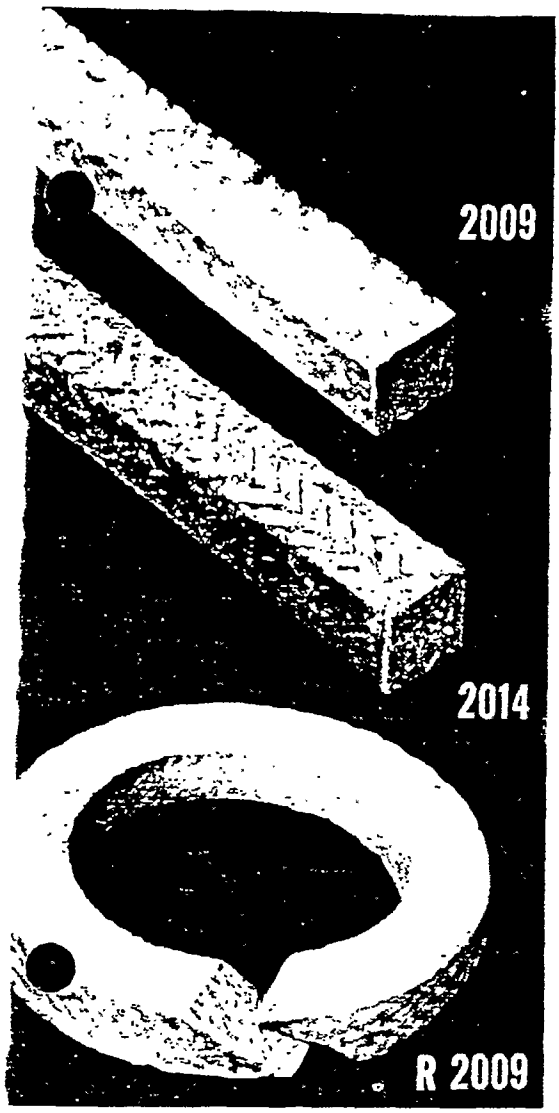
Equation (2) shows that as pressure, stuffing box size, shaft diameter, shaft speed and coefficient of friction increase, heat problems increase accordingly. This compound effect requires adequate lubrication to compensate for this increase in heat.

Why Packings Fail

The most common cause of packing failure is lack of lubrication. Why? When you turn off the lubrication, you generate heat. The initial impregnation put in by the manufacturer is intended to serve as a primary sealant for start-up and break-in period, and to prevent shaft scoring during start-up. After start-up lubrication must be provided to insure long packing life.

The second most common cause of packing failure is poor initial installation. Many maintenance men try to jam the packings into the packing box to prevent leakage on start-up. Proper packing installation and bolt take-up on the gland will prevent packing failures.

Some tips on trouble-shooting packing failures are given on page 43.



Johns-Manville

Chempac is the Johns-Manville trade name applied to a broad range of J-M Asbestos-TFE materials. Each will provide the excellent sealing and heat resistance of asbestos, plus the immunity of TFE to almost all chemicals and solvents.

Chempac Packings are premium priced, but because they deliver such long, efficient and economical service, they have become the accepted general purpose packing.

Many styles are available. Some are made of strong asbestos yarns impregnated with TFE suspensoid. Some use 100% Teflon yarns.

White asbestos Chempac styles are recommended for handling practically all media* including dilute or weak acids. Blue asbestos styles, and white Teflon filament styles, are suitable for the most concentrated, strong acids.

J-M Chempac 2009 Packing is the most popular Chempac Mechanical Packing, for use on all types of pumps, agitators and valve stems. It consists of white asbestos yarns braided in the Interlocked pattern into a strong but firm and resilient packing. TFE impregnated for chemical resistance and low friction. Lubricated with special wax and oil. T

Speeds to 3600 rpm; temperature limit 500 F.
PV limit = 650,000; pH range = 12 to 2.

J-M Chempac 2008 Packing for expansion joint and valve stem use. Same as J-M 2009, but not lubricated with special wax and oil. T

J-M Chempac 2006 Packing is the most popular Chempac Packing made of 100% white Teflon filament yarns. Excellent sealability, low friction and long life under severe and extremely corrosive applications. Recommended for centrifugal pumps, valves, agitators and other equipment where maximum chemical resistance is required. Sizes ¼" and up, Interlocked; under ¼" plaited construction. Square cross-section. Impregnated with Teflon suspensoid. Contains an inert oil. X

Speeds to 1800 rpm; temperature limit 500 F.
PV limit = 275,000; pH range 14 to 0.

J-M Chempac 2013 Packing is non-contaminating, soft, adaptable, with maximum sealability. Popular for centrifugal pumps, agitators and other applications where lubricants might contaminate the medium handled. Made from braided white asbestos over a core of asbestos, impregnated with TFE, square cross-section. Contains no lubricants. T

Speeds to 1800 rpm; temperature limit 500 F.
PV limit = 275,000; pH range 12 to 2.

J-M Chempac 2012 Packing is a general service packing for pumps and valve stems. Soft but strong, white asbestos yarns in braid-over-braid construction, saturated with TFE, calendered to a square cross-section. Gives excellent service on reciprocating stems of control valves. High TFE content provides maximum sealability and low friction. Lubricated with pure mineral oils. T

Speeds to 3600 rpm; temperature limit 500 F.
PV limit = 650,000; pH range = 12 to 2.

J-M Chempac 2011 Packing is made in the same braid-over-braid construction as J-M 2012 but is not lubricated with oil. Ideal for valves and expansion joints to 500 F. T

Basically a valve packing.

*NOTE: Chempac cannot be used against molten alkali metals or fluorine at elevated temperatures and pressures. Also, blue asbestos fiber breaks down in alkaline solutions.

CAUTION: TFE remains inert from minus 300 F to plus 500 F, but can give off dangerous fumes above 500 F.

FBW-177

Chempac® Packings

- withstand chemicals, heat
- provide tight seals, low friction

J-M Chempac 2014 Packing is made by braiding jacket-over-jacket 100% blue asbestos yarns and impregnating with TFE suspensoid. Both are noted for acid resistance, impervious to attack by even the most corrosives. Used on valve stems, expansion joints, grooves, positive displacement pumps and other comparatively low-speed mechanisms. Contains no organic fiber or oil. Also can be used for hot caustic services 300 F to 500 F. X

Speeds to 1800 rpm; temperature limit 500 F.

PV limit = 275,000; pH range = 2 to 1 and 12 to 13.

J-M Chempac 2024 Packing for liquid oxygen service to minus 300 F. Braid-over-braid structure of AAAA (99/100%) white asbestos yarns, impregnated with TFE. A standard for safe industrial oxygen service. Particularly effective in expansion joints where other packings require frequent attention and replacement. T

Speeds to 1200 rpm; temperature limit 500 F.

PV limit = 50,000; pH range = 12 to 2.

J-M Chempac 2005 Packing is white Teflon, Interlocked construction, impregnated with Fluorlube (low temperature limit). Used where the chemical resistance of Teflon is required but an added lubricant is needed for lower friction or greater sealability. X

Speeds to 1800 rpm; temperature limit 500 F.

PV limit = 275,000; pH range = 2 to 0.

J-M Chempac 2004 Packing consists of 100% white Teflon yarns, Interlocked structure, with no further treatment. X

Speeds to 1800 rpm; temperature limit 500 F.

PV limit = 275,000; pH range = 14 to 0.

J-M Chempac 587 Packing is made of Commercial Grade asbestos yarns twisted together to form a round cross-section and impregnated with TFE. Ideal for packing small valves and instruments. T

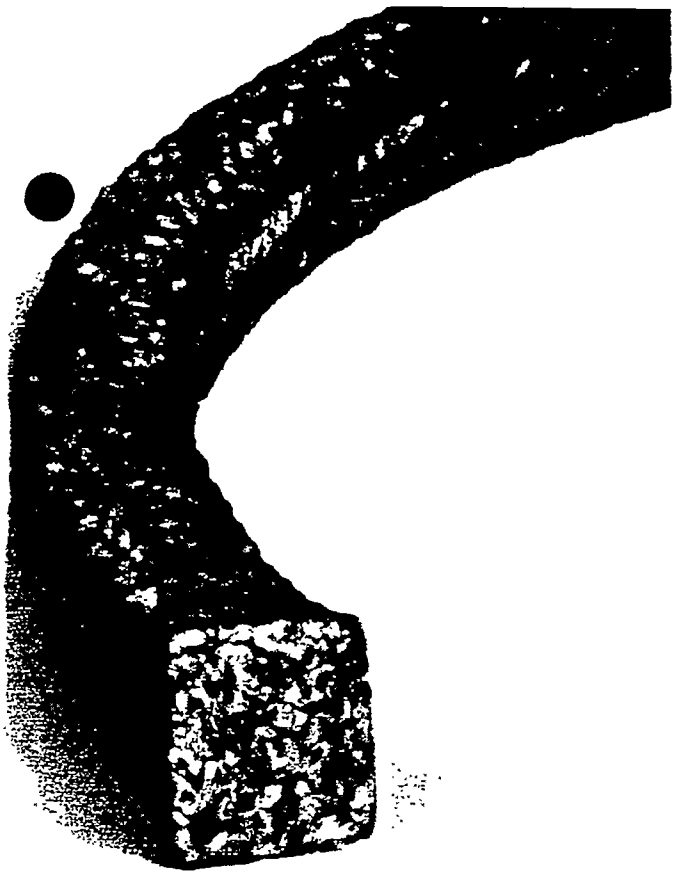
Temperatures to 500 F.

J-M Chempac Valve Stem Packing is made of Commercial Grade asbestos yarns twisted together to form a round cross-section, impregnated with TFE and treated with mineral oil. Ideal for packing small valves and instruments. Available in 12 pound case lots, consisting of 3 pound counter display boxes, each containing 12 ¼ pound spools, individually boxed. Sizes: 1/16", 3/32", ⅛", 3/16", ¼" and 5/16", either in standard case lots of a size, or in mixed sizes, one size to each display box. T

Temperatures to 500F.

Note: For information on other J-M Chempac materials incorporating TFE, refer to J-M Catalog PK-185A, which describes molded packings, sheet materials, rods, tubes, tapes, etc.

FORMS FURNISHED See Page 49 for Size Range and Weight	
Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C2009 5/8".
Rings, Die Formed:	Die formed skive joint, approximately square cross section. To order Rings, show prefix "R", I.D. and O.D. and depth. Example: R2009 1" I.D. x1½" O.D. x ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, show prefix "R", suffix "Set", I.D., O.D., depth and number of rings per set. Example: R2009 sets 1" I.D. x 1½" O.D. x ¼" depth x 5 rings.
Rings, Hand Cut:	Hand cut butt joint, square cross section, cut from coil packing, bulk packaged. To order, show prefix "H/C", I.D., O.D. and depth. Example: H/C 2009 1" I.D. x 1½" O.D. x ¼".
Sets:	A specified number of rings, assembled and wrapped as a set. Example: H/C 2009 1" I.D. x 1½" O.D. x ¼" depth x 5 rings.



Johns-Manville

Johns-Manville LOKLUBE Packings are designed for general service in a wide range of applications. New improved ingredients and production methods have been incorporated to increase performance levels and packing life, thereby reducing the frequency of gland takeups and repacking. This assures positive, demonstrable savings in packing costs, down-time and labor. J-M LOKLUBE Packings are specifically designed to provide extra efficiency in performing particular operations.

J-M LOKLUBE lubricants are special-purpose types, developed particularly for pump packings. Their performance and service life are far superior to lubricants used by the Industry in general service packings. Their unusual heat resistance (up to 500F) insures they remain stable at high temperatures, so that the combination of heat and pressure does not force them out of the packings.

Ordinary lubricants, which melt at 160-190F, "ooze" out—either in routine operations, or if the gland has been tightened too much. For instance, when new packings are installed, and adequate leakage has been allowed for during the break-in period, another maintenance man often follows and tightens the gland excessively to stop the leakage. The temperature rises—the lubricant melts and is forced out of the packing, which shrinks and fails.

J-M LOKLUBE Packings retain their full lubrication and continue their sealing and protective functions even when operating temperatures are higher than normal. This means less friction, longer packing life, fewer repacks and less shaft/sleeve wear.

Johns-Manville has developed an entirely new, different and inventive production method which prelubricates each asbestos strand prior to braiding! The lubricant is locked integrally into the structure of the packing, insuring a constant supply of lubricant throughout the life of the packing.

Most packings are lubricated by dipping the finished product into the lubricant. In operation, the lubricant washes out, leaving the bare strands to seal the shaft. This leads to overheating, premature packing failure and shaft wear.

Long after lubricants in ordinary packings have washed away, J-M LOKLUBE Packings retain their efficiency, preventing overheating and wear on both the shaft and the packing. You save on the costs of the packings, labor, downtime and shaft/sleeve replacement.

Johns-Manville Interlocked Construction in all LOKLUBE Packings uses only one or two strands in the center to "lead" the braiding process. This produces a firm, long-wearing packing. Lubricant loss remains at a minimum, reducing friction and shaft wear —less adjustment and longer life before repacking.

Some packings use multiple single strands of asbestos in the center to build up the required bulk to make the correct size. The result is a weaker, less resilient structure which tends to ravel in installation, requires more compression to obtain a seal, and needs more frequent adjustment. It packs down, squeezing out the lubricant, causing faster wear.

J-M LOKLUBE Packings are designed for general service media ranges—pH from 4 to 10. This permits handling a broad range of fluids—hot and cold water, brine, oils, weak acids, weak caustics, etc. This versatility allows you to standardize on J-M LOKLUBE Packings and reduce your inventory requirements.

FBW-179

Loklube* Packings

- for improved service in centrifugal and rotary pumps
- four styles color-coded for specific services

J-M LOKLUBE Packings are even and smooth. They fit into stuffing boxes without preliminary pounding to size. Easy to cut, easy to pack without forcing or keystoning, they require less compression and less gland take-up to maintain a seal.

IMPORTANT: Use normal, good installation practices. Remove all old packing, clean the stuffing box, use the right packing size, cut rings properly, install one ring at a time. Pay particular attention to the following step: After the last ring is installed, take up the bolts finger-tight. Start the pump and take up the bolts until the leakage is decreased to an acceptable minimum. Allow packing to leak freely when starting up; allowing generous leakage during the first hour of operation results in better break-in. Take up gradually on the bolts until the leakage is tolerable. Never try to stop leakage entirely. Your J-M Representative will be glad to provide you with complete, detailed Installation Procedures.

J-M 1050R Red Loklube

For hot water service such as boiler feed pumps. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc. PV limit on this Style may be increased to 1,000,000 by using Header and Follower Rings of J-M 393 Lead or J-M 392 Aluminum.

J-M 1009A Amber Loklube

For Paper Mills. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc. Contains no graphite, will not discolor fluid media.

J-M 1012M Gray-Blue Loklube

For aluminum, steel and other primary metal plants. Molydisulphide throughout, molydisulphide finish. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc.

J-M 1003G Black Loklube

For Pulp Mills and other services where Graphite is desirable. Graphited throughout, graphite finish. Handles hot and cold water, brine, oils, weak acids, weak caustics, etc.

For all Loklube Styles 1050R, 1009A, 1012M and 1003G.

Speeds to 3600 RPM; temperature limit 500°F

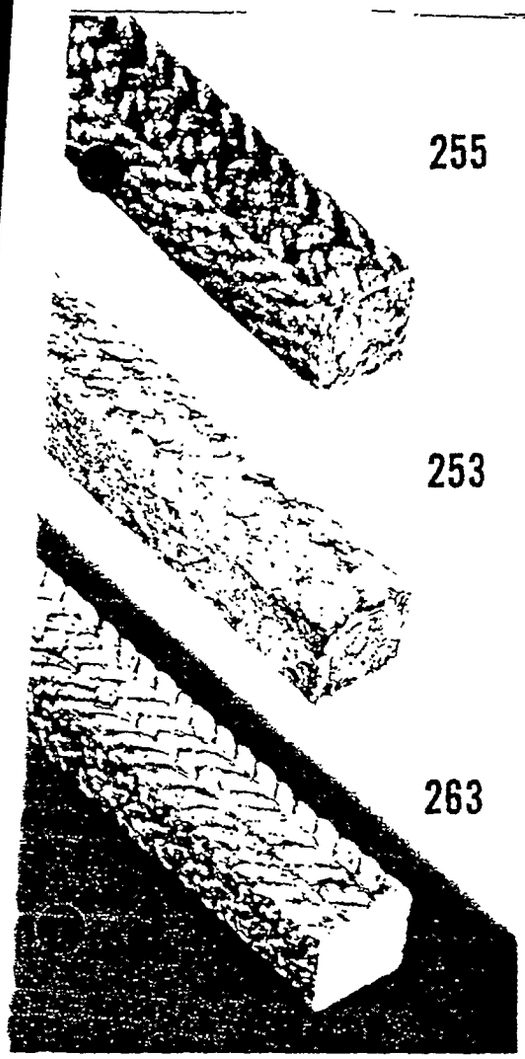
PV limit=650,000; pH range=10 to 4.

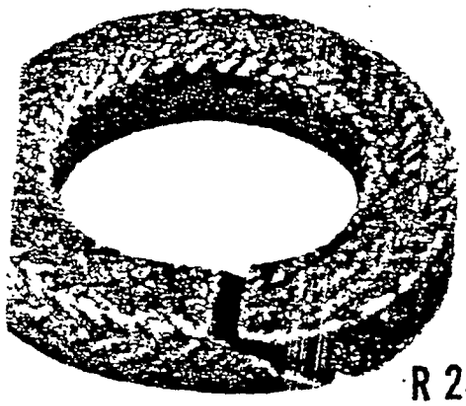
FORMS FURNISHED See Page 49 for Size Range and Weights	
Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C1050R ⅜".
Rings, Hand Cut:	Hand Cut butt joint, taped ends, approximately square cross section. To order Rings, show prefix H/C, I.D. and O.D. and depth. Example: H/C 1050R 1" I.D. x 1½" O.D. and ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, state H/C Set, give I.D., O.D., depth and number of rings per set. Example: H/C Sets 1" I.D. x 1½" O.D. x ¼" depth x 5 Rings.
Rings, Die Formed:	Not available

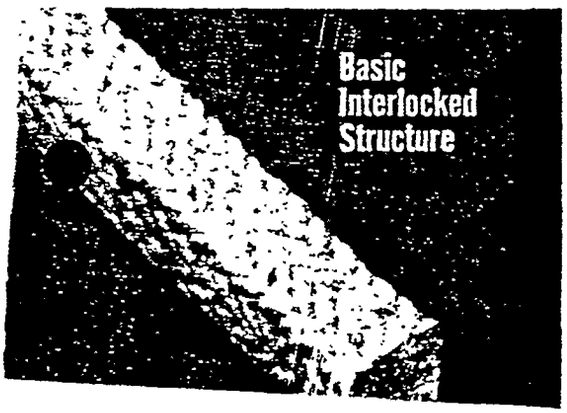
*Johns-Manville Trademark

†Patent applied for

FBW-180







Johns-Manville

J-M Interlocked Asbestos Packing is an extremely versatile and adaptable packing that delivers outstanding performance and is highly recommended for selection as a general service style for most plants.

It is suitable for applications on both centrifugal and reciprocating pumps, agitators, valves, expansion joints and in grooves.

A unique and distinctive method of braiding asbestos yarn, exclusive with Johns-Manville, is employed in the construction of Interlocked Packing. There are no jackets to wear through or come apart, and no plaits which might become loose. All the long fiber asbestos yarns extend back into the body of the packing and are strongly interlocked to form a solid integral structure that cannot ravel or come apart in service.

Interlocked Packing is unusually flexible and resilient. And because it is braided square rather than being pressed into shape, it presents a full surface contact across the entire width of the ring, thus it provides a tight seal with minimum gland pressure and take up. Also its inner compressible structure offers good recovery to original dimensions.

STYLES AND FORMS

J-M Interlocked Packing is made in a variety of styles to meet a wide range of operating conditions. All of these styles have the same interlocked braided construction but are made with various types of impregnation and yarns.

The styles described on these pages are made of Asbestos yarns, with or without wire reinforcements.

J-M 255 Interlocked Packing is an outstanding general service style. It will handle hot water, cold water, brine, oils, weak caustics and acids, solvents and a wide variety of materials designated **G** in the Chemical Table. **G**

It is an excellent packing for centrifugal pumps, positive displacement pumps, expansion joints and valve stems.

J-M 255 has proved extremely popular with maintenance engineers because it has demonstrated unusual ability to handle almost any packing requirement. With a stock of J-M 255 on hand, the maintenance man is assured he will be able to handle almost any situation, including many applications for which special packings are often specified. Actually, J-M 255 can be considered an excellent universal packing to put in any service. Unless some special reason or condition exists, it can be counted on to work successfully.

Made of white asbestos yarns in a square cross-section, it is lubricated with a special petroleum base wax. Has a graphite finish.

Speeds to 8600 rpm; temperatures to 500 F.
PV limit = 525,000; pH range = 10 to 4.

FBW-181

Interlocked® Packing

- an outstanding universal service packing
- strongest, most resilient

J-M 253 Interlocked Packing is designed for general pulp and paper industry service where a comparatively soft, adaptable packing is required. It can be used on Jordans, refiners, and other special paper mill rotary service, as well as on process pumps, and general power plant pumps and equipment. **P&G**

It can be used against hot water, cold water, white water, weak caustics and acids and any of the materials designated G in the Chemical Table.

J-M 253 is braided from white asbestos yarns and impregnated with a special petroleum base wax. Has no graphite content.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 525,000; pH range = 10 to 4.

J-M 263 Interlocked Packing is designed for special service in mills handling fine paper stock, where no contamination whatever can be tolerated. It can also be used generally on high speed pumps, Jordans, refiners, and other paper mill equipment in good condition. **P&G**

J-M 263 is braided square from white asbestos yarns impregnated with a combination of selected petroleum base waxes and oils. Has no graphite content.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 525,000; pH range = 10 to 4.

J-M 270 Interlocked Packing is specifically designed for service against hot oil, gasoline and solvents that cannot be handled by general service packings. **S**

The braided square section of white asbestos, contains a neoprene base cement as a part of its structure. This provides a sealing barrier against leakage of thin petroleum derivates through the packing itself. The impregnant is a vegetable base compound containing glycerine and inorganic fillers. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 525,000; pH range = 10 to 4.

J-M 257 Interlocked Packing is designed for use in services where shock, vibration or other severe mechanical conditions exist. Each yarn contains a copper wire reinforcement. Otherwise, it is similar to J-M 255 style. **G**

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 600,000; pH range = 10 to 4.

REFERENCE SYMBOLS

Indicate service classification or condition

General	G
Caustic	C
Pulp & Paper	P
Solvent	S
Food and Related Services	F
Chempac (TFE Impregnated Asbestos)	T
Most Corrosive requiring Teflon filament or Blue Asbestos Packings	X

Chemical table appears on page 49

J-M 254 Interlocked Packing is designed and lubricated for use on centrifugal pumps and valves handling severe caustic solutions. **C**

J-M 254 is braided square in the interlocked construction using a special asbestos yarn designed to maintain its strength in caustic service. The impregnation consists of petroleum base wax, having an exceptionally low saponification number.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 525,000; pH range = 14 to 10.

J-M Chempac 2009 Packing is the most popular Chempac Mechanical Packing style. Designed for use on all types of pumps, expansion joints, agitators and valve stems; TFE impregnated for chemical resistance and low friction sealability; it is an excellent all-purpose packing. **T**

Chempac 2009 consists of white asbestos yarns braided in the Interlocked pattern into a strong but soft and resilient packing. TFE impregnated and lubricated with a special wax and oil.

Speeds to 3600 rpm; temperature limit 500 F.

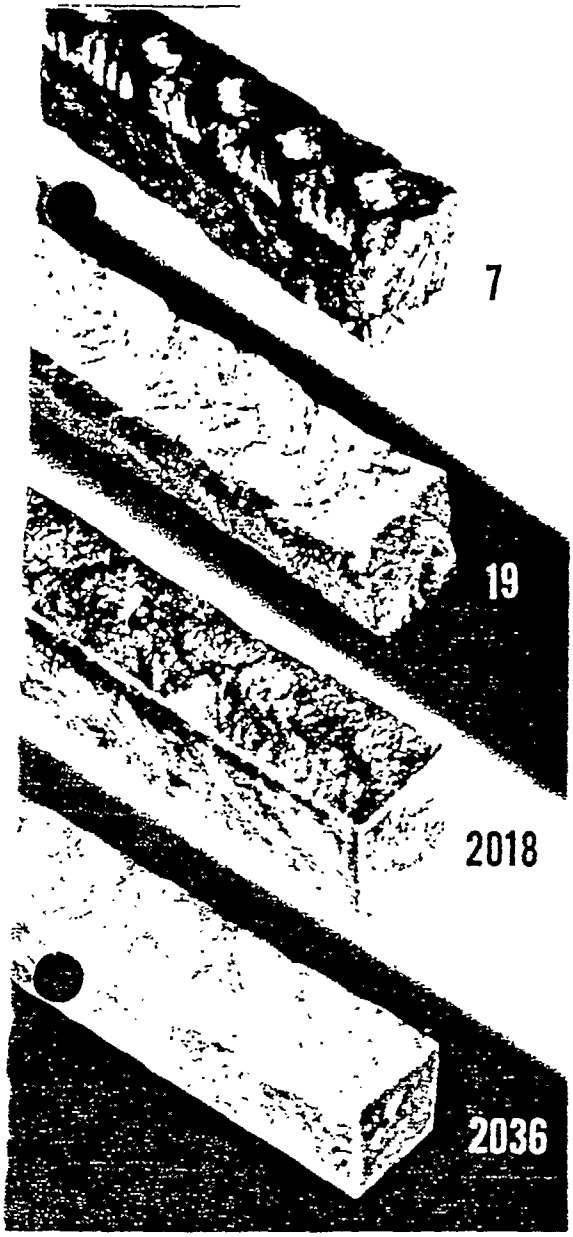
PV limit = 650,000; pH range = 12 to 2.

For additional Interlocked styles see J-M 2009, 2019, 2004, 2005 and 2006 in the Chempac-TFE section, page 6. Also J-M 179 in the Ramie section page 14.

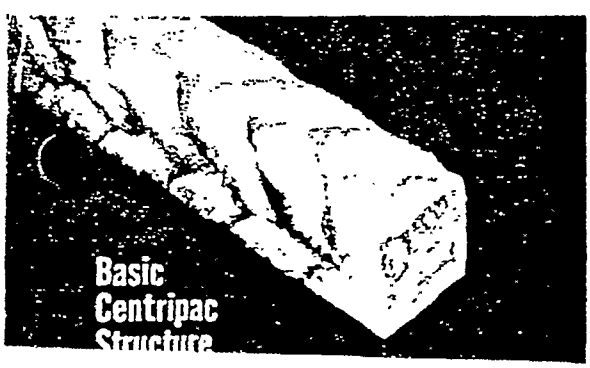
FORMS FURNISHED
See Page 49 for Size Range and Weights

Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C255 ⅝".
Rings, Die Formed:	Die formed skive joint, approximately square cross section. To order Rings, show prefix "R", I.D. and O.D. and depth. Example: R255 1" I.D. x1½" O.D. x ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, show prefix "R", suffix "Set", I.D., O.D., depth and number of rings per set. Example: R255 Sets 1" I.D. x 1½" O.D. x ¼" depth x 5 rings.
Rings, Hand Cut:	Hand cut butt joint, square cross section, cut from coil packing, bulk packaged. To order, show prefix "HH/C", I.D., O.D. and depth. Example: H/C 255 1" I.D. x 1½" O.D. x ¼".
Sets:	A specified number of rings, assembled and wrapped as a se Example: H/C 255 1" I.D. x 1½" O.D. x ¼" depth x 5 ring

FBW-182







Johns-Manville

Centripac Asbestos Packings are designed specifically for service on centrifugal or rotary pumps, agitators, and other equipment using rotary mechanical motion. It is the best recommendation for single-stage process pumps handling a wide range of chemicals.

Centripac is plaited square from asbestos yarn, with or without wire reinforcement. The soft, absorbent structure can carry a maximum of lubricant. The square section presents a full surface contact which accommodates readily to turning shafts. It stabilizes, after run in, at a low and uniform leakage rate.

General service styles are treated with selected oils and graphite. Refer to specifications of available styles listed below for specific details.

J-M 4 Centripac Packing is a general service style. Chemically it can be used to handle hot and cold water, brine, oil, some weak acids and caustics, as well as any material designated G in the Chemical Table. **G**

Designed specifically for single-stage centrifugal pumps in the process industries, it is also used for slurry pumps by itself or in conjunction with J-M 350 as header and follower.

J-M 4 is made of white asbestos yarn, pre-lubricated before plaiting. The heavy-body type lubricant is a mixture of petroleum oil and wax, plus an inert filler. The yarns are graphited, as well as the finished packing. Also available with Molydisulphide finish on special order.

Speeds to 3600 rpm; temperatures to 200 F.

PV limit = 325,000; pH range = 10 to 4.

J-M 7 Centripac Packing is the general service style. Chemically, it can be used to handle hot and cold water, brine, oil, some weak acids and caustic solutions, as well as any material designated G in the Chemical Table. **G**

Designed specifically for single-stage centrifugal pumps in the process industries, it can also be used on agitator shafts and other turning or oscillating shafts or for low pressure valve stems. It also gives outstanding service on small, high speed domestic service pumps.

J-M 7 is made of white asbestos yarns and is lubricated with a combination of light petroleum base oil and heavy viscous petroleum base compounds which augment its sealability. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 325,000; pH range = 10 to 4.

J-M 11 Centripac Packing is recommended where pressure, vibration or shock conditions require a more rugged style than J-M 7 Packing. **G**

It is plaited square from strands made up of white asbestos with a copper wire reinforcement. It is impregnated with a blend of viscous petroleum base oils designed to provide sealability and low friction. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 500 F.

PV limit = 400,000; pH range = 10 to 4.

FBW-183

Centripac® Packing

- dependable service
- adaptable construction
- many applications

J-M 18 Centripac Packing is designed for centrifugal and rotary pumps and turning shafts on equipment handling gasoline, naphtha, solvents and other thin and aggressive petroleum derivatives that would wash the lubricant out of general service packings. **S**

J-M 18 is made up of white asbestos yarns plaited to a square cross-section and impregnated with a compound consisting of vegetable oils, glycerine and inert inorganic fillers. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 500 F.
PV limit = 325,000; pH range = 10 to 4.

J-M 19 Centripac Packing is designed for pulp and paper industry service on pumps, Jordans, refiners and other paper mill equipment having rotary shafts. **P**

The non-contaminating white lubricant in the packing permits its use on white water and paper stock. It is also suitable for other general paper mill service.

J-M 19 is made of white asbestos yarns, pre-lubricated before plaiting. The lubricant is white, a blend of mineral oil, wax and inert non-toxic grease.

Speeds to 3600 rpm; temperature to 200 F.
PV limit = 325,000; pH range = 10 to 4.

J-M 2018 Centripac Packing is designed for service against the most severe acids in equipment such as centrifugal pumps, rotary pumps and agitators. It should not be used with strongly alkaline solutions. **X**

J-M 2018 is plaited to a square cross-section from strands consisting of 100% blue African asbestos yarn. It is impregnated with an extremely inert composition consisting of polyisobutylene and hydrocarbon waxes. Has a graphite finish.

Speeds to 1800 rpm; temperatures to 750 F.
PV limit = 275,000; pH range = 5 to 2.

J-M 2021 Centripac Packing is designed for service on centrifugal pumps, positive displacement pumps, agitators and other equipment handling strong caustic solutions. **C**

It is exceptionally well suited for black liquor service in paper mills and was originally developed for that extremely severe service.

J-M 2021 is plaited square from strands of specially fabricated asbestos yarns made up to resist the attack of caustic solutions. The impregnation consist of petroleum base waxes and oils having an extremely low saponification number. Has no graphite content.

Speeds to 3600 rpm; temperatures to 500 F.
PV limit = 325,000; pH range = 14 to 10.

J-M 2036 Centripac Packing is made for the Food Industry and other services where a white packing is required for centrifugal and rotary pumps, agitators and other equipment having turning shafts. It can be used on valves handling food products. **F**

J-M 2036 is made of strands consisting of white asbestos plaited to a square cross-section and impregnated with a nontoxic compound containing petroleum base waxes and oils and a special inert grease. This impregnation has been checked and approved by private laboratories and state health departments. The surface finish is mica.

Speeds to 3600 rpm; temperatures to 300 F.
PV limit = 325,000; pH range = 9 to 3.

J-M 350 Centripac Packing is designed to handle those conditions where the low-friction bearing characteristics of lead are desirable in addition to the stability and sealability of asbestos. It is used particularly at speeds above 3500 rpm and where mechanical conditions require a more rugged and shock-resistant packing than J-M 7 Centripac. **G**

J-M 350 is plaited square with strands consisting of lead ribbon and asbestos yarns twisted together. This base structure is impregnated with a light petroleum base oil. Has a graphite finish.

It is recommended for use where the bearing surface and the strength of the lead-and-asbestos combination is needed for the higher speeds and pressures. At low speeds it will handle pressures to 2000 psi.

Speeds to 3600 rpm; temperatures to 450 F.
PV limit = 725,000; pH range = 10 to 4.

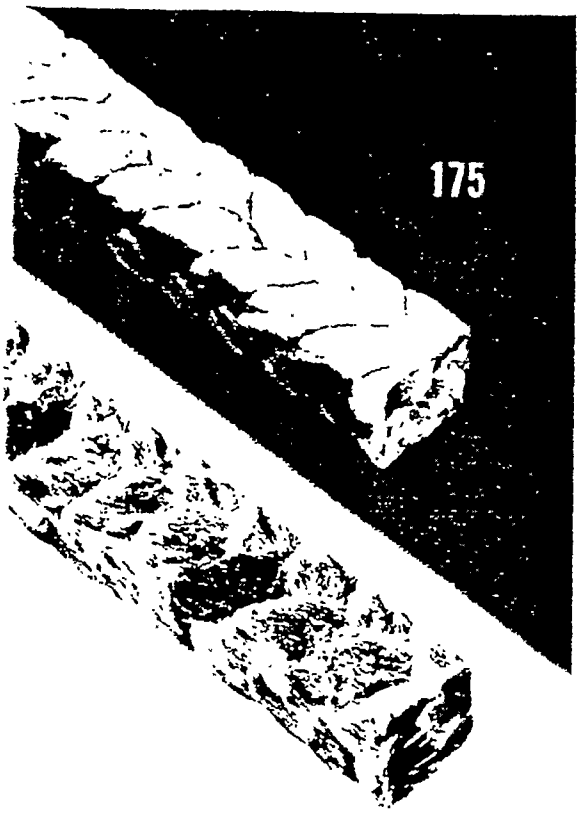
J-M 351 Centripac Packing is made in the same basic pattern as J-M 350 but it is impregnated with a combination of vegetable oils, glycerine and inert inorganic fillers specifically for service against gasoline, naphtha, solvents and petroleum derivatives. Has a graphite finish. **S**

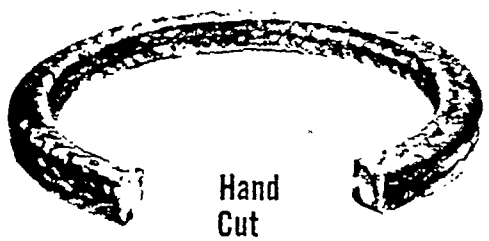
Speeds to 3600 rpm; temperatures to 450 F.
PV limit = 725,000; pH range 10 to 4.

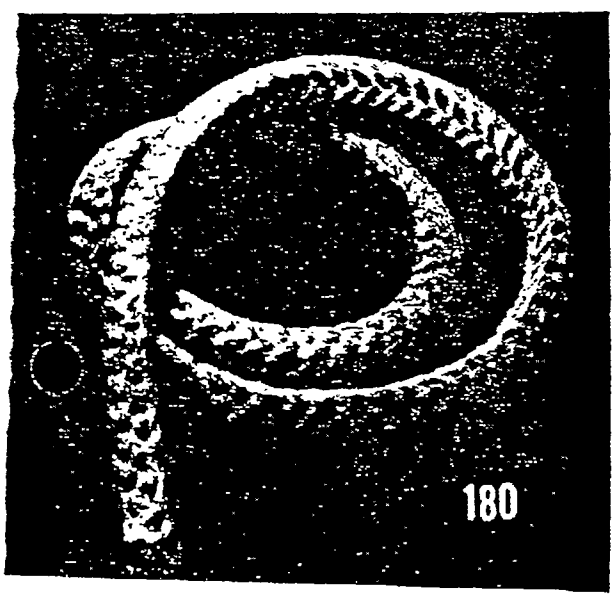
J-M 2022 Centripac Packing is designed and lubricated for caustic service. Otherwise it is similar to J-M 350 style construction which enables it to handle pumping pressures to 2000 psi. at low speeds. **C**

Speeds to 3600 rpm; temperatures to 450 F.
PV limit = 725,000; pH range = 14 to 10.

FORMS FURNISHED See Page 49 for Size Range and Weights	
Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C7 ⅝".
Rings, Hand Cut:	Hand Cut butt joint, taped ends, approximately square cross section. To order Rings, show prefix H/C, I.D. and O.D. and depth. Example: H/C 7 1" I.D. x 1½" O.D. and ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, state H/C Set, give I.D., O.D., depth and number of rings per set. Example: H/C Sets 1" I.D. x 1½" O.D. x ¼" depth x 5 Rings.







Johns-Manville

Johns-Manville produces a variety of packings braided from select plant fibers. They are suitable for sealing rods, or outside packed plungers of reciprocating pumps, as well as accumulators, plungers and rams on other hydraulic equipment handling cold water.

Temperature limits will range, depending on fiber selection, up to 200 F for water or mild aqueous solutions. They are carefully lubricated to provide good sealability and low coefficient of friction. They are especially recommended for applications on brass and bronze shafts.

J-M Navalon® Packings, described below, are constructed of ramie rovings. A maximum amount of lubricant is absorbed by these fibers. Ramie fibers have excellent strength which improves with wetting. Also they are extremely stable and will not swell or expand in service as will flax.

Navalon Packings are impregnated with lubricants designed to improve temperature resistance. These packings can be identified by the blue-colored center strand.

J-M Flax Packings should be used where the characteristic of some swell or expansion in service is not objectionable. The Flax Packings described below contain no impregnation that will become rancid or cause chemical reactions to break down fibers. The lubricants are compounded for working temperature limits of 100 F.

J-M 175 Navalon Packing was originally designed for Marine stern shaft service. Recommended also for cold and warm water service and mild aqueous solutions. **G**

J-M 175 has become the most popular packing for industrial and mining applications where long service life and operating efficiency with low shaft wear is important.

Navalon 175 is plaited square from rovings of first quality Ramie fibers and saturated with petroleum base oils and waxes. Contains no tallow.

Speeds to 3600 rpm; temperature limit 200 F.

PV limit = 200,000; pH range = 6 to 8.

J-M 175N Navalon Packing is the style which meets all the requirements of United States Spec MIL-P-20084. It contains more lubricating impregnant than standard 175 style. It is also suggested for use on commercial ships where a heavily lubricated Stern Tube packing is preferred. **G**

PV limit = 200,000; pH range = 6 to 8.

FBW-185

Ramie • Flax Packings

- for cold water and hydraulic service at medium or low pressures

J-M 190 Navalon Packing is designed to handle water and mild solutions to 100 F. It is plaited square from high quality Ramie rovings. It is impregnated with a white compound of petroleum base oils, waxes and animal fat. G

Speeds to 3600 rpm; temperature limit 100 F.

PV limit = 200,000; pH range = 6 to 8.

J-M 245 WPH Navalon Packing is suitable for reciprocating pumps, accumulators, and in hydraulic press service ranging to 3000 psi if Style 280 copper end rings are used. G

J-M 245 WPH is plaited square from Ramie rovings and impregnated with a compound of Japan Wax, graphite and vegetable oil.

Pressures to 2000 psi; temperatures to 100 F.

J-M 188 Flax Packing is designed for centrifugal shafts handling cold water and mild aqueous solutions. G

Style 188 is the best quality flax packing. Constructed from rovings of Long Line flax, plaited square, and saturated with a white compound containing petroleum base oils, waxes and animal fat.

Speeds to 3600 rpm; temperatures to 100 F.

PV limit = 175,000; pH range = 6 to 8.

J-M 189 Flax Packing is a general purpose flax packing. It does not have the strength or durability of Style 188 but can be used for similar services. It is plaited square from Tow flax and saturated with a white compound containing petroleum base oils, waxes and animal fat. G

Speeds to 3600 rpm; temperatures to 100 F.

PV limit = 175,000; pH range = 6 to 8.

J-M 181 WPH Flax Packing resembles 240 WPH but basic structure uses shorter Tow flax fibers. Thus, it does not have the strength or durability of 240, but could be used in similar applications at somewhat lower pressures where reciprocating motion is involved. G

Pressures to 1000 psi; temperatures to 100 F.

J-M 240 WPH Flax Packing is designed for service in applications involving high pressures, slow speeds, and reciprocating motion. It is a popular packing on hydraulic presses having deep stuffing boxes. Often used in combination with Style 280 copper end rings. Can also be used in accumulator service.

J-M 240 WPH is plaited square from rovings of Long Line flax and impregnated with a compound containing Japan Wax, graphite and a small quantity of vegetable base oil. G

Pressures to 2000 psi; temperatures to 100 F.

J-M 180 Sinbad Pure Flax Packing is specially made for the stern tube shafts on small commercial vessels. G

Constructed of pure flax roving, plaited square and heavily saturated with lubricant, Style 180 Flax Packing is particularly well suited to meet the requirements of salt water service. It contains no impregnation that will become rancid or cause chemical reactions to break down the fibers.

Heavily lubricated for low-friction service, J-M Style 180 Sinbad Flax easily withstands shaft speeds, and the wearing surfaces of the shaft polish smoothly and quickly. The lubricants are compounded for working temperature limits of 100 F. If desired, Style 180 can also be supplied graphited. Please specify 'graphited' when this is wanted.

Speeds to 3600 rpm; temperatures to 100 F.

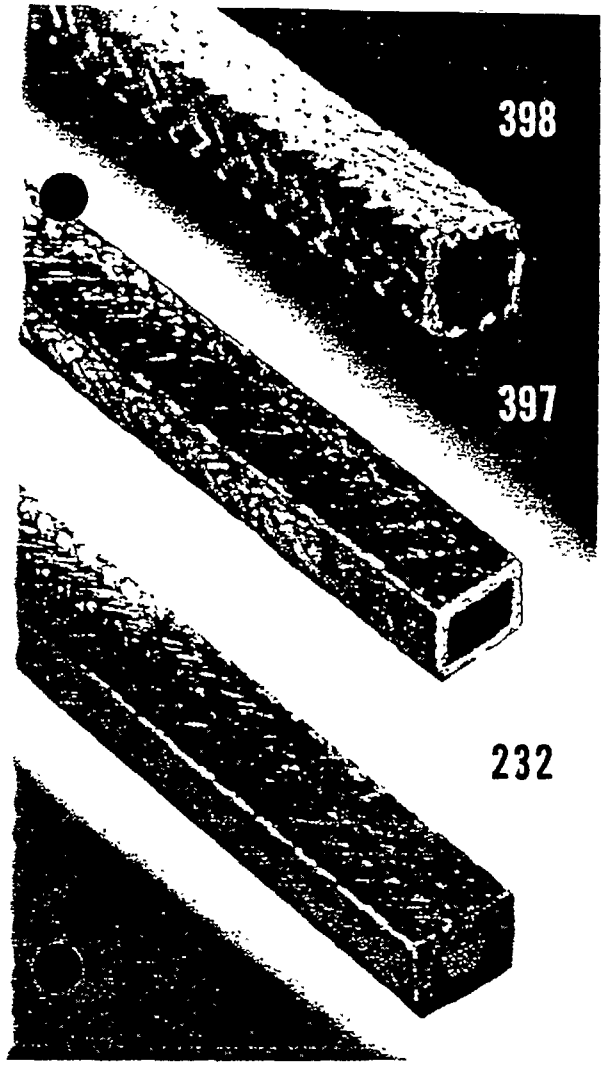
PV limit = 175,000; pH range = 6 to 8.

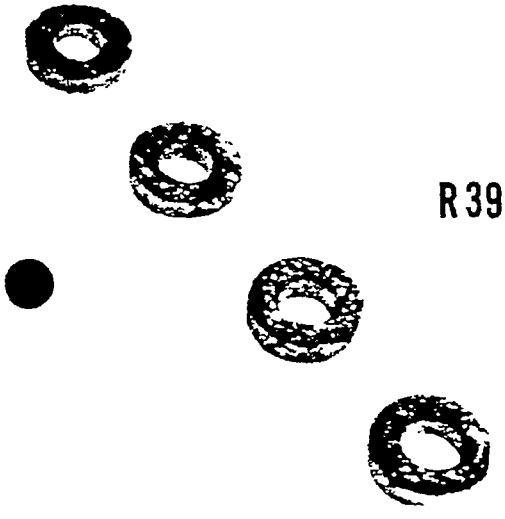
Johns-Manville ramie packings (J-M Navalon) are recommended for installation in new stern tube applications; and J-M flax packings are recommended for installation in stern tubes where the shaft has become worn as a result of use over a period of time.

These recommendations also apply for reciprocating applications.

FORMS FURNISHED
See Page 49 for Size Range and Weights

Coils in Flat Boxes	Size	¼"	5/16"	⅜"	7/16"	½"	9/16"	⅝"	¾"	⅞"	1"
	Coils per box	4	4	4	4	4	4	4	3	3	2
	Feet per box	150	125	109	93	80	66	60	36	33	19
Spools:	⅛" and 5/32" on 1 lb. spools ¼" to 1" on 25 or 50 lb. spools on special order 1" and up on 50 lb. spools Style 180 ⅛" thru 5/32" on 1 lb. spools ⅜" thru ¼" on 25 lb. spools ⅜" thru 1½" on 50 lb. spools										





Johns-Manville

J-M Thermocore Packings are designed for excellent heat resistance, and maximum adaptability to effect sealing under least compression. The construction comprises one or more jackets of asbestos yarn braided over cores, either plastic or asbestos.

J-M Thermocore is recommended specifically for valve stems. Some styles will handle service lines with temperatures ranging to 1200 F.

Braid-over-asbestos-core types result in the softest and most adaptable of packings. These styles are recommended for valve stems, slowly moving shafts, or other mechanisms where clearances are so wide as to require a material which will fill the stuffing box and readily adapt and compensate so as to seal under pressure. The Rajah Packings are typical of this construction.

Styles constructed with plastic cores are designed for extremely high temperature and high pressure service conditions in valves. The inert core provides stability and minimum volume loss under temperatures to 1200 F. Low stem friction is another feature. Sizes over ⅝" have 2 or more jackets, depending on size.

Styles made with metallic mesh cores are recommended for shafts having eccentric motion. The cores are designed to offer high recovery characteristics which enable these styles to follow off center shaft movements and still maintain maximum sealability. These styles are furnished in sets only and are described in the "Special Packing Sets" section.

Styles embodying a heavy grease type core are designed to handle high centrifugal shaft speeds where lubrication is a problem, as in gasoline pumps or pumps having no facilities for supplemental lubrication.

J-M 398 Thermocore Packing is designed for service in **G** valves handling steam at line temperatures up to 1000 F and handling other media designated G and S. Braid-over-core Inconel wire inserted 95/98% asbestos yarn jackets over a plastic core. Size ¼" and up furnished with a plastic core consisting of white asbestos, mica and a small amount of Neoprene; and sizes up to but not including ¼" furnished with 95/98% Inconel wire inserted yarn-mica treated core. Has a mica finish. J-M 398 can be furnished with graphite instead of mica when so stated. Contains the J-M Corrosion Inhibitor.

J-M 398 has a long successful record as a Valve Stem Packing. Once installed in the valve and taken up as necessary to heat set in service, it is stable and rugged, requires a minimum of further take-up during extended life.

Pressures to 5000 psi; line temperatures to 1000 F.

FBW-187

Thermocore® Valve Packings

- withstand temperatures to 1200 F • seal under light compression
- adapt readily to eccentric motion

J-M 397 Thermocore Packing is designed to handle fluids under extreme service conditions found in power plants, and the petroleum, petro-chemical and chemical industries. It is a braid-over-core construction consisting of Inconel wire-inserted 95/98% yarn jackets over a plastic core. Sizes ¼ inch and up are furnished with a plastic core of white asbestos and graphite; sizes up to but not including ¼ inch are furnished with blue African asbestos yarn graphite-treated core. J-M 397 has a graphite finish and J-M corrosion inhibitor (to protect valve stems after hydrostatic test and before they are placed in service). G

Because of the inert qualities of the asbestos, Inconel wire and graphite, J-M 397 can be used in valves handling a wide range of petroleum products and chemicals. It will handle all chemicals designated G and S in the tables, at pressures up to 5000 psi in usual designs for valve stuffing boxes. Chemically, it will handle materials designated P and F as well, if the packing does not enter the medium handled. Depending on concentration of such solutions, it will also handle acids and caustics designated T and C.

Because J-M 397 is almost entirely inorganic, it maintains its stability even in valves where line temperatures run up to 1200 F.

This packing contains no component which would harden under high or low temperature conditions, or oil lubricant that could squeeze out of the packing under gland pressure.

J-M 397 meets MIL-P-17303C, Class II, Type E, Symbol 1111.

Pressures to 5000 psi; line temperatures to 1200 F.

J-M 399 Thermocore Packing is exactly the same as J-M 398 except that there is no wire reinforcement in the yarns. It can be used where a slightly softer packing is required or where shaft motion makes a wire reinforcement undesirable. G

J-M 399 has a mica finish, and contains the J-M corrosion inhibitor.

J-M 399 is noted for its sealability and adaptability under high temperature conditions.

Pressures to 4000 psi; line temperatures to 900 F.

J-M 6 Rajah Packing is made in a square cross-section of the braid-over-core construction. The core consists of soft twisted asbestos and the jacket is braided from white asbestos yarns. The packing is not lubricated with an oil but is treated with a light surface coat of natural and buna-S rubbers. Has a graphite finish. G

Because it has no oil content, J-M 6 Rajah can be used at temperatures higher than J-M 223. It is a soft, adaptable, inert packing suitable for service up to 750 F line temperature in valves. It can be used in other services where the conditions correspond to valve stem service.

Pressures to 300 psi; line temperatures to 750 F.

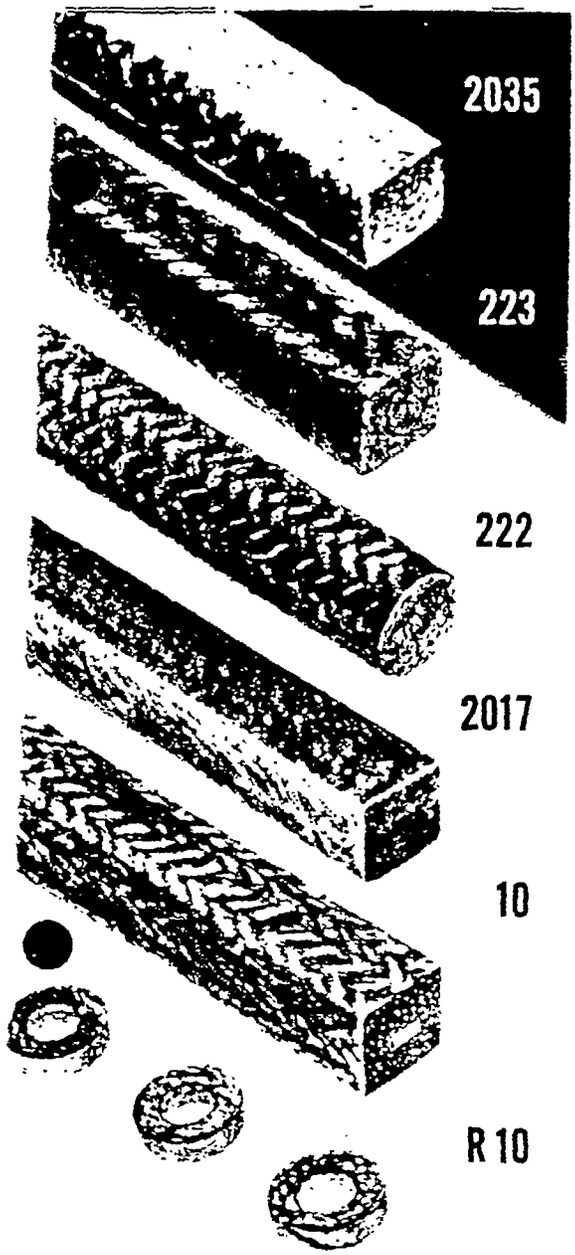
J-M 2 Rajah Packing is made exactly the same as J-M 6 but in a round cross-section and should be employed where the most adaptable of all braided packings is required. It can be deformed to fit packing spaces smaller than the nominal size or spaces larger than the nominal size of the packing. For best sealability, J-M 2 Rajah should have packing space the same width as the diameter of the packing. Has a graphite finish. G

Pressures to 300 psi; line temperatures to 750 F.

J-M 232 Packing is furnished only in rings and sets. It is described on page 27

FORMS FURNISHED See Page 49 for Size Range and Weights	
Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C397 ⅝".
Rings, Die Formed:	Die formed skive joint, approximately square cross section. To order Rings, show prefix "R", I.D. and O.D. and depth. Example: R397 1" I.D. x 1½" O.D. x ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, show prefix "R", suffix "Set", I.D., O.D., depth and number of rings per set. Example: R397 Sets: 1" I.D. x 1½" O.D.. x ¼" depth x 5 rings.
Rings, Hand Cut:	Hand cut butt joint, square cross section, cut from coil packing, bulk packaged. To order, show prefix "HH/C", I.D., O.D. and depth. Example: H/C 397 1" I.D. x 1½" O.D. x ¼".
Sets:	A specified number of rings, assembled and wrapped as a set. Example: H/C 397 1" I.D. x 1½" O.D. x ¼" depth x 5 rings.

FBW-188



REFERENCE SYMBOLS

Indicate service classification or condition

General	G
Caustic	C
Pulp & Paper	P
Solvent	S
Food and Related Services	F
Chempac (TFE Impregnated Asbestos)	T
Most Corrosive requiring Teflon filament or Blue Asbestos Packings	X

Chemical table appears on page 49

FBW-189

Johns-Manville

Johns-Manville produces a variety of soft, highly adaptable asbestos packings of braided construction. Each of the styles described below has been providing excellent service for more than fifty years.

These packings are made by braiding tubular jackets of asbestos yarn, employing either braid-over-braid construction, or braid over a soft asbestos core. They are made up round, then calendered to form a square cross-section.

Braid-over-braid types result in the strongest of all braided constructions. This strength has made it popular for valve stems where high pressures are encountered. The Mogul® and Jewett® Packings are typical of this form. These braid-over-braid types can also be used for slow moving shafts.

The braid over asbestos types, including the Rajah® styles, are described in the Thermocore section, page 16.

J-M 223 Mogul Packing has almost countless uses where a soft pliable packing without rubber is required. The expression "Graphited Asbestos Packing" generally applies to J-M 223 Mogul. Popular with the plumbing trade, it is widely used on valve stems and low pressure steam lines. It can be used on slowly turning or oscillating shafts. **G**

J-M 223 Mogul is made by braiding white asbestos yarns, braid-over-braid to the proper size, and lubricating with a light petroleum base oil. It is then calendered to a square cross-section. Has a graphite finish.

Pressures to 300 psi; temperatures to 600 F.

Speeds to 1750 rpm.

PV limit = 400,000; pH range = 10 to 4.

J-M 222 Mogul Packing is suggested for low pressure general service, especially where packing space is small. The round shape is often used where tolerances are too wide, or the packing space too varied to accept square designs. Easily deformed, it compresses readily to form rings of desired dimensions. **G**

J-M 222 Mogul will handle low pressure steam and is suitable for general service on valve stems, and reciprocating or oscillating rods and shafts operating at slow speeds.

It is made by braiding commercial grade white asbestos yarns to the proper size, and lubricating with a light petroleum base oil. Has a graphite finish.

Pressures to 300 psi; temperatures to 600 F.

Speeds to 1750 rpm.

PV limit = 400,000; pH range = 10 to 4.

J-M 2020 Braided Packing is made of special white asbestos yarns, braid-over-braid and squared. It is impregnated with a combination of petroleum base oils and waxes, with a low saponification number. **C**

J-M 2020 is used in severe caustic service on valves, on slowly turning shafts and in grooves or expansion joints. Has no graphite content.

Pressures to 300 psi; temperatures to 600 F.

Speeds to 1750 rpm.

PV limit = 400,000; pH range = 14 to 10.

Braided Packings

- recommended for general utility
- soft, adaptable strong materials

J-M 10 Jewett Braided Packing has long been recognized for outstanding service on valve stems handling line temperatures to 600 F. It is also used on reciprocating rods and as a groove packing. Will handle hot and cold water, as well as heavy petroleum products such as fuel oil and hot asphalt. **G**

Valve manufacturers prefer J-M 10 packing construction for close tolerance Die-Formed Rings that are well formed, easy to seat and have low friction.

J-M 10 Jewett has a center core of lead ribbon. Over it are braided jackets of white asbestos yarns reinforced with copper wire. Impregnated with heavy petroleum base compound. Has graphite finish. Thus the construction provides maximum strength and the compound contributes exceptional sealability.

Pressures to 500 psi; temperatures to 600 F.

A valve packing.

J-M 2035 Braided Packing is the white impregnated asbestos packing designated for Food Industry service. The structure is braid-over-braid white asbestos yarns. The impregnant is a non-toxic petroleum base oil and wax compound, containing an inert grease which has been checked and approved by State Health Departments. Has a mica finish. **F**

J-M 2035 is used on equipment handling food, liquor and other media where it is imperative that the packing be non-toxic. It also is used for light caustic and acids and in other services where a white packing is preferred.

Pressures to 300 psi; temperatures to 300 F.

Speeds to 1750 rpm.

PV limit = 400,000; pH range = 9 to 3.

J-M 55 Braided Packing is made in the same braid-over-braid construction as J-M 223, except that the white asbestos yarns contain a copper wire reinforcement for added strength. It is lubricated with a light petroleum base oil and graphited. **G**

J-M 55 is used in air service and in service up to 600 F where the adaptable Mogul construction is needed but pressures are too high for J-M 223.

Pressures to 500 psi; temperatures to 600 F.

J-M 323 Braided Packing will service valve stems, oscillating shafts, and centrifugal shafts rotating up to 1800 rpm, handling gasoline, solvents and other thin liquids. **S**

J-M 323 is braid-over-braid, white asbestos yarns, square cross-section. It is treated with Neoprene base cement and a lubricant containing vegetable oil, glycerine and inert fillers. Has a graphite finish.

Speeds to 1800 rpm; temperatures to 600 F.

PV limit = 400,000; pH range = 10 to 4.

J-M 322 Braided Packing has round cross-section designed to handle variations in stuffing box design. Otherwise it is similar to J-M 323 above. It is recommended for valve stem service primarily. **S**

Pressures to 300 psi; temperatures to 600 F.

Speeds to 1750 rpm.

PV limit = 400,000; pH range = 10 to 4.

J-M 14 Braided Packing is a strong packing made of yarns containing 95/98% white asbestos and having a copper wire reinforcement. This is the most popular style of packing for high temperature valve steam service. Handles up to 1000 F line temperature. The media can be steam at pressures up to 5000 psi, hot or cold water, and all media designated G in the Chemical Tables. It can also be used in valves handling liquids designated S. Ability to handle caustics and acids depends on the concentration of the contained solution. It is impregnated with a heavy petroleum base compound that will not break down in high temperature service. Has a graphite finish. **G**

J-M 14 Packing is widely used by valve manufacturers who purchase it in the form of dense close-tolerance Die Formed Rings. Rings can be furnished with J-M Corrosion Inhibitor if the packing is to be used on stainless steel stems.

Specify style 13 for a mica-type packing of similar construction on special inquiry.

Pressures to 5000 psi; temperatures to 1000 F.

A valve packing.

J-M 2017 Braided Packing will service valve stems, and slowly turning shafts handling most severe acids. Can be used as a groove packing. It is a good general service packing in plants handling corrosive liquids. Not suitable for strongly alkaline solutions. **X**

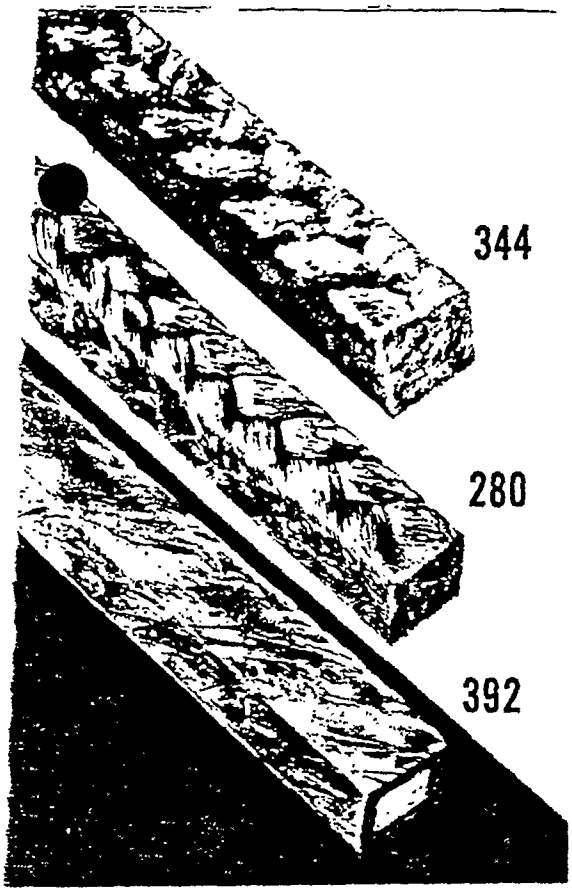
J-M 2017 is braid-over-braid, 100% blue African asbestos yarns, square construction. It is impregnated with an extremely inert composition consisting of polyisobutylene and hydrocarbon waxes. Has a graphite finish.

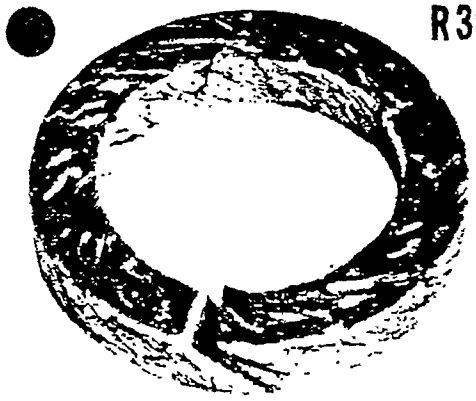
Speeds to 1800 rpm; temperatures to 750 F.

PV limit = 400,000; pH range = 5 to 2.

FORMS FURNISHED
See Page 49 for Size Range and Weights

Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C223 ⅝".
	Die formed skive joint, approximately square cross section. To order Rings, show prefix "R", I.D. and O.D. and depth. Example: R223 1" I.D. x 1½" O.D. x ¼" depth
Sets:	A specified number of Rings, assembled and wrapped as a set. To order Sets, show prefix "R" suffix "Set" I.D., O.D., depth and number of rings per set. Example: R223 sets, 1" I.D. x 1½"O.D.'x ¼" depth x 5 ring
Rings, Hand Cut:	Hand cut butt joint, square cross section, cut from coil packing, bulk packaged. To order, show prefix "H/C", I.D., O.D. and depth. Example: H/C 223 1" I.D. x 1½" O.D. x ¼".
Sets:	A specified number of rings, assembled and wrapped as a set. Example: H/C 223 1" I.D. x 1½" O.D. x ¼" depth x 5 rings.





Johns-Manville

J-M Flexible Metallic Packings are generally recommended where operating conditions such as shock or pressure are severe. They are sometimes used as end rings to support asbestos, flax or plastic packing in the stuffing box when shaft or rod clearances are wide. Metallic packings are also recommended for applications where chemical resistance is important.

J-M Flexible Metallic Packings are made from various metals and alloys, to suit the service for which they are intended, in most of the standard packing constructions. Constructions include: braid-over-braid, square plaited twisted foil, knitted mesh, spiral and others.

J-M 280 Metallic Packing, copper wire type, is a general service packing. It is used on hydraulic presses with J-M 240 and J-M 245 center rings and on steam hammers with J-M 4201 center rings. It is also used in conjunction with J-M 183 and 184 packings. **G**

J-M 280 is plaited to a square cross-section from copper wire strands. Its construction makes it a strong packing, suitable for use as end rings to support softer center rings in a packing set.

Temperatures to 500 F.

J-M 360 Asbestos-Metallic Packing, antimony-lead ribbon type, is used as header and follower rings on centrifugal pumps in services such as boiler feed water. The center rings may be J-M 610 Plastimatic Packing or a suitable asbestos style.* **G**

A feature of J-M 360 is the good, protective bearing surface of the antimony-lead ribbon. The ribbon is braided flat over a soft, twisted asbestos core and well lubricated with light petroleum base oil. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 450 F.

**PV limit = 1,250,000; pH range = 10 to 4.*

J-M 344 Asbestos-Metallic Packing, copper mesh type, is specifically designed for high temperature valve stem service. It is stable and long lived, provides outstanding sealability. It is also an excellent packing for high pressure air conditions and is a popular style for air compressors. **G**

J-M 344 is made in a square plaited structure, each strand composed of knitted copper mesh twisted together with 95/98% white asbestos yarn. It is lubricated with a high-viscosity, petroleum-base oil compound. Has a graphite finish.

Pressures to 5000 psi; line temperatures to 1000 F.

J-M 379 Asbestos-Metallic Packing, lead-alloy ribbon type, is designed for acid service on centrifugal shafts. It is used as end rings with J-M 640 plastic center rings. **X**

J-M 379 has the same general construction as J-M 360. However, the lead ribbon is a special alloy and the core is 100% blue asbestos fiber. It is impregnated with an extremely inert composition consisting of polyisobutylene and hydrocarbon waxes. Has a graphite finish.

Speeds to 3600 rpm; temperatures to 450 F.

PV limit = 1,000,000; pH range = 5 to 2.

FBW-191

Flexible Metallic Packings

- withstand severe shock
- seal against high pressures
- protect soft packing rings

J-M 395 Metallic Packing, aluminum mesh and foil type, is designed specifically for hot oil service. It is also an excellent packing for hot and cold water and other services where the fluid handled is compatible with aluminum. A good packing for turning shafts where dry heat is involved. **S**

J-M 395 is made entirely of 100% aluminum and is the softest of the aluminum types. It has a soft core of knitted aluminum mesh with a foil cover twisted around the core and formed to square cross-section. The lubricant is a compound of vegetable oils, glycerine, inert fillers and graphite.

Speeds to 3600 rpm; temperatures to 1000 F.

PV limit = 1,500,000; pH range = 10 to 4.

J-M 391 Metallic Packing, is the most dense of the aluminum foil types and is suitable for centrifugal pumps and turning shafts in a dry heat environment where the fluid handled is compatible with aluminum. **G**

J-M 391 is 100% aluminum foil, spiralled on itself and formed to a square cross-section. The lubricant is a vegetable oil, glycerine and graphite compound. It is denser than J-M 395.

Speeds to 3600 rpm; temperatures to 1000 F.

PV limit = 1,500,000; pH range = 10 to 4.

J-M 392 Asbestos-Metallic Packing, aluminum foil type, is most popular in oil field service, although it is also suitable in other media under the same conditions as J-M 395. It is not as soft as J-M 395 but carries more lubricant. **G**

J-M 392 is made of aluminum foil, spiralled around a 98/99% asbestos core which adds softness and acts as a lubricant reservoir. The lubricant is a vegetable oil, glycerine and graphite compound.

Speeds to 3600 rpm; temperatures to 1000 F.

PV limit = 1,500,000; pH range = 10 to 4.

J-M 393 Asbestos-Metallic Packing, lead foil type, is designed for centrifugal pumps, particularly against solvents and petroleum derivatives as well as for general maintenance work. It combines the bearing characteristics of lead with the softness of the asbestos core. The high percentage of lubricant in the core extends packing life. **S**

J-M 393 consists of lead foil twisted around a 98/99% asbestos wick core. The lubricant is a vegetable oil, glycerine, inert fillers and graphite compound.

Speeds to 3600 rpm; temperatures to 450 F.

PV limit = 1,000,000; pH range = 10 to 4.

For additional Flexible Metallic Styles, see J-M 350 and 351 Centripac Lead-Asbestos Packings, page 11.

METALLIC PACKINGS *See page 49 for size range and weights*

FORMS		¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1⅛	1¼
Spiral	Length (ft.) 391, 392, 393 & 395	18	17	16	16	16	16	16	15½	15½	15½	15½	15½
Spiral	Length (ft.) 280, 344, 360 & 379	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½
Spiral	Number of Spirals per box	1	1	1	1	1	1	1	1	1	1	1	1
Spiral	Inside Diameter of Spiral (inches)	1⅝	1⅝	2	2	2½	2½	3	4	5	5	5	5
Coil	280, 344, 360 & 379	All sizes: 5, 10, 25 and 50 lb. spools. To order Coil show prefix "C" and size. Example: C 280 1".											
Rings		Die Formed, approximately square cross-section. To order Rings, show prefix "R" ID and OD. Examples: R 344 1½" ID x 2¼" OD.											
Sets		A specified number of rings, assembled and wrapped as a set. To order sets, show prefix "R" suffix set, ID, OD and number of rings. Example: R 344 Set 1½" ID x 2¼" OD x 5 rings.											

FBW-192

Asbestos Fabric Packings

- solid resilient packings
- impervious to penetration by liquids

J-M 168 Kearsarge Packing is basically a high-temperature valve stem packing although it can be used in expansion joints and similar essentially static applications. It is preferred by many engineers who require a dense packing with good sealability for service on stainless steel valve stems to 1000 F and pressures to 5000 psi. **G**

J-M 168 is made of 90 to 94% asbestos cloth with copper wire insertion, wrapped on itself, formed to a square cross-section. Cement is natural and buna-S rubber compound, lubricant is a vegetable base compound. Mica surface lubricant.

Because of its density, once seated, J-M 168 does not require follower take-up as often as softer construction. For essentially static equipment; pressures to 5000 psi; temperatures to 1000 F.

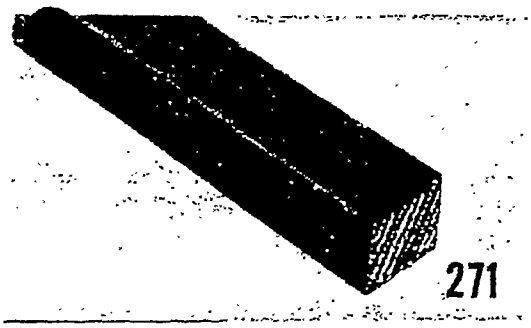
FABRIC PACKINGS *See page 49 for size range and weights*

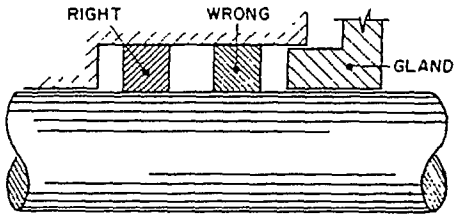
	Forms	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 3/8	1 1/2	2
Coil	Number of 12½ ft. lengths per box	8	6	5	4	4	3	3	3	2	2	2	2	2	2
Coil	Feet per box	100	75	62½	50	50	37½	37½	37½	25	25	25	25	25	25
Coil	Weight per box	4.5	5.4	6.3	6.8	8.8	8.4	10.0	13.9	11.6	14.5	20.5	23.8	27.2	42.5
Spiral	Number of 12½ ft. lengths per box	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Spiral	Feet per box	25	25	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½
Spiral	Inside diameter of Spiral	1 1/16	1 1/16	1 5/8	1 7/8	1 7/8	2 3/8	2 3/8	3½	4½	4½	4½	4½	4½	4½
Spiral	Weight per box	1.1	1.8	1.3	1.7	2.2	2.8	3.3	4.6	5.8	7.2	10.5	11.9	13.6	21.2
Rings	Cut from Spiral; approximately square cross section; Butt joints.														
Sets	Rings cut from Spiral. Specify number of rings per set.														

FBW-193

J-M **Rubber and Duck** Packings

- handles cold water, hot water to 250 F.
- compensates for swelling
- seals against off-center motion





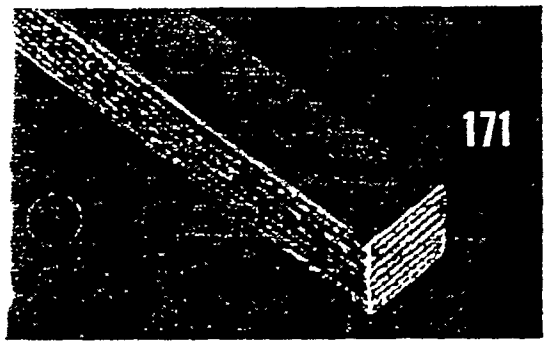
Johns-Manville rubber and duck packings are recommended for use against hot water to 250 F and low pressure steam. Some styles, however, may also be used for other media such as light oils, ammonia, cold water and light aqueous solutions in reciprocating and slow rotary service.

They are made of high quality duck which is laminated and bonded with specially compounded rubbers to prevent leakage through the packing. This provides a strong stable material which is then lubricated with mineral oil and graphited. The natural resiliency of this type of construction compensates for swelling tendencies in hot water service and also aids in sealing off-center motions.

J-M 271 Cross Diagonal Rod Packing is the best packing for cold and hot water service on water end of reciprocating pumps. It is excellent for boiler feed water service and will withstand the action of caustic treatments in water. **G**

The rubber and duck plies run diagonally to the rod so as to allow natural swell of the packing without excessive pressure against the rod. This results in less rod wear, better sealing, longer packing life. Lubricant is mineral oil. Has a graphite finish.

Temperatures to 250 F.

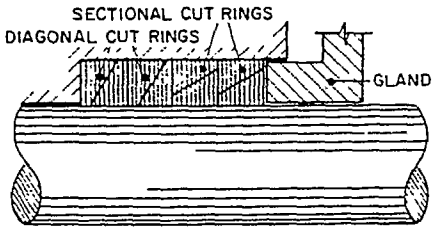


J-M 171 Duro Rod Packing is a good, dependable material for service against low pressure hot or cold water and mild aqueous solutions. It will give satisfactory service on reciprocating rods, valve stems and outside-packed pistons and valve rods on many types of reciprocating engines and pumps. **G**

J-M 171 is made in laminated form from plies of heavy duck bonded together with a strong non-hardening rubber friction compound, then lubricated with heavy mineral oil. Has a graphite finish.

Rings may be furnished cut from spiral or cut from slab. Rings cut from spiral are suggested for most uses. Rings are regularly furnished with Butt joints. Endless rings supplied when specified. When specified can be furnished with diagonal or sectional cuts.

Temperatures to 250 F.



J-M 172 Besta-Monia Packing is specifically designed for ammonia service on reciprocating rods, slow rotating shafts and valve stems. **G**

Made of closely woven duck plies laminated with Neoprene and special ammonia-resistant lubricant. Has a graphite finish.

Temperatures to 250 F.

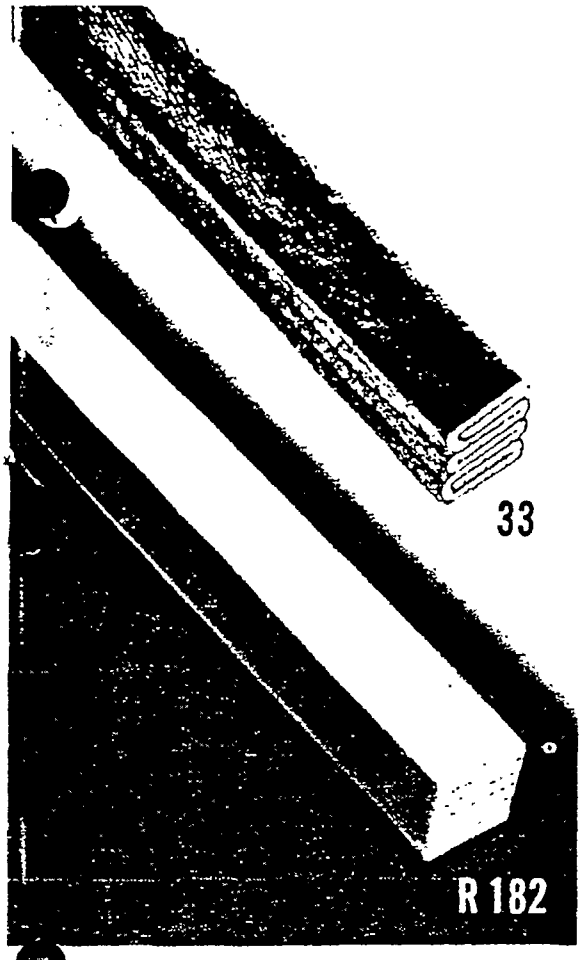
FORMS FURNISHED — COILS and SPIRALS
See page 49 for size range and weights

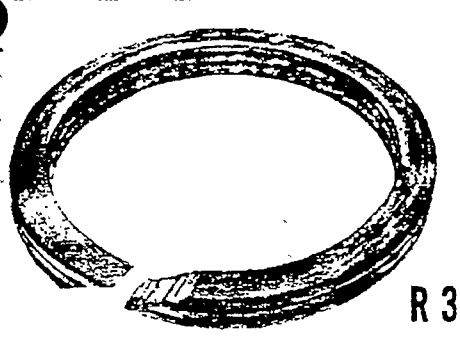
	Forms	¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1	1¼	1⅜	1½	2
No. of lengths per box 171, 172, & 271	Coil	8	6	5	4	4	3	3	3	2	2	2	2	2	2
Feet per box 171, 172	Coil	120	90	75	60	60	45	45	45	30	30	30	30	30	30
Feet per box 271	Coil	100	75	62½	50	50	37½	37½	37½	25	25	25	25	25	25
No. of spirals per box 171, 172, & 271	Spiral	4	2	1	1	1	1	1	1	1	1	1	1	1	1
Feet per box 171, 172	Spiral	60	30	15	15	15	15	15	15	15	15	15	15	15	15
Feet per box 271	Spiral	50	25	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½	12½
Inside diameter	Spiral	1"	1"	1¼"	1½"	1⅝"	2"	2"	2½"	3"	3½"	4"	4"	4"	4"

All styles furnished in 15-foot lengths except Style 271 which is furnished in 12½-foot lengths.

RINGS and SETS

271:	Cut from Spiral; skive joint.
171 & 172	Cut from slab, with skive joint unless otherwise specified.
	Cut from slab; no joint, when specified "Endless".
	Cut from Coil; skive joint, when specified "Cut from coil"—or suffix "C".
	Cut from ½" thick slab; no joint; with Sectional Cut, when specified "SC".
	Cut from ½" thick slab; no joint; Diagonal Cut, when specified "DC".





Johns-Manville **Piston** Packing

- provide completely satisfactory seal
- minimize friction and scoring
- increase efficiency of equipment

J-M Piston Packings are recommended for inside packed pistons on the work end of reciprocating pumps. These packings are designed to withstand considerable wear and tear, provide longer life in highly efficient service with fewer shutdowns for replacement.

J-M 33 Universal Piston Packing offers the widest operating range of any J-M Piston Packing. It can be used in service against weak caustic and acid solutions, water, brine, air, oil, petroleum derivatives such as gasoline, naphtha, propane, butane, and light hydro-carbons of a corrosive nature. **S**

J-M 33 has a dense, strong structure of asbestos cloth and duck. These are interplied in such a way that round edges operate against the cylinder wall. The bond is neoprene base cement. Rings are furnished with a skive joint.

Temperatures to 350 F.

J-M 182 Aqua Piston Packing is the most popular high quality rubber duck piston packing. It is used on cold and hot water to 200 F and is suggested for boiler feed water pumps. **G**

Cross-laminations of fine, white cotton duck and heat resistant rubber provide a white piston packing of great tensile strength and durability.

Coil or ring form, rings generally cut from slab and step jointed. Spiral form, rings cut from coil, or endless rings on special order.

Temperatures to 200 F.

R182 (RH) can be furnished with Rock Hard cure suitable for temperatures to 250 F, when so specified.

PISTON PACKINGS

See page 49 for size range and weights

FORM		¼	5/16	⅜	7/16	½	9/16	⅝	¾	⅞	1
Coil—All Styles	Number of lengths per box	8	6	5	4	4	3	3	3	2	2
Coil—Rubber & Duck	Feet per box: 15 ft. lengths	120	90	75	60	60	45	45	45	30	30
Coil—#33 Universal	Feet per box: 12 ft. lengths	96	72	60	48	48	36	36	36	24	24
Spiral—Rubber & Duck	Feet per box: 15 ft. lengths	15	15	15	15	15	15	15	15	15	15
Spiral—Rubber & Duck	Inside diameter of spiral	1	1	1¼	1½	1⅝	2	2	2½	3	3½
Spiral—#33 Universal	Feet per box: 12 ft. lengths	12	12	12	12	12	12	12	12	12	12
Spiral—#33 Universal	Inside diameter of spiral	1⅝	2	2	2½	2½	3	4	5	5	5

RINGS—RUBBER & DUCK

Standard:	Cut from slab stock ½" thick; step joint.
Solid:	Cut from slab stock ½" thick; no joint; when specified.
Coil:	Cut from coil stock, step joint; when specified.

RINGS #33 UNIVERSAL

Standard:	Cut from Spiral only; skive joint.

Styles 182 and 182 RH furnished in 15 foot lengths. Style 33 furnished in 12-foot lengths.

FBW-195

Johns-Manville **Packing Sets**

J-M **Cumpac**® Packing Sets

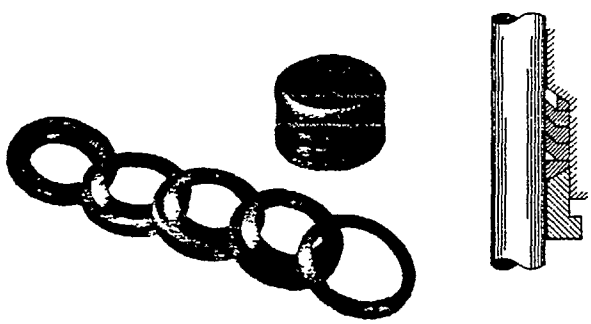
- **low friction, efficient sealing, under severe operating conditions**

J-M Cumpac Packing Sets are asbestos packings with a unique cross-section. They are designed to give O.D. and rod or shaft sealing, without excessive interference through follower pressure.

Gland pressure seats each ring's flat section firmly in the stuffing box. This leaves the flexible lips free to seal with minimum friction.

The special cross-section also permits more rings in a given stuffing box depth, resulting in greater sealing effectiveness.

A minimum set consists of 3 center rings and a header ring. A follower ring is desirable when depth permits. For maximum sealability, 5 center rings with header and follower are required.



J-M 237 Cumpac Packing is intended for service on reciprocating, oscillating or rotary shafts. G

J-M 237 is formed from a base stock of commercial grade white asbestos yarns in a dense braid-over-braid structure. It is further strengthened by a neoprene base compound and has a graphite finish. Hot moulded to density for services to 1500 psi. Supplied solid or split. Please specify when ordering.

Pressure to 500 psi; temperatures to 500 F.

J-M **Conepac** Packing Sets

- **Automatic low-friction sealing, without frequent gland adjustment**

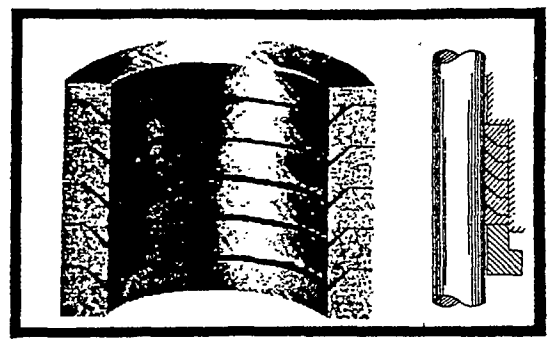
J-M Conepac Sets are made of rings in the conventional 45 degree diagonal sections, with or without header and follower adaptors. Although some stuffing boxes are so designed that adaptors are not needed, flat-end stuffing boxes would always require adaptors.

J-M 46 Conepac Packing is a general service packing used in valves and also in slow speed reciprocating or rotary service. G

It is made of commercial grade, white asbestos, copper wire inserted yarns, braided over a lead-ribbon core, then formed to the Conepac shape. It is lubricated with a petroleum base lubricant and graphited. Split rings furnished.

Pressures to 1500 psi; temperatures to 500 F.

J-M 236
J-M 397 Cumpac Soot Blower Packing is especially recommended for Soot Blower service and is furnished to fit all popular Soot Blower sizes. G



These two soot-blower packing sets withstand the severe, demanding service requirements of today's power plants—whether for use with oil, gas, coal (or interchangeably) as fuel. J-M Research has developed these packings to save money—in installation, maintenance and service life, whether soot-blowers are movable or stationary. The distinctive—actually unique—design of these packing rings—J-M Cumpac®—provides both O.D. and shaft, rod or lance sealing without excessive pressure. The flat section seats firmly in the stuffing box, leaving the flexible lips free to seal with minimum friction, even against slight off-center or reciprocating motion.

- **For saturated steam up to 500F.**

J-M Style 236 Cumpac® consists of Inconel wire inserted AAA Asbestos yarn braided over a plastic core which is made of Asbestos fiber, mica and a binder. A standard choice for ordinary boiler operations. *Mica or graphite finish. Pressures to 375 psi. Line temperatures to 500F.*

- **For super-heated steam and compressed air**

J-M Style 397 Cumpac® consists of Inconel wire inserted AAA Asbestos yarn braided over a plastic core, which is made of Asbestos fiber, graphite and a high temperature binder. Recommended for high-temperature usage, over 500F. *Graphite finish. Pressures to 5000 psi. Line temperatures to 1200F.*

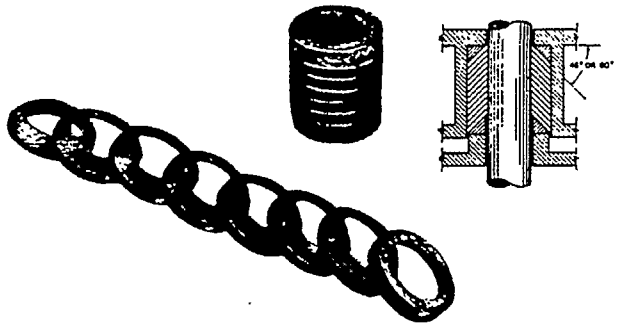
- **J-M styles are available in the following set sizes to fit various makes of soot-blowers**

	I.D.	O.D.	SET DEPTH
DIAMOND			
IK	2⅜	3⅛	3½
IR	2	2 11/16	2¼
G9B	2 5/16	3 1/16	2⅛
COPES-VULCAN			
RW2E Swivel	2⅜	3	4
RW2E Cam	1¼	2½	2¼
ROT2E Retractable	1⅞	2½	2⅞
E 4 Rotary	1 9/16	2 13/16	1⅞
WV2	2.35	3	1 15/16
PM3-2	2⅜	3	1¾
BAYER			
Type S	1 13/16	2½	2 15/16
VH	2 11/32	3¼	2¼

Other sizes on request

FBW-196

J-M 45 Conepac Packing is designed for medium-temperature service to 1000 F. G



It is made from 95/98% white asbestos, copper wire inserted yarns, braided and formed to the Conepac shape. Has a graphite finish. The long bevel joint permits tight sealing against leakage through the joints.

Pressures to 2000 psi; line temperatures to 1000 F.

J-M 42 Conepac Packing is made specially for service in turbine control valves and related equipment handling steam at higher temperatures. G

It is braided of strands of 95/98% pure, white asbestos roving, twisted together with knitted copper mesh. Lubricated by a compound containing butyl and petroleum base oils. Has a graphite finish.

Pressures to 2000 psi; temperatures to 1200 F.

Other Packing Sets for **Special Services**

- **designed to handle unusual or severe packing requirements**

Special packing sets are available to handle particular or special equipment needs.

J-M Special Packing Sets are applicable where high temperatures, chemical conditions, vibration, eccentric shaft motion, or extreme shock conditions preclude the use of a standard packing set.

J-M 4201 Steam Hammer Packing is specially made to handle the eccentricity and shock conditions often found in steam hammer service. G

J-M 4201 consists of commercial grade, white asbestos cloth, wrapped over a core of asbestos rope combined with a non-hardening, high-recovery core of metal mesh. It is frictioned with a cement containing natural and buna-S rubbers. The entire packing is lubricated and graphited. Furnished for round rods only.

Pressures to 500 psi; temperatures to 500 F.

J-M 3869 Defibrator Packing was developed to handle the shock and thrust conditions found on Defibrators in Paper Mill and related industries. G

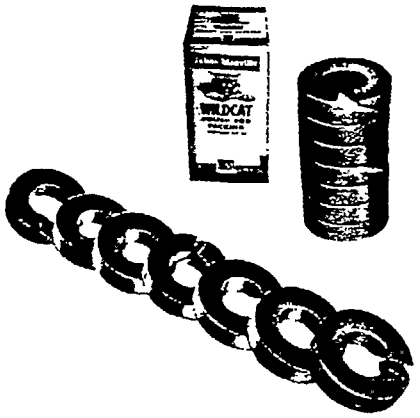
J-M 3869 consists of a layer of lead and commercial grade asbestos, plied on a diagonal to the shaft, with a neoprene base compound. The strong diagonal ply structure results in sealability with the least pressure on the shaft. The lead ply provides an excellent bearing surface and adds strength to the packing. Lubricated and graphited.

Pressures to 300 psi; temperatures to 250 F.

J-M 232 Mesh Core Packing is essentially a low-pressure packing for eccentric and slow moving shafts in either reciprocating or rotary service.

J-M 232 consists of commercial grade, white asbestos yarns, braided over a non-hardening metal mesh core. It is impregnated with a heavy-bodied, petroleum-base oil and has a graphite finish.

The resiliency of the mesh core gives unusual adaptability and recovery to this packing. It is outstanding for such service as air hammers where there is a constantly recurring shock condition at high, reciprocating speeds. Because of the packing's recovery characteristics, it can be operated for long periods with no follower take-up.



In oil field operation where it is known as "Wildcat" Polish Rod Packing, it gives outstanding service because it can handle constant off-center motion, exclude dirt, and seal with little or no follower take-up.

Furnished in sets only. Temperatures to 500 F.

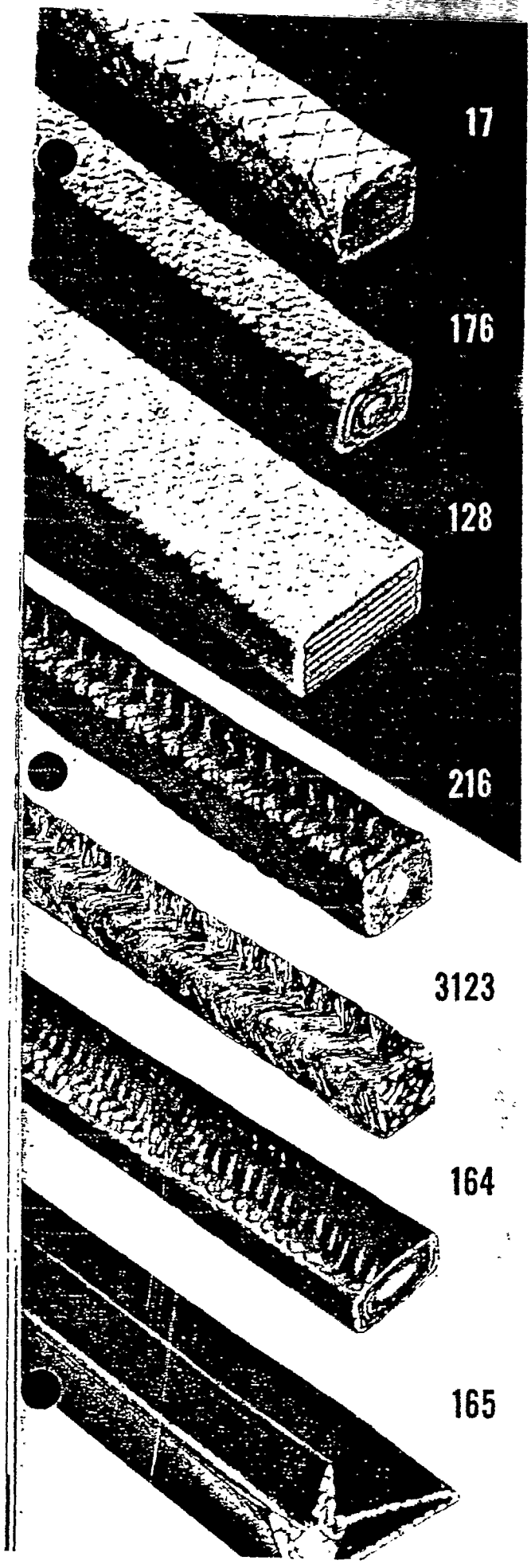
FORMS FURNISHED

J-M Packing Sets are furnished individually wrapped or boxed.

To order, give:
I.D. (shaft diameter)
O.D. (stuffing box bore diameter)
Depth (stuffing box depth, less initial follower entrance)
State whether header and follower rings are to be flat or must be bevelled to fit stuffing box and follower.

Best results are assured by sending a drawing with initial order

FBW-197



Johns-Manville

J-M Groove Packing is designed for use as door or cover seals on furnaces, ovens, filters, vacuum tanks, and pressure vessels such as autoclaves. Styles are available for grooved or flat-faced applications on door or flange whether the seal is effected by mechanical pressure of door against flange or by internal pressure forcing the packing outward against the door. Some industrial oven door designs provide a groove in the body of the oven to hold packing against which the flat face of the door operates; some are designed with groove in the door so that packing seals against the flat metal flange of the opening.

To meet the separate sealing needs of the many available door and hatch designs, J-M offers several packing styles, in varying densities, and treated to handle various internal media. Some are moulded under heat and pressure from asbestos and compounds. Asbestos types are either braided, folded, or fabric styles formed over resilient non-hardening cores. Available in square and rectangular cross-section.

Extruded styles of special compounds, are available on application.

J-M 17 Braided Groove Packing is a comparatively soft packing for sealing gases and hot, dry air. **G**

J-M 17 consists of copper wire-inserted, commercial grade white asbestos yarns, braided over a twisted asbestos core. A copper wire mesh casing is braided over the entire packing to prevent excessive wear.

For constant temperatures to 500 F.

J-M 790 Braided Groove Packing is designed for service on hot blast stove clean-out doors, boiler explosion doors, and similar applications handling hot gases. **G**

J-M 790 is denser than J-M 17, made in a solid braid-over-braid construction using commercial grade white asbestos yarns with copper wire insert.

For constant temperatures to 500 F.

J-M 872 Braided Groove Packing is similar to J-M 790 in construction but withstands higher temperatures. It is made of 95/98% asbestos yarns with copper insert. **G**

For constant temperatures to 800 F; short term temperatures to 1000 F.

J-M 216 Braided Groove Packing, the most rugged of the braided groove packings, is designed to withstand repeated opening and closing of doors and covers. **G**

J-M 216 consists of braided, commercial grade white asbestos yarns, copper wire-inserted, over a twisted, commercial grade asbestos, rope core. Treated with heat-resistant buna-S base cement and graphited.

For constant temperatures to 500 F.

FBW-198

Groove Packing

- for sealing doors and covers on heat and pressure vessels

J-M 164 Inconel Mesh Core Groove Packing is the best J-M general service groove packing. It is excellent for autoclaves, whether bolted or quick-opening types. **G**

J-M 164 is made of asbestos cloth woven from Inconel wire-inserted, 90/94% asbestos yarns that will not deteriorate in high temperature service. A resilient Inconel core retains high recovery for the life of the packing. The fabric is wrapped around the core and frictioned with buna-S and neoprene cements. The packing is then formed to a square or rectangular shape and given a graphite finish.

For constant temperatures to 360 F.

J-M 163 Inconel Mesh Core Groove Packing is same as J-M 164, except that Viton cement is used, making it suitable for hot creosote service, particularly in the Wood Preserving Industry. **S**

For constant temperatures to 500 F.

J-M 176 Folded Groove Packing is designed especially for sealing around converter bottoms, also has wide range usage as an adaptable groove packing that possesses high mechanical strength and heat resistance. **G**

J-M 176 is made of commercial grade asbestos cloth wrapped around an asbestos rope core. Furnished square or rectangular.

For constant temperatures to 500 F; short term temperatures to 800 F.

J-M 177 Folded Groove Packing is the same as J-M 176, but is denser and offers more wear resistance, the yarns having a copper wire insert. **G**

For constant temperatures to 500 F; short term temperatures to 800 F.

J-M 128 Folded Groove Packing is recommended where maximum strength and resistance to constant 500 F temperatures are required. **G**

J-M 128 is made of commercial grade asbestos cloth wrapped over a solid, accordion-folded core of the same material. The buna-S base cement used on the core is compounded for maximum heat resistance. The plain asbestos outside layer carries no cement.

When furnished as endless rings, an interplied joint, wrapped with tape is used. In coil form, this style can be furnished square or rectangular.

For constant temperatures to 500 F.

J-M 129 Folded Groove Packing is same as J-M 128 but is denser, the yarns having a copper wire insert for more wear resistance. **G**

For constant temperatures to 500 F.

J-M 165 Moulded Autoclave Packing is designed to withstand severe mechanical usage at temperatures to 300 F in autoclave and similar service. **G**

It is moulded from an asbestos cloth of 90/94% asbestos yarns Inconel wire-inserted, and special heat-resistant buna-S and neoprene rubbers. These are formed into the required cross-sectional shape and then vulcanized into endless rings.

J-M 165 comes in a variety of cross-sectional shapes. Consult your J-M Distributor Representative for current list of available designs.

For constant temperatures to 360 F.

J-M 124 Tubular Gasketing is made of brass-wire-inserted asbestos cloth, treated with a natural and Buna-S rubber cement, and rolled into a round cross-section with a hollow core. Lead insert and friction tape join ends to make gasket. **G**

Furnished in 10 and 12 pound boxes.

For temperatures to 250 F.

J-M 2559 100% Inconel Packing will withstand high temperatures and resist corrosion caused by most gases, alkalies and acids. It also has exceptional ability to absorb vibration and shock. **G**

J-M 2559 is plaited square from strands of twisted Inconel wire mesh.

For temperatures to 2000 F.

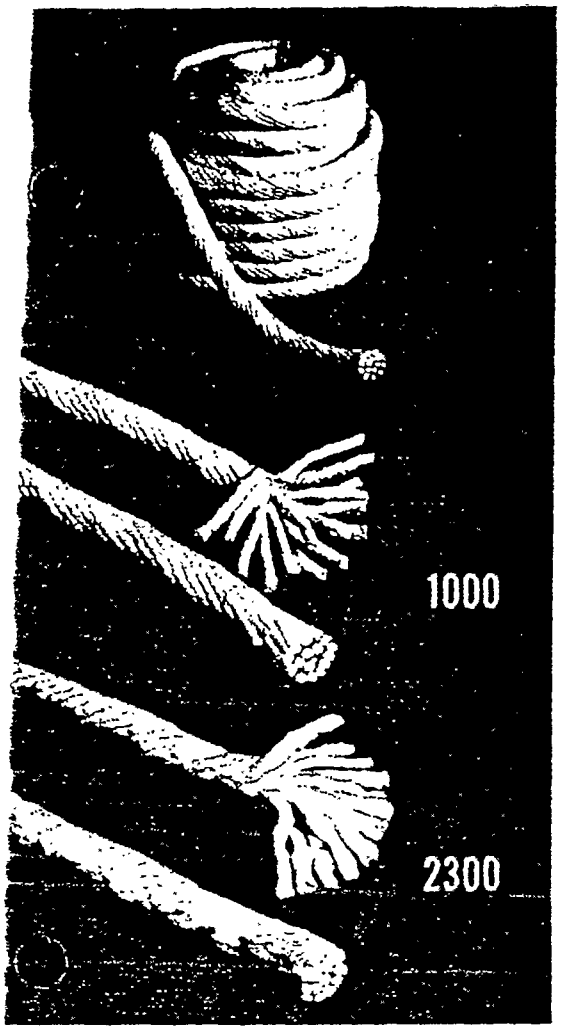
J-M 3123 Inconel-Asbestos Packing is the same as J-M 2559 except the strands are Inconel wire mesh twisted together with 95/98% asbestos yarns. It is slightly less resilient but offers better sealability because of the asbestos content. **G**

For temperatures to 2000 F.

FORMS FURNISHED
See Page 49 for Size Range and Weights

MOULDED AND EXTRUDED GROOVE PACKINGS — J-M 165	
Coil:	Lengths as specified, up to 50 feet.
Rings:	Endless; vulcanized joint.
Note:	In ordering for the first time, send sketch of packing cross-section.
FABRIC GROOVE PACKINGS — J-M 128, 129, 163, 164, 176, 177	
Coil:	50 foot lengths, or in lengths up to 50 feet if so ordered.
Rings:	Endless, with interplied and taped joint.
Note:	In ordering Coil, specify width of groove, depth of groove and depth of packing. In ordering Rings, state I.D. and O.D. of groove and depth of packing clearly.
BRAIDED GROOVE PACKINGS — J-M 17, 216, 790, 872, 2559, 3123	
Coil:	10, 25 and 50 pound spools.
Rings:	Not furnished. Specify cut lengths.
Note:	In ordering Coil, if rectangular in cross-section, specify

FBW-199



Johns-Manville

Thermo-Pac* Rope

- general-purpose asbestos and refractory rope with temperature ranges from minus 400F to plus 2700F

J-M Thermo-Pac Twisted Ropes are recommended for emergency packing and gasketing where other materials are not available, or where shape or condition of the equipment will not allow the use of less pliable, less adaptable materials. They are suitable as caulking or filling materials where high temperatures or other conditions require an inert filler. They are recommended for confined areas protected from abrasion or tensile stress.

These ropes are extremely versatile in that size can be reduced or increased – simply by separating the strands or building up thickness by twisting several together.

To simplify specifications for a particular service, the following styles are standard

Each style is designated by the temperature range it will handle efficiently at the lowest cost for the job requirement. However, to further simplify Inventory Requirements, J-M recommends stocking J-M Thermo-Pac 1000 which handles most services. For higher temperatures than 1000 F or for severe acid services, other J-M Thermo-Pac Ropes are available as standard Styles. See the listing below for detailed information.

J-M Thermo-Pac 500 — G

Commercial grade white Chrysotile asbestos fiber. Gives economical service against constant temperatures to 500 F.

J-M Thermo-Pac 750 — G

AAA (95/98%) white Chrysotile asbestos fiber. A soft rope, made of high-purity asbestos twisted roving. Withstands temperatures to 750 F.

J-M Thermo-Pac 1000 — G

Pure (98/100%) white Chrysotile asbestos fiber. This is the most popular and versatile rope. It is made of soft, twisted, felted strands, and reinforced with a fine nylon thread for tensile strength. Operating temperatures to 1000 F.

J-M Thermo-Pac 2300 — G

Refractory Alumina-Silica fiber. A new development in a strong, flexible and stable fiber for high-temperature use. Especially suited to metal and chemical processing, as well as aeronautics, missiles and spacecraft. Operating temperatures to 2300 F.

J-M Thermo-Pac 2700 — G

Refractory Alumina-Silica-Chromia fiber. Recommended for extremely high-temperature operations, up to 2700 F.

J-M Thermo-Pac BLUE — X

Pure African Crocidolite asbestos fiber. Recommended for severe acid service. Resists corrosion under extreme acid conditions in temperatures up to 1000 F.

In the past, sizes under 3/16" have been called "Wick." Generally, these small sizes of rope have been relatively softer and less dense than sizes 3/16" and up, traditionally designated "Rope." In the new Thermo-Pac line, for added simplicity, all sizes are called "Rope." However, sizes less than 3/16" will continue to be soft and light-density products

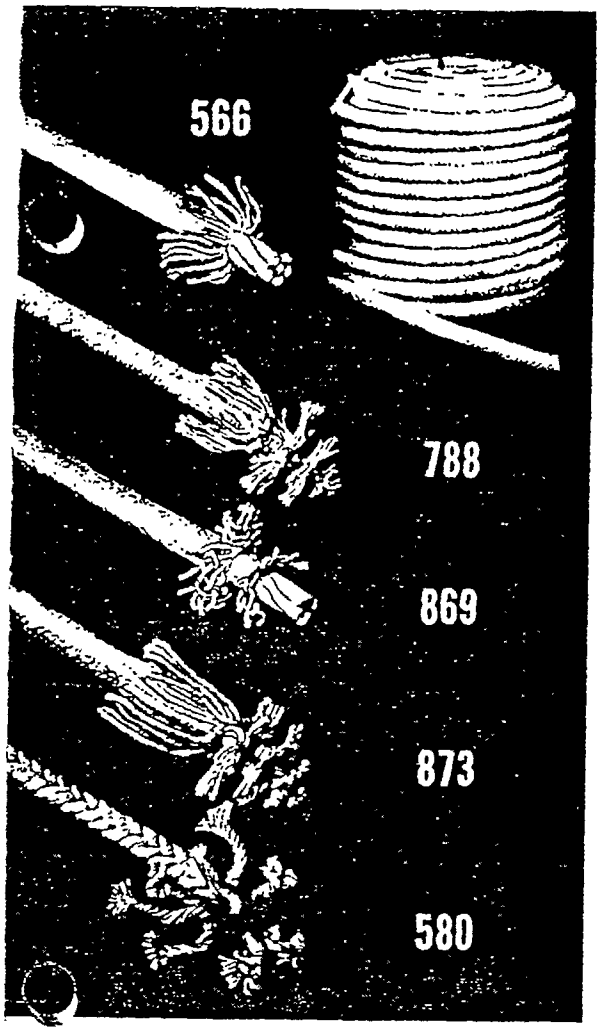
FBW-200

FORMS FURNISHED
See Page 49 for Size Range and Weights

Sizes 3/16" and up	10, 25 and 50 pound balls
Sizes under 3/16"	25 and 50 pound paper tubes or 1-pound balls

REFERENCE: For other Styles of Twisted Rope and Wick, see pages 32 and 33.

*Johns Manville Tradem



Johns-Manville
Braided Asbestos Rope

- compact structure withstands abrasion and rough usage

Braided Asbestos Ropes are suitable where a more compact dense structure than J-M Twisted Rope is needed. They are sometimes used in applications where the rope is not entirely contained, as in grooves on furnace doors, on oven doors or for similar hot gas services.

The softest types are made by braiding jackets over a twisted rope core.

The denser types are made by braiding jacket over jacket to the required size.

Because braided ropes are stronger and more definitely formed than twisted ropes, they are furnished in a square cross-section as well as round.

PLAITED ASBESTOS ROPE

Plaited ropes are preferred by some users who find them soft, adaptable packings which are well formed owing to the plaited structure. Style 581 is furnished with a wire insertion in the strand for maximum strength.

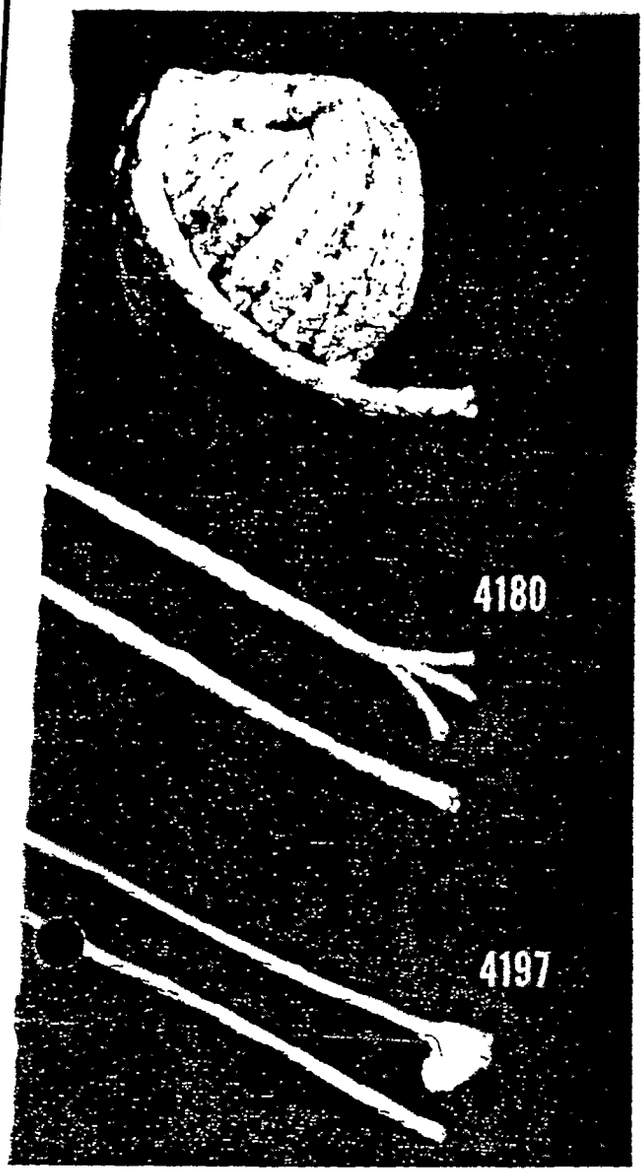
BRAIDED ASBESTOS ROPE

Style No.	Construction	Cross-Section	Density
95/98% Pure Asbestos . . . service to 750F			
857	Braided jacket over twisted core One jacket thru ¾" Two jackets ⅞" and up	Round	Soft
788	Braided jacket over jacket	Round	Dense
869	Braided jacket over twisted core One jacket thru ⅝" Two jackets ¾" and up	Square	Soft
873	Braided jacket over jacket	Square	Dense
Commercial Grade Asbestos . . . service to 500F			
566	Braided jacket over twisted core One jacket thru ¾" Two jackets ⅞" and up	Round	Soft
702	Braided jacket over jacket	Round	Dense
787	Braided jacket over twisted core One jacket thru ⅝" Two jackets ¾" and up	Square	Soft
733	Braided jacket over jacket	Square	Dense
580	Solid Plaited	Square	Soft
581	Solid Plaited, wire inserted strands	Square	Dense

FORMS FURNISHED
See Page 49 for Size Range and Weights

Coil:	10, 25 or 50 pound balls.

FBW-201



Johns-Manville

J-M Twisted Asbestos Wick styles are soft, easily handled, highly heat resistant materials used as general utility and emergency packing, and in gasketing and caulking services. Wick is especially suited for small packing spaces.

It is made by twisting together one or more strands of roving or felted strips of asbestos. Individual strands may be untwisted and used separately. Or, two or more lengths can be twisted together to provide any greater thickness.

J-M Asbestos Wick is employed as an expansion joint in the masonry construction of furnaces, and as a seal around hot pipes passing through masonry. In the Iron and Steel Industry, Asbestos Wick serves to prevent runout at damaged or eroded portions of metal moulds and stools, to seal joints in sand moulds, and in hot topping.

In light metal constructions such as domestic heaters, wick serves as a packing in grooves pressed into metal shells.

For general maintenance work, J-M Wick will serve as gasketing on light, rough or uneven flanges where a conventional gasket could not be used.

J-M 4180 Wick is the most popular Commercial Grade asbestos twisted wick in a stranded construction. It differs from J-M Thermo-Pac 500 (a single-ply wick). It is made of a number of rovings for greater strength and density. Many manufacturers use it as a groove packing in light metal construction; it is also widely used as a general seal in the steel industry. *For service to 500 F.* **G**

SELECTION CHART

Style — 25 and 50 lb. paper tubes or 1/4, 1/2 and 1 lb. balls

Thermo-Pac	Special	Description	Plies	Size	*Weight	Feature
—	195	Commercial Grade Asbestos	4	¼"	1.66	Lightest Weight
—	195		3	7/32"	1.25	
500	—		2	3/16"	.84	
500	—		1	⅛"	.37	
—	535	Commercial Grade Asbestos	4	¼"	1.49	Wire Wiping Wick
—	4180	Commercial Grade Asbestos	3	¼"	2.50	Stranded
—	4180		4	⅜"	3.50	Stranded
750	—	95/98% Pure Asbestos	4	¼" - ⅜"	1.75	Stranded
Blue	—	100% Blue Asbestos	Multiple	¼"	.66	Acid service
500	—	Commercial Grade Asbestos	1	¼"	1.80	Softest
—	4197	98/99% Pure Asbestos	1	¼"	2.00	Soft
—	4198	98/99% Pure Asbestos	1	¼"	2.00	Hard
—	4199	98/99% Pure Asbestos	1	¼"	2.00	Most popular and versatile
1000	—	98/99% Pure Asbestos	3	¼"	2.50	
1000	—	FBW-202	2	3/16"	1.50	
	—		1	⅛"	.74	

Asbestos Wick

- General and emergency services
- Special uses in steel mills and chemical plants

J-M 4197 Wick is made specifically as a packing for chemical service and is used as a packing on stoppers on carboys containing acids, and similar services. Like J-M 4199, it is made of a single twisted strand of felted 98/99% asbestos but is a softer construction and contains no cotton reinforcement. It is recommended for services where even the small amount of organic content represented by a cotton thread reinforcement is objectionable. For service to 1000 F. G

J-M 4198 Wick is the same as J-M 4197, except that it has a harder finish preferred in some operations. For service to 1000 F. G

J-M 4199 Wick is suitable for use in high temperature service up to 1000 F. Its chemical purity is the same as J-M Thermo-Pac 1000, and is frequently specified when a one-ply construction in ¼" size is desired, rather than the three-ply construction of J-M Thermo-Pac 1000. G

J-M 195 Wick is made of Commercial Grade asbestos rovings in 1-, 2-, 3- or 4-strand construction, depending on size. It is stronger than J-M Thermo-Pac 500, and the strands may be untwisted to reduce the diameter to a desired size. Also, two or more lengths can be twisted together to form larger sizes. Style 195 has long enjoyed a reputation as the highest quality plied, Commercial Grade asbestos twisted wick. *For service to 500 F.* G

J-M 535 Wick is made of Commercial Grade asbestos with a soft but strong construction ideally suited to wire wiping services. It has worked successfully in a wide variety of wire wiper equipment. *For services to 500 F.* G

FORMS FURNISHED
See Page 49 for Size Range and Weights

25 and 50 pound paper tubes and 1 pound balls

Johns-Manville **Twisted Asbestos Rope**

- for special services

J-M 4185 Rope consists of multiple strands of Commercial Grade asbestos rovings twisted together. Style 4185 is somewhat less dense than J-M Thermo-Pac 500. In addition to its service as a temperature-resistant static packing, it is widely used as a caulking material in chemical lines. *Temperatures to 500 F.* G

J-M 4186 Rope is similar to J-M 4185, but is used where greater density and strength are required. *Temperatures to 500 F.* G

J-M 4188 Rope is similar to J-M 4185, but is furnished where the rope must meet the requirements of Federal Specification HH-P-41C. *Temperatures to 500 F.*

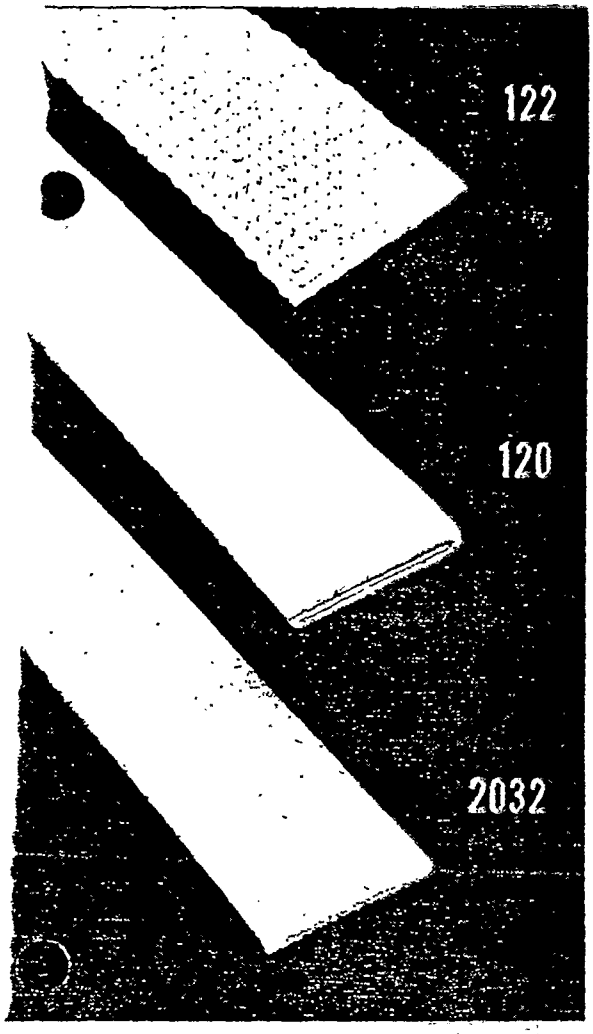
J-M 4196 Rope is furnished for services where a strong, plied Commercial Grade rope in the small ¼" size is required. It will handle the same temperature conditions as J-M Thermo-Pac 500, but differs in that it has the strong, plied construction, rather than the soft single ply. *Temperatures to 500 F.* G

J-M 4200 Rope in the ¼" size is used where a more tightly twisted, stronger, more dense product is needed than J-M Thermo-Pac 1000 in the small ¼" size. *Temperatures to 1000 F.* G

FORMS FURNISHED
See Page 49 for Size Range and Weights

Sizes 3/16" and up	10, 25 and 50 pound balls
Sizes 3/16" and under	25 and 50 pound paper tubes or 1 pound balls

FBW-203





Johns-Manville

J-M Gasketing Tapes are soft, resilient, versatile materials recommended for many services where mechanical or economical reasons preclude the use of pre-formed gasket styles. Some typical applications of Gasketing Tapes are: in light metal flanges in oven construction; between structural sections of bridges; on marine or aircraft equipment, and on oil refinery bubble trays.

They are particularly suitable where the service may not be critical enough to justify the cost of gaskets, the opening flange too large and irregular for a gasket, or the installation is such that it is impossible to install a gasket. They also serve effectively where only light pressure can be applied against the gasket.

Gasketing Tapes are not to be used where a complete seal of positive internal pressure is needed. For this, a cut or metallic gasket is required. If a gasket cannot be furnished or applied, a tape assembly may be used but with the understanding that there may be some leakage.

The commonly used asbestos tapes are all made of Commercial Grade (75/80% pure) asbestos for service to 500 F. *For higher temperature service, available on special order,* Styles 121, 122, 131 and 132 are made in Underwriters Grade, AA (90/94% asbestos – to 600 F), AAA (95/98% asbestos – to 850 F) and AAAA Grade (99/100% asbestos – to 1000 F). Example: J-M 122 – AAAA Grade.

J-M 122 Gasketing Tape is the most popular woven tape for long term sealing of low pressure gases. Containing no compound, it has a wide range of applications in services handling hot, dry gases. **G**

J-M 122 is a plain woven tape, made from yarns of commercial grade, white asbestos. It contains no compound, cement or wire.

#121 Underwriters Grade, AA, AAA and AAAA Grades, for higher temperature service, available on special order.

J-M 121 Gasketing Tape is generally used instead of J-M 122 when greater tensile strength is needed to maintain the proper position between flanges. **G**

J-M 121 is made by weaving yarns of commercial grade white asbestos, containing a brass wire reinforcement, to the proper width and thickness.

#122 Underwriters Grade, AA, AAA and AAAA Grades, for higher temperature service, available on special order.

J-M 120 Gasketing Tape is the most popular gasketing tape treated with compounds. It is widely used in steam service. **G**

J-M 120 is made from asbestos cloth woven from brass wire inserted, commercial grade white asbestos yarns. The cloth is treated with a natural and buna-S rubber compound cement, then folded to the proper width and thickness.

Constant temperatures to 250 F; short term temperatures to 500 F.

FBW-204

Gasketing Tapes

- provide easy sealability, fit designs where bolt pressures are light
- treated for special services

J-M 119 Gasketing Tape has the same folded construction as J-M 120 but uses a neoprene base cement, enabling it to handle solvents. **S**

Temperatures to 250 F.

J-M 2032 Gasketing Tape is used particularly in the Chemical, Oil and the Aviation Industries. It is suitable for those services where greater sealability is required than would be afforded by J-M 122 tape, and fluid or temperature conditions are too severe for a rubber-like impregnation. **T**

J-M 2032 is woven from commercial grade white asbestos yarns, then impregnated with Teflon. It may be used against all media, except metallic sodium and potassium. It is also recommended where there is a certain amount of flange movement. The Teflon impregnation provides a low friction filler, resulting in longer packing life.

Constant temperatures to 500 F.

#2032 Underwriters Grade, AA, AAA and AAAA Grades, for higher temperature service, available on special order. May also be sintered on special order.

J-M 2031 Gasketing Tape is similar to J-M 2032, except that each individual yarn contains brass wire reinforcement for added strength. **T**

J-M 132 Gasketing Tape known as Bolt Hole Tape, is widely used in the Oil Refining Industry as a gasketing material for bubble trays. It is also popular with boiler and furnace manufacturers. A number of the center length-wise yarns are eliminated, leaving only the cross yarns to maintain the tape construction. This permits the use of bolts or rivets to hold the tape in place without punching holes through the structure. J-M 132 is plain, woven tape made from Commercial Grade white asbestos yarns. It contains no compound, cement or wire. **G**

Constant temperatures to 500 F.
#132 Underwriters Grade, AA, AAA and AAAA Grades for higher temperature service, available on special order.

J-M 131 Gasketing Tape is the same as J-M 132 except the yarns have brass wire reinforcement for added strength. **G**

J-M 142 Gasketing Tape is designed to be used under dry heat conditions where greater sealability is required than would be provided by J-M 122 or 2032. It is suitable against all media that will not attack silicone. J-M 142 is woven from commercial grade white asbestos yarns, the resulting tape being treated with silicone cement. **G**

Constant temperatures to 500 F; intermittent to 600 F.

J-M 141 Gasketing Tape is the same as J-M 142 except that the commercial grade white asbestos yarns contain a brass wire reinforcement for added strength. **G**

J-M Besto-Tak® is asbestos tape with a *pressure-sensitive* backing. It is designed to save time, labor and cost in application. The adhesive backing is supplied only for assembly purposes, basically to hold the tape in place while flanges can be brought together, or cover applied. Bolt holes can be punched right through the backing strip before or after the tape is in place.

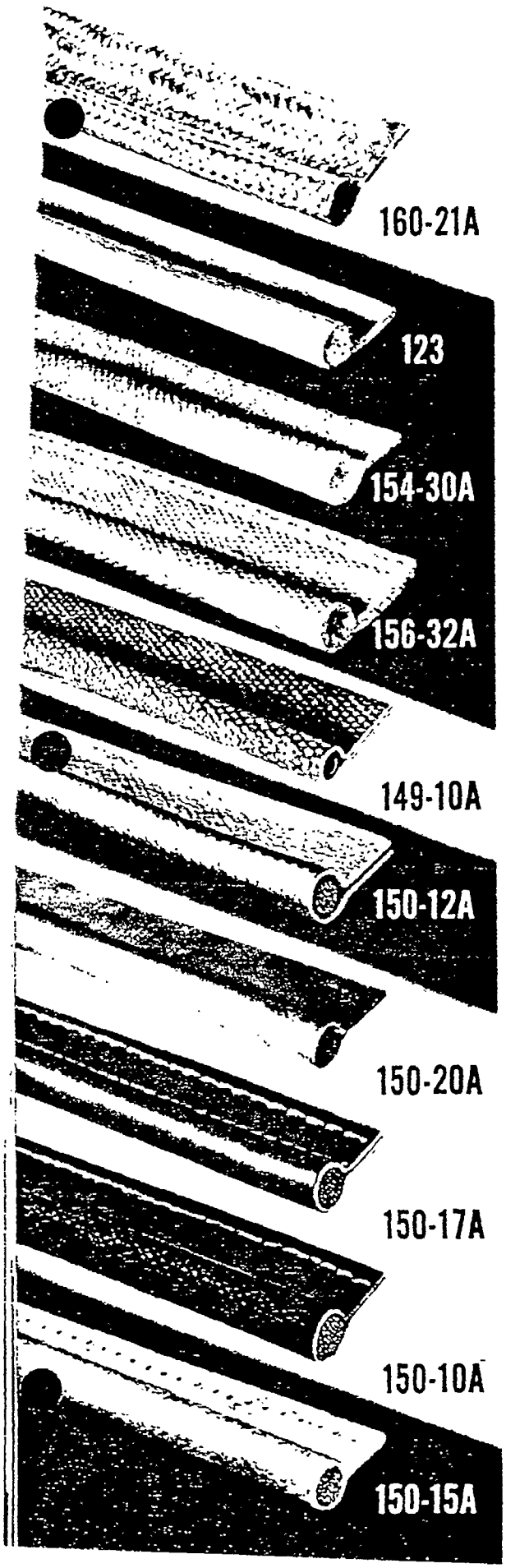
Standard Commercial Grade Besto-Tak is furnished in 1/2", 3/4", 1", 1-1/2" and 2" widths; 25 ft. rolls; 1/32" and 1/16" thicknesses. However, many different widths, thicknesses and grades can be furnished to meet customers' requirements. Thicknesses to 1/4" and purities to AAAA Grade are available.

Temperatures to 500 F (Commercial Grade)
Other Grades available for service to 1000 F.
NOTE: The adhesive is effective only up to 270 F, being designed only for economical assembly.

J-M Inconel Gasketing Tape is made entirely of Inconel and is most widely used in Aviation service, Missile construction and high-temperature boiler construction. J-M Inconel Tape is made of knitted wires, enclosed in a jacket of Inconel wires, and formed to the required width and thickness.

FORMS FURNISHED
See Page 49 for Size Range and Weights

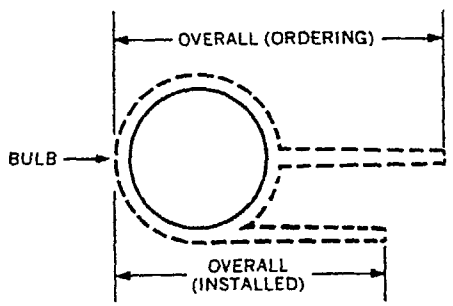
FOLDED TAPES	
Styles 120, 119	1/16 thru 3/16" thick: 150 foot rolls. 1/4 thru 5/16" thick: 75 foot rolls. 3/8" and up thick: 50 foot rolls.
WOVEN TAPES	
Styles 121, 122, 131, 132, 2031, 2032, 141, 142	1" wide and up, in thicknesses to 5/16": 100 ft. rolls. Less than 1" wide, in thicknesses to 5/16": two 50 ft. rolls.
METAL MESH TAPES	
Style Inconel	Lengths as required.
BESTO-TAK	
	Made from slit cloth: 25 ft. lengths. Made from woven tapes: 100 ft. lengths.



Johns-Manville

Johns-Manville Tadpole Tapes are designed to serve as gasketing on light metal flanges or where limited bolting force is available, and the packing must conform to uneven or unequal surfaces . . . where equipment types and designs do not permit use of endless gaskets or flat gasketing tape. Because of their softness and resilience, they adapt readily to irregularities, and are particularly popular where doors come to rest on the bulb of the Tadpole. They are easily installed by riveting, bolting, or by metal straps. The effect is that of a groove packing without the necessity of providing a groove, or of a high temperature "O" Ring, held in place by the fabric tail assembly. These tapes offer long-lasting efficiency because they do not harden at high temperature. However, no Tadpole Tape is guaranteed to seal positive internal pressure.

Tadpole Packing is made by wrapping a core with asbestos cloth cover. The edges of the cloth are stitched or cemented together to form a tail structure. Johns-Manville Tadpole Tapes are made in: Commercial Grade, 90/94% asbestos, and 95/98% asbestos. All three grades are available plain or wire inserted, in soft, medium or dense constructions. Special compounds can be applied to the cover cloth.



Note: If the Tadpole Tape is to be assembled with the tail tangential to the bulb, the "assembled" overall dimension should be increased by the radius of the bulb, to arrive at the ordering description. Otherwise the tail may be too short for installation.

J-M 123 Tadpole Tape is the basic Tadpole construction and was designed for steam service at constant temperatures to 250 F. At higher temperatures up to 500 F the compound treatment becomes progressively harder. The asbestos itself is not affected. **G**

The core of J-M 123 is a commercial grade, twisted asbestos rope. The cover is asbestos cloth with brass wire insert, treated with a general service compound containing natural and buna-S rubbers. The tail section is cemented.

FBW-206

Tadpole Tapes

- form tight seal under light pressure
- adapt to uneven mating surfaces
- seal doors and other closures
- simplify design of closures

J-M 191 & 192 Tadpole Tapes are the most widely used and easily available. They consist of a core (bulb) of J-M Thermo-Pac 500 Rope, covered with Commercial Grade asbestos fabric, stitched with asbestos thread. Style 192, the most popular, is constructed in this manner. Style 191 differs only in that the yarns comprising the cover are brass wire-inserted. Their constructions are identical with Special J-M 154-31A and 154-30A. (See table below for specifications.) These designations are used because they indicate stock sizes, ready availability and prompt shipment.

STYLES 191 & 192
SIZES (in inches)

BULB	OVERALL	BULB	OVERALL	BULB	OVERALL	BULB	OVERALL
3/8	x 7/8	3/8	x 2 13/16	5/8	x 1 3/16	1	x 1 1/2
3/8	x 1 3/16	1/2	x 1	5/8	x 1 11/16	1	x 2 1/2
3/8	x 1 3/8	1/2	x 1 1/4	3/4	x 1 5/8	1 1/4	x 2 3/8
3/8	x 1 13/16	1/2	x 1 3/4	3/4	x 2 5/8	1 1/2	x 2 1/4

STYLE 192 ONLY
SIZES (in inches)

3/8 x 1 5/8	5/8 x 1 7/16	1 x 2	
3/8 x 2 5/16	5/8 x 2 3/16	1 1/4 x 1 7/8	
1/2 x 1 1/2	3/4 x 1 3/8		
1/2 x 2 1/4	3/4 x 2 1/8		

QUANTITIES: 100 feet and up, per size.

SPECIAL TADPOLE TAPE STYLES WITH ASBESTOS CORES†

STYLE	COVER	CORE ASBESTOS GRADE	CORE STRUCTURE	TEMP LIMIT (F)	BULB DENSITY
152-30A	Commercial	Commercial	Twisted Strands	500	Softest Tadpole
152-31A	Commercial—brass wire insert*	Commercial	Twisted Strands	500	Softest Tadpole with W.I. cover*
153-30A	Commercial	Commercial	Twisted Roving	500	Medium Core & Soft cover
153-31A	Commercial—brass wire insert*	Commercial	Twisted Roving	500	Medium Core with W.I. cover*
154-30A	Commercial	Commercial	Twisted Rope	500	Dense Core & Soft cover
154-31A	Commercial—brass wire insert*	Commercial	Twisted Rope	500	Dense Core with W.I. cover*
155-32A	90/94%	98/99%	Wick	750	Softest H.T. Core & Soft cover
155-33A	90/94%—brass wire insert*	98/99%	Wick	750	Softest H.T. Core & W.I. cover*
156-32A	90/94%	98/99%	Twisted Rope	750	Medium H.T. Core & Soft cover
156-33A	90/94%—brass wire insert*	98/99%	Twisted Rope	750	Medium H. T. Core & W.I. cover*
157-32A	90/94%	95/98%	Braided Rope	750	Densest H.T. Core & Soft cover
157-33A	90/94%—brass wire insert*	95/98%	Braided Rope	750	Most dense Tadpole
156-34A	95/98%	98/99%	Twisted Rope	850	Highest Temperature asbestos co Tadpole

†These styles are made to order, in any size.

*Wire inserts add strength and abrasion resistance to covers. W.I. covers used to withstand stresses and abrasion where there is constant opening and closing of a door or hatch.

FBW-207

TADPOLE—continued on page 38

J-M **Tadpole** Tapes *(continued)*

METAL MESH CORE TADPOLES

Metal Mesh Core Tadpoles are the softest of all Tadpoles, and have highest rate of recovery and greatest temperature resistance. Certain styles are unaffected by constant temperatures to 2000 F.

Metal Mesh Core Tadpoles were originally developed as firewall seals on aircraft. They will withstand a 2000 F temperature for 15 minutes without permitting the passage of flame.

J-M 150-12A Tadpole Tape will compress 40% of its bulb diameter with a load of 10 to 14 lbs. per running inch—and will recover 90% of its original diameter. **G**

J-M 150-12A consists of an Inconel Mesh core with a cover cloth of 90/94% pure asbestos yarns, and Inconel wire. This cover has silicone rubber inside, a neoprene base flameproof treatment and a reflective aluminum finish outside. The tail is stitched with asbestos thread.

For constant temperatures to 600 F.

J-M 150-13A is the same as 150-12A except the asbestos cloth cover contains no wire reinforcement and is therefore softer and more adaptable. **G**

For constant temperatures to 600 F.

J-M 151-18A offers good sealability because of a foil wrapping over the core. **S**

It consists of an Inconel mesh core wrapped with metal foil and covered with cloth of 90/94% asbestos yarn having Inconel wire reinforcement in each yarn. The cover is treated with a flameproof compound having a neoprene base. It has a reflective aluminum finish. The tail plies are stitched with asbestos thread.

For temperatures to 400 F.

J-M 150-10A is the lowest priced of the mesh core types. It may be used where constant temperatures are not high, but the exceptional resiliency of the mesh core is desired. **S**

J-M 150-10A consists of an Inconel mesh core covered with cloth of Inconel wire inserted yarns of 90/94% pure asbestos. It has a flameproof compound finish.

For temperatures to 350 F.

J-M 150-15A is recommended where there is movement of the mating metal flange surfaces. **T**

It has an Inconel mesh core and is covered with a cloth of 90/94% pure asbestos yarns, and treated with Teflon suspensoid which reduces friction. The tail plies are fixed with asbestos stitching.

For service against any media except metallic sodium and potassium.

For temperatures to 500 F.

J-M 150-14A is the same as 150-15A except that the cloth contains an Inconel wire reinforcement for greater strength and durability. **T**

J-M 150-17A is suitable for sealing gases and most aqueous solutions except those which attack silicone. **G**

It consists of an Inconel mesh core with a cover cloth of 90/94% asbestos yarn. It has a flameproof treatment and an exterior finish of silicone rubber for good sealability.

For constant temperatures to 450 F.

J-M 150-20A is the lightest in weight, easiest to compress, and has highest recovery factor of any Tadpole structure. **S**

It consists of an Inconel mesh core with a cover consisting of neoprene base flameproof compound reinforced with Inconel mesh.

For constant temperatures to 350 F.

J-M 160-21A is the Tadpole that will withstand highest operating temperatures. **G**

It is made of a core containing Inconel mesh, foil and a soft refractory fiber. The cover consists entirely of fine Inconel wires braided over the core.

For constant temperatures to 1000 F; intermittent to 2000 F.

REFERENCE SYMBOLS

Indicate service classification or condition

General	G
Caustic	C
Pulp & Paper	P
Solvent	S
Food and Related Services	F
Chempac (Teflon Impregnated Asbestos)	T
Most Corrosive requiring Teflon filament or Blue Asbestos Packings	X

Chemical table appears on page 49

FORMS FURNISHED

TADPOLE TAPES are furnished in 150 foot rolls except #150-20A, or cut pieces, any length, totalling at least 25 feet per size, per order. #150-20A furnished generally in 12 foot lengths but any length available, up to 150 feet, in sizes up to ¾". Over ¾", 12 foot lengths suggested as best for handling. In case of question, check J-M Representative.

FBW-208

SHAPES: The most popular shape of Tadpole is a round bulb with a radial tail. For special applications it can be furnished with no tail, double tail, endless rings with fabricated joints or with rectangular bulb section.

J-M **Twisted** Packing

- adapts readily to any thickness
- ideal for maintenance or plumbing service

J-M Twisted Packing is a soft, easily handled packing widely used in the Plumbing Trade and for industrial maintenance. It is especially suitable as an all-purpose Valve Stem Packing and other applications where its adaptable thickness can be used to accommodate different size requirements.

It is made by twisting together a number of commercial grade white asbestos yarns. These are then lubricated and finished to suit the service. Individual strands may be untwisted and used separately. Or, two or more lengths can be twisted together for larger size.

J-M 193 Twisted Packing is an extremely popular and versatile general service type of packing for hot and cold water and low pressure steam. It is used throughout industry, in building maintenance, and the plumbing trade. Available in small quantities such as ¼-pound spools in popular sizes. **G**

Made of twisted white commercial grade asbestos yarns, lubricated with a light petroleum base oil and graphited.

Temperatures to 500 F.

J-M 293 Twisted Packing is used on valves handling solvents and all types of petroleum base derivatives. **S**

Made of commercial grade asbestos yarns, twisted to the proper size, it is lubricated with a compound containing vegetable oils, glycerine, inert fillers and graphite. The surface finish is graphite.

Temperatures to 500 F.

J-M 487 Asbestos Cord is made of 95/98% asbestos yarns twisted together. It is used above the temperature limits of J-M 274 or J-M 285. **G**

J-M 487 is suitable in chemical services where the purer asbestos yarn is required. It is also used to pack small low pressure valves handling chemicals.

Temperatures to 800 F.

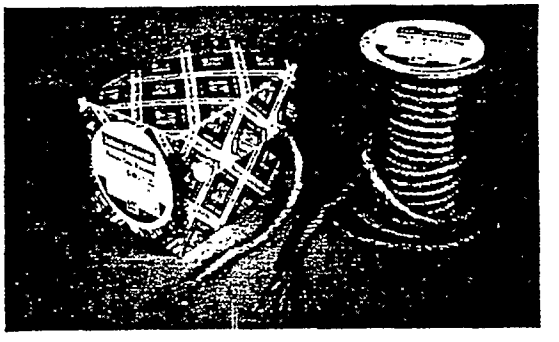
Note: For J-M Styles 285, 274, 487

a) all styles furnished unsized as standard
b) sizes up to and including ¼" furnished with wax sizing when specified
c) sizes over ¼" furnished with starch sizing when specified

J-M 2016 Twisted Packing is used on valves handling low pressure acids that are too severe for conventional valve stem packings. **X**

J-M 2016 consists of strands of blue asbestos fiber yarn twisted together, and impregnated with an inert composition of polyisobutylene and hydrocarbon waxes.

Temperatures to 500 F.



J-M **Asbestos Cord**

- withstands corrosives, heat, flame
- suspends parts for metal plating

J-M Asbestos Cord is recommended for many uses in metal plating works, glass and chemical plants, laboratories and similar operations. It will suspend metal parts or objects submerged in caustic solutions or mild acids. It will cushion and insulate retorts, crucibles and other equipment coming in contact with flames and heat.

J-M 285 Asbestos Cord is made by tightly twisting together strands of strong commercial grade white asbestos yarns to the desired size. **G**

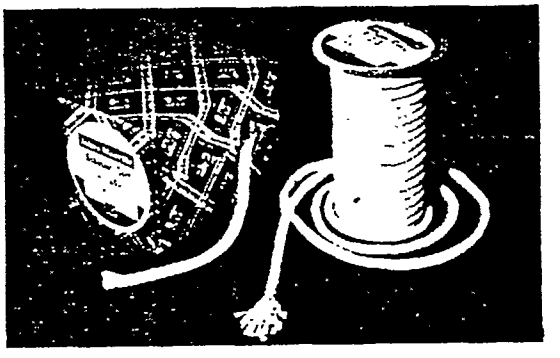
Temperatures to 450 F.

J-M 274 Asbestos Cord is made by twisting together commercial grade white asbestos yarns. The yarns used are larger than those in J-M 285, resulting in a somewhat less expensive cord having a softer, coarser finish. **G**

Temperature to 450 F.

J-M 276 is made by twisting Underwriters Grade white asbestos yarns together in a firm cord. J-M 276 is always furnished without starch or other treatment. **G**

Temperatures to 500 F.



FORMS FURNISHED
See Page 49 for Size Range and Weights

Twisted Packing

All sizes: 5, 10, 25 and 50 pound spools.

Up to and including ½": 1 pound spools.

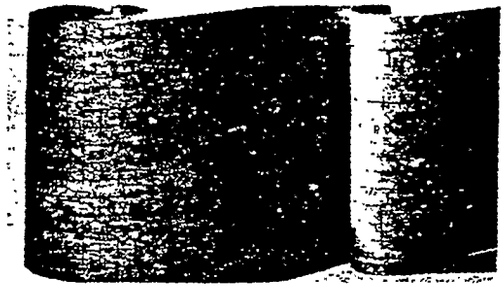
Special Counter Assortment: Display cartons of style 193, of 25, or 50, ¼-pound boxes made up of an assortment of ⅛", 3/16" and ¼" sizes.

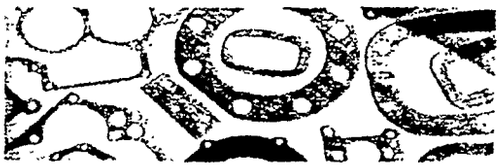
Asbestos Cord All sizes: 5, 10, 25 or 50 pound spools.

All sizes: ¼, ½ or 1 pound balls.

FBW-209

Johns-Manville
Sheet Packing Materials and Cut Gaskets





For complete information on Sheet Packing, Cut Gaskets and Folded Gaskets, ask for Sheet Packing Catalog.

• Compressed Asbestos • Rubber
• Vegetable Fibers • Teflon

Johns-Manville can supply a wide assortment of sheet materials which are designed for service in packing and gasket applications. These materials are noted for uniformity of composition, density, resilience, and resistance to deterioration.

Listed below are popular J-M Sheet Packings which provide a high degree of dependability under the particular service conditions for which they are recommended.

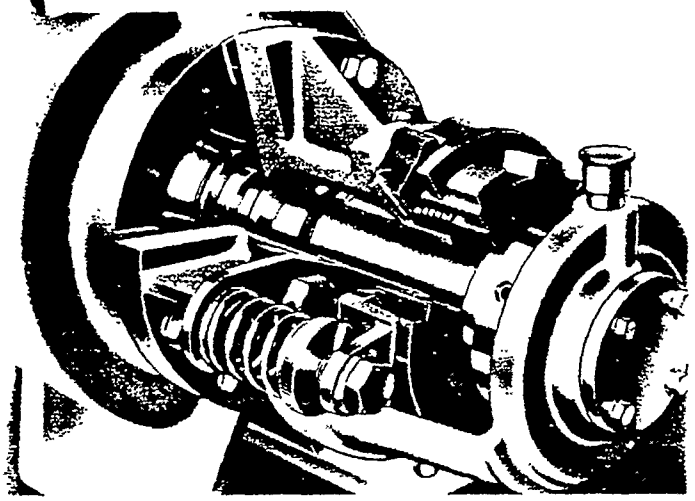
J-M Factory-Cut Gaskets can be furnished in any required shape accurately cut to size from the materials listed. They can also be supplied cut from asbestos paper, asbestos millboard, felt paper, manila tag paper, manila rope paper, strawboard, chipboard, fish paper, blotting paper, varnished cloth, etc.

Ready Reference Table of Standard J-M Gasket Material

Service	Style	Description	Thick. In.
COMPRESSED General conditions, such as superheated or saturated steam, air, hot or cold water, ammonia, oil, some acids, alkalies and other chemicals.	60 61	Compressed asbestos fiber and heat-resisting compounds. Treated with J-M Parting Agent.	1/64 thru ¼
Controlled swell in oil.	50	Compressed asbestos fiber sheet, softer and less dense than No. 60.	1/64
Quality sheet for critical service such as hot oil.	70	Compressed asbestos fiber sheet, harder and denser than No. 60.	1/64 thru ⅛
For good electrical resistance, also general service where a soft and flexible gasket is desirable.	71	Long fiber asbestos with bonding compound high in dielectric strength.	1/64 thru ⅛
Hot oils, petroleum solvents, refrigerants, animal and vegetable oils, etc. Supplied to AMS 3232H or MIL-A-7021B, Class 1.	76	Long fiber asbestos bonded with synthetic rubber.	1/64 thru ⅛
Critical service sheet for aromatic, carbon tetrachloride, petroleum solvents, etc. Supplied to ASTM-D-1170 P-1141A, AMS-3232H and MIL-G-12803, P-1141 thru ¼" thk.	78	High tensile, long fiber asbestos bonded with Buna-N synthetic rubber.	1/64 thru ⅛
Most acids, where relatively hard, dense gasket required.	84	Blue African asbestos bonded with acid-resisting binder.	1/32 thru ⅛
CHEMPAC Severe solvents and caustics, weak acids. Temperatures to 500 F.; pressures to 750 psi.	91	Plies of white asbestos cloth treated with Teflon suspensoid.	nominal 3/32
Metal flanges against acids, severe acid and solvent service. Temperatures to 500 F.; pressures to 750 psi.	92	Plies of Blue African asbestos cloth treated with Teflon suspensoid.	nominal 3/32
CORK AND RUBBER COMPOSITIONS Resilient materials suited for light-duty sealing for low bolt pressures on rough surfaces, or on thin, flexible flanges.	570 thru 578	Cork and rubber compositions, ground cork combined in Neoprene or Nitrile binders.	1/32 thru ⅜
WOVEN For rough flanges against gasoline, oil and petroleum derivatives.	88	Same as No. 100 except for impregnation with petroleum-resistant compound of neoprene.	1/32 thru ¼
Rough flanges against low, medium or high pressure steam, air and water.	100	Tightly twisted asbestos yarn, brass wire inserted, woven into cloth, and impregnated with rubber heat resisting compound.	1/32 thru ¼
Gas, gasoline and diesel engine service on rough cast flanges such as exhaust manifolds, water jacket connections and some cylinder head applications.	101	Strong asbestos fabric, brass wire inserted, impregnated with high temperature compound.	1/32 thru ⅛
PLANT FIBER Gasoline, benzine, oil, greases, to 250 F. and hot or cold water.	711	Strong, dense plant fiber thoroughly impregnated with special solvent-resisting compound.	1/64 thru ⅛
FELTED High temperature service.	219	Long fiber asbestos thoroughly felted, bonded with heat resistant rubberless binder.	1/32 thru ¼
Recommended for use with glass and glass-lined equipment. Low pressure pipe flanges against most acids used in chemical and industrial plants.	83	Soft, felted gasket of Blue African asbestos bonded with butyl.	1/16 thru ⅛
RUBBER General conditions against hot and cold water, air, medium or low pressure saturated steam. Quality sheet for oil and gasoline.	107 104	Highest quality special heat-resisting rubber compound. Compounded of CR (neoprene) rubber.	1/32 thru ¼

Other J-M Cut Rubber Gaskets:
Style No. 103—Cr (neoprene) Rubber Sheet
Style No. 105—C. I. Synthetic Rubber Diaphragm Sheet
Style No. 106R—CR (neoprene) Rubber Diaphragm Sheet
for Hydraulic Service
Style No. 111—CR (neoprene) Sheet for Oil
Style No. 112—Black Oil-Proof Rubber
Style No. 113—NR (natural) Rubber for Mild Acid
Style No. 114—SBR Black Rubber for Mild Acid
Style No. 115—C.I. Rubber Diaphragm Sheet
Style No. 126—NBR (nitrile, buna N) Rubber Sheet
Style No. 127—NBR (nitrile, buna N) Rubber Sheet

Johns-Manville **Mechanical Seals** for leak-proof service on rotary shafts



Simple design — easy to install and maintain

The J-M Mechanical Seal provides a *new, simple, economical, general-purpose* seal which combines the best features of both mechanical seals and stuffing-box experience and practice. It is the engineer's solution to the problem of positively sealing pumps and mixers. Designed to fit easily into standard stuffing-boxes, it provides clean, leak-proof sealing. Because of its simple and efficient construction, compared with most other mechanical seals, it gives long, trouble-free, "set-it-forget-it" operation.

J-M Mechanical Seals are readily available *from stock in standard sizes and construction.* Only two components – the "O" Rings and End Seals – are variable from standard materials. This simplifies selection, installation and allows a wide variety of uses. This simplification makes it ideal for standardization of your sealing requirements and ordering procedures. Your J-M Representative will be glad to help you select just the right combination for your sealing requirements.

Data

- **shaft sizes** from 7/8" to 9¾" diameter, standard sizes; larger sizes available on special inquiry.
- **pressures** to 150 psi, gauge.
- **speeds** to 5,000 rpm.
- **temperatures** to 200°F.
- **standard pH range** of 10 to 4. Other pH ranges use special materials.
- **maximum PV factor** is 300,000.

Widespread uses in many different industries

- **Power Plants:** Cooling and circulating water (river and sea); evaporator; condensate; boiler feed.
- **Sewage:** Raw sewage; activated sewage; waste effluent.
- **Paper:** Raw bleached sulphites and paper stocks up to 6% concentration.
- **Food and Drink:** Starch solutions; fruit juices; hot fats; milk; chocolate.
- **Brewing and Distilling:** Beer; beer wort; distillery mash; grain juice.
- **Sugar:** Cane juice; beet tails; molasses; glucose, thick, thin or raw juices.
- **Marine:** Bilge; circulating water; fire pump.
- **Gas:** Water; water containing coke dust; soda ash.
- **Mining:** Coal slurry water; asbestos cement slurry; water slurries.
- **Steel:** Water; water with mill scale in suspension; dirty water.
- **Textiles:** Dye liquors with cotton or wool fibers in suspension.
- **Chemicals:** Industrial alcohol; calcium hydroxide; acetate anhydride; aluminum nitrate solution; sodium dichromate slurry.
- **Petro-Chemicals:** Crude oils and a wide range of services common to the industry.

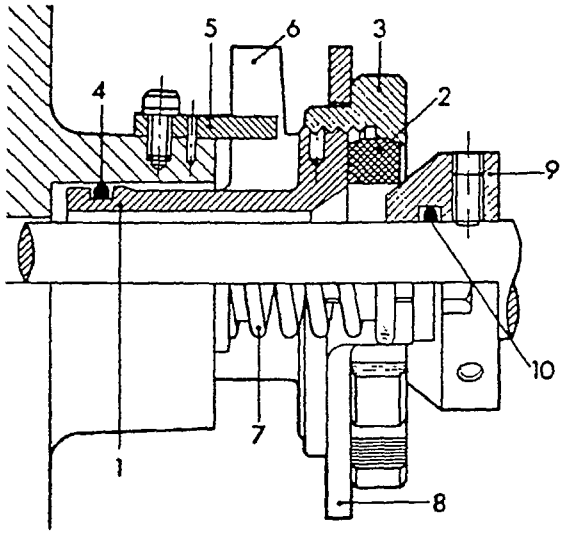
Money-saving advantages

- **external springs** are adjustable at running pressure – out of contact with medium being pumped – cannot clog with solids in suspension.
- **split end-seals** allow replacement in five minutes without disassembly of unit – no costly downtime.
- **easily installed** by regular maintenance men, in many cases without machining.
- **seals a wide range** of liquids, coagulants, abrasives and slurries.
- **extremely low friction** – no shaft wear.
- **readily available** from inventory at "off-the-shelf" prices – in a popular selection of sizes and materials. Special materials for severe service.
- **leak-proof operation** – saves costly fluids – cleaner plant housekeeping.
- **lasts many times longer** than conventional mechanical packings.
- **tested and proved** in all types of industries.

FBW-211

Johns-Manville **Mechanical Seals**

Popular sizes readily available from stock–suitable for many single-stage centrifugal pumps – up to 150 psi.



Method of Operation

The sealing principle of the J-M MECHANICAL SEAL is common to the full range of standard sizes available, i.e., for shafts from ⅜" to 9¾" in diameter and is diagrammatically presented in the accompanying illustration.

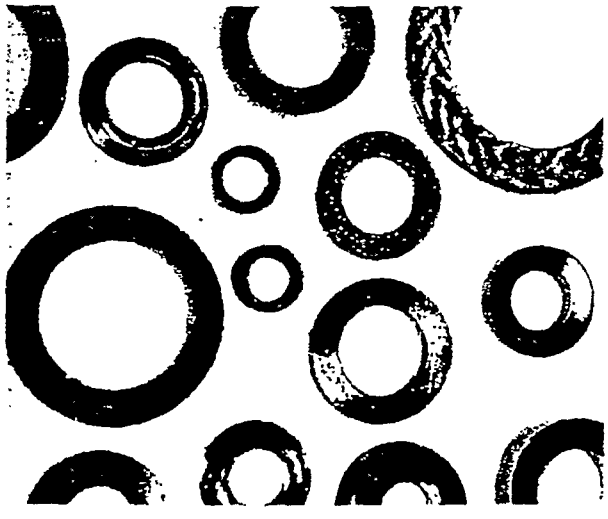
The Gland Sleeve (1), which has a replaceable End Seal in halves (2) held in position by the Gland Nut (3), is fitted into the stuffing box and it is sealed by the 'O' Ring (4). An Anti-rotation Stud (5) fitted into the stuffing box passes between two guide lugs (6) on the Gland Sleeve.

The whole assembly is allowed to move axially within the stuffing box according to the pressure exerted by adjustable Springs (7) acting through the Yoke Plate (8) on the Gland Nut. These springs force the End Seal against the Cone (9), which rotates with the shaft and is sealed by the 'O' Ring (10), to provide the running seal.

Special Sealing Requirements

J-M Mechanical Seals, in stock, cover a broad standard range of sizes and materials suitable for most uses. They are available for immediate shipment. For special sealing requirements, in size or materials, consult your J-M Representative.

J-M **Die Formed Rings**



J-M Die Formed Packing Rings are custom made to closely controlled dimensions to provide a mechanically perfect fit. Grouped into two tolerance ranges—standard and close tolerance—to fit specific equipment needs, they assure easy assembly and maximum sealability.

These precision-made rings are available in virtually any required size and flange width, in many styles and compositions, and are lubricated to meet the needs of specific service conditions.

FBW-212

HELPFUL SUGGESTIONS ON HANDLING PACKINGS

How to Get the Best Results from Packings

There are four main factors that influence the life and performance of packings in service. Give careful attention to all these factors and the most satisfactory service will be assured.

Quality of Packing Used—Packing costs far less than the labor and lost production time of re-packing. The use of poor quality packing can sometimes result in damage to equipment. The best quality packing is the cheapest.

The Right Style for the Service—The recommendations on pages 4 and 5 are based on Johns-Manville's research plus practical field service. For special cases, consult your J-M Packing Distributor or J-M Sales Engineer.

Mechanical Condition of Equipment—It pays to use high quality equipment that is properly maintained. If bearings, shafts, sleeves or guides are in bad condition, the result is poor sealing, short packing life.

Packing Installation and Lubrication—Properly installed and lubricated, packings help equipment operate efficiently. The suggestions below have been found helpful.

HOW TO PACK STUFFING BOXES

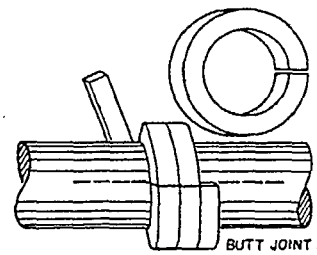
Pumps and Agitators

1. Remove all old packing from the stuffing box. Clean the box and shaft thoroughly and examine shaft for wear or scoring. Replace shaft or sleeve if wear is excessive. Check bearing by lifting shaft up and down; do not expect the packing to act as a bearing.

2. Use the right size of coil packing, to be sure the packing will fit and can compensate for shaft wear, if any. To determine the correct coil packing size, measure the diameter of the shaft (inside the stuffing box area if possible) and then measure the inside diameter of the stuffing box itself (to give you the O.D. of the ring). Subtract the I.D. measurement (the shaft diameter) from the O.D. measurement and divide by two. The result is the required size.
   Other than special precision molded packings, all standard shaft packings are made up in increments of 1/16" from the smallest size available and up. For most applications, if the calculated size figures under a 16th of an inch, it is generally best to use the next size greater. Thus, if the shaft measures 2½" and the inside of the stuffing box 3 7/16", the size of coil packing to use would be ½" rather than 7/16".

3. Cut packing into rings. Never wind packing into a stuffing box. For pumps and agitators cut rings with a butt (square) joint; it is easier and you can do a better job.

   The best way to cut packing rings is to cut them on a mandrel the same diameter as the shaft in the stuffing box area. If there is no shaft wear, they can



   be cut on the shaft itself outside the stuffing box if there is room. Hold the coil packing tightly and firmly on the mandrel but do not stretch it excessively. Cut the ring and try it in the stuffing box to make certain that it fills the packing space properly, with no gap in the joint at the O.D. of the ring.
   Each successive ring 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 rings are cut on a flat surface be certain that the *side* of the master ring, and not the O.D. or I.D. surface is laid on the rings to be cut; this is necessary so that the slight bevel at the ends of the rings be reproduced. Remember that the O.D. circumference of the ring is greater than the I.D. circumference.

4. To cut rings from a packing that is unusually soft or that has a tendency to fray excessively, some mechanics apply a small piece of tape at the point where the cut is to be made, then cut through the tape. If the tape is thin, it can be left right on the ring.

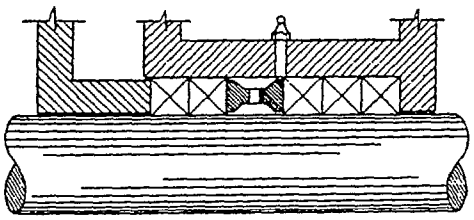
5. Install one ring at a time. Make sure it is clean and has not picked up any dirt in handling before installing it. If clean oil is available it is well to lubricate each ring thoroughly; some mechanics also lubricate the shaft and the inside of the stuffing box.
   Joints of successive rings should be staggered and be kept at least 90° apart. Each individual ring should be firmly seated with a tamping tool. When enough rings have been individually seated so the nose of the follower will reach them, the individual tamping should be supplemented by the follower. Never depend on the follower entirely to seat a set of rings properly—this practice will jam the last rings installed but leave the front rings loose in the box. The result is excessive and rapid wear of rear rings; erratic packing performance; sometimes, twisting and tearing of the front rings because they are loose in the stuffing box.

6. After last ring is installed, take up bolts finger tight. Start the pump, and take up bolts until leakage is decreased to no more than 2 drops per second. Stopping leakage entirely at this point will cause the packing to burn up.

FBW-213

7. 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 follower as the packing seats until the leakage is about 2 drops per second on a 1" shaft at 3600 RPM. Allow proportionately more as the shaft size increases. For speeds lower than 3600 RPM, less leakage is permissible. It will take about one working day to break in a set of packing to a point where the leakage is stabilized at a uniform acceptable rate. Never try to stop leakage entirely.

8. If at all possible, provide through a lantern ring, means of lubricating the shaft and packing by supplying grease, oil, water, or the liquid handled in the pump. Fittings for this purpose are standard on most pumps.



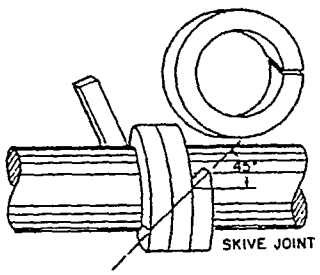
9. If the stuffing box has a lantern ring, make sure the lantern ring, as installed, is slightly behind the lubricant fitting so it will move under the fitting as follower pressure is applied.

10. Replace packing when leakage cannot be controlled by further take-up on the follower.

Valves and Expansion Joints

The function of a Valve Stem Packing is like a gasket function rather than pump packing, which must both seal and carry lubricant for a turning shaft. Valve Stem Packings must provide a dense structure that will not permit movement of the liquid or gas through the body of the packing itself. The packing under follower pressure must be able to flow sufficiently to seal along the stem and along the stuffing box wall. By maintaining low friction, it will permit easy movement of the stem. To pack valves:

1. Carefully perform all the operations outlined under steps 1, 2, 3, 4 and 5, as given for pumps and agitators. Rings used on valves and expansion joints should be cut with a skive joint.



In preparing skive cut (45 degree bevel) rings, be sure the first ring is carefully cut and then tested on the shaft. It can then be used as a master for cutting other rings on a flat surface to insure that the additional rings are cut precisely at the correct angle.

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 wrench 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. If it is leaking at all, tighten the follower until there is no leakage.

TROUBLE SHOOTING PACKING FAILURES

Carefully examine packing removed from a stuffing box, as it often gives clues to the condition of the equipment and may be the means of solving packing problems. The following clues and possible troubles were found by examining sets of packing which had seen service:

Clue: Excessive reductions in the cross-section of the packing directly beneath the rod, shaft or plunger.
Possible trouble: Low bearings with shaft or rod riding on packing. In service early leakage occurs around the top of the shaft or rod.

Clue: Excessive reduction in the thickness of the packing directly over or on either side of rod or shaft.
Possible trouble: Rod or plunger out of alignment and in the case of the rod or shaft, the bearings may be badly worn causing whipping of the shaft.

Clue: One or more rings missing from set.
Possible trouble: Bottom of stuffing box badly worn, with packing being extruded into system. Considerable difficulty, such as packing getting into the valves, traps or contaminating the fluid handled, may result.

Clue: Wear on outside diameter of the packing.
Possible trouble: Rings rotating with shaft or loose in the box.

Clue: Bulge in the side of one or more rings.
Possible trouble: Adjacent rings cut too short causing packing under pressure to be forced into the open space.

Clue: Rings next to gland followers badly deformed with bottom rings in fair condition.
Possible trouble: Improper installation of packings and excessive gland pressure used.

Clue: Packings showing tendency to sheet out or extrude between rod or shaft and the gland follower.
Possible trouble: Excessive pressure or more likely too great a clearance between the rod or shaft and the gland follower.

Clue: Wearing face of rings dried and charred with rest of packing in good condition.
Possible trouble: High temperatures with lack of lubrication.

FBW-214

How To Select Packing For Media Handled

Most Packing selections can be made using the Equipment Recommendations given on pages 4 & 5. However, if the liquid you are handling is corrosive or critical in some other way, then you can choose the exact style by reference to the Chemicals listed on these pages.

Listed are hundreds of liquids commonly used in the Process Industries.

At the *right* of each is a symbol indicating Packings constructed of materials which should handle the liquid.

At the *left* of each is a code symbol showing the general chemical nature of the liquid. These symbols are explained on page 52.

Chempac styles "T" will also handle conditions designated "G", "C", "P", "S" or "F" to the pressure and temperature assigned to the Chempac style.

REFERENCE SYMBOLS

Symbols indicate styles for General service or special conditions. Use after choosing packing construction from equipment recommendation tables, pages 4 & 5.

- General ..... G
- Caustic C
- Pulp & Paper ..... P
- Solvent ..... S
- Food and Related Services ..... F
- Chempac (Teflon Impregnated Asbestos) ..... T
- Most Corrosive requiring Teflon filament or Blue Asbestos Packings X

Each basic J-M Packing construction has one style treated for general service conditions and other related styles treated for more severe chemical conditions as indicated. For example you will note that in the Centripac styles, #7 is designated "G", #2036 is "F", #2021 is "C", #19 is marked "P", #18 is "S", #2018 is "X".

CHEMICALS/PACKINGS • *class* • *liquid* • *packing*

04	Acetaldehyde	T-S
09	Acetate solvents	S
012	Acetates, esters & petroleum derivatives	S
02A	Acetic acid	T
02A	Acetic acid, glacial	T
02A	Acetic acid (hydroxy crude)	T
02D	Acetic anhydride	T
05	Acetone	T-S
05	Acetophenone	T-S
01E	Acetyl chloride	T
01C	Acetylene	G
01C	Acetylene gas	G
012	Acetylene with water	G
012	Acetylene gas with water or liquid H.C.	G
15	Acid sludge	X-T
08	Acrylonitrile	S
07	Alcohol, ethyl	S-G
012	Alcohol & lub. oil	S
07	Alcohol methyl	G
04	Aldehyde	T-S
01A	Alkanes	T-G
02A, 02B	Alkyl arylsulphonic acid	T
01B	Alkyl benzene	T-S
012	Alkylate light	S
05	Allyl acetone	T-S
08	Allyl amine	G
01E	Allyl chloride	G
08	Alpha Picoline	G
13	Alum solution	G
13	Aluminum chloride	G
12	Aluminum hydroxide	G
08	Amine: Diethanol amine	T-S
08	Amine: Monoethanol amine	T-S
012	Amine-fat condensate	S-G
08	Amines	T-S
14	Ammonia, anhydrous	G
12	Ammonia, aqua	G
14	Ammonia gas	G
12	Ammonia, liquid	G
012	Ammonia, liquors & oil	G
13	Ammonium acid phosphate	G
13	Ammonium bifluoride	X-G
13	Ammonium bicarbonate	G
13	Ammonium bromide	G
13	Ammonium carbonate	G
13	Ammonium chloride	G
13	Ammonium fluosilicate	G
12	Ammonium hydroxide	G
13	Ammonium nitrate	G
13	Ammonium nitrate, molten	G
13	Ammonium oxalate	G
13	Ammonium persulphate	G
13	Ammonium phosphate, dibasic	G
13	Ammonium phosphate, monobasic	G
13	Ammonium phosphate, tribasic	G
13	Ammonium sulfate	G
13	Ammonium sulphite, to boiling	G
13	Ammonium thiocyanate	G
13	Ammonium thiocyanide	G
09	Amyl acetate	T-S
09	Amyl acid phosphate	S-G
07	Amyl alcohol	S-G
09	Amyl chloride	S-G
09	Amyl nitrate	S-G
08	Aniline	T
012	Aniline dyes	T-G
08	Aniline Hydrochloride	T
012	Antibiotic fermentation broth—no solvent	G
012	Antibiotic fermentation broth—with solvent	S
07	Anti-freeze water & alcohols or glycols	G
13	Antimony trichloride	T
11	Aqua regia	X
14	Argon gas	G
01D	Arocior	T-S
01D	Arocior 1242	T-S
01D	Arocior 1248	T-S
01D	Arocior 1254	T-S
01B	Aromatic fuels	T-S
012	Asphalt-emulsified	S
13	Barium chloride solution 0-20%	G
13	Barium hydroxide	G
13	Barium nitrate solutions	G
13	Barium sulphide	G
012	Beer (Note #1)	T
012	Beer and beer mash (Note #1)	T
012	Beer wort (Note #1)	T
012	Beet sugar liquers	F
04	Benzaldehyde	T-S
01B	Benzene (Benzol)	T-S
012	Benzene & gas mixtures	T-S
01A	Benzene (petroleum ether)	T-S
08	Benzoic acid solution	G
07	Benzonitrile	G
01D	Benzyl alcohol	S-G
13	Benzyl chloride	T-S
13	Bichloride of mercury	G
012	Bittern	G
012	Black liquor	C
012	Black sulphate liquor, to boiling	C
012	Blood	F
012	Boiler feed water	G
012	Bonderite solution	S-G
13	Borax solution	G
11	Boric acid	F-G
13	Boron trichloride	T
13	Boron trifluoride	T
13	Brine (acid)	G
13	Brine, calcium chloride	C-G
13	Brine, copper chloride	G
13	Brine, sea water	G
13	Brine, sodium	G
14	Bromine	T
01D	Bromobenzene	T
012	Bunker "C" fuel oil	S
01C	Butadiene	T-S
01A	Butane	T-S
012	Buttermilk	F
09	Butyl acetate	T-S
07	Butyl alcohol	S-G
01E	Butyl chloride	T-S
06	Butyl ether	T-S
09	Butyl sebacate	T-S
01C	Butylene	G
08	Butylamine	T-S
03B	Butyric acid	G
03B	Butyric acid, to 150F	G
13	Calcium bisulfide	G
13	Calcium bisulfite	G
13	Calcium carbonate slurry	G
	Calcium chloride	G
12	Calcium hydroxide (Note #2)	P
13	Calcium hypochlorite	G
13	Calcium phosphate slurry	G
	Calgon	F
012	Camphene	S
012	Candelilla wax & varsol mixture	G
012	Cane sugar liquors & cane juice	F
07	Carbinol	S-G
09	Carbitol acetate	S
011	Carbolic acid	T
01A	Carbon bisulfide	T-S
14	Carbon dioxide (dry)	G
14	Carbon dioxide (wet)	G
01A	Carbon disulfide	T-S
01E	Carbon tetrachloride wet	T-S
01E	Carbon tetrachloride, anhydrous	T-S
11	Carbonic acid	G
14	Carbon monoxide	G
010	Castor oil	G
	Caustics	C
012	Cellosolve acetate	S
010	Chinawood oil	G
15	Chlorex	C
01E	Chlorextol	T
14	Chloric acid	T
01D	Chlorinated hydrocarbons	T
01D	Chlorinated polyphenyl	G
01D	Chlorinated toluene	T-S
14	Chlorinated water	F
14	Chlorine, anhydrous liquid	T
14	Chlorine (dry)	T
14	Chlorine (wet)	T
14	Chlorine gas (Chlorine Institute Sizes) (Note #3)	T
01E	1-Chloro-1-nitropropane	S
02A	Chloroacetic acid	T
01D	Chlorobenzene	T
01D	Chlorobenzene, to boiling	T
01E	Chloroethane	T
01E	Chloroform	S
06	Chloromethyl ether	T-S
01E	2-Chloropropane	T-S
11	Chlorosulfonic acid	T
01D	Chlorotoluene	T-S
01E	Chlorotrifluoroethylene	T
13	Chrome alum	G
11	Chromic acid	T
02C	Citric acid	F
15	Clay slurries	G
012	Coca-Cola syrup	F
012	Cocoa butter	F
012	Cocoanut, fatty acid	F
012	Coffee, to boiling	F

FBW-215

CHEMICALS / PACKINGS • *class* • *liquid* • *packing* (continued)

I3	Copper cyanide	T-G
I3	Copper nitrate	G
I3	Copper sulfate (blue vitrol)	G
I3	Copperas (Greene)	G
O12	Cora oils	G
O10	Cottonseed oil	G
O12	Creosote	T
O11	Cresol, meta	S
O11	Cresylic acid	S
I3	Cuprous ammonia acetate	S
I3	Cupric chloride	G
I3	Cyanide	T-S
I4	Cyanogen chloride	G
O8	Cyanohydrin	F
O1A	Cyclohexane	S
O5	Cyclohexanone	S
O12	DDT Solutions (kerosene solvent)	S
O12	DDT Solutions (toluene solvent)	S
O1D	DNC (Dinitrochloro benzene)	T
O12	De-Butanizer reflux	S-G
O12	*De-Ethanizer charge*	S
O12	De-Propanizer reflux	S
O12	*Developer Solution*	T
O5	Diacetone	S-G
O12	Dibutyl cellosolve adipate	S-G
O9	Dibutyl phthalate	S
O9	Dibutyl sebacate	S
O1E	Dichlorobutane	T-S
O1E	*Dichloroethane*	S
O6	Dichloroethyl ether	T-S
O1E	Dichlorohexafluorocyclobutane	T-S
O1E	Dichloropropylene	S
O1D	Dichlorotoluene	S
O1A	Dicyclopentadiene	S
O12	Diesel fuel	S-G
O8	Diethanolamine	S-G
O1A	Diethyl carbitol	S
O12	Diethyl carbonate	S
O12	Diethyl cellosolve	S
O8	Diethylamine	S
O7	Diethylene glycol	S-G
O8	Diethylenetriamine	S
O4	Dimethyl formaldehyde	S-G
O8	Dimethyl hydrazine	S-G
O12	Dinitrochloro benzene & styrene	T-S
O1D	*Dinitrochlorobenzene*	T-S
O8	Dioctyl amine	S
O6	Dioctyl phthalate	S
O1A	Dioxane	S-G
O1B	Diphenyl	T
O1D	Diphany, chlorinated	T
O5	Disobutyl ketone	T-S
O12	Doctor solutions	C
O12	Dow Corning silicone fluid	G
O12	Dowtherm "A" (Note #4)	T
O12	Dowtherm "E" (Note #4)	T
O12	Dyewood liquors	G
O4	Embalming fluid	G
O9	Ester type plasticizer	T
O1A	Ethane	S
O7	Ethanol	G
O8	Ethanolamine	S
O6	Ether	S
O9	Ethyl acetate	S
O9	Ethyl acrylate	S
O7	Ethyl alcohol	G
O1E	Ethyl chloride	S
O6	Ethyl ether	S
O9	Ethyl formate	S
O12	Ethyl mercaptan	S
O9	Ethyl-n-butyrate	S
O1E	Ethyl bichloride	S
O9	Ethyl propionate	S-G
O9	Ethyl sulphate	S-G
O1E	Ethylene chloride	T-S
O12	Ethylene chlorohydrin	S
O1E	Ethylene dichloride	T
O7	Ethylene glycol	G
O8	Ethyl pyridine	S-G
O3	Fatty acids	G
I3	Ferric chloride	G
I3	Ferric nitrate	G
I3	Ferric sulfate	G
I3	Ferrous sulfate (Green Copperas)	G
I3, I2	Ferrous sulphate & lime	S
O12	Film dope	S-G
O12	Fish oils	S
O4	Formaldehyde or formalin	S-G
O2A	Formic acid	S-G
O1E	Freon 11	S-G
O1E	Freon 12	S-G
O1E	Freon 121	S-G
O12	Freon 12 and refrigeration oil	S-G
O12	Freon 22 and refrigeration oil	S-G
O12	Freon 113 and 114	S-G
O12	*Freons—liquids*	S-G
O12	Fruit juices	F
O12	*Fuel oil*	S
O4	Furfural	S-G
O1A	Furan	S-G
O2B	Gallic acid	S-G
O12	Gas oil	S
O1A	Gasoline	S
O1B	Gasoline (aromatic)	S
O1A	Gasoline (automotive grades)	S
O1A	*Gasoline (bronze)*	S
O1A	Gasoline (ethyl)	S
O1A	Gasoline (100 Octane)	S
O1B	Gasoline (Hi-test)	S
O1A	Gasoline with mercaptan	S
O1A	Gasoline with H_2S	S
O12	*Gelatin*	F
O12	Ginger ale	F
O2C	Glacial acetic acid	T
I3	Glaubers salt	G
O12	Glue	G
O12	Glue (acid)	G
O12	*Glue sizing*	G
O12	Glucose	F
O7	*Glycerine* (glycerol)	G-F
O12	Grain mash	G-F
O12	Grease	G
O12	Green liquor	C
O1E	Halowax 1000	G
O1A	Heptane	S
O5	Hexachlore acetone	S
O1A	Hexane	S
O5	Hexone (mik)	T-S
O12	Hollingshead H-2	G
I1	Hydrofluoric acid	T
I1	Hydrobromic acid	T
O1A	Hydrocarbons (light)	S
I1	Hydrochloric acid	T
I5	Hydrocyanic acid	T-S
I1	Hydrofluoric acid (anhydrous)	T
I1	Hydrofluosilicic acid	T-S
O2D	Hydroformic acid	T-S
I4	Hydrogen	G
I4	Hydrogen cyanide	T-S
I4	Hydrogen fluoride	X
I5	Hydrogen peroxide	T-S
I5	Hydrogen sulfide	S
I5	Hydrogen sulfide & organic sulfur compounds	S
I5	Hydrogen & water	G
O11	Hydroquinone	G
O2C	*Hydroxy—acetic acid*	T
O12	Ink	G
O12	Insecticides	G
O1E	Iodoform	S-G
O1E	Iodoform	S
O1A	Iso-butane	S
O5	*Iso-butyl methyl ketone*	T-S
O1C	Iso-butylene	S
O1A	Iso-pentane	S
O9	Iso-propyl-acetate	S
O7	Iso-propyl alcohol	S-G
O8	Iso-propyl amine	S-G
O6	*Iso-propyl ether*	S
O1A	Kerosene	S
O12	*Ketchup*	F
O12	Lacquer in ketone solvents	T-S
O12	Lacquer solvents	T-S
O12	Lacquers, hot	S
O2C	Lactic acid	F
O10	Lard	F
O12	Latex	G
I3	Lead nitrate	G
I2	Lime slurries	C
I5	Lime-sulfur	G
I2	Lime water (milk of lime)	G
O9	Lindol (triersol phosphate)	S
O10	Linseed oil	S
O12	Liquid cyanide	T-S
O12	Liquid latex & gaseous butadiene	T-S
O12	Liquor, black	C
O12	Liquor, green	C
O12	Liquor, lime	C
O12	Liquor steep	C
O12	Liquor sulphate	C
O12	Liquor white	C
I3	*Lithium bromide brine*	G
I3	Lithium chloride	G
O12	*Lubricating oils, hot*	S
I2	Lye, caustic	T
O11	Lysol	T-S
I3	Magnesium chloride	G
I3	Magnesium hydroxide	G
I3	Magnesium oxychloride	G
I3	Magnesium sulfate (epsom salts)	G-F
O2C	Maleic acid	T
O8	Maleic hydrazide	T-S
O12	Malt beverages (Note #1)	T-F
I3	Manganese chloride	G
O12	Mash (Note #1)	T
O10	Mayonnaise	F
O12	Meat products	F
O12	Melamine resins	G
O12	Mercaptan	G
I3	Mercuric chloride	G
I5	Mercury	G
I3	Mercury salts	G
I3	Mercurious nitrate	G
O5	Mesityl oxide	T-S
O7	Methanol	S-G
O9	Methyl acetate	S-G
O9	Methyl acrylate	S-G
O7	Methyl alcohol	S-G
O1E	Methial	T
O1E	Methallyl chloride	T-S
O7	Methyl alcohol	G
O1E	Methyl bromide	T
O12	Methyl cellosolve	S-G
O1E	Methyl chloride	S-G
O12	Methyl chloro-silanes	S
O6	Methyl ether	S
O5	Methyl ethyl ketone	T
O9	Methyl formate	S-G
O5	Methyl iso-butyl ketone	T-S
O9	Methyl methaerylate (Note #5)	T-S
O9	Methyl propionate	S
O8	Methylamide (hot)	S
O1E	Methylene chloride	S-G
O12	Milk	F
O1A	Mineral oil	S
O1A	Mineral spirits	S
O12	Miscellas	T
I1	Mixed acids ($HNO_3 + H_2SO_4$)	X
O12	Molasses	F
O8	Mono ethanolamine (with copper sulphate)	S-G
O1D	Monochloro-benzene	S
O12	Mustard	F
O1A	Naptha	S
O1A	Naptha, sour or gasoline (trace H_2S)	S
O1A	Naptha, Vmp	S
O2B	Napthalene sulphonic acid	T-S
O1B	*Napthalene*	S
O2B	Napthalenic acid, to hot	T-S
O12	Natural gas	S
I3	Nickel chloride	G
I3	Nickel sulfate	G
O12	Nicotine sulfate	G
I1	Nitrating acids	X
I1	Nitric acid	X
O12	Niter cake (fused)	G
I1	Nitric acid fuming	X
O1A	Nitro methane	T-S
O8	Nitrobenzene	T-S
O8	*Nitroethane*	T-S
I4	Nitrogen	S
I4	Nitrogen gas	G
O8	Nitromethane	S
O8	Nitropropane	S
I1	Nitrous acid	T
O12	Oakite	G
O12	Oil, air corps hydraulic	T-S
O12	Oil, apiezon	S-G
O12	Oil, asphalt base	S-G
O12	Oil, Bunker C fuel	S
O10	Oil, Chinawood (tung)	S-G
O10	Oil, coconut	S-G
O10	Oil, cotton seed	S
O12	Oil, crude (asphalt base)	S
O12	Oil, crude (corrosive)	S
O12	Oil, crude (paraffin base)	S
O12	Oil, crude (sweet)	S
O12	Oil, cutting (soluble)	S
O12	Oil, Diesel	S
O12	Oil, domestic fuel	S
O12	Oil, fuel & gas	S
O12	Oil, #6 fuel	S
O12	Oil, fuel	S-G
O12	Oil, hydraulic	S
O12	Oil, hydraulic (mineral base)	S
O12	Oil, kerosene	S
O10	Oil, linseed	S
O1A	Oil, lubricating	S
O1A	Oil, mineral	S
O1A	Oil, mineral seal	S-G
O10	Oil, nut	S-G
O10	Oil, palm	S-G
O1A	Oil, paraffin base	S
O10	Oil, peanut	S-G
O12	Oil, quenching	S
O10	Oil, rapeseed	S-G
O12	Oil with refrigerants	S-G
O12	Oil, rich	S-G
O12	Oil, silicone	S
O10	Oil, soya bean	S-G
O1A	Oil transformer	T-S
O10	Oil vegetable	S
O12	Oil and Freon (11 & 12)	T-S
O12	Oil and Freon (22)	T-S
O12	Oil and methylene chloride	S-G
O12	Oil and sulphur dioxide	T-S
O3B	Oleic acid	S-G
O1C	Olefin (crude)	S
I1	Oleum	X
O2C	Oxalic acid	T-S
I4	Oxygen (Note #6)	X
I4	Ozone	G

FBW-216

CHEMICALS / PACKINGS • *class* • *liquid* • *packing* (continued)

03A	Palmitic acid	G
012	Paracymene	G
012	Paraffin, hot	G
012	Paraffin Wax 60%	G
012	Paregoric Compound	F
012	Pectin liquor	F
012	Penicillin	F
01E	Pentachloroethane	S
011	Pentachlorophenol	S
01A	Pentane	S
07	Pentasol	F
01E	Perchlorethylene	T
012	Perchlorathylene & filter aid	T-S
09	Perfume	T-S
11	Perchloric acid	T-S
08	Perfluorotriethylamine	S
15	Peroxide of hydrogen	G
01A	Petroleum ether	T-S
011	Phenol	T-S
012	Phenol, formaldehyde mix	T-S
012	Phenolic sulphonate	S
02B, 02C	Phenylacetic acid	T
012	Phenylethylmalonic ester	S
14	Phosgene	T-S
11	Phosphoric acid	T-S
11	Phosphoric acid, crude	T-S
11	Phosphoric anhydride	T-S
15	Phosphorus (liquid) hot	T-S
012	Photographic developers	T-S
09	Phthalate esters	T-S
02D	Phthalic anhydride	S
011	Picric acid	S
011	Picric acid, molten	S
012	Pine gum (hot)	G
012	Pineapple juice	F
08	Piperidine	G
012	Plasticizer (liquid dibutyl)	S
012	Plating solutions	S
07	Polyglycols	G-S
012	Polyvinyl acetates	S
13	Potash alum	G
13	Potassium bitartrate, to boiling	G
13	Potassium bromide	G
13	Potassium bicarbonate	F
13	Potassium carbonate	G
13	Potassium carbonate, to boiling	G
13	Potassium chlorate	G
13	Potassium cyanide	G
13	Potassium dichromate, to boiling	G
13	Potassium ferricyanide, to boiling	G
13	Potassium hydroxide	C
12	Potassium hypochlorite	G
13	Potassium iodide	G
13	Potassium nitrate	G
13	Potassium ferrocyanide	G
09	Potassium perfluoro-acetate	T
13	Potassium permanganate	G
13	Potassium phosphate	G
13	Potassium phosphate, di- or tri-	G
13	Potassium sulfate	G
13	Potassium sulfide	S
14	Producer gas	S
012	Propane	S
04	Propionaldehyde	T-S
02A	Propionic acid	S-G
01C	Propylene	S-G
01E	Propylene chloride	S
01E	Propylene dichloride	S
07	Propylene glycol	F
09	N-propyl acetate	S
06	N-propyl ether	S
09	N-propyl formate	S
09	N-propyl propionate	S
07	Propylene glycol	F
012	Propylene oxide	S
012	Propylene polymer	S-G
012	Pulp stock	P
08	Pyridine	S
012	Pyroligneous acid	T-S
07	Pyronol	S
012	Quinine bisulphate	S
012	Quinine sulphate	S
012	Resins, hot	G
012	Resins	G
13	Sal ammoniac	G
13	Salt cake	T-G
012	Santicizer 8	S-G
012	Santicizer B-16	S-G
012	Santicizer E-15	S-G
012	Santicizer M-17	S-G
012	Santolube 31	S-G
13	Sea water	G
012	Sewage	G
012	Silicone fluid	S
14	Silicon tetrachloride	T
13	Silver bromide	S
13	Silver chloride	T
13	Silver nitrate	G
012	Slop, brewery	G
012	Slop, distillers	G
012	Sludge acid	T-S
012	Soap	C
13	Soda ash (sodium carbonate)	G
12	Soda, caustic	C
012	Soap liquor	C
13	Sodium acetate	S
13	Sodium aluminate	G
13	Sodium aluminate lime	G
13	Sodium bicarbonate or baking soda	F
13	Sodium bichromate	G
13	Sodium bisulfate	T-S
13	Sodium bisulfite	T-S
13	Sodium bromide	G
13	Sodium carbonate	G
13	Sodium chloride	G
09	Sodium glutamate	F
13	Sodium cyanamide	T-S
13	Sodium cyanide	T-S
13	Sodium dichromate	G
13	Sodium dichromate & water	G
012	Sodium ethylate	C
13	Sodium fluoride	G
13	Sodium hydrosulfite	C
13	Sodium hydrosulfide	C
13	Sodium hydroxide	C
12	Sodium hydroxide (Doctor's Solution)	C
12	Sodium hydroxide over 180F	S
15	Sodium hypochlorite	G
09	Sodium lactate	G
13	Sodium metaphosphate	G
13	Sodium nitrate	G
09	Sodium oleate	G
13	Sodium perborate	C
13	Sodium peroxide	T-S
13	Sodium peroxide solution	G
13	Sodium phosphate (DI)	G
13	Sodium phosphate (mono)	G
13	Sodium phosphate, to boiling	G
13	Sodium phosphate (tri)	G
13	Sodium polysulfide	G
13	Sodium plumbite	G
012	Sodium resinate	G
09	Sodium salicylate	S
13	Sodium silicate	G
13	Sodium sulfate	G
13	Sodium sulfide	G
13	Sodium sulfite	G
13	Sodium tetraborate (Borax)	G
13	Sodium thiosulphate	G
13	Sodium thiosulfate or "Hypo"	G
012	Solvasol	S
07	Sorbitol	S-G
13	Stannic chloride	S-G
13	Stannous chloride	G
012	Starch slurry	G
012	Starch, to boiling	F
15	Steam	G
03A	Stearic acid	G
03A, 03B	Stearic & oleic acid	G
01A	Stoddard Solvent	S
01B	Styrene (Note #5)	S
01B, 01D	Styrene & dinitrochloro benzene	S
012	Sugar liquors & solutions	F
012	Sulfate liquors, kraft	C-P
15	Sulfur molten	T
15	Sulfur chloride	T
14	Sulfur dioxide (wet)	T
14	Sulfur dioxide, anhydrous liquid	T
14	Sulfur trioxide	T
11	Sulfuric acid (Note #7)	X
11	Sulfurous acid	T-S
012	Sulphite pulp	P
012	Sulphonated fatty alcohol	S-G
012	Sulphonated vegetable oils	G
15	Sulphur (molten)	G
15	Sulphur chloride	T
14	Sulphur dioxide & water vapor	T-S
012	Syrup (high sugar)	F
010	Tallow	P-G
02B	Tannic acid	G
012	Tanning liquors (veg)	G
012	Tar	S
02C	Tartaric acid	G
02B	Terephthalic acid (water slurry 10% N. acid)	T-S
01E	Tetrachloroethylene	T-S
01E	Tetrachlorethane	T-S
01E	Sym-tetrachlorethane	T-S
01A	Tetrahydrofuran	T-S
012	Tetraethyl lead	T-S
012	Thiamin solution	F-S
13	Titanium tetrachloride	T-S
01B	Toluene or toluol	T-S
012	Tomato juice	F
01E	Trichloropropane	S
01E	Trichlorathylene (dry)	T-S
01E	Trichlorethylene (wet)	T-S
01E	Trichloro ethane	T-S
09	Tricresyl phosphate	S
08	Triethylamine	S
13	Trisodium phosphate	G
012	Turpentine	S
012	Ucon Hydrolubes	G
08	Urea	S
011	Urea & Phenolic resins	S-G
012	Urine	S
012	Varnish	S
012	Vegetables, juices	F
010	Vegetables, oils	F
11	Vinegar	F
012	Vinyl acetate (Note #5)	S
012	Vinyl chloride	S
012	Vinyl chloride gas	S
08	Vinyl pyridine	T-S
01E	Vinylidine chloride	T
11	Vitrol, oil of	X
15	Water (acid, mine, nonoxidizing)	T-S
15	Water (acid, mine-oxidizing)	T-S
15	Water (boiler feed)	G
15	Water (brackish)	G
15	Water (chilled air, washing)	G
15	Water (chilled condenser service)	G
15	Water (cooling tower)	G
15	Water (de-ionized)	G
15	Water (detergent)	G
15	Water (distilled)	G
15	Water (grit, carrying, cool)	G
15	Water (fresh, clean, cool)	G
012	Water (soapy)	G
15	Water (to boiling)	G
012	Water (with soluble oil)	G
010	Wax, hot	G
010	Wax, slurry	G
012	Whey	F
07	Whiskey	F
012	White liquor	P
07	Wine	F
012	White water	P
012	Wort (Note #1)	T
01B	Xylene or xylol	T-S
012	Zein	G
15	Zeolite, treated water	G
13	Zinc chloride	G
13	Zinc cyanide	G
13	Zinc nitrate	G
13	Zinc sulfate	G
13	Zinc sulphate (to boiling)	G

NOTES FOR CHEMICAL RECOMMENDATION TABLE

1. Chempac is specified for this service because it is common that any lubricant whatever may have the undesirable characteristic of defoaming the final product. For this reason many brewers use #2004 or #2006 although some use #2008.

2. Pulp & Paper Packing is recommended for calcium hydroxide and other compounds common to the Pulp & Paper industry because of the factor of contamination, although generally packings designated F for white impregnation would handle the service.

3. Style #2013, sometimes with a graphite finish, is widely used in chlorine service. In some uses the packing must have the approval of the Chlorine Institute. In those instances you should check with your Johns-Manville representative to make certain that the packing used has the approval of the Institute.

4. Chempac is satisfactory for Dowtherm but for high temperature service #392 should be used. In valves, #397 would be the best recommendation.

5. If Catalysis is possible, it is best to secure a recommendation from your J-M representative, giving all conditions.

6. When Dry Asbestos Packings were used for oxygen service it was customary to specify 100% asbestos content because of the possible combustibility of any organic material in the packing. However, 95/99% asbestos packings impregnated with approximately 35% Teflon, J-M Style #2024, is the most popular style for oxygen service today. It can be used at temperatures from minus 300F up to 500F, the top service recommendation for any packing containing Teflon. If it were necessary in any instance to use a packing with no organic content whatever it would be necessary to use a Teflon filament type or a 100% blue asbestos like #2014 or #2019, and the sealability in the service involved would determine the style.

7. Concentrations of sulphuric acid up to 40% may be handled by the Teflon impregnated packings. We have specified the Teflon filament types to take care of all concentrations.

FBW-217

General Classification of Chemicals*

This table need be used only when the chemical being handled is not listed in the Selection Chart on the preceding pages.

We have assigned arbitrary chemical code symbols as shown below, to each general class of chemicals. In the Selection Chart on the preceding pages, these symbols appear at the left of each liquid listed. Thus, each chemical is classified.

In making your Packing selection, should you fail to find a particular liquid on the Selection Chart the use of these symbols, along with the classifications below, will enable you to decide which Packing is most suitable. For example, if a particular aromatic hydrocarbon is not listed in the chart, you can determine by reference to the General Classification of Chemicals below that aromatic hydrocarbons are code "01B". Then, checking the Selection Chart listings coded "01B" and choosing a hydrocarbon closely related to the liquid in question, you can determine if a "T" Packing is required, or if an "S" type or even a "G" Packing will handle the liquid.

ORGANIC	J-M Code
Hydrocarbons	01
Aliphatic	01A
Aromatic	01B
Unsaturated	01C
Aromatic Halogenated	01D
Aliphatic Halogenated	01E
Acids	02
Aliphatic	02A
Aromatic	02B
Carboxylic—moni, di, and tri	02C
Anhydrides	02D
Fatty Acids	03
Saturated	03A
Unsaturated	03B
Aldehydes	04
Ketones	05
Ethers	06
Alcohols	07
Amines-amine salts, nitrogen derivatives, etc.	08
Esters	09
Vegetable, animal fats, waxes and oils	010
Phenols	011
Commercial and misc.	012

INORGANIC	J-M Code
Acids	I1
Bases	I2
Salts	I3
Gases	I4
Commercial and misc.	I5

* All chemicals used in industry cannot be classified into a brief table without taking liberties. This has been done here in assigning a general class to a medium inasmuch as the sole purpose is to indicate to the engineer which packing will withstand service in specified media without deterioration. Some compounds are such that classification as one type or another is entirely arbitrary. Where this condition is extreme, we have resorted to a classification "commercial and miscellaneous". The symbols for classification of chemicals ("O1A" for example) have no meaning other than identification for the purposes of this table.

FBW-218

Johns-Manville MECHANICAL PACKINGS

Approximate Weights—Pounds per 100 Feet

SIZES														
Style	Min. Size	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	Max. Size
2	1/8	3/4	1 1/3	2 1/2	3 1/2	5 1/2	7	8 1/2	11	13 1/2	22	25	33	3
4	1/8	1 1/4	2 3/4	5	9	12 1/2	15	18	22	29	40	54	74	
6	1/8	1 1/3	2 1/2	3 1/2	5 1/2	8 1/2	11	13 1/2	18	22	25	39	46	2 1/2
7	1/8	1	2 1/2	4 1/2	7	10	14	17	20	24	35	47	65	2
10	1/8	2 1/2	4	6 1/4	8	11	13	16	20	25	36	52	62	2 1/2
11	1/8	1 1/4	2 3/4	5	8 1/4	11 1/2	16	20	24	27	40	55	72	2
13	1/8	1 1/2	3	4 1/2	7 1/2	10 1/2	13	15 1/2	20	24	33	50	60	2 1/2
14	1/8	1 1/2	3	4 1/2	7 1/2	10 1/2	13	15 1/2	20	24	33	50	60	2 1/2
17						Groove Packing—See page 52								
18	1/8	1	2 1/2	4 1/2	7	10	13	17	20	24	35	47	65	2
19	1/8	1	2 1/2	4 1/2	7	10	13	17	20	24	35	47	65	2
33	1/4	—	—	4 1/2	7 1/2	10	14	18	20	24	36	45	60	1 1/4
42						Packing Sets—See page 27								
45						Packing Sets—See page 27								
46						Packing Sets—See page 26								
55	1/8	2 1/2	4	6	8	12	19	26	30	33	46	65	85	2 1/2
119						Tape—See page 53								
120						Tape—See page 53								
121						Tape—See page 53								
122						Tape—See page 53								
124	3/8	—	—	—	—	8	—	14	—	24	40	52	64	1
128						Groove Packing—See page 52								
129						Groove Packing—See page 52								
131						Tape—See page 53								
132						Tape—See page 53								
141						Tape—See page 53								
142						Tape—See page 53								
162						Groove Packing—See page 52								
163						Groove Packing—See page 52								
164						Groove Packing—See page 52								
165						Groove Packing—See page 52								
166	1/8	—	—	4 1/2	7	10	13 1/2	17 1/2	22	26 1/2	37	46 1/2	58	2
167	1/4	—	—	4 1/2	7 1/4	10	13	16	20	24	33	43	55	2
168	1/4	—	—	6	9	12	16	19	23	27	36	48	60	2
171	1/4	—	—	4 3/8	—	9 3/4	13 1/2	17 1/4	22	27	39	53	69	1 1/2
172	1/4	—	—	4 3/8	—	9 3/4	13 1/2	17 1/4	22	27	39	53	69	1 1/2
175						Ramie, Flax—See page 52								
175N						Ramie, Flax—See page 52								
176						Groove Packing—See page 52								
177						Groove Packing—See page 52								
180						Ramie, Flax—See page 52								
181						Ramie, Flax—See page 52								
182	1/4	—	—	3 3/4	—	8 3/4	12 1/4	15 3/4	21	25	35	48	63	1 1/2
188						Ramie, Flax—See page 52								
189						Ramie, Flax—See page 52								
190						Ramie, Flax—See page 52								
193	1/16	1	2 1/2	4	5 1/2	8	10 1/2	13	17	21	32	36	50	2
195						Wick—See page 32								
216						Groove Packing—See page 52								
222	1/8	1	2	3 1/2	5 1/4	7	10	12 1/2	16	20	28	40	53	3
223	3/32	1	3 1/2	5 1/4	7	12 1/2	16	20	24	28	40	53	67	2 1/2

FBW-219

continued

Johns-Manville **MECHANICAL PACKINGS** (continued)

Approximate Weights—Pounds per 100 Feet

SIZES														
Style	Min. Size	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	Max. Size
232						Packing Sets—See page 26								
236						Packing Sets—See page 26								
237						Packing Sets—See page 26								
240						Ramie, Flax—See page 52								
245						Ramie, Flax—See page 52								
253	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
254	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
255	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
257	1/4	—	—	6	9	13	18	23	28	32	42	62	86	1 3/8
263	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
270	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
271	1/4	—	—	4	6 1/2	8 3/4	12	15	21	27	35	48	60	1 1/2
274						Cord—See page 52								
276						Cord—See page 52								
280	3/16	—	11	17	24	34	49	63	82	100	152	200	245	1 1/2
285						Cord—See page 52								
293	1/16	1	2 1/2	4	5 1/2	8	10 1/2	13	17	21	32	36	50	2
322	1/8	1	2	3 1/2	5 1/4	7	10	12 1/2	16	20	28	38	50	3
323	3/32	1 1/2	3 1/2	5 1/4	7	12 1/2	16	20	24	28	38	50	67	2 1/2
341						Furnished in Endless Ring form only.								
344	1/16	—	4	5 1/2	10	17	20	23	32	40	52	68	97	1
350	1/16	—	10	17	26	34	42	50	58	66	82	99	114	1 1/4
351	1/16	—	10	17	26	34	42	50	58	66	82	99	114	1 1/4
360	1/16	—	8 1/2	16	24	36	50	64	84	104	156	212	272	1
379	1/16	—	8 1/2	16	24	36	50	64	84	104	156	212	272	1
390	1/4	—	—	3 1/2	5 1/2	8	11	14	18	22	26	35	48	1 1/2
391	1/4	—	—	5	7	12	13 1/2	15	19	22	30	40	54	1
392	1/4	—	—	5	7	12	13 1/2	15	19	22	30	40	54	1
393	1/4	—	—	18	25	35	48	60	79	97	130	180	225	1
395	1/4	—	—	4	60	8 1/2	12	16	22	27	38	48	64	1
397	1/8	1 1/2	3 1/2	5	7 3/4	11	14	17	21	24	34	45	55	1
398	1/4	—	—	5	7 3/4	11	14	17	21	24	34	45	55	1
399	1/4	—	—	4 1/2	7	9 1/2	12 1/2	15	19	21	31	41	51	1
487						Cord—See page 52								
500						Thermo-Pac—See page 53								
535						Wick— See page 32								
566	1/8	2/3	1 1/4	2	3	5	6	7	10	14	16	25	34	3
580	1/16	—	1 1/2	3	5	7 1/2	9	10 1/2	14	17	30	37	51	2 1/2
581	1/16	—	1 3/4	4 1/2	6 1/2	9	10 1/2	12 1/2	16	19	33	42	56	2 1/2
587	1/8	1 1/2	2 1/2	3 1/2	4 3/4	8	12 1/2	17	—	—	—	—	—	2
702	1/8	2/3	1 1/4	2	3	5	7	9	11	14	20	25	34	3
733	1/8	1	1 3/4	3 1/4	4 1/2	6 1/2	9	11 1/2	14	17	23	30	37	2 1/2
750						Thermo-Pac—See page 53								
787	1/8	1	2	3	5	7	10	14	15	16	25	34	40	2 1/2
788	1/8	3/4	1 1/2	2 1/4	3 1/4	7 3/4	9	11	14	17	25	34	50	3
790						Groove Packing—See page 52								

FBW-220

Johns-Manville MECHANICAL PACKINGS (continued)

Approximate Weights—Pounds per 100 Feet

SIZES														
Style	Min. Size	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	Max. Size
857	1/8	3/4	1 1/2	2	3	6	7	8	11	15	19	27	36	3
866						Groove Packing—See page 52								
869	1/8	1	2	3	6	8	11	15	17	19	27	36	50	2 1/2
872						Groove Packing—See page 52								
873	1/8	1 1/2	2 1/4	3 1/4	7 3/4	11	14	17	21	25	34	50	66	2 1/2
1000						Thermo-Pac—See page 53								
1003G	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
1009A	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
1012M	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
1050R	1/4	—	—	4 1/2	7	10	14	18	21	24	32	46	65	1 3/8
2004	1/4	—	—	5 1/2	8 1/2	12	15 1/2	20	26	31	43 1/2	58	74	—
2005	—	—	—	—	9 1/3	11 3/4	12 1/4	23 1/2	—	—	—	—	—	—
2006	1/8	1 1/2	3 1/2	5 1/2	8 1/2	12 1/2	16 1/2	21 1/2	27	32 1/2	45	58 1/2	75	—
2007	—	—	—	—	10	15	22	27 1/2	—	—	—	—	—	—
2008	1/4	—	—	3 3/4	5 3/4	8	12	15	19	22	34	51	62	1 3/8
2009	1/4	—	—	4 1/3	7 1/2	10 1/4	14	17	21	25	35	56	68	1 3/8
2011	1/8	1	2	3 3/4	5 1/2	8	9 1/2	11	17	22	31	40	50	2 1/2
2012	1/8	1	2 1/4	4	6	9	13	16	21	26	35	45	55	2 1/2
2013	1/8	1	2	3 1/2	5	6 1/2	11	16	19	22	39	—	—	2 1/2
2014	1/8	1 1/2	3 1/2	6	8 3/4	11	15	18	21	24	30	—	—	2 1/2
2016	1/8	1	2	3 1/2	6	8	11	14	18	22	32	44	55	1 1/2
2017	1/8	1 1/2	3 1/4	3 3/4	6 1/2	8 3/4	12	16	21	25	37	49	59	2 1/2
2018	3/16	—	3	5	7	9 1/4	14	19	24	28	43	52	64	2
2020	1/8	1 1/2	2 1/2	3 3/4	6 1/2	8 3/4	11	14	19	24	32	48	58	2 1/2
2021	3/16	—	2 1/4	4	7	9 1/4	12	15	21	26	36	50	65	2
2022	3/16	—	—	19	23	35	40	46	60	75	102	135	165	1 1/4
2024	1/8	1	2 1/2	4 1/2	5 1/2	11	14 1/2	16	24	33	40	50	60	2 1/2
2031						Tape—See page 53								
2032						Tape—See page 53								
2035	1/8	1 3/4	2	3 3/4	6 1/2	8 3/4	11	14	19	24	32	48	58	2 1/2
2036	1/8	—	2 1/4	4	7	9 1/4	12	20	26	36	50	60	—	2
2300		2				Thermo-Pac—See page 53								
2559						Groove Packing—See page 52								
2700						Thermo-Pac—See page 53								
3123						Groove Packing—See page 52								
4180						Wick—See page 32								
4185	3/16	—	—	—	—	—	5	9	—	12	15 1/2	23	26 1/2	2
4186	3/16	—	—	—	—	—	5	9	—	12	15 1/2	23	26 1/2	2
4188*	1/4	—	—	2 1/2	—	5	—	8 1/2	—	12 1/2	16 1/2	—	31	2
4196	1/4	—	—	2 1/2	3/16 and up, see Thermo-Pac 500, page 53									2
4197					Wick—See page 32									
4198					Wick—See page 32									
4199					Wick—See page 32									
4200	1/4	—	—	2 3/4	3/16 and up, see Thermo-Pac 1000, page 53									2
4201					Packing Set—See page 27									
Blue					Thermo-Pac—See page 53									

* Style 4188 is also available in 1 1/4" (40 lbs.) and 1 1/2" (56 lbs.)

continued

FBW-221

RAMIE and FLAX

Approximate Weights—Pounds per 100 Feet

Style	Min. Size	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"	1 5/8"	1 3/4"	2"	Max. Size
		SIZES														
175	1/8	3	4 1/2	6 3/8	12	18	26	47	60	73	89	106	124	142	186	2
175N	1/8	3	4 1/2	6 3/4	12	18	26	47	60	73	89	106	124	142	186	2
180	1/8	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160	2
181	1/8	4	6	8	14	22	32	53	66	79	93	108	122	136	164	2
188	1/8	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160	2
189	1/8	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160	2
190	1/8	3 1/3	5 1/3	7 3/4	11 3/4	18	28	51	64	78	89	120	—	—	—	2
240	1/8	4	6	8	14	22	32	53	66	79	93	108	122	136	164	2
245	1/8	3 1/2	5 1/2	7 3/4	11 3/4	18	28	51	64	78	89	120	—	—	—	2

GROOVE PACKINGS—Square Cross-Section

Approximate Weights—Pounds per 100 Feet

Style	Min. Size	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	Max. Size
	SIZES									
*17	3/8	—	—	11	15	20	28	37	46	2
124	3/8	—	—	8	14	24	40	52	64	1
128				Rectangular Form Only						
129				Rectangular Form Only						
162				Special Molded Shapes						
163	3/8	—	—	11	16	25	36	52	62	1 1/2
164	3/8	—	—	11	16	25	36	52	62	1 1/2
165				Special Molded Shapes						
*176	1/4	4	6	8	13	21	31	43	56	2
*177	1/4	5	7	10	16	25	36	49	63	2
*216	1/4	—	—	9	19	28	37	48	65	2
*790	1/4	—	—	11	15	21	28	36	45	2
*866	1/4	3 3/4	4 1/2	8	15	23	30	38	51	2
*872	1/4	—	—	12	19	28	38	52	67	2
2559	1/8	6	7 1/2	12	25	50	100	—	—	3/4
3123	1/8	8 1/2	11	14 1/2	—	—	—	—	—	3/4

*When furnished in rectangular shape, width can be no greater than twice the thickness.

GROOVE PACKINGS—Rectangular Cross-Section

Approximate Weights—Pounds per 100 Feet

Style	3/8" x 1/2"	3/8" x 3/4"	1/2" x 5/8"	1/2" x 1"	5/8" x 3/4"	5/8" x 1 1/4"	3/4" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1" x 2"
	SIZES									
128	—	—	—	36	—	—	47	72	80	112
129	—	—	—	38	—	—	50	76	88	112
163	24	36	36	42	42	51	55	84	97	124
164	24	36	36	42	42	51	55	84	97	124

ASBESTOS CORD

Approximate Weights—Pounds per 100 Feet

Style	Min. Size	1/32"	1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	Max. Size
	SIZES										
274	1/32	—	.20	.72	1.47	2.33	3.03	5.56	8.35	11.11	1/2
276	1/16	—	.14	.54	.86	2.00	2.50	3.57	5.03	6.25	5/8
285	1/32	—	.20	.80	1.75	2.63	3.57	5.88	9.19	12.50	1/2
487	1/32	—	.20	.80	1.75	2.63	3.57	5.88	9.19	12.50	1/2

FBW-222

Johns-Manville MECHANICAL PACKINGS (continued)

GASKETING TAPES

Approximate Weights—Pounds per 100 Feet

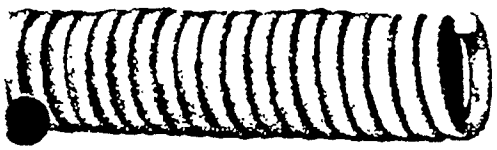
SIZES							
Style	Width (in.)	Thickness					Maximum Width
		1/16"	1/8"	3/16"	1/4"	5/16"	
119 120	½ 1 2 3	2¼ 4¼ 8¼ 13	5½ 10½ 20½ 31	7½ 14½ 29 43	10 22 43 60	12 25 49 75	24"
121	½ 1 2 3	1½ 3 5½ 9	4½ 8 15 24	6 12½ 25 38	8 17 33 50	9 18½ 37 56	24"
122	½ 1 2 3	½ 3 5 8	3 6 13 20	5 10½ 21 32	6½ 13 26 39	8 15½ 31 47	24"
131	1 2 3	2½ 5½ 8	6 12 18	— — —	— — —	— — —	3"
132	1 2 3	2 4½ 6½	5 10 15	— — —	— — —	— — —	3"
141 2031	½ 1 2 3	2 4 8 12	5½ 11 23 34	8 17 34 51	11 23 44 67	12 25 50 75	24"
142 2032	½ 1 2 3	1½ 3⅓ 6¾ 10	5⅓ 9½ 20 30	6¾ 14 28 43	8¾ 17 35 52	11 21 42 63	24"
Inconel		Sold on lineal foot basis only					

THERMO-PAC ROPE

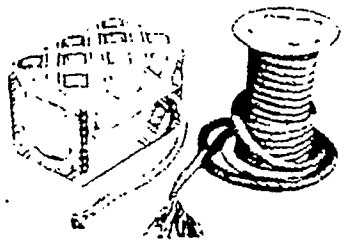
Approximate Weights—Pounds per 100 Feet

SIZES															
Style	1/8"	3/16"	1/4"	3/8"	7/16"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"
500	¾	1¼	1¾	4	7	10	14	20	25	33	40	50	67	93	114
750	—	—	1¾	4	7	10	12	15½	23	26½	30	38	53	59	77
1000	¾	1½	2½	5	7½	10	14'	20	25	33	40	45	67	93	114
2300	—	—	¾	2¼	—	3¼	5	7	9	15	—	19	26	36	45
2700	—	—	¾	2¼	—	3¼	5	7	9	15	—	19	26	36	45
Blue	—	—	⅔	6	—	10	16	20	27	33	40	45	67	93	114

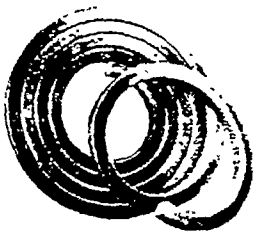
FBW-223



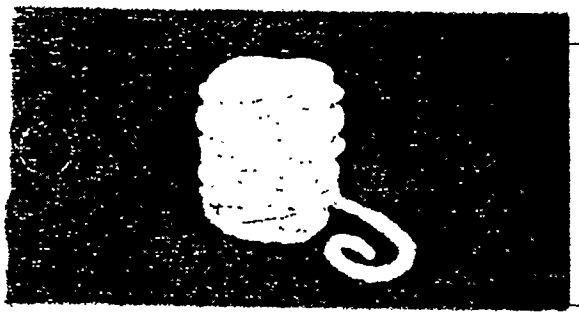
SPIRALS



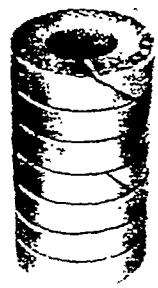
SPOOLS



FLAT COILS



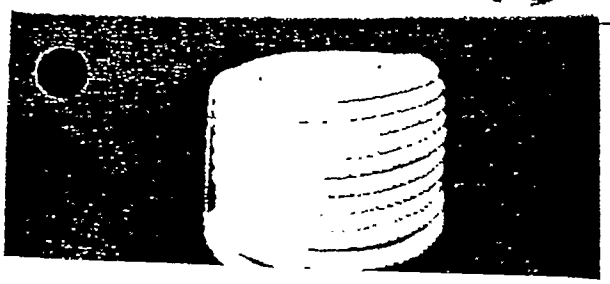
One pound
BALLS



SETS



RINGS



Twenty-five pound
BALLS

ALPHABETICAL INDEX OF J-M PACKING STYLES

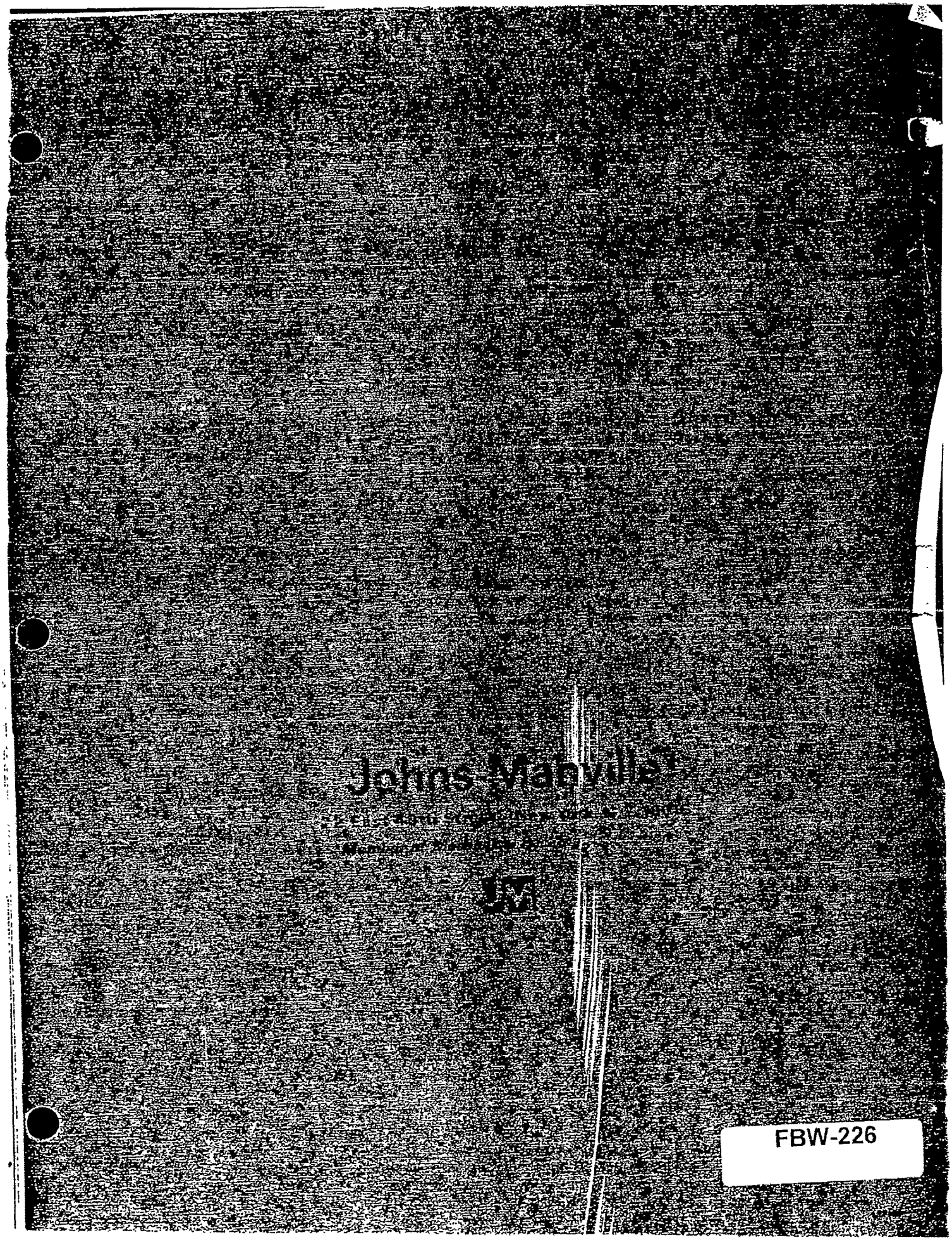
Aqua 25
Asbestos-Metallic 20
Autoclave 29
Besta-Monia 24
Besto-Tak 35
Braided 18
Centripac 12
Chempac 6
Conepac 26
Cord 39
Cross Diagonal 24
Cumpac 26
Defibrator 27
Die Formed Rings 42
Duck 24
Duro 24
Fabric 22
Flax 14
Flexible Metallic 20
Gasketing Tape 34
Groove 28
Hollow Core 23
Inconel 35
Interlocked 10
Jewett 19
Kearsarge 22
Loklube 8
Mechanical Seals 41
Mesh Core 27
Metallic 20
Mogul 18
Navalon 14
Piston 25
Plastic 12
Plastimatic 12
Rajah 17
Ramie 14
Rope—Braided 31
Rope—Twisted 30
Rubber & Duck 24
Sheet Packing 40
Sinbad 15
Special Sets 27
Steam Hammer 27
Superheat 22
Tadpole 36
Tape 34
Thermocore 16
Thermo-Pac 30
Twisted 39
Universal, Fabric 23
Universal, Piston 25
Wick 32

FBW-224

NUMERICAL INDEX OF J-M PACKING STYLES

Style	Page	Style	Page	Style	Page	Style	Page
2	17	165	29	323	19	2006	6
4	12	166	22	344	20	2007	7
6	17	167	22	350	13	2008	6
7	12	168	23	351	13	2009	6
10	19	171	24	360	20		
11	12	172	24	379	20	2011	6
13	19	175	14			2012	6
14	19	175N	14	391	21	2013	6
17	28	176	29	392	21	2014	7
18	13	177	29	393	21	2016	39
19	13	180	15	395	21	2017	19
33	25	181	15	397	17	2018	13
42	27	182	25	398	16		
45	27	188	15	399	17	2020	18
		189	15	487	39	2021	13
46	26	190	15	500	30	2022	13
55	19	191	37	535	33	2024	7
119	35	192	37	566	31	2031	35
120	34	193	39	580	31	2032	35
121	34	195	33	581	31	2035	19
122	34	216	28	587	7	2036	13
123	36	222	18	702	31	2300	30
124	29	223	18	733	31	2559	29
128	29	232	27	750	30	2700	30
129	29	236	26			3123	29
131	35	237	26	787	31	3869	27
132	35	240	15	788	31	4180	32
141	35	245	15	790	28	4185	33
142	35	253	11	857	31	4186	33
		254	11			4188	33
150	38	255	10	869	31	4196	33
151	38	257	11	872	28	4197	33
152	37	263	11	873	31	4198	33
153	37	270	11	1000	30	4199	33
154	37	271	24			4200	33
155	37	274	39	1003	9	4201	27
156	37	276	39	1009	9	Thermo-Pac	
157	37	280	20	1012	9	Blue	30
160	38	285	39	1050	9		
163	29	293	39	2004	7	Inconel	
164	29	322	19	2005	7	Tape	35

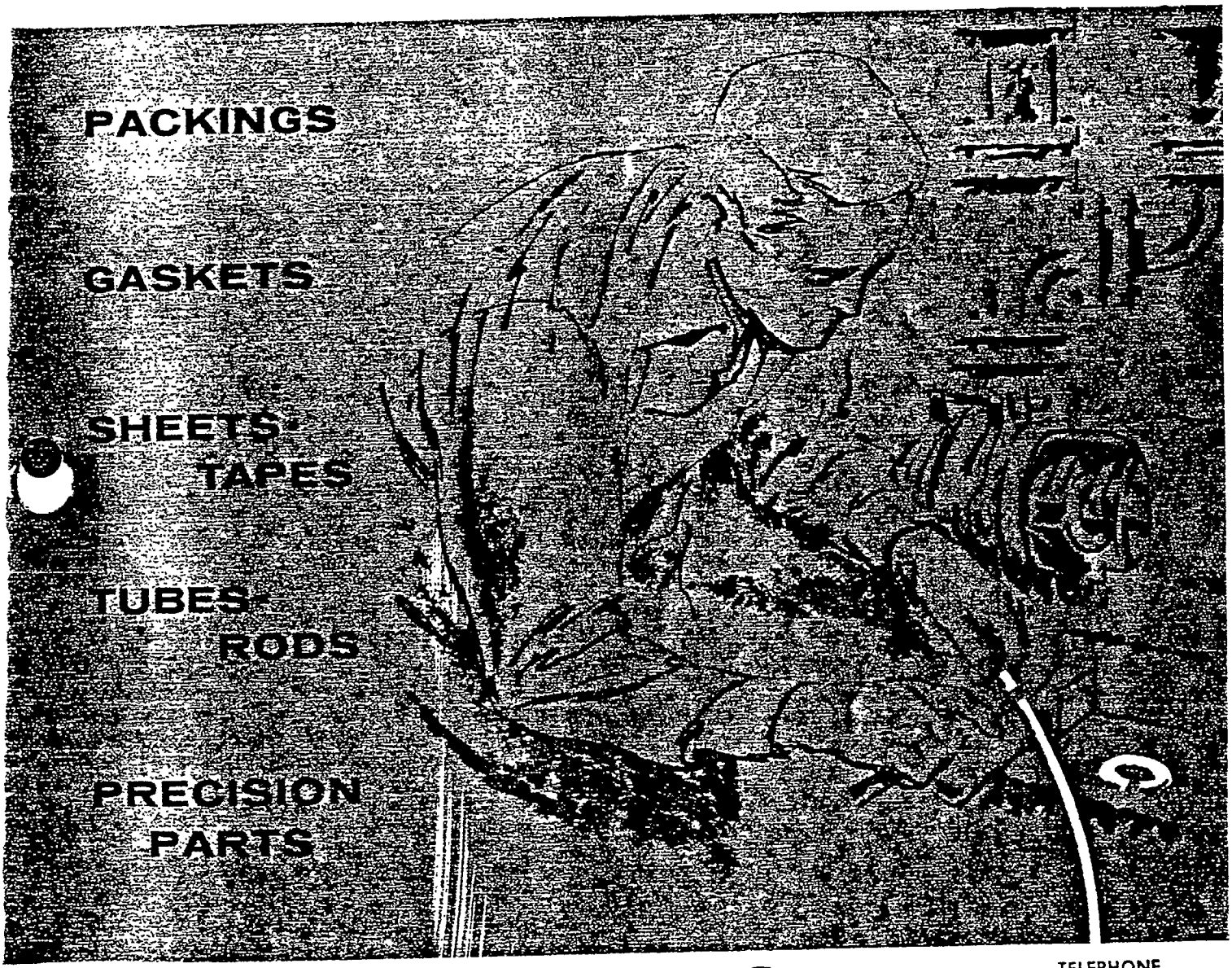
FBW-225


Johns-Manville
FBW-226

JOHNS-MANVILLE

CHEMPAC®

TFE* AND ASBESTOS-TFE



9999 Mercier Avenue
Dearborn, Michigan

F. B. Wright Company

TELEPHONE
VI. 3-8250

OUTSTANDING CHEMICAL, ELECTRICAL, MECHANICAL PROPERTIES

* Tetrafluorethylene — such as DuPont Teflon, Allied Chemical Halon and/or Imperial Chemical Industries Fluon.

FBW-227 THIRD PRINTING

Why the wide range of J-M Chempac TFE Products perform better, last longer in critical applications

Today, industry is using Johns-Manville Chempac* materials in constantly increasing quantities. Notable among the users are the producers of chemicals, petro-chemicals, petroleum products, plastic moulding powders, foods and munitions. They are serving in missiles, aircraft, automobiles, and in many electrical and electronic units.

This growing preference is due to the superior performance and longer life of these Johns-Manville chemical and solvent resisting packings and gaskets; efficient and durable sheets, tapes, tubes or parts moulded or machined to close tolerances.

Their outstanding advantages are obtained because Johns-Manville designs and constructs each Chempac product so that the inherent characteristics of the base material, TFE, are retained. This holds for both the pure TFE and the Asbestos-TFE forms.

J-M Chempac Asbestos-TFE Products are made with an impregnation of pure TFE suspensoid. The basic material is either Chrysotile (white) or Crocidolite (blue) Asbestos Fibre. This construction offers the excellent sealing and heat resistance of asbestos, plus the added protection of TFE against chemical and solvent action.

*Johns-Manville Trademark.



FBW-228

PRODUCT WARRANTY

J-M products are warranted free from defects in workmanship and raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of any Warranty, express or implied, is limited, at our sole option, to refund of the invoice value of our products, or to the replacement thereof F O B our plant or other shipping point, full freight allowed to prior destination.

CONTENTS

PURE TFE
Tape
Sheet
Gaskets
Cup Packings
Uneepac
O-Rings

TYPICAL PROPERTIES OF PURE TFE

1. Chemical Inertness. TFE is completely inert to the action of all chemicals and solvents except the molten alkali metals and fluorine at elevated temperatures and pressures.

2. Thermal Stability. TFE remains inert at temperatures from –300°F to 500°F.

3. Tough and Flexible. TFE retains its toughness and flexibility even at low temperatures.

4. Low Coefficient of Friction (0.04). This non-sticking property means less wear and longer life for packings as well as easy removal of gaskets from flanges.

5. Zero Moisture Absorption (ASTM 0.005%). Nonporous, TFE is immune to weathering.

6. Excellent Electrical Properties, as shown in the table below. Recommended working stresses are 50-100 vpm.

PROPERTY	UNITS	METHOD	
Tensile strength, 73°F.	lb./sq. in.	D638-52T	1500-3000
Elongation, 73°F.	%	D638-52T	100-200
Flexural strength, 73°F.	lb./sq. in.	D790-49T	did not break
Stiffness, 73°F.	lb./sq. in.	D747-50	50,000-90,000
Impact strength, Izod, –70°F.	ft.-lb./in.	D256-47T	2.0
73°F.	ft.-lb./in.	D256-47T	3.0
170°F.	ft.-lb./in.	D256-47T	6.0
Hardness, durometer		D676-49T	D55-D65
Compressive stress at 1% deformation, 73°F.	lb./sq. in.	D695-52T	600
at 1% offset, 73°F.	lb./sq. in.	D695-52T	1000
Coefficient of linear thermal expansion per °F., 77-140°F.		D696-44	5.5×10^{-5}
Thermal conductivity, 0.18 in.	Btu/hr./sq. ft./°F./in.	(1)	1.7
Specific heat	Btu/lb./°F.		0.25
Deformation under load, 122°F., 1200 lb./sq. in., 24 hrs.	%	D621-51	4-8
2000 lb./sq. in., 24 hrs.	%	D621-51	25
Dielectric strength, short-time, 0.080 in.	v/mil.	D149-44	400-500(2)
Surface arc-resistance	sec.	D495-48T	excellent (3)
Volume resistivity	ohm-cm.	D257-52T	$> 10^{15}$
Surface resistivity, 100% R.H.	megohms	D257-52T	3.6×10^{6}
Dielectric constant, 60 cycles		D150-54T	2.0
10^3 cycles		D150-54T	2.0
10^6 cycles		D150-54T	2.0
10^8 cycles		D150-54T	2.0
Power factor, 60 cycles		D150-54T	< 0.0003
10^3 cycles		D150-54T	0.0003
10^6 cycles		D150-54T	0.0003
10^8 cycles		D150-54T	0.0003
Water-absorption	%	D570-42	0.0
Flammability	in./min.	D635-44	nonflammable
Specific gravity		D792-50	2.0-2.2
Resistance to weathering			excellent (4)

FOOTNOTES . . .

Tests have been performed by A.S.T.M. methods unless otherwise indicated. Data shown are average values and should not be used for specifications.

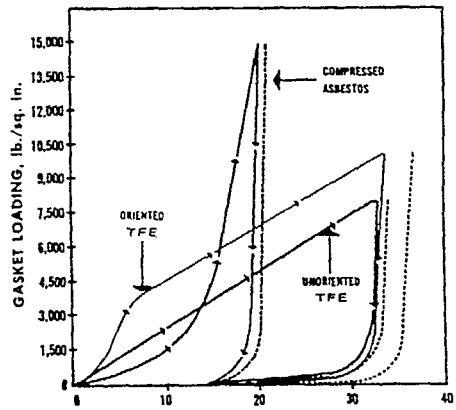
(1) Thermal conductivity measured by Cenco-Fitch apparatus.

(2) Value is 1000-2000 volts/mil in thicknesses of 5 to 12 mils.

(3) Does not track.

(4) No detectable change after 10 years of outdoor exposure in Florida.

COMPRESSION AND RECOVERY OF SOLID TFE VS. COMPRESSED ASBESTOS



(Broken lines show gasket recovery after re-application of initial full load)

COMPRESSED ASBESTOS 7¼" I.D., 8½" O.D., 0.113" Thick.

ORIENTED TFE 7¼" I.D., 8½" O.D., 0.134" Thick.

UNORIENTED TFE 7¼" I.D., 8½" O.D., 0.136" Thick.

(Compression of gaskets measured with dial indicators at four points on platens of tester.)

FBW-229

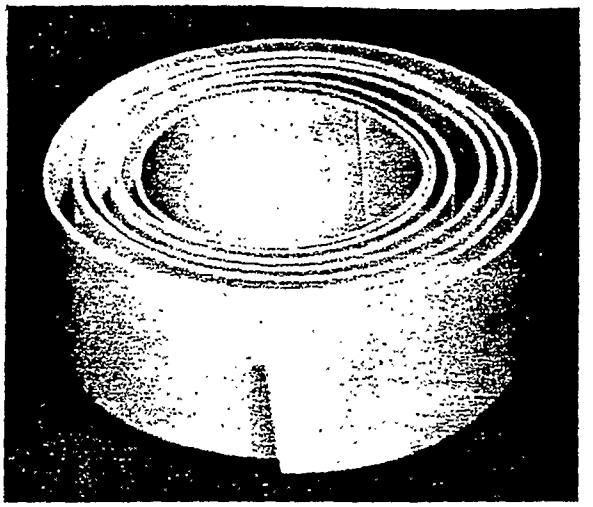
J-M Chempac Pure TFE Skived Tape

Johns-Manville Chempac Pure TFE Skived Tape has the unique combination of high chemical resistance, flexibility, excellent electrical insulating value, and the economical convenience of availability in coil form or in long lengths.

J-M Chempac Tape is skived from densely moulded billets of virgin TFE, using special high speed equipment which manufacturers tape that is uniformly dense, dimensionally accurate, tough and strong. This skive cutting method assures tape of smooth, uniform appearance and free from cracks, flaws and porosity.

Available in electrical, mechanical and general purpose grades, J-M Chempac Tape conforms readily to irregular objects. Physically strong, it can be economically applied by conventional wrapping machines.

Because of its high dielectric strength, J-M Chempac Skived Tape is recommended as cable wrapping and as insulation in electrical and electronic applications. Also, it is used as gasketing material and as linings for chutes and tanks in mechanical industries because of its resistance to high and low temperatures, its chemical, anti-shock, and low friction properties.



Chempac Tape is available in the sizes listed below. [illegible] 0.250"

POPULAR SIZES OF CHEMPAC TAPE

Popular Thicknesses*	Pure Chempac Tape Width ▶		Lo-Flo Chempac Tape Width ▶		Approximate Weight Pounds per Square Foot
	Minimum	Maximum	Minimum	Maximum	
0.003"	¼"	12"	—	—	0.036
0.004"	¼"	12"	—	—	0.048
0.005"	¼"	18"	—	—	0.06
0.010"	¼"	24"	1"	24"	0.12
0.015"	¼"	30"	1"	24"	0.18
0.020"	¼"	30"	1"	24"	0.24
0.031"	¼"	30"	1"	24"	0.37
0.062"	¼"	30"	1"	24"	0.74
0.093"	¼"	30"	1"	24"	1.1
0.125"	¼"	30"	1"	24"	1.5
0.250"	¼"	24"	—	—	3.0

▶ Widths 12" and over, in all thicknesses, are furnished untrimmed unless otherwise specified. Widths greater than 24" can be furnished to specification.

*THICKNESS TOLERANCES:

Thickness	Tolerance
0.003" thru 0.004"	±0.0005"
over 0.004"	±10%

▶ WIDTH TOLERANCES:

Thru 0.060"	+1/16", −.00"
0.061" thru 0.125"	+3/16", −.00"
0.126" and up	+1/2", −.00"

Widths 12" and over, all thicknesses, are furnished untrimmed unless specified.

LENGTH AND PACKAGING:

Chempac Tape is normally wrapped on 3" I.D. cores. 1½" I.D. and 2" I.D. cores are available upon request.

The standard pad or reel of Chempac tape is approximately 8½" in diameter.

Each pad or reel of Chempac may contain one or more lengths to make up the total length. Continuous lengths can be furnished on request. The maximum continuous length depends upon thickness.

SPECIFICATIONS:

When specified, Johns-Manville pure Chempac Tape can be furnished to comply with AMS 3651-B with the exception of the Dimensional Stability requirement (section 4.2.11).

CEMENTABLE TAPE:

Pure Chempac tape or Lo-Flo Chempac tape can be treated on one or two sides so that it can be cemented.

Cementable tape is available in same widths and thicknesses as shown in table above.

LO-FLO* CHEMPAC TAPES:

Lo-Flo* Chempac Tapes make use of a glass-filled TFE to offer greater resistance to abrasion and cold flow than pure TFE Tapes. The filler is milled glass fiber, approximately 25% by weight of the finished product. A distinctive blue color, which is inorganic and in no way affects the superior properties of Chempac, identifies Lo-Flo Chempac.

FBW-230

J-M Chempac Pure TFE Skived Sheet

Johns-Manville Pure TFE Skived Sheet is widely used in the chemical and process industries because it is inert and impervious to acids, alkalies, solvents, aggressive chemicals, reagents and other industrial materials. Each skived sheet has zero water absorption, and will not contaminate or be contaminated. Its wax-like surface resists adhesion and abrasion.

Like J-M Skived Tape, J-M Pure TFE Sheet is skived from densely moulded billets of virgin TFE, using special high speed equipment. The resultant sheet is uniformly dense, dimensionally accurate, tough and strong. Each sheet is assured a smooth and uniform appearance, and free from cracks, flaws and porosity.

J-M Skived Sheet is furnished in electrical and mechanical (both virgin TFE), and general purpose (reprocessed TFE) grades. Available in standard sizes 12″ x 12″, 12″ x 24″, 24″ x 24″, 24″ x 48″, 30″ x 30″; in thicknesses 1/32″ to ¼″. Continuous lengths of skived sheet are furnished to 160 feet in 1/32″ thickness; to 80 feet in 1/16″ thickness; to 41 feet in ⅛″ thickness; and to 22 feet in ¼″ thickness; to widths of 30″. Longer lengths of Skived Sheet are available upon request. For special requirements, J-M Pure TFE Skived Sheet can be cut to customer specification.

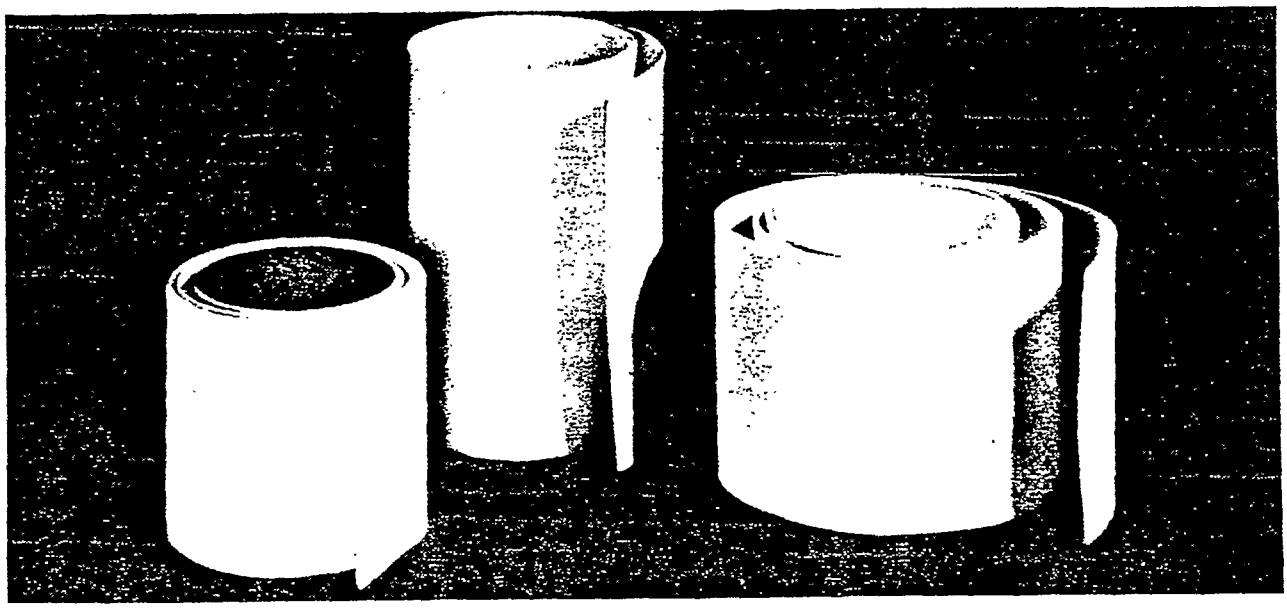
MOLDED SHEET

Johns-Manville Molded Sheet made of pure TFE is available to customer specification. Consult your J-M Representative.

CRYOL SHEET

Johns-Manville Cryol, a new specially fabricated glass-filled TFE Sheet, is designed for cryogenic service. Approved for this service by the Ballistics Systems Division of the U.S. Air Force.

J-M Cryol is available in standard 1/32, 1/16, 3/32 and ⅛-inch thicknesses, in long continuous lengths with widths up to 30 inches. Other thicknesses are available upon request.



J-M PIPE-PAC®

Pipe Dope in Convenient Tape Form. Designed for plant and home application, Johns-Manville Pipe-Pac offers an easy, economical method of getting cleaner, tighter, more permanent joints in threaded pipe.

Made of pure TFE, Pipe-Pac will withstand temperatures from minus 300°F to plus 500°F.

Pipe-Pac is recommended for jointing metal, plastics, ceramic, rubber and other pipe materials carrying air, oil, water, gas, steam, solvents, chemicals and corrosives. This tape will not cake or harden, and it will prevent freezing of the joint. When maintenance is required, Pipe-Pac allows easy disassembly.

Pocket-sized packs of Pipe-Pac are available in 240 and 480-inch rolls, ¼″ and ½″ widths. Other sizes available to order.



FBW-231

J-M Chempac TFE

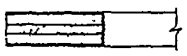
Johns-Manville Chempac TFE Envelope Style Gaskets are engineered specifically for glass-lined equipment. They are soft, conformable gaskets which effect a seal at low bolting. Designed to handle solvents and corrosives in the chemical field, they are also widely used in food processing and other lines where contamination must be avoided.

J-M Style 933 Gaskets have proved highly satisfactory against active chemicals and solvents. Each gasket has an envelope of pure electrical-grade TFE, either split or welded, for chemical resistance. Standard filler constructions are either Style 60 compressed Chrysotile asbestos (J-M Service Sheet) or corrugated metal (J-M Style 900) sandwiched between two sheets of Style 83 felted blue asbestos. These three layers provide longer life, outstanding corrosion and heat resistance, and the 'cushion' effect so desirable in glass-lined equipment. Cross-sections and descriptions of the two standard constructions and the three special constructions are shown on this and the following page.

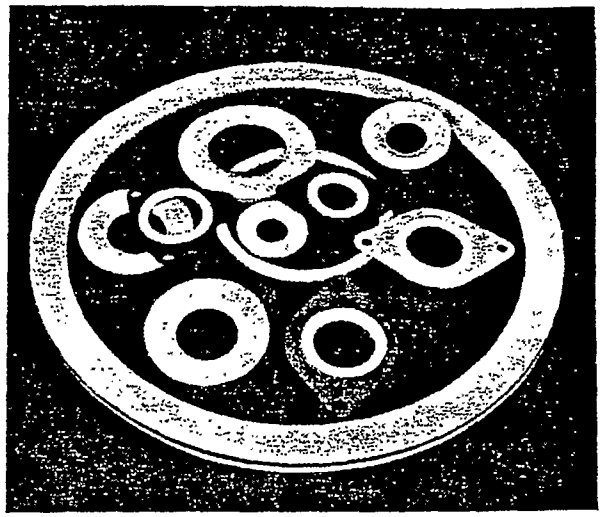
Three types of pure TFE envelopes are made up for Style 933 Gaskets. The gaskets—Type 'C' and Type 'M'—have envelopes machined from virgin TFE tube or rod stock. Type 'R' Gaskets have envelopes formed from virgin TFE tape. Prior to the machining of Type 'C' and Type 'M', two sample envelopes are slit from the TFE stock and spark tested. If these show any penetration, the entire tube or rod is rejected for envelope use. The normal spark test is 5,000 volts.

TYPE 'C', also referred to as the slit type, is the standard envelope construction for J-M 933 Gaskets. It is the most popular of the envelope types. Machined or sliced from virgin TFE stock, Type 'C' offers important economies and is readily available in a wide range of sizes. For illustration of Type 'C', see Standard Construction cross-sections on this page.

TYPE 'M' (also referred to as the milled, square shoulder or full flow type) envelopes are furnished for Style 933 Gaskets when unrestricted flow is required. Machined from virgin TFE stock with a square shoulder on the I.D. The space between the leafs of the envelope is determined by the thickness of the filler as illustrated.



TYPE 'R' is formed from virgin TFE tape to the required radius and heat sealed with an overlapped joint. This envelope type is generally used where the Style 933 Gasket I.D. exceeds 12 inches. It is formed to give a square shoulder effect on the I.D. When the filler is inserted, the I.D. of the filler and the I.D. of the envelope are brought together to eliminate any gap. For illustration of Type 'R', see Special Construction cross-sections on the following page.



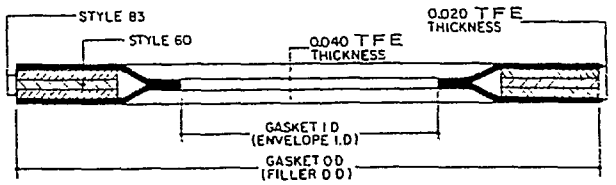
All envelopes for J-M 933 Envelope Style Gaskets are furnished with standard individual leaf thicknesses of .018 to .020 inches, in order to assure maximum protection against chemical as well as mechanical failure.

After the filler has been inserted into the TFE envelope, the J-M Style 933 Gasket is pressed, then taped to insure keeping it flat during shipment and storage, and making it easier to insert between the flanges during installation.

J-M Style 933 Envelope Style Gaskets are available from stock in pipe sizes ½" thru 12" as standard. Custom gaskets in various sizes and shapes with special fillers are available for specific requirements.

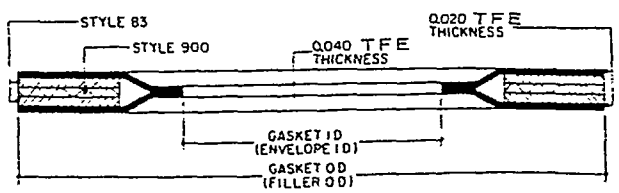
Standard Constructions—Type C

For 125 psi and 150 psi pressures*



Style No. 933-C-8360 *Split* TFE *Envelope.* Filler is one layer of Style No. 60 Service Sheet (compressed white chrysotile asbestos) between two layers of Style No. 83 Blue Acid Resisting Asbestos sheet.

For 250 psi and 300 psi pressure*

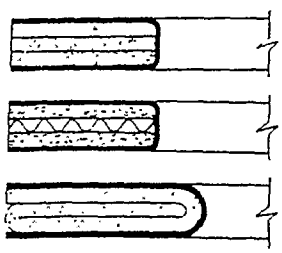


Style No. 933-C-8390 *Split* TFE *Envelope. Filler is a plain deeply corrugated metal* gasket (Style No. 900) between two sheets of compressed blue asbestos (Style No. 83).

* Available with Type "M" envelope

Envelope Gaskets

Special Constructions—Type R



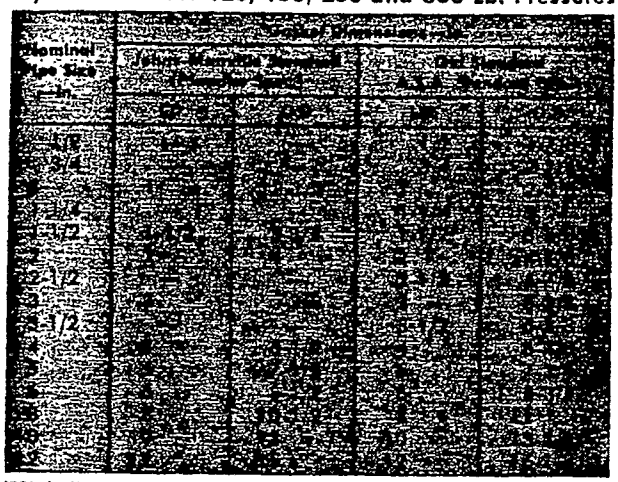
Style No. 933-R-8360 *Welded* TFE *Envelope.* Filler is one layer of Style No. 60 Service Sheet (compressed white chrysotile asbestos) between two layers of Style No. 83 Blue Acid Resisting Asbestos sheet.

Style No. 933-R-8390 *Welded* TFE *Envelope.* Filler is a plain deeply corrugated metal gasket (Style No. 900) between two sheets of compressed blue asbestos (Style No. 83).

Style 933-C or 933-R furnished upon application with other fillers such as folded woven asbestos cloth, plain or treated with TFE suspensaid.

AVAILABLE SIZES

Johns-Manville Standard Style 933 Chempac Envelope Style Gaskets for 125, 150, 250 and 300 Lb. Pressures

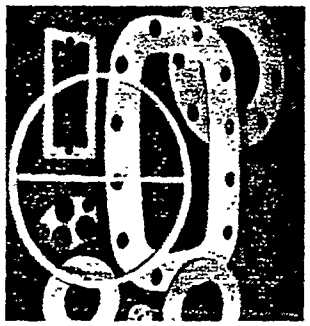


*TOTAL FILLER THICKNESS: For Style 933-C-8360 1/16" for all sizes.
For Style 933-C-8390 3/64" for 1/2" thru 1 1/2" nominal pipe sizes. Total filler thickness is 1/16" for all other pipe sizes shown.

NOTE: For nominal pipe sizes over 12" the use of Style 933-R-8360 or Style 933-R-8390 Welded TFE Envelope Style Gaskets are recommended. Gasket sizes depend on type of joint.

CUT GASKETS • SPECIAL SHAPES

Cut Gaskets and Special Shapes of Pure TFE, Cryol and Lo-Flo can be fabricated to custom specifications in all sizes. Consult your J-M Distributor for detailed information.

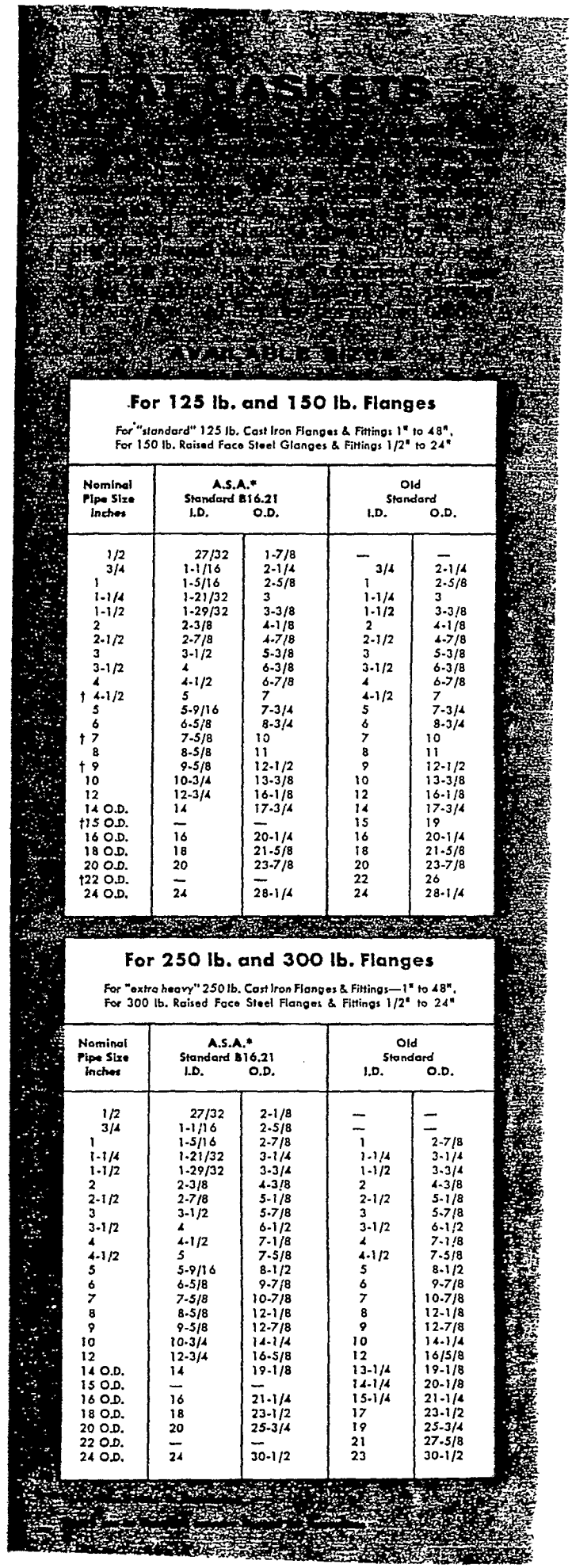


TFE NOZZLE ADAPTORS

Johns-Manville Style 933 M-8394 TFE Nozzle Adaptors provide a tight, safe seal wherever glass-coated steel or similar nozzels with large inside radii are joined to vessels of glass, porcelain, Haveg, Karbate, etc. Made of a combination of a steel bearing ring core, which provides rigidity; and resilient asbestos facings . . . sandwiched in a Type 'M' square shoulder TFE envelope.

PIPE SIZES — In	ADAPTOR SIZES — In.
1	15 16 x 2-1 2
1-1 2	1-7 16 x 3-3 8
2	1-15 16 x 4
3	2-15 16 x 5-1 2
4	3-15 16 x 6-1 2
6	5-15 16 x 8-1 2

FBW-233



For 125 lb. and 150 lb. Flanges

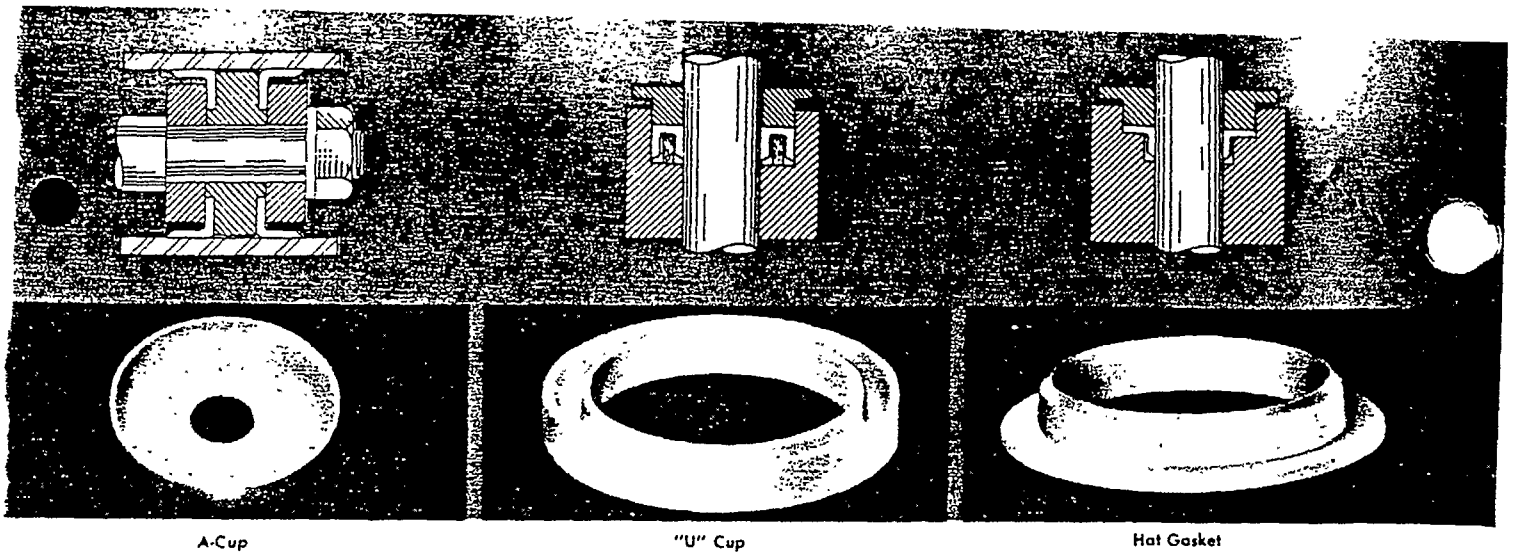
For "standard" 125 lb. Cast Iron Flanges & Fittings 1" to 48".
For 150 lb. Raised Face Steel Glanges & Fittings 1/2" to 24"

Nominal Pipe Size Inches	A.S.A.* Standard B16.21 I.D.	O.D.	Old Standard I.D.	O.D.
1/2	27/32	1-7/8	—	—
3/4	1-1/16	2-1/4	3/4	2-1/4
1	1-5/16	2-5/8	1	2-5/8
1-1/4	1-21/32	3	1-1/4	3
1-1/2	1-29/32	3-3/8	1-1/2	3-3/8
2	2-3/8	4-1/8	2	4-1/8
2-1/2	2-7/8	4-7/8	2-1/2	4-7/8
3	3-1/2	5-3/8	3	5-3/8
3-1/2	4	6-3/8	3-1/2	6-3/8
4	4-1/2	6-7/8	4	6-7/8
† 4-1/2	5	7	4-1/2	7
5	5-9/16	7-3/4	5	7-3/4
6	6-5/8	8-3/4	6	8-3/4
† 7	7-5/8	10	7	10
8	8-5/8	11	8	11
† 9	9-5/8	12-1/2	9	12-1/2
10	10-3/4	13-3/8	10	13-3/8
12	12-3/4	16-1/8	12	16-1/8
14 O.D.	14	17-3/4	14	17-3/4
†15 O.D.	—	—	15	19
16 O.D.	16	20-1/4	16	20-1/4
18 O.D.	18	21-5/8	18	21-5/8
20 O.D.	20	23-7/8	20	23-7/8
†22 O.D.	—	—	22	26
24 O.D.	24	28-1/4	24	28-1/4

For 250 lb. and 300 lb. Flanges

For "extra heavy" 250 lb. Cast Iron Flanges & Fittings—1" to 48".
For 300 lb. Raised Face Steel Flanges & Fittings 1/2" to 24"

Nominal Pipe Size Inches	A.S.A.* Standard B16.21 I.D.	O.D.	Old Standard I.D.	O.D.
1/2	27/32	2-1/8	—	—
3/4	1-1/16	2-5/8	—	—
1	1-5/16	2-7/8	1	2-7/8
1-1/4	1-21/32	3-1/4	1-1/4	3-1/4
1-1/2	1-29/32	3-3/4	1-1/2	3-3/4
2	2-3/8	4-3/8	2	4-3/8
2-1/2	2-7/8	5-1/8	2-1/2	5-1/8
3	3-1/2	5-7/8	3	5-7/8
3-1/2	4	6-1/2	3-1/2	6-1/2
4	4-1/2	7-1/8	4	7-1/8
4-1/2	5	7-5/8	4-1/2	7-5/8
5	5-9/16	8-1/2	5	8-1/2
6	6-5/8	9-7/8	6	9-7/8
7	7-5/8	10-7/8	7	10-7/8
8	8-5/8	12-1/8	8	12-1/8
9	9-5/8	12-7/8	9	12-7/8
10	10-3/4	14-1/4	10	14-1/4
12	12-3/4	16-5/8	12	16/5/8
14 O.D.	14	19-1/8	13-1/4	19-1/8
15 O.D.	—	—	14-1/4	20-1/8
16 O.D.	16	21-1/4	15-1/4	21-1/4
18 O.D.	18	23-1/2	17	23-1/2
20 O.D.	20	25-3/4	19	25-3/4
22 O.D.	—	—	21	27-5/8
24 O.D.	24	30-1/2	23	30-1/2



A-Cup "U" Cup Hat Gasket

J-M Chempac Cup Packings

Seal automatically, have high dimensional accuracy and stability

Where hydraulic packings are subjected to destructive action of corrosive or solvent fluids, Chempac Cup Packings are recommended. They are also used to seal against chemical solutions, aromatics, corrosive gases and other aggressive fluids.

Three standard cup packing designs are available machined from pure TFE, Lo-Flo Chempac or filled TFE as required. Piston, or "A" Cups are used on inside packed pistons. Their lip forms a tight seal under discharge pressure but relaxes on the reverse stroke to reduce wear and friction. For applications on pistons where low operational friction is necessary, "U" Cups are recommended.

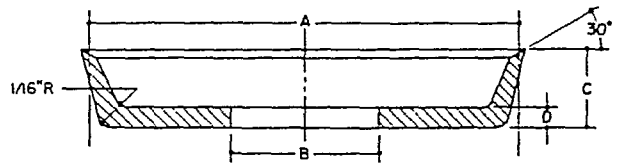
Hat Gaskets are intended for rod applications. The lips are designed with the proper interference fit to provide optimum sealing efficiency.

TYPE "A" CUPS

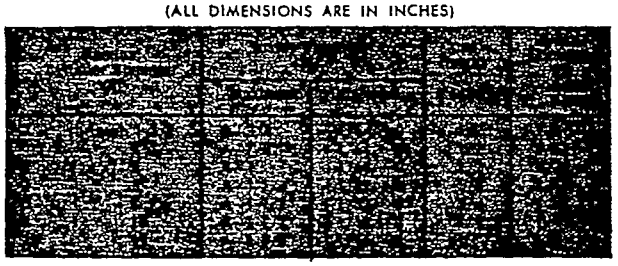
The Chempac Type "A" Packing Cup design features:

- A base thin enough to minimize cold flow yet thick enough to give the cup rigidity.
- A tapered lip which increases the sealing effectiveness of the cup and which yields, upon installation into the bore, without causing lip damage.
- A thick heel to provide increased material for longer cup life.
- Flared lips so the lip diameter has sufficient interference with the cylinder bore.

CHEMPAC TYPE "A" CUPS—STANDARD DESIGN



(ALL DIMENSIONS ARE IN INCHES)

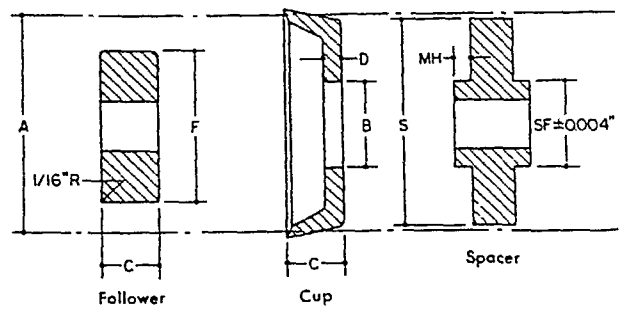


Chempac Type A Cups will always be furnished to the standard design unless otherwise specified. Other nominal dimensions are available upon application.

In event special cups are required, complete nominal dimensions with special tolerances, if necessary, should be forwarded along with the purchase order.

Installation:

A It is recommended that the spacer and follower be designed as indicated:



S = A −.010" +0.000"
MH = (D −0.005") −0.004"
F = See table in section E

B Inside diameter "B" is designed so the cup is properly centered and can be slipped, without force, over the projection "SF" on the spacer.

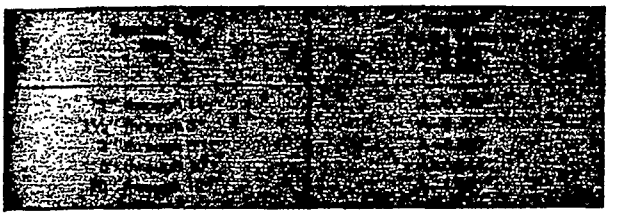
C Dimension "MH" should be machined to allow for sufficient compression of the packing cup base without causing the heel to be forced against the cylinder wall.

D The spacer diameter "S" must be a close fit to the cylinder wall to prohibit extrusion of the heel of the cup.

E The outside diameter, "F", of the follower is such that pinching of the cup lip against the cylinder wall is eliminated.

FBW-234

Follower diameters recommended for use with standard Chempac Type A packing cups:



F Cups can be furnished with equally spaced holes in the base where bolted piston assemblies are used. When bolt holes are required, the bolt circle and number and size of holes must be specified. Caution should be taken to properly and uniformly tighten the bolts.

Unless otherwise requested, the following tolerances will apply:



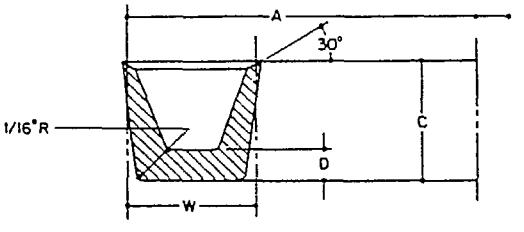
G A cylinder wall finish of 15-30 RMS is recommended.

TYPE "U" CUPS

The Chempac Type "U" Cup design features:

- Tapered lips to increase the sealing effectiveness of the Cup and with sufficient yield during installation to eliminate lip damage.
- A thick heel to provide increased material for longer Cup life and stability.
- Flared lips for sufficient initial interference.

CHEMPAC TYPE "U" CUPS—STANDARD DESIGN



(ALL DIMENSIONS ARE IN INCHES)



Chempac "U" Cups will always be furnished to the standard design unless otherwise specified. Other nominal dimensions available upon application.

In event special cups are required, complete nominal dimensions with special tolerances, if necessary, should be forwarded along with the purchase order.

Installation:

A Chempac Type "U" Cups can be used in those installations where standard U Cups were previously used; however, clearances should be held to a minimum to eliminate the possibility of extrusion under pressure.

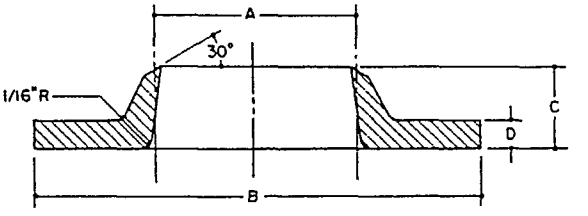
B Pedestal rings should be used to protect the TFE lips and to keep the "U" Cup in position.

HAT CUPS

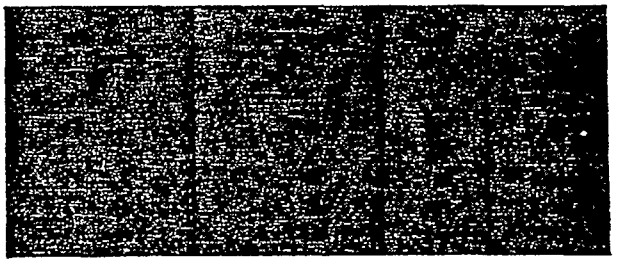
The Chempac Hat Cup design features:

- A base of proper thickness to adequately support the sealing lip and yet allow sufficient compression of the base to prevent leakage at that location.
- A tapered lip to increase the sealing effectiveness of the Cup and with sufficient yield during installation to eliminate lip damage.
- A thick heel to provide increased material for longer Hat Cup life.
- Flared lips so the lip diameter has sufficient interference with the shaft.

CHEMPAC HAT CUPS—STANDARD DESIGN



(ALL DIMENSIONS ARE IN INCHES)



Chempac Hat Cups will always be furnished to the standard design unless otherwise specified. Other nominal dimensions available upon application.

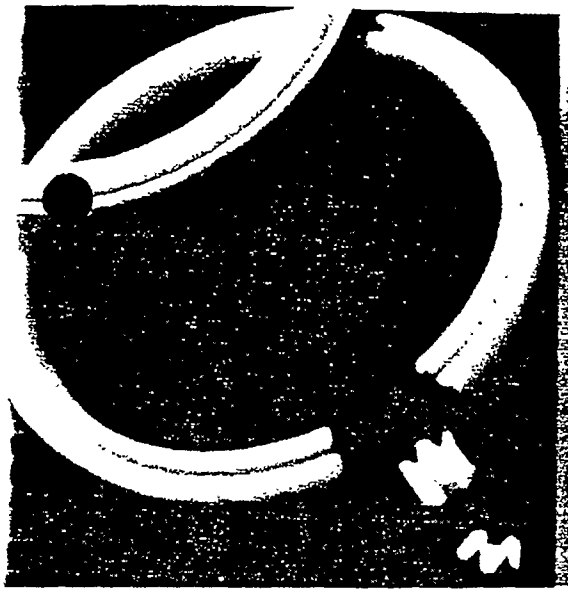
In event special Hat Cups are required, complete nominal dimensions with special tolerances, if necessary, should be forwarded along with the purchase order.

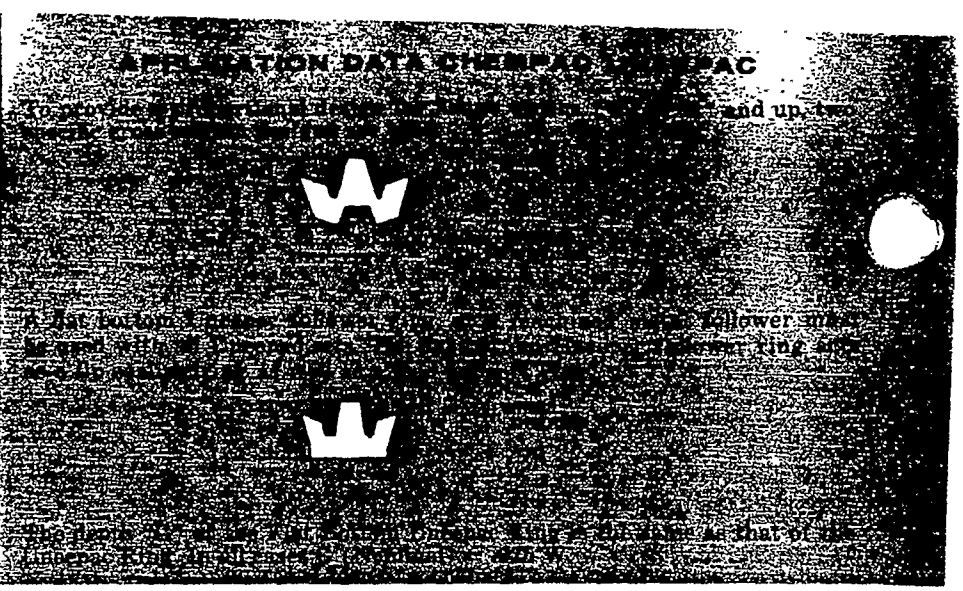
Installation:

A Sufficient clearance should be provided between the housing and the rod, so as to prevent binding of the Hat Cup lip.

B The outside diameter, (B), of the Hat Cup should not be a tight fit in the gland. The standard design of the Chempac Hat Cup is such that the outside diameter is at least 0.010" undersize.

FBW-235





J-M Chempac Uneepac® Packings

fully automatic packing elements for piston and rod applications

J-M Chempac Uneepac is a fully automatic ring packing for sealing reciprocating rods and pistons. Designed so that each ring is a complete packing unit, Uneepac provides high sealing efficiency with minimum packing depth. These pressure-actuated rings are self-centering and self-adjusting packings that seal against the most rugged conditions, even with minimum stuffing box depths.

Precision-made, Uneepac sets are easy to assemble, are quickly installed, fit accurately, reduce friction and give exceptionally long service.

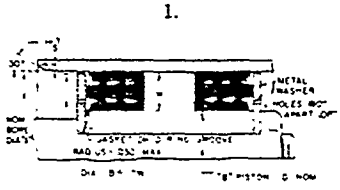
FLANGE WIDTH W (In.)	PACKING SPACE REQUIRED—D (In.) NO. RINGS PER SET*				RECOMMENDED NO. RINGS/SET FOR VARIOUS PRESSURE RANGES
	3	4	5	6	
1/4	0.392	0.504	0.616	0.727	
9/32	0.439	0.565	0.690	0.815	
5/16	0.486	0.625	0.764	0.903	
11/32	0.532	0.686	0.838	0.990	
3/8	0.579	0.746	0.912	1.078	PRESSURE PSI — NO. RINGS PER SET
13/32	0.626	0.807	0.987	1.166	0—500 — 3
7/16	0.673	0.868	1.061	1.254	500—2000 — 4
1/2	0.767	0.989	1.209	1.430	2000 AND UP — 5
9/16	0.884	1.138	1.391	1.644	
5/8	0.978	1.260	1.541	1.822	
11/16	1.073	1.382	1.691	1.999	
3/4	1.166	1.504	1.840	2.176	

*As per illustrations and explanations (1) and (2) below, "D" dimensions apply to the total number of moulded rings used.

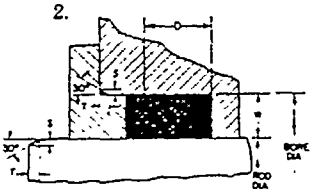
Uneepac designs having "W" dimensions other than shown, are available.

The cut away sectional sketches show a conventional piston application (1), and rod application (2), using Uneepac sets. Sketch (1) illustrates the number of rings including a flat bottom Uneepac ring and the "D" dimension applicable. Sketch (2) illustrates the number of rings as used with a machined follower and the points of measurement of the "D" dimension.

1.



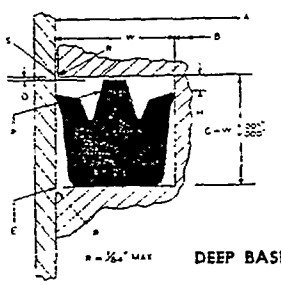
2.



J-M Chempac Deep Base Uneepac is a simplified single-ring version of the standard Uneepac design. It offers important economies in many light duty applications where space is not available for multiple-ring sets. They are excellent replacements for O-Rings or Army-Navy U-cups because they offer lower breakaway load, less friction and smooth dependable action.

The Chempac Deep Base Uneepac design features (see line drawing):

- The pedestal portion (P) keeps the ring positioned in the groove depth (C).
- The clearance (H) prevents the lip from being wedged into the piston-cylinder clearance at point (S).
- The pedestal (P) and the deep base section prevent upsetting and roll of the Deep Base Uneepac.
- The clearance (O) allows the ring to float in the groove.
- The heavy base section keeps the lip away from the extrusion wear point (E).



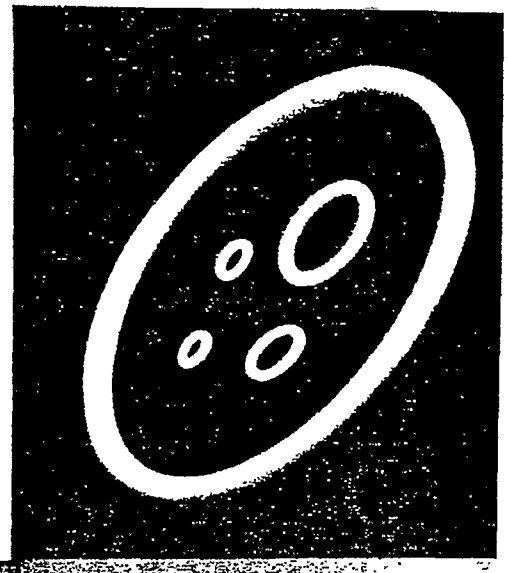
DEEP BASE UNEEPAC

RECOMMENDED BORE AND ROD CHAMFERS		
FLANGE WIDTH W—INS.	S INS.	T INS.
¼" through ½"	.040	.069
Over ½"	.070	.121

Johns-Manville Chempac Uneepac and Deep Base Uneepac are available moulded from Pure TFE, Lo-Flo Chempac or Filled TFE to suit requirements. Consult your J-M Distributor for details.

FBW-236

J-M Chempac "O" Rings

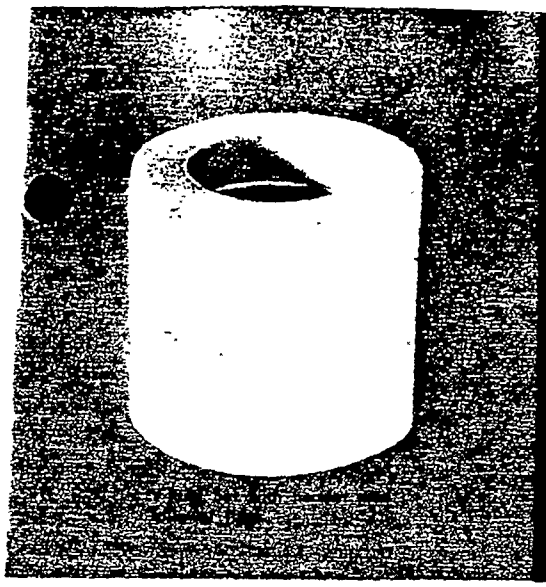


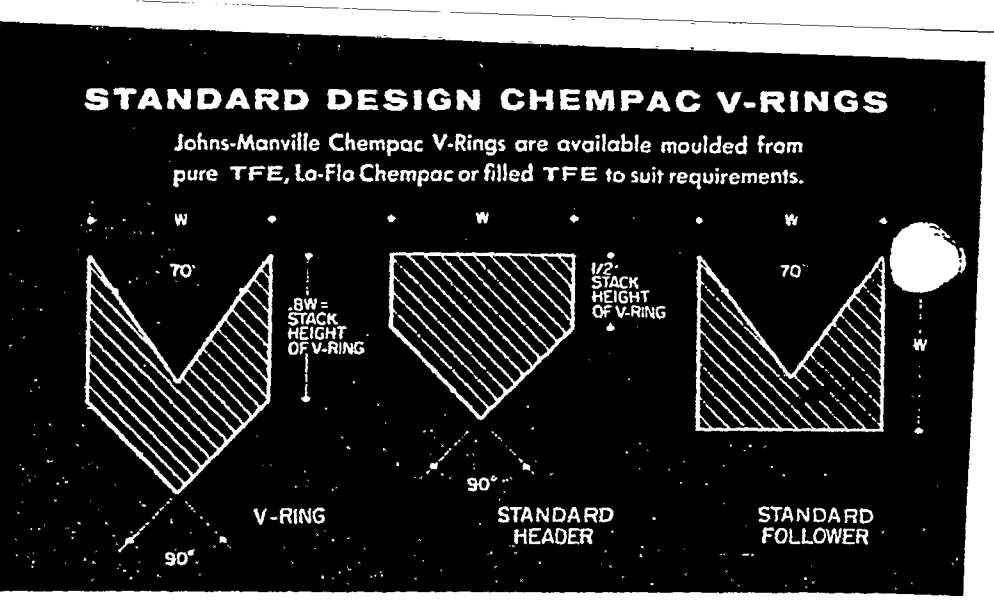
Chempac "O" Rings are fabricated to extremely close tolerances. The standard "O" rings conform in respect to military dimensional specifications or to customers dimensional requirements. Since they are made of solid TFE, "O" Rings are completely impervious to gases and liquids. A wide range of sizes is available based on the following standard government drawings:

AN-6227	MS-29512 (The sizes listed in this MS drawing are identical to AN-6290.)
AN-6230	
AN-6290	
AN-123856 thru AN-124034	MS-29513

AVAILABLE SIZES—CHEMPAC O-RINGS

NEW J-M SERIES 40 DASH NOS. J-M Equiv. To ARP 568 Uniform Dash Numbering System	SERIES DASH NO.	NOMINAL SIZE I.D.	NOMINAL SIZE O.D.	NOMINAL SIZE C.S. Diam.	ACTUAL SIZE W	ACTUAL SIZE I.D.
	AN6227 DASH NO.					
40-006	1	1/8	1/4	1/16	.070 ± .003	.114 ± .005
007	2	5/32	9/32	1/16	.070 ± .003	.145 ± .005
008	3	3/16	5/16	1/16	.070 ± .003	.176 ± .005
009	4	7/32	11/32	1/16	.070 ± .003	.208 ± .005
010	5	1/4	3/8	1/16	.070 ± .003	.239 ± .005
011	6	5/16	7/16	1/16	.070 ± .003	.301 ± .005
012	7	3/8	1/2	1/16	.070 ± .003	.364 ± .005
110	8	3/8	9/16	3/32	.103 ± .003	.362 ± .005
111	9	7/16	5/8	3/32	.103 ± .003	.424 ± .005
112	10	1/2	11/16	3/32	.103 ± .003	.487 ± .005
113	11	9/16	3/4	3/32	.103 ± .003	.549 ± .005
114	12	5/8	13/16	3/32	.103 ± .003	.612 ± .005
115	13	11/16	7/8	3/32	.103 ± .003	.674 ± .005
116	14	3/4	15/16	3/32	.103 ± .003	.737 ± .005
210	15	3/4	1	1/8	.139 ± .004	.734 ± .006
211	16	13/16	1-1/16	1/8	.139 ± .004	.796 ± .006
212	17	7/8	1-1/8	1/8	.139 ± .004	.859 ± .006
213	18	15/16	1-3/16	1/8	.139 ± .004	.921 ± .006
214	19	1	1-1/4	1/8	.139 ± .004	.984 ± .006
215	20	1-1/16	1-5/16	1/8	.139 ± .004	1.046 ± .006
216	21	1-1/8	1-3/8	1/8	.139 ± .004	1.109 ± .006
217	22	1-3/16	1-7/16	1/8	.139 ± .004	1.171 ± .006
218	23	1-1/4	1-1/2	1/8	.139 ± .004	1.234 ± .006
219	24	1-5/16	1-9/16	1/8	.139 ± .004	1.296 ± .006
220	25	1-3/8	1-5/8	1/8	.139 ± .004	1.359 ± .006
221	26	1-7/16	1-11/16	1/8	.139 ± .004	1.421 ± .006
222	27	1-1/2	1-3/4	1/8	.139 ± .004	1.484 ± .006
	AN6230 DASH NO.					
40-223	1	1-5/8	1-7/8	1/8	.139 ± .004	1.609 ± .010
224	2	1-3/4	2	1/8	.139 ± .004	1.734 ± .010
225	3	1-7/8	2-1/8	1/8	.139 ± .004	1.859 ± .010
226	4	2	2-1/4	1/8	.139 ± .004	1.984 ± .010
227	5	2-1/8	2-3/8	1/8	.139 ± .004	2.109 ± .010
228	6	2-1/4	2-1/2	1/8	.139 ± .004	2.234 ± .010
229	7	2-3/8	2-5/8	1/8	.139 ± .004	2.359 ± .010
230	8	2-1/2	2-3/4	1/8	.139 ± .004	2.484 ± .010
231	9	2-5/8	2-7/8	1/8	.139 ± .004	2.609 ± .010
232	10	2-3/4	3	1/8	.139 ± .004	2.734 ± .015
233	11	2-7/8	3-1/8	1/8	.139 ± .004	2.859 ± .015
234	12	3	3-1/4	1/8	.139 ± .004	2.984 ± .015
235	13	3-1/8	3-3/8	1/8	.139 ± .004	3.109 ± .015
236	14	3-1/4	3-1/2	1/8	.139 ± .004	3.234 ± .015
237	15	3-3/8	3-5/8	1/8	.139 ± .004	3.359 ± .015
238	16	3-1/2	3-3/4	1/8	.139 ± .004	3.484 ± .015
239	17	3-5/8	3-7/8	1/8	.139 ± .004	3.609 ± .015
240	18	3-3/4	4	1/8	.139 ± .004	3.734 ± .015
241	19	3-7/8	4-1/8	1/8	.139 ± .004	3.859 ± .015
242	20	4	4-1/4	1/8	.139 ± .004	3.984 ± .015
243	21	4-1/8	4-3/8	1/8	.139 ± .004	4.109 ± .015
244	22	4-1/4	4-1/2	1/8	.139 ± .004	4.234 ± .015
245	23	4-3/8	4-5/8	1/8	.139 ± .004	4.359 ± .015
246	24	4-1/2	4-3/4	1/8	.139 ± .004	4.484 ± .015
247	25	4-5/8	4-7/8	1/8	.139 ± .004	4.609 ± .015
248	26	4-3/4	5	1/8	.139 ± .004	4.734 ± .015
249	27	4-7/8	5-1/8	1/8	.139 ± .004	4.859 ± .015
250	28	5	5-1/4	1/8	.139 ± .004	4.984 ± .015
251	29	5-1/8	5-3/8	1/8	.139 ± .004	5.109 ± .023
252	30	5-1/4	5-1/2	1/8	.139 ± .004	5.234 ± .023
253	31	5-3/8	5-5/8	1/8	.139 ± .004	5.359 ± .023
254	32	5-1/2	5-3/4	1/8	.139 ± .004	5.484 ± .023
255	33	5-5/8	5-7/8	1/8	.139 ± .004	5.609 ± .023
256	34	5-3/4	6	1/8	.139 ± .004	5.734 ± .023
257	35	5-7/8	6-1/8	1/8	.139 ± .004	5.859 ± .023
258	36	6	6-1/4	1/8	.139 ± .004	5.964 ± .023
259	37	6-1/4	6-1/2	1/8	.139 ± .004	6.234 ± .023
260	38	6-1/2	6-3/4	1/8	.139 ± .004	6.484 ± .023
261	39	6-3/4	7	1/8	.139 ± .004	6.734 ± .023
262	40	7	7-1/4	1/8	.139 ± .004	6.984 ± .023
263	41	7-1/4	7-1/2	1/8	.139 ± .004	7.234 ± .030
264	42	7-1/2	7-3/4	1/8	.139 ± .004	7.484 ± .030
265	43	7-3/4	8	1/8	.139 ± .004	7.734 ± .030
266	44	8	8-1/4	1/8	.139 ± .004	7.984 ± .030
267	45	8-1/4	8-1/2	1/8	.139 ± .004	8.234 ± .030
268	46	8-1/2	8-3/4	1/8	.139 ± .004	8.484 ± .030
269	47	8-3/4	9	1/8	.139 ± .004	8.734 ± .030
270	48	9	9-1/4	1/8	.139 ± .004	8.984 ± .030
271	49	9-1/4	9-1/2	1/8	.139 ± .004	9.234 ± .030
272	50	9-1/2	9-3/4	1/8	.139 ± .004	9.484 ± .030
273	51	9-3/4	10	1/8	.139 ± .004	9.734 ± .030
274	52	10	10-1/4	1/8	.139 ± .004	9.984 ± .030
	AN6227 DASH NO.					
40-325	28	1-1/2	1-7/8	3/16	.210 ± .005	1.475 ± .010
326	29	1-5/8	2	3/16	.210 ± .005	1.600 ± .010
327	30	1-3/4	2-1/8	3/16	.210 ± .005	1.725 ± .010
328	31	1-7/8	2-1/4	3/16	.210 ± .005	1.850 ± .010
329	32	2	2-3/8	3/16	.210 ± .005	1.975 ± .010
330	33	2-1/8	2-1/2	3/16	.210 ± .005	2.100 ± .010
331	34	2-1/4	2-5/8	3/16	.210 ± .005	2.225 ± .010
332	35	2-3/8	2-3/4	3/16	.210 ± .005	2.350 ± .010
333	36	2-1/2	2-7/8	3/16	.210 ± .005	2.475 ± .010
334	37	2-5/8	3	3/16	.210 ± .005	2.600 ± .010
335	38	2-3/4	3-1/8	3/16	.210 ± .005	2.725 ± .015
336	39	2-7/8	3-1/4	3/16	.210 ± .005	2.850 ± .015
337	40	3	3-3/8	3/16	.210 ± .005	2.975 ± .015
338	41	3-1/8	3-1/2	3/16	.210 ± .005	3.100 ± .015
339	42	3-1/4	3-5/8	3/16	.210 ± .005	3.225 ± .015
340	43	3-3/8	3-3/4	3/16	.210 ± .005	3.350 ± .015
341	44	3-1/2	3-7/8	3/16	.210 ± .005	3.475 ± .015
342	45	3-5/8	4	3/16	.210 ± .005	3.600 ± .015
343	46	3-3/4	4-1/8	3/16	.210 ± .005	3.725 ± .015
344	47	3-7/8	4-1/4	3/16	.210 ± .005	3.850 ± .015
345	48	4	4-3/8	3/16	.210 ± .005	3.975 ± .015
346	49	4-1/8	4-1/2	3/16	.210 ± .005	4.100 ± .015
347	50	4-1/4	4-5/8	3/16	.210 ± .005	4.225 ± .015
348	51	4-3/8	4-3/4	3/16	.210 ± .005	4.350 ± .015
349	52	4-1/2	4-7/8	3/16	.210 ± .005	4.475 ± .015
426	53	4-5/8	5-1/8	1/4	.275 ± .006	4.600 ± .015
427	54	4-3/4	5-1/4	1/4	.275 ± .006	4.725 ± .015
428	55	4-7/8	5-3/8	1/4	.275 ± .006	4.850 ± .015
429	56	5	5-1/2	1/4	.275 ± .006	4.975 ± .015
430	57	5-1/8	5-5/8	1/4	.275 ± .006	5.100 ± .023
431	58	5-1/4	5-3/4	1/4	.275 ± .006	5.225 ± .023
432	59	5-3/8	5-7/8	1/4	.275 ± .006	5.350 ± .023
433	60	5-1/2	6	1/4	.275 ± .006	5.475 ± .023
434	61	5-5/8	6-1/8	1/4	.275 ± .006	5.600 ± .023
435	62	5-3/4	6-1/4	1/4	.275 ± .006	5.725 ± .023
436	63	5-7/8	6-3/8	1/4	.275 ± .006	5.850 ± .023
437	64	6	6-1/2	1/4	.275 ± .006	5.975 ± .023
438	65	6-1/4	6-3/4	1/4	.275 ± .006	6.225 ± .023
439	66	6-1/2	7	1/4	.275 ± .006	6.475 ± .023
440	67	6-3/4	7-1/4	1/4	.275 ± .006	6.725 ± .023
441	68	7	7-1/2	1/4	.275 ± .006	6.975 ± .023
442	69	7-1/4	7-3/4	1/4	.275 ± .006	7.225 ± .030
443	70	7-1/2	8	1/4	.275 ± .006	7.475 ± .030
444	71	7-3/4	8-1/4	1/4	.275 ± .006	7.725 ± .030
445	72	8	8-1/2	1/4	.275 ± .006	7.975 ± .030
446	73	8-1/2	9	1/4	.275 ± .006	8.475 ± .030
447	74	9	9-1/2	1/4	.275 ± .006	8.975 ± .030
448	75	9-1/2	10	1/4	.275 ± .006	9.475 ± .030
449	76	10	10-1/2	1/4	.275 ± .006	9.975 ± .030
450	77	10-1/2	11	1/4	.275 ± .006	10.475 ± .030
451	78	11	11-1/2	1/4	.275 ± .006	10.975 ± .030
452	79	11-1/2	12	1/4	.275 ± .006	11.475 ± .030
453	80	12	12-1/2	1/4	.275 ± .006	11.975 ± .030
454	81	12-1/2	13	1/4	.275 ± .006	12.475 ± .030
455	82	13	13-1/2	1/4	.275 ± .006	12.975 ± .030
456	83	13-1/2	14	1/4	.275 ± .006	13.475 ± .030
457	84	14	14-1/2	1/4	.275 ± .006	13.975 ± .030
458	85	14-1/2	15	1/4	.275 ± .006	14.475 ± .030
459	86	15	15-1/2	1/4	.275 ± .006	14.975 ± .030
460	87	15-1/2	16	1/4	.275 ± .006	15.475 ± .030
461	88	4-1/2	5	1/4	.275 ± .006	4.475 ± .015





J-M Chempac V-Rings

Made by a special process to a Johns-Manville Design, to assure superior performance as well as operational and dimensional stability

The design, manufacturing process and finishing methods employed in the production of these moulded TFE packings were developed at the Johns-Manville Research Center. The various tests employed show these packings to be markedly superior to the conventional TFE V-Rings.

This design is unique in principle and simple in cross-section. It provides a maximum of lip flare under gland pressure, allowing gland take up to be more effective and providing compensation for lip wear. Followers are designed to act as additional sealing rings. This is of particular importance when packings must be installed in shallow stuffing boxes.

J-M processing and fabricating techniques assure minimum internal stresses and maximum operational and dimensional stability in service. Chempac V-Rings can be moulded to any practicable dimensional requirement. All the immunity to chemical and solvent action for which TFE is noted is displayed in the finished J-M Chempac V-Ring.

DESIGN FEATURES:

1. Parts are molded so as to produce a minimum of clearance between the I.D. and the rod and between the O.D. and the bore, permitting sets to be installed easily without force.
2. A 20° difference between the angles of the parts making up the set forces the lips of the V-Rings and the follower against rod and bore when gland pressure is applied. As a result, the packing will function under zero pressure as well as full load.
3. The lip of the V-Rings and the follower are molded to as sharp an edge as possible.
4. The standard Stack Height of the V-Ring is 0.8W where W is the nominal flange width in inches.
5. The standard Stack Height of the header is ½ of the Stack Height of the V-Ring.
6. The standard Stack Height of the follower is equal to the nominal flange width, W, in inches.
7. Unless otherwise specified, flat bottom headers and followers will be furnished. Headers and followers having standard 30° bevels or special bevels can be furnished upon application. A drawing should be attached to the order so as to clarify any special dimensions or tolerances.

Specially designed V-Ring sets can be furnished upon request. A drawing showing all of the required part dimensions should be included with the order.

RANGES	
	Follower*
	1
	1
	1
	1

*When metal followers are used, increase number of V-Rings by one.

FBW-238

Available Sizes

Standard Custom Chrome

Standard Metric Material

I.D.	O.D.	Stack Height (Inches)
1/8"	3/8"	.1
	7/16	.12
	1/2	.15
	9/16	.17
	3/4	.25
	7/8	.30
3/16"	7/16"	.1
	1/2	.12
	9/16	.15
	5/8	.17
.240	.450	.08
1/4"	1/2"	.1
	5/8	.12
	5/8	.15
	11/16	.17
	3/4	.20
	7/8	.25
	1	.3
.252	.456	.08
.281	.436	.06
.295	.469	.06
.300	.500	.08
5/16"	15/32"	.06
	9/16	.1
	19/32	.11
	39/64	.11
	5/8	.12
	21/32	.14
	11/16	.15
	3/4	.17
	13/16	.2
	7/8	.22
	1 1/8	.32
.350	.550	.08
.359	.534	.06
3/8"	5/8"	.1
	.640	.10
	21/32	.11
	11/16	.12
	3/4	.15
	13/16	.17
	7/8	.2
	1	.25

I.D.	O.D.	Stack Height (Inches)
25/64"	9/16	.06
	11/16	.11
27/64"	4/64	.08
.403	.590	.07
.405	.658	.10
.436	.760	.12
7/16"	21/32	.08
	11/16"	.1
	45/64	.10
	23/32	.11
	3/4	.12
	13/16	.15
	7/8	.17
	15/16	.2
	1	.22
	1 1/16	.25
	1 1/8"	.27
	1 9/64	.28
	1 3/16	.300
.450	.650	.08
.451	.687	.09
.483	.803	.12
.492	.747	.10
.498	.786	.11
.499	.892	.15
15/32"	7/8	.16
1/2"	3/4"	.1
	25/32	.11
	13/16	.12
	7/8	.15
	15/16	.17
	1	.2
	1 1/16	.22
	1 1/8	.25
	1 1/4	.30
.528	.881	.14

I.D.	O.D.	Stack Height (Inches)
17/32"	15/16	.16
	1 1/32	.2
.540	1	.18
.547	.765	.08
35/64"	7/8	.13
9/16"	3/4"	.07
	13/16"	.1
	27/32	.11
	7/8	.12
	15/16	.15
	1	.17
	1 1/16	.2
	1 1/8	.22
	1 3/16	.25
.581	.813	.09
.591	.984	.15
.600	.970	.14
.600	1.00	.16
5/8"	7/8"	.1
	15/16	.12
	1	.15
	1 3/64	.16
	1 1/16	.17
	1 1/8	.2
	1 5/32	.21
	1 3/16	.22
	1 1/4	.25
	1 5/16	.27
	1 3/8	.30
21/32"	1	.13
	1 1/8	.18
.660	1.051	.15
.673	1.018	.13
11/16"	15/16"	.1
	1	.12
	1 1/16	.15
	1 1/8	.17
	1 3/16	.2
	1 1/4	.22
	1 5/16	.25
.703	1.062	.14
3/4"	.950	.08
	1"	.1
	1 1/16	.12
	1 1/8	.15
	1 3/16	.17
	1 1/4	.2
	1 5/32	.21
	1 5/16	.22
	1 3/8	.25
	1 7/16	.27
	1 1/2	.3
	1 9/16	.32
13/16"	1 1/16"	.1
	1 1/8	.12
	1 3/16	.15
	1 1/4	.17
	1 5/16	.2
	1 11/32	.21
	1 3/8	.22
	1 7/16	.25
	1 1/2	.30
	1 11/16	.35

I.D.	O.D.	Stack Height (Inches)
7/8"	1 1/8"	.1
	1 3/16	.12
	1 1/4	.15
	1 5/16	.17
	1 3/8	.2
	1 7/16	.22
	1 15/32	.23
	1 1/2	.25
	1 9/16	.27
	1 5/8	.30
	1 3/4	.34
.904	1.500	.23
15/16"	1 3/16"	.1
	1 1/4	.12
	1 5/16	.15
	1 3/8	.17
	1 7/16	.2
	1 1/2	.22
	1 5/8	.27
1"	1 1/4"	.1
	1 5/16	.12
	1 3/8	.15
	1 7/16	.17
	1 1/2	.2
	1 17/32	.21
	1 5/8	.25
	1 23/32	.28
	1 3/4	.3
	2 1/8	.45
1 1/16"	1 7/16	.14
	1 11/16	.24
	1 13/16"	.25
1.102	1.575	.18
1 1/8"	1 3/8"	.1
	1 7/16	.12
	1 1/2	.15
	1 9/16	.17
	1 5/8	.2
	1 3/4	.25
	1 7/8	.3
	2	.35
1.180	1 13/16	.65
1 3/16"	1 5/8	.17
	1 7/8	.27
	1 15/16	.30
	2	.32
1 7/32"	1 15/16	.28
1 1/4"	1 1/2"	.1
	1 5/8	.15
	1 11/16	.17
	1 3/4	.2
	1 7/8	.25
	2	.3
	2 1/8	.35
	2 1/4	.4
1 5/16"	1 13/16"	.2
1.370	1.895	.20
	2.031	.26

I.D.	O.D.	Stack Height (Inches)
1 3/8"	1 5/8"	.1
	1 3/4	.15
	1 7/8	.2
	2	.25
	2 1/8	.3
	2 1/4	.35
	2 5/16	.37
	2 3/8	.4
	2.495	.44
	2 17/32	.46
1 7/16"	2 3/16	.30
1.475	2.48	.40
1 1/2"	1 3/4"	.1
	1 7/8	.15
	2	.2
	2 1/8	.25
	2 1/4	.3
	2 3/8	.35
	2 1/2	.4
	2 3/4	.10
1 9/16"	2 13/16	.50
1.582	2.082	.20
1 5/8"	1 7/8"	.1
	2	.15
	2 1/8	.2
	2 1/4	.25
	2 3/8	.3
	2 1/2	.35
	2 5/8	.4
1 11/16"	2 3/16"	.2
	2 11/16	.40
1.745	2.284	.21
1 3/4"	2"	.1
	2 1/8	.15
	2 1/4	.2
	2 5/16	.22
	2 3/8	.25
	2 1/2	.3
	2 5/8	.35
	2 3/4	.4
	2 7/8	.44
1 7/8"	2 1/8"	.1
	2 1/4	.15
	2 3/8	.2
	2 1/2	.25
	2 5/8	.3
	2 3/4	.35
	2 7/8	.4
1 15/16"	2 11/16	.30
2"	2 1/4"	.1
	2 3/8	.15
	2 1/2	.2
	2 5/8	.25
	2 3/4	.3
	2 7/8	.35
	3	.4
	3 1/32	.4
	3 3/8	.54
2 1/8"	2 3/8"	.1
	2 1/2	.15
	2 5/8	.2
	2 3/4	.25
	2 7/8	.3
	3	.35
	3 1/8	.4

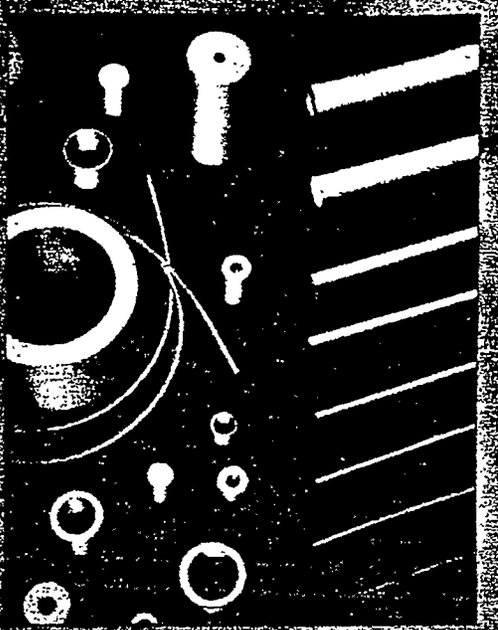
I.D.	O.D.	Stack Height (Inches)
2 1/4"	2 1/2"	.1
	2 5/8	.15
	2 3/4	.2
	2 7/8	.25
	3	.3
	3 1/8	.35
	3 1/4	.4
2 3/8"	2 5/8"	.1
	2 3/4	.15
	2 7/8	.2
	3	.25
	3 1/8	.3
	3 1/4	.35
	3 3/8	.4
2 13/32"	2 29/32	.20
2 7/16"	2 15/16	.20
	3 3/8	.37
2 1/2"	2 3/4"	.1
	2 7/8	.15
	3	.2
	3 1/8	.25
	3 3/16	.27
	3 1/4	.3
	3 3/8	.35
	3 1/2	.4
2 3/4"	3 1/2	.30
	3 3/4"	.4
	4	.50
3"	3 1/2	.20
	3 3/4"	.3
	3 7/8"	.30
	4	.40
	4 1/2	.60
3 1/4"	4"	.30
	4 1/8"	.35
	4 1/4	.40
	4 1/2	.50
3 1/2"	4 1/4	.30
	4 1/2"	.40
3.740	4.495	.30
4"	5	.40
	5 1/2	.60
4 3/8"	5 1/8"	.3
4 7/16	5 3/16	.30
4 1/2"	5 1/2"	.40
	5 3/4	.50
5"	6"	.40
	6 1/4	.50
6 5/8"	8 1/8	.20
7"	8	.40

TOLERANCES

Standard stock
be furnished
Up to
I.D.
O.D.
Over
Stock
I.D.
O.D.
Over
Stock
I.D.
O.D.
Special

FBW-239

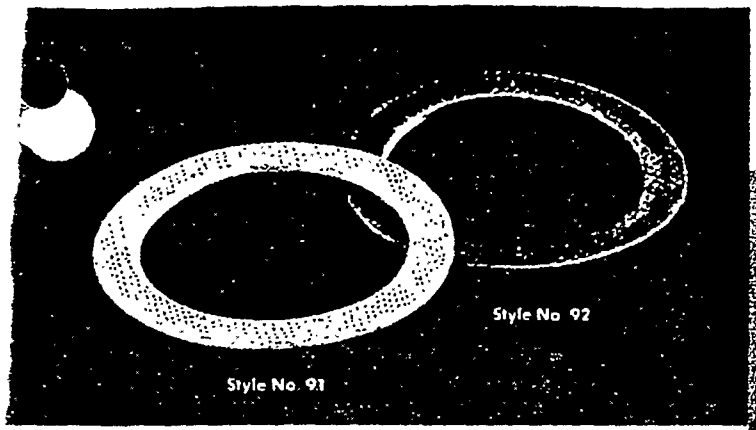
J-M Chempac Molded Rod and Tube

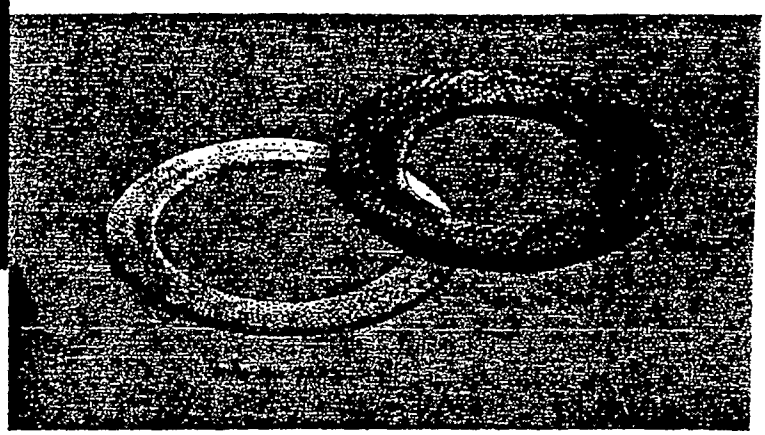


AVAILABLE SIZES MOLDED CHEMPAC TFE ROD	
NOMINAL ROD SIZE	APPROX. LBS/FT
1	.785
1½	2.07
1¾	2.76
2	3.54
2¼	3.97
2⅜	4.9
2½	5.41
*2⅞	7.06
3	7.068
3⅛	7.7
3¼	9.0
3½	11.04
4	14.18
4½	17.72
5	21.64
5½	26.0
5¾	28.87
***5⅞	29.46
** 6	30.68
6¼	31.919
7	41.28
** 8	50.4

AVAILABLE SIZES MOLDED CHEMPAC TFE TUBE							
NOMINAL TUBE SIZE	APPROX. LBS/FT	NOMINAL TUBE SIZE	APPROX. LBS/FT	NOMINAL TUBE SIZE	APPROX. LBS/FT	NOMINAL TUBE SIZE	APPROX. LBS/FT
¾x2	3.1	1¾x4⅛	11.4	3x5½	18.89	5¼x7½	17.07
⅞x1¾	1.8	1⅞x2¾	3.17	3x6½	29.3	5⅜x8½	33.0
1⅝x1¾	1.9	1 1⅜x2¾	2.99	3¼x3¾	5.5	**5¾x8⅜	38.28
1x2	2.9	2x3	5.15	3¼x4½	6.73	6x7½	18.9
1x2½	4.7	2x3½	7.9	3½x5	13.35	6x7¾	21.99
1x2⅜	5.2	2x4¼	11.89	3⅜x4¼	6.08	**6x8¼	28.5
1x3	7.6	2x4½	14.58	3⅜x4½	8.78	6¼x7¾	17.1
1x3½	10.35	2x5¼	21.0	****3¾x5¼	14.8	6½x8	17.08
1x4	13.5	2⅛x2⅜	1.86	3¾x5¾	20.52	**6½x8¼	23.56
1⅛x2½	4.5	2⅛x3	3.86	3¾x7½	38.22	6½x9¾	45.3
1⅜x2¼	2.86	2⅜x3½	6.6	3½x6¼	21.06	6½x11¼	75.247
1⅜x2½	4.3	2¾x4¾	15.2	3 1⅜x5½	13.07	**7¼x8¼	15.46
*1⅜x2⅞	5 96	**2⅝x6	26.2	3⅞x7½	35.38	**7¼x8½	15.53
1⅜x3	5.96	2¾x3¼	3.12	3 1⅝x5½	11.58	**7¼x8¾	24.1
1⅜x4¼	13.9	2⅝x4¼	9.62	4x5	9.855	**7¾x10½	39.41
1¾x3¼	7.46	2¾x4¼	9.1	4x6½	23.992	7¾x10¼	35.34
1⅞x2¼	2.49	2¾x4½	11.78	4⅛x5	9.08	7¾x14½	123.5
1⅞x2¼	3.0	2¾x4¾	13.7	**4¾x6½	20.62	**7⅞x11	46.32
1½x2½	3.64	2⅞x4	6.07	4⅞x7¾	30.6	*8x9¼	30.25
1½x2¾	5.3	****2⅞x5¼	15.15	**4 1⅜x7⅞	26.51	**8x10¼	44.76
1½x3¼	7.18	2⅞x5½	17.26	5x5⅞	9.83	**8x11¼	58.16
1½x3⅜	9.27	3x4	7.11	5x6½	16.1	**8⅛x10½	24.72
1½x4¼	13.2	3x4¼	7.96	5x7½	27.33	**9x11¼	44.81
1 1⅜x2¼	1.31	3x4½	10.66	5 1⅛x7½	18.77	10x13	54.19
1¼x3¼	6.6	3x4¾	12.56	**5⅜x6¾	12.51	**12x14½	60.68
1⅜x3	5.53	****3x5¼	16.68	**5¼x7	15.3		

CODE: * 4" MAX LENGTH, ** 6" MAX LENGTH, *** 7" MAX LENGTH, **** 11" MAX LENGTH





J-M Asbestos-TFE

Sheet Packing and Gaskets

High Density for conventional metal flanges

These sheet and cut gaskets are designed for use on conventional metal flanges where strong solvents, caustics and acids must be contained. The base material is asbestos impregnated with TFE. This Johns-Manville construction affords higher mechanical strength and heat resistance than TFE alone. It is recommended for applications where conventional metal flanges are employed.

These unique high density, low porosity gaskets are made by plying together layers of asbestos cloth that is protected with TFE suspensoid. The resulting products have high sealability at low bolt stresses and withstand a wide range of temperatures and fluid pressures. Maximum sheet size available is 40″ x 40″. Nominal thickness is 3/32″. Minimum thickness furnished is .084″ ± .010.

J-M Chempac Style No. 91 for solvent and caustic service: White Chrysotile asbestos cloth treated with TFE suspensoid. Excellent for Liquid Oxygen (LOX) and Cryogenic service.

J-M Chempac Style No. 92 for acid service: Inherently acid-resisting blue Crocidolite asbestos cloth treated with TFE suspensoid. Excellent for corrosive Cryogenic service.

Folded Gaskets for lightly bolted uneven flanges

Chempac Gaskets, Style Nos. 117 and 138, were developed particularly for applications where a highly conformable, soft gasket must be used. Although they do not have the sealing effectiveness of Chempac Style No. 933, these gaskets will contain a wide range of aggressive fluids in installations for which they are properly specified.

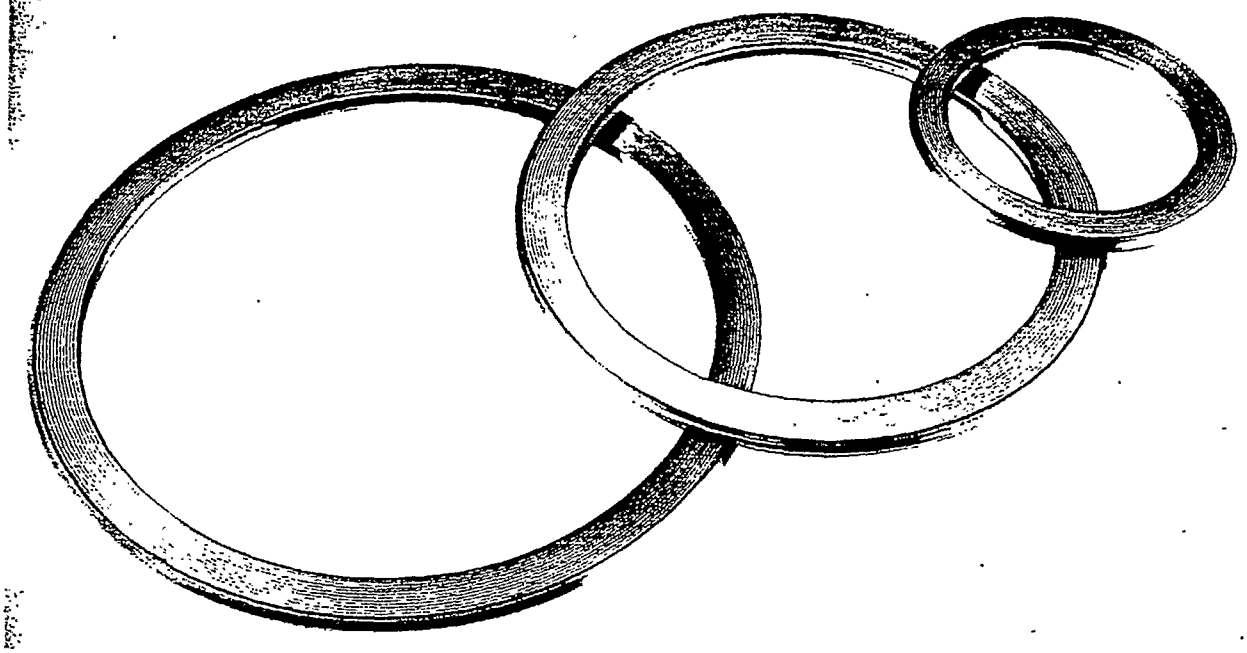
Chempac Gaskets, Style Nos. 117 and 138, are made of asbestos cloth stitched together and treated with chemically inert TFE. They combine the resilience, mechanical strength and heat resistance of asbestos with the virtual immunity of TFE to chemical and solvent action. The stitched and folded construction of these styles affords the maximum advantage of the resilience of asbestos. Each of these styles is furnished in the following thicknesses: 1/8″ —3 ply; 3/16″—4 ply; 1/4″—5 ply.

J-M Chempac Style No. 117 for strong solvent and caustic solutions: Plies of white Chrysotile asbestos cloth treated with TFE suspensoid.

J-M Chempac Style No. 138 for acids or acid bearing solvents: Plies of blue Crocidolite asbestos cloth treated with TFE suspensoid.

FBW-241

J-M Chempac Spirotallic® Flange Gaskets



For many years, Johns-Manville Spirotallic Gaskets with white Canadian asbestos strip filler have been known for their ability to make and maintain a perfect seal under temperature and pressure extremes. They are also available in Chempac construction for chemical and process applications requiring high corrosion or solvent resistance.

Chempac Spirotallic Gaskets are made of corrosion-resistant, spring-like metal strips, formed into a special vee shape, alternately spiral wound with a solid TFE strip filler. This construction is suitable for −320°F to +450°F service. Gaskets are also available with blue African asbestos paper filler, for temperatures to 850°F.

When the gasket is compressed in service, the central spring-like corrugation of the metal compensates for any expansion or contraction resulting in changes in temperature. This spring action creates and maintains the seal.

Spirotallic Gaskets have great mechanical strength and resilience unequalled by any other metallic gasket construction. They are readily compressible with relatively light bolting, available in the following styles:

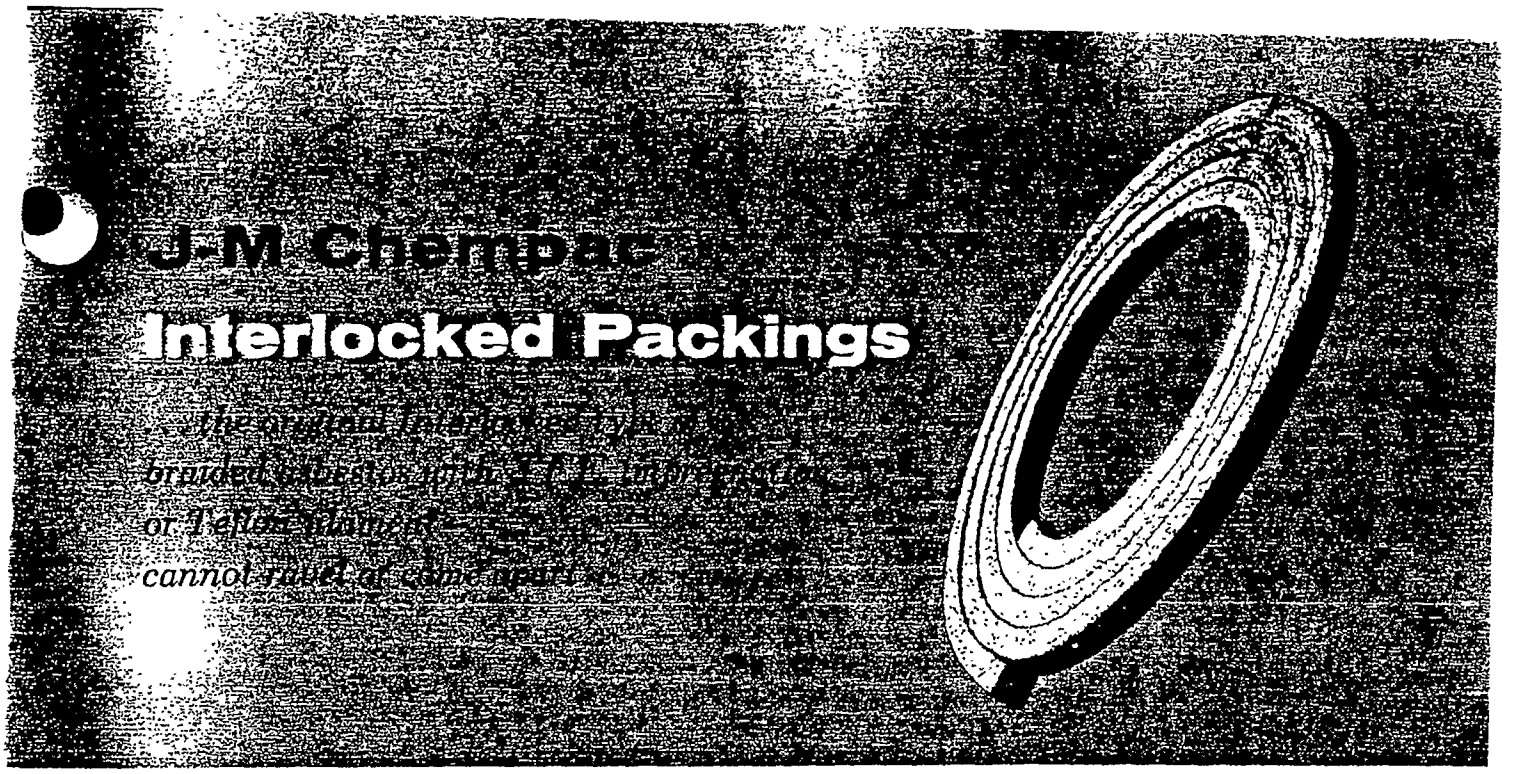
Style No. 911 (shown above). This style has no centering device and is for flat faced standard or special flanges, valve bonnets, etc. Made in circular, or moderately non-circular shapes. Standard gasket thickness 3/16″ or ⅛″ nominal.

Style No. 912. Has light, rigid centering device that positions the gasket concentric to the flange contact face on raised face flanges. This device acts as a reinforcing ring allowing proper radial expansion under compression. Standard gasket thickness 3/16″ nominal.

Style No. 913. Has a ⅛″ thick combination centering guide and compression limiting gauge. The thick guide prevents damage by over-stressing. Standard gasket thickness 3/16″ nominal.

Refer to J-M Metallic Gasket Catalog, PK-152A for additional information on construction details, applications, available metals, and standard dimensions.

FBW-242



Two types of J-M Interlocked Packings employ TFE Nos. 2008 and 2009 are Asbestos-TFE Impregnated to provide the sealing and heat resistant qualities of asbestos with the inertness of TFE.

Nos. 2004, 2005 and 2006 are constructed of white Teflon filament yarns. Each has the interlocked construction which results in a sturdy integral structure. All the yarns extend back into the body and are strongly interlocked. There are no jackets to wear through and no plaits to come loose. Because Interlocked is braided square, it presents a better contacting surface and provides a tight seal with minimum gland pressure.

Chempac Interlocked can be used to pack pump rods or shafts, valve stems, agitator shafts, expansion joints, rotary filters, mixers and similar apparatus handling strong alkalies, caustic solutions, active solvents and many other reagents at temperatures to 500°F. It is supplied in the styles described on the right.

Style No. 2008

TFE-impregnated Chrysotile asbestos braided solid by the Interlocked method. Unlubricated.

Style No. 2009

Also composed of TFE-treated Chrysotile asbestos, braided by the Interlocked method—like 2008—but softer and specially lubricated.

Style No. 2004

Teflon yarn braided by the J-M Interlocked method. No lubricant.

Style No. 2005

Teflon yarn, Interlocked braided, lubricated with fluorolube grease.

Style No. 2006

Teflon yarn, Interlocked braided, lubricated with Teflon suspensoid.

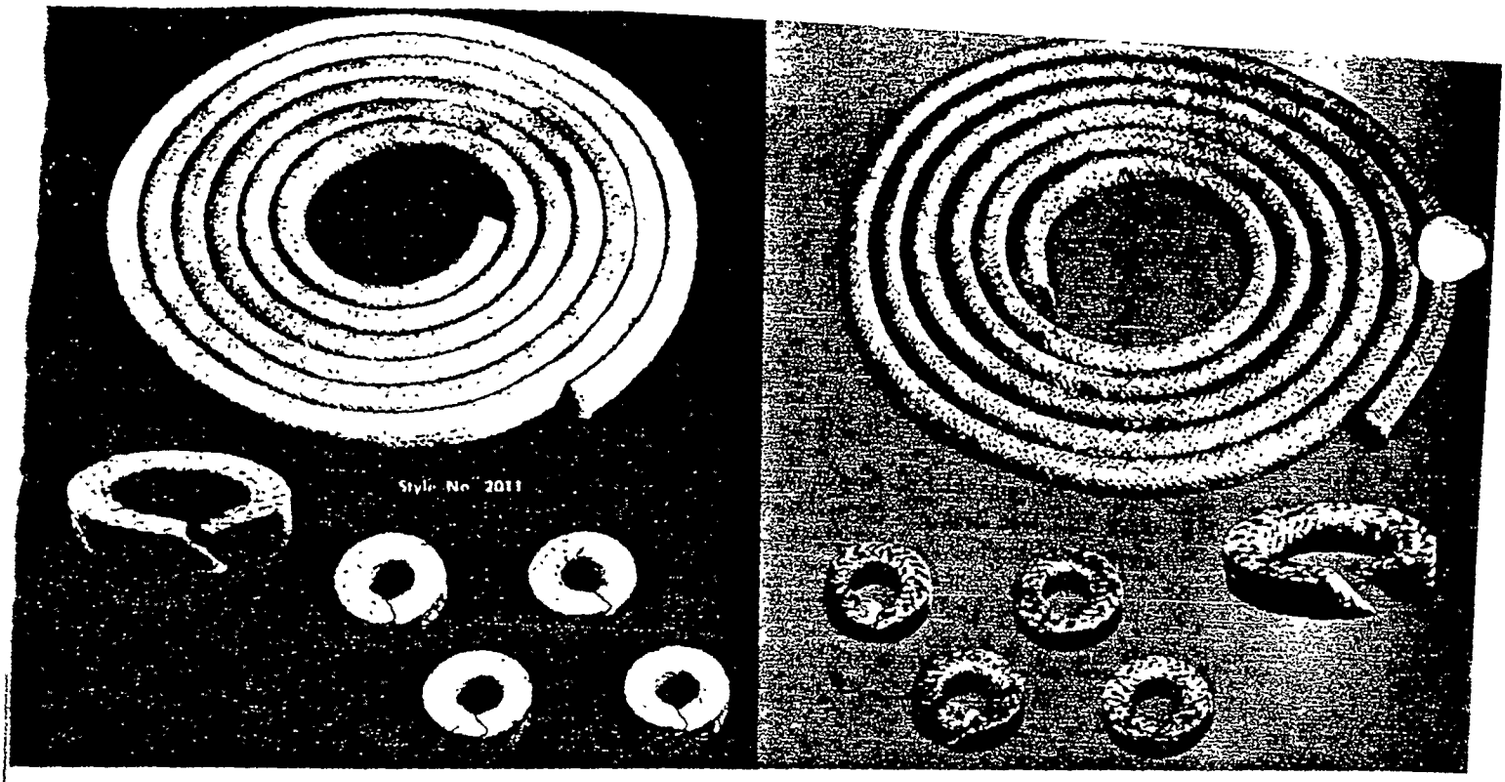
Style No. 2007

Teflon filament yarn, braided over a core of blue African asbestos, lubricated with fluorolube grease.

SIZES, APPROXIMATE WEIGHTS AND METHOD OF PACKAGING

	Weight—Lb. per 100 Linear Ft.												Form of Package	
Style No.	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	Coil	Rings
2004	—	—	—	6 1/4	8 1/3	13	16 3/4	—	—	—	—	—	On reels weighing 5, 10, 25, and 50 lbs. or on 1 lb. spools in sizes up to and including 1/2".	Packed in boxes weighing: 1" to 2" I.D.— 5 lbs. 2" to 3" I.D.—10 lbs. 3" to 4" I.D.—15 lbs. Over 4" I.D.—20 lbs.
2005	—	—	—	9 1/3	11 3/4	12 1/4	23 1/2	—	—	—	—	—		
2006	—	—	—	7	9 3/4	14	18 1/2	—	—	—	—	—		
2007	—	—	—	10	15	22	27 1/2	—	—	—	—	—		
2008	—	—	3 3/4	5 3/4	8	12	15	19	22	34	51	62		
2009	—	—	4 1/3	7 1/2	10 1/4	14	17	21	25	35	56	68		

FBW-243



J-M Chempac TFE -Treated Packings

combine the sealing effectiveness of Asbestos with the chemical inertness of TFE

These packings are composed of strong resilient asbestos impregnated with Pure TFE suspensoid. Each of these Johns-Manville style numbers has the excellent sealing and heat resistant qualities of asbestos plus the immunity of TFE to almost all solvent and chemical action. Each style described below is supplied in coil form, and cut rings. Die-Formed Rings to close tolerances are available to equipment manufacturers.

Style No. 2011—A general purpose packing especially suited to valve stems and reciprocating rods. It is widely used where fluid contamination is to be avoided and where higher than average pressures are encountered. Since it is a hard packing, supplemental lubrication lengthens its service life.

Style No. 2012—Softer than 2011, this style contains a lubricating medium. Recommended where sealing with minimum gland pressure is required. Particularly adapted to centrifugal pumps as well as similar applications.

Style No. 2013—A braided packing with a soft, resilient asbestos core. No. 2013 was designed for service on Chlorine Valves but has gained a wide acceptance in general chemical service because of its conformability.

Style No. 2014—Similar to Style No. 2011 but made of blue Crocidolite asbestos. For valves handling acids and acid bearing solvents.

Other special styles for critical services are available.

SIZES, APPROXIMATE WEIGHTS AND METHOD OF PACKAGING

	Weight—Lb. per 100 Linear Ft.												Form of Package	
Style No.	1/8"	3/16"	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	Coil	Rings
2011	1	2	3 3/4	5 1/2	8	9 1/2	11	17	22	31	40	50	On reels weighing 5, 10, 25, and 50 lbs. or on 1 lb. spools in sizes up to and including 1/2".	Packed in boxes weighing 1" to 2" I.D.— 5 lbs. 2" to 3" I.D.—10 lbs. 3" to 4" I.D.—15 lbs. Over 4" I.D.—20 lbs.
2012	1	2 1/4	4	6	9	13	16	21	26	35	45	55		
2013	—	—	3 1/2	5	6 1/2	11	16	19	22	39	—	—		
2014	1 1/2	3 1/2	6	8 3/4	11	15	18	21	24	30	—	—		

FBW-244

Many other TFE and Asbestos-TFE Constructions are available

CHEMPAC ASBESTOS-TFE WOVEN TAPES



These gasketing tapes combine the resilience and heat-resistance of asbestos with TFE'S chemical inertness, solvent immunity and heat resistance. TFE content is 35% to impart its protective characteristics to the tape. Asbestos-TFE Tapes may be used at temperatures to 500° F.

Style No. 2031 is wire-inserted long fiber asbestos yarn, woven, and impregnated with TFE.

Style No. 2032 is long fiber asbestos yarn without wire insertion, woven, and impregnated with TFE.

Note: For Liquid Oxygen (LOX) Service, specify AAAA grade asbestos. Furnished on special order.

Styles 2031 and 2032 furnished ½" to 3" wide, 1/16" to 5/16" thick. Tapes 1/16" thick in widths under 1" supplied in 100 ft. rolls; tapes 1/16" thick over 1" in width furnished in 150 ft. rolls; tapes over 1/16" in all widths furnished in 50 ft. or 100 ft. rolls.

In aircraft, missile and related designs, TFE impregnated asbestos tapes are often used in light metal flanges as a chafing strip. For this service, and for the ease of installation, Asbestos-TFE Tapes with pressure-sensitive backing can be supplied on special order.

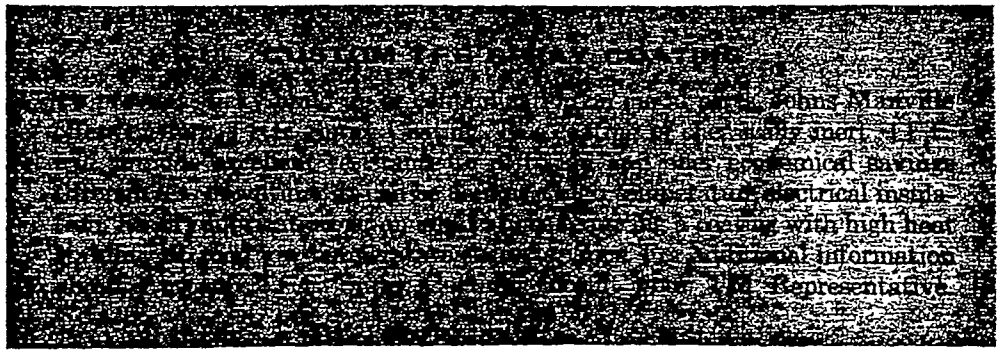
CHEMPAC CLIPPER® SEALS



Clipper Seals of TFE provide positive sealing in the presence of and in contact with active solvents and corrosives. They are available in two types—Type TMA-L (spring loaded) and Type TMA-S (springless). Both types are made of lip material style L-17, metal encased.

The seals have successfully contained oils with varying aniline points that are destructive to many compounds. They have also been effective against such widely diverse fluids as rocket engine fuel, perchlorethylene, destructive insecticides and various refrigerants. In addition to withstanding the destructive action of such fluids, these seals have also undergone severe mechanical abuse.

Chempac Clipper Seals are precision machined products. To achieve effective sealing, each application must be treated on an individual basis.



FBW-245



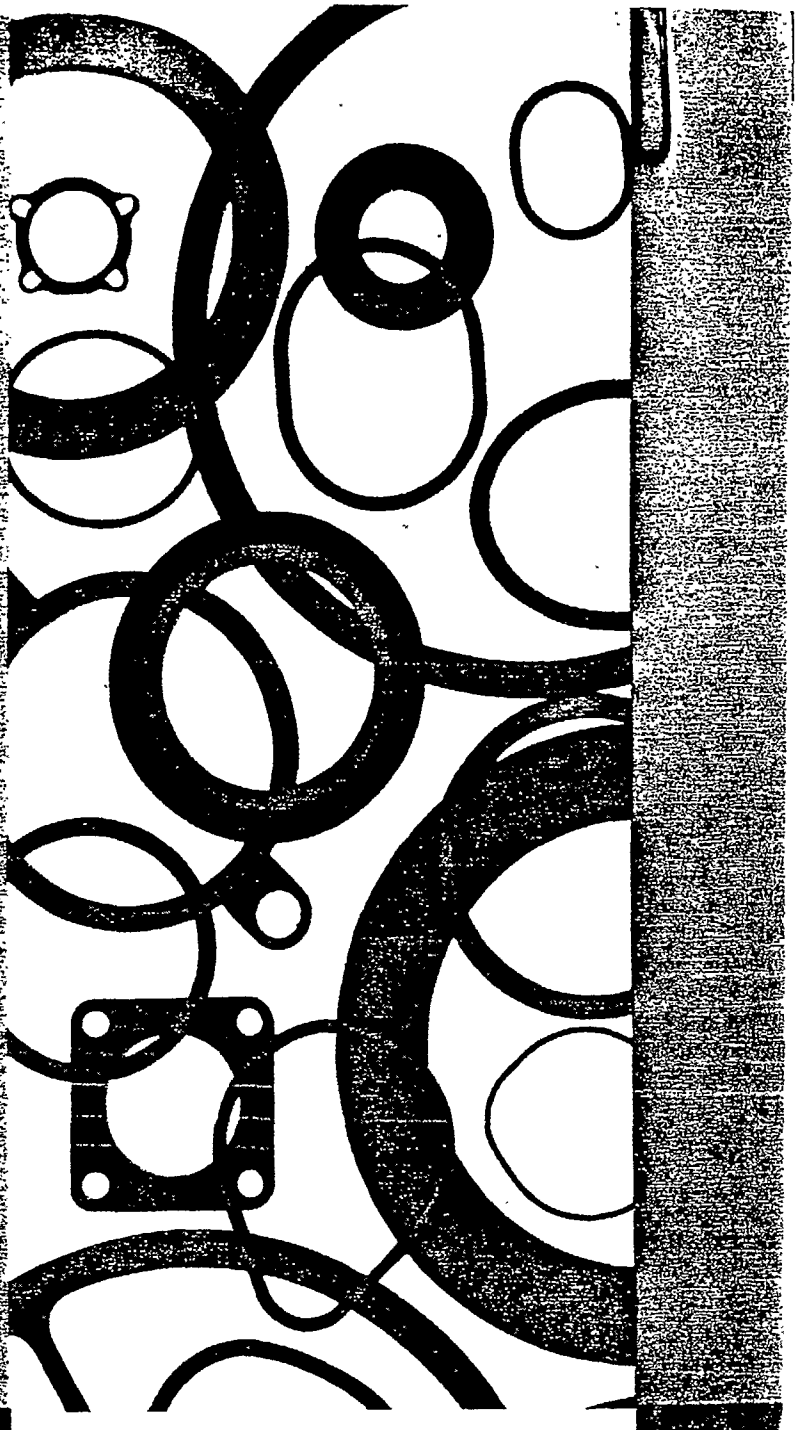
Johns-Manville

22 East 40th Street • New York, N.Y. 10016

Sales Offices in Principal Cities

JM

FBW-246



For long, dependable leak-proof performance

JM

Johns-Manville

GOETZE

METALLIC GASKETS

F. B. Wright Company

9999 Mercier Avenue
Dearborn, Michigan
TELEPHONE VI. 3-8250

FBW-247

The Johns-Manville Goetze Plant Produces a Complete Range of Metallic Gaskets Skillfully Designed to Seal Pipe Flanges and Equipment Closures



Higher temperatures, pressures and corrosives are placing ever greater burdens on the metallic gasket. This book is designed to aid you in making the right choice of these sealing elements, thus assuring you optimum efficiency and economy of service.

The superbly-equipped Johns-Manville Goetze Plant at N. Brunswick, N. J. is highly regarded throughout industry for the production of metallic and semi-metallic gaskets to almost any specification and of practically any metal.

Here you will find tool makers turning out templates, dies and fixtures in a completely equipped machine shop . . . a blacksmith shop with every up-to-the-minute facility...a "hand" department to fabricate prototypes and sample models; a hand-and-press pilot plant for short runs . . . a high production press section capable of manufacturing one hundred, or a hundred million units of any size or type with equal precision.

In these and other departments of the J-M plant, men and machines are teamed up to turn out metallic gaskets which we believe are the finest of their kind and will provide long, dependable service.

To choose a standard gasket for your needs, refer to the Simplified Selection Chart, presented here. You will find recommended J-M gasket styles listed by applications and service conditions. For additional information, consult your local Johns-Manville Distributor. Or, your J-M Representative will help you select the gaskets best suited for your applications.

PRODUCT WARRANTY

J-M Goetze Gaskets are warranted free from defects in workmanship and in raw materials of our own manufacture. These products are not guaranteed as to performance under any specific service condition nor for any specific period of time. Our liability for breach of this warranty is limited, at our option, to refund of the invoice value of defective material or in the replacement thereof.

CONTENTS

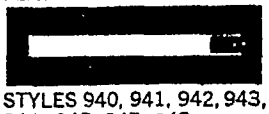
Many Efficient Sealing Elements Stem From These
Six Basic Johns-Manville Gasket Designs

SPIROTALLIC® GASKETS — PAGE 6



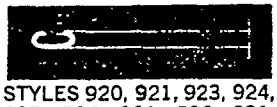
STYLES 911, 912, 913, 914

FLAT METAL GASKETS — PAGE 13



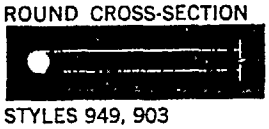
STYLES 940, 941, 942, 943, 944, 945, 947, 948

METAL JACKETED GASKETS — PAGE 6



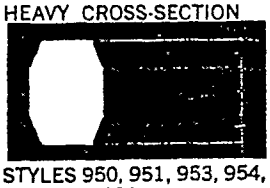
STYLES 920, 921, 923, 924, 925, 926, 929, 930, 931, 932, 933, 934

ROUND CROSS-SECTION — PAGE 15



STYLES 949, 903

HEAVY CROSS-SECTION — PAGE 16



STYLES 950, 951, 953, 954, 955, 980, 981

CORRUGATED GASKETS — PAGE 11



STYLES 900, 904, 905, 910

HEAT EXCHANGER GASKETS 19 STANDARD SIZE TABLES 20

JOINT SEALING COMPOUNDS 31 GASKET CUTTING TOOLS 31

SIMPLIFIED SELECTION CHART
APPLICATION • SERVICE CONDITION • RECOMMENDED J-M GASKET STYLE

JOINT*	J-M RECOMMENDATION	Second Choice	Third Choice
Cast Iron (ASA B 16.1 & B 16.2) 125# & 250#	905	911	923 Soft Metals
Forged Steel Flanges (ASA B16.5)			
Raised Face and Large Male-Female			
150# & 300# 4-Bolt Flanges	912	926	900 Coated†
150# other than 4-Bolt	912	926	900 Coated†
300# (other than 4-Bolt), 400#, 600#, 900#, 1500#, 2500#	913	926	941
Tongue & Groove — All Pressures	911	941	923
A.P.I. Ring Type Joint — All Pressures (ASA B16.20)	951	950	
Metal-to-Metal	911		
EQUIPMENT APPLICATION			
Ammonia Fittings	911	940	900 Coated†
Autoclaves	954B, 954D	911	923
Dowtherm Equipment & Lines	Proper Spirotallic Style	900 Soft Iron Coated with Plastiseal	941 Soft Iron Coated with Plastiseal
Gas Mains	900 Lead	930, 923 (Lead)	
Handholes, Manholes (Boiler)	914	920, 923	
Heat Exchangers	923	940	
Metal-to-Metal	911		
Vacuum Lines & Pumps	949 or 903	930	940 Soft Metals
Valve Bonnets			
Screwed, less than ¼" wide	930	941	920
Screwed, more than ¼" wide	941	930, 920	900
Bolted, Round	911	941	930, 920
Bolted, Oval-Oblong	911	930, 920	900
Bolted, Rectangular	931	900	
Pressure Seal	954B		
Metal-to-Metal	911		

*Recommendations also apply to flanges of other materials dimensioned to these specifications.

†"Coated" means gasket should be coated with J-M Plastiseal or Aquaseal when installed.

FBW-249

READY REFERENCE AND
Cross-Sections of J-M Metallic Gaskets

SPIROTALLIC®

General purpose, spiral-wound gaskets. Consist of preformed V-shaped strip of metal which is wound into a spiral. Metal layers are separated by an asbestos filler. Available with centering or compression limiting device.

Pages 6-7

911



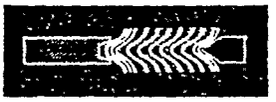
912*



913*



913*



914



* COLOR CODING USED ON J-M 912 and 913 SPIROTALLIC GASKETS

Aluminum	Silver
Carpenter 20	Pink
Copper	Brown
Hastelloy "C"	Gold
Inconel	Orange & Blue
Monel	Orange
Nickel	Orange & Green
Steel, Plain	Black
Steel, Zinc Coated	White
Titanium	Purple
Type 304 Stainless	Yellow
Type 304 ELC Stainless	Yellow & Black
Type 309 SCb Stainless	Yellow & Green
Type 316 Stainless	Green
Type 316 ELC Stainless	Green & Black
Type 347 Stainless	Blue

METAL JACKETED

An early basic design. Offered today in many variations. Consist of soft compressible filler (asbestos, Teflon, etc.) partially or wholly enclosed in a metal jacket. Available in irregular or non-circular shapes.

Pages 8-10

920



921



923



924



925



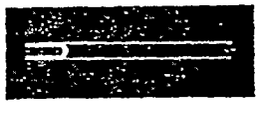
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929



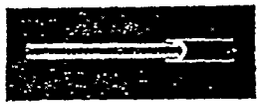
930



931



932



933



934



FLAT METAL

"Brute-force" seals. Gaskets made of flat metal, relatively thin in relation to their width. Used as cut from sheet metal, or with the surface area reduced by machining for greater sealability.

Pages 13-14

940



941



942



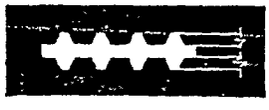
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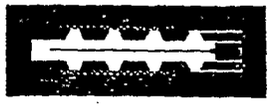
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948



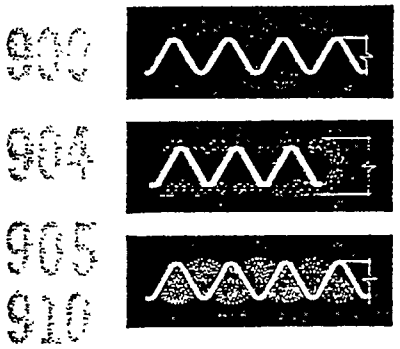
FBW-250

COMPARISON CHART
Described in this Catalog

CORRUGATED

Line contact seals. Consist of thin metal, corrugated or embossed concentric with I.D. Used plain, coated with sealing compound, with an asbestos cloth jacket, or with asbestos cord cemented into the corrugations.

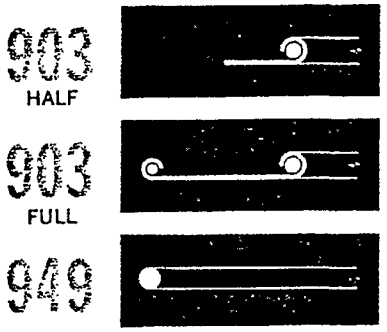
Pages 11-12



ROUND CROSS-SECTION

Solid metal, line contact seal. Generally made from round wire of the desired diameter, cut to the length of the gasket mean circumference, then formed into a circle and welded.

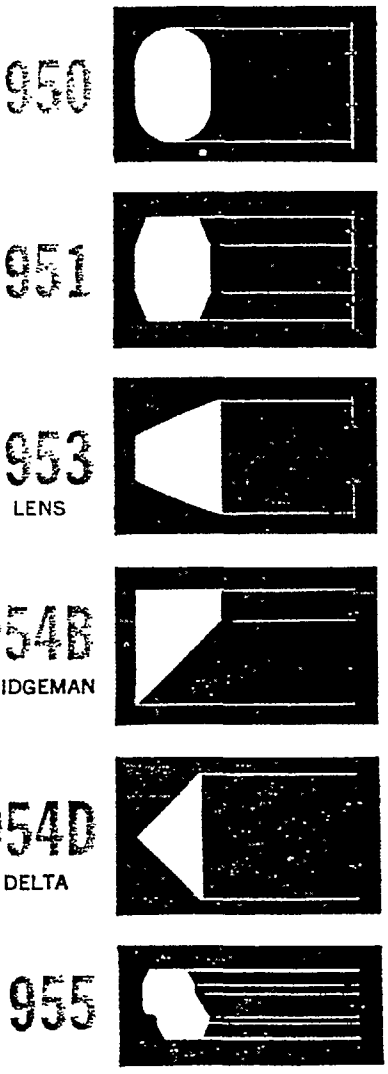
Page 15



HEAVY CROSS-SECTION

Seal by line contact or wedging action. Usually rectangular or triangular shaped gaskets, machined in heavy cross-sections from solid metal for high-pressure, temperature service where operating conditions require special joint design.

Pages 16-18



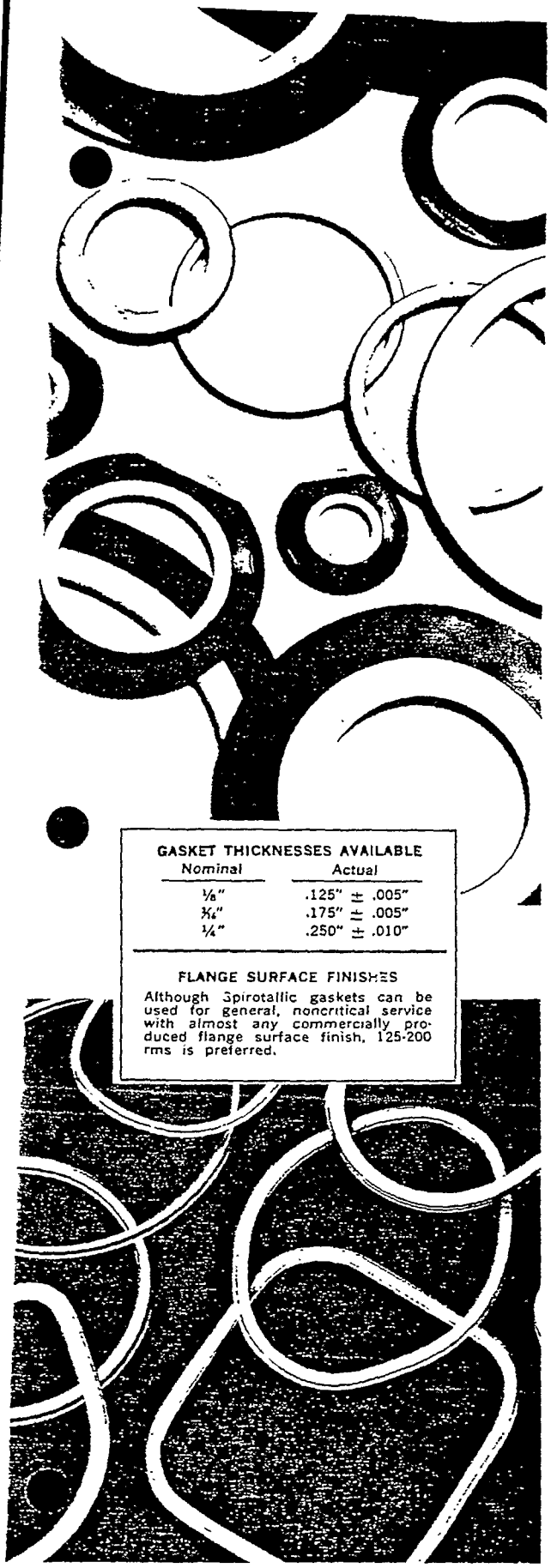
SELECTING THE RIGHT METAL IS IMPORTANT IN GASKET CONSTRUCTION

For any gasket application the choice of metal will depend upon the operating conditions, the mechanical features of the flanged assembly, and the design characteristics of the gasket.

On the following pages, reference is made to materials which are or are not used for certain gasket constructions. (Lead, for example, is not suitable in some designs because of its poor compression-recovery ratio.) Temperature plays a role. The tabulation (right) lists some of the typical metals used by Johns-Manville for metallic gaskets together with their generally accepted maximum temperature limitation for long duration exposure. Gasket style and size, and the severity of the corrosive conditions expected might increase or decrease these limits. Any nonmetallic elements in the gasket also may possibly affect upper temperature limits.

MATERIAL	MAX. TEMP. (°F)
Lead	212
The Common Brasses	500
Copper	600
Aluminum	800
Stainless Steel, Type 304	1000
Stainless Steel, Type 316	1000
Soft Iron, Low Carbon Steel	1000
Titanium	1000
Stainless Steel, Type 502	1150
Stainless Steel, Type 410	1200
Silver	1200
Nickel	1400
Stainless Steel, Type 430	1400
Monel	1500
Stainless Steel, Type 309 SCb	1600
Stainless Steel, Type 321	1600
Stainless Steel, Type 347	1600
Inconel	2000
Hastelloy	2000

FBW-251



GASKET THICKNESSES AVAILABLE	
Nominal	Actual
1/8"	.125" ± .005"
3/16"	.175" ± .005"
1/4"	.250" ± .010"

FLANGE SURFACE FINISHES

Although Spirotallic gaskets can be used for general, noncritical service with almost any commercially produced flange surface finish, 125-200 rms is preferred.

WHERE recommended: J-M Spirotallic gaskets keep tight durable seals, despite difficult conditions, on standard or special flanges, valve bonnets, boiler tube caps, handholes and manholes. They are particularly suitable to extremes in joint relaxation, temperature or pressure cycling, shock or vibration.

Spirotallic Gaskets are recommended for any circular or moderately non-circular application where an approximate compressed thickness of either 3/32" or 1/8" can be accepted.

HOW they work: Spirotallic gaskets are made of spring-like metal strips, formed into a special vee shape, alternately spiral wound with an asbestos filler. Sealing action is the result of a complex combination of the yield and flow of the metal and soft filler plies, when the gasket is compressed to its predetermined thickness. Metal-to-metal plies making up the inner and outer edges must be under compression.

WHY suggested: Spirotallic gaskets offer greater resiliency than any other metal-asbestos type. Very strong mechanically, each gasket is uniformly dense in construction. Available in different densities to match bolting conditions and thus assure optimum performance. J-M produces a complete line engineered for ASA standard flanges (See pages 20-23). And for special flanges, J-M will design and produce gaskets with the precise characteristics desired.

WHAT constructions are available: This basic Spirotallic design (J-M 911) is intended for flanges engineered to accept them. They can be made circular or moderately non-circular in shape. The addition of centering devices, and compression limiting rings adapt Spirotallic gaskets to use on many other types of flanges and closures. These variations are described under individual styles.

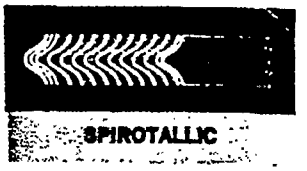
Standard metals used to make Spirotallic Gaskets are zinc-plated low carbon steel, and type 304 stainless steel. Available to order metals include aluminum, copper, plain low carbon steel, nickel, monel, Inconel, Inconel "X", stainless steel types 309 SCb, 316, 321, 347, Hastelloy B and C, Carpenter 20, Silver and titanium. See page 5 for assistance in selecting the metal.

Color-coding is employed on J-M 912 and J-M 913 Spirotallics to indicate the metal employed, and to make it easier for storekeepers and installers. Each metal is assigned a distinctive color which is painted on the edge of the centering guide. See page 4, under Spirotallic.

Fillers: White Canadian Paper is standard. Blue African Asbestos Paper Fillers are also available. There are many satisfactory Spirotallic installations on record where line temperatures run as high as 1300°F for sustained periods, with asbestos fillers. Solid Teflon fillers are available and are suitable for −320°F to +500°F service. Teflon impregnated fillers are suitable to 600°F service.

FBW-252

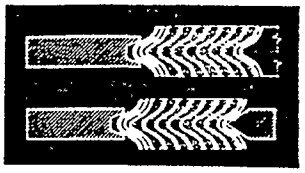
SPIROTALLIC® Gaskets



HIGHLY RESILIENT SPRING-ACTION DESIGN AFFORDS OUTSTANDING EFFICIENCY IN COUNTLESS APPLICATIONS. WITHSTANDS VIBRATION, VARYING STRESSES AND TEMPERATURES.



J-M 911 Spirotallic Gaskets are widely used by equipment builders employing metal-to-metal joints in an ever growing list of applications. They are also suitable for standard tongue and groove, and male-female joints at all pressures (see page 20 for dimensions), for ammonia fittings, valve bonnets, and many other closures designed to accept this highly resilient gasket. They are particularly suited to applications where weight and space are critical factors in over-all design problems, as in aircraft or missile units. Standard gasket thickness is 1/16" nominal; 1/4" and 1/8" available for special applications.



J-M 913 Spirotallic Gaskets are recommended for excellent service life on standard piping, and will withstand wide variations in pressure or temperature. They give equally good service in many other closures. Ordinarily furnished with a solid metal centering and compression limiting ring around the outer edge only. For extreme operating conditions, J-M 913 can be furnished with an inner as well as an outer compression ring. Such a ring fills space between flanges and helps to minimize turbulence or erosion of flange facings.

Standard Style 913 Gasket dimensions are based on API Standard 601 (see page 21 for standard flange sizes available). Gasket thickness is 1/16" nominal. The solid compression limiting rings are 1/8" thick and are intended to prevent damage from possible over-bolting or careless insertion.

For closures with non-circular outer perimeters the metal rings can be made to required configuration and drilled for bolt holes if necessary.

Style 913 also available in compliance with MIL-G-16265 and MIL-G-21032.



J-M 912 Spirotallic Gaskets are well suited to general service on low pressure lines. They should be used on raised face flanges, lightly bolted assemblies, or where there is no possibility of over-compression of the gasket. J-M 912 are supplied with a lightweight metal device to center the gasket and control radial expansion under compression. Standard gasket thickness is 1/16" nominal.

See page 20 for ASA standard flange sizes.



J-M 914 Spirotallic Boiler Gaskets, because of their design, are highly recommended for manhole, handhole and tube cap applications. They are made to the same basic construction as spirally-wound J-M 911, but in suitable shapes for boiler applications. Rugged and highly resistant to effects of corrosion and temperature, they can make and maintain a tight seal even on badly pitted surfaces. Readily compressed with light bolting. Can be used as a long-lasting replacement for woven asbestos gaskets.

Available for nearly all existent handhole, tube cap and manhole covers for standard makes of boilers, economizers and superheaters. (See pages 20-22-23 for sizes.) Spirotallic Manhole Gaskets with inner centering guide can be furnished on request. Standard gasket thickness is 1/16" nominal; 1/4" and 1/8" available for special applications.

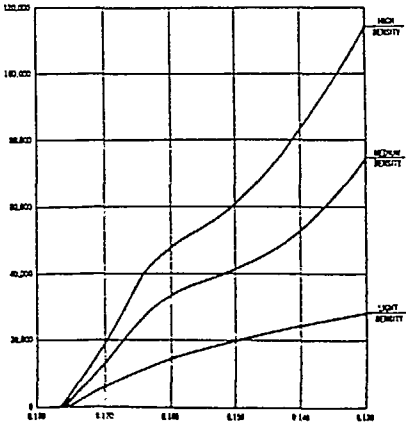
Also available in compliance with requirements of MIL-G-15342A.

When ordering, give name, actual shape, inside dimensions and over-all gasket width. For unclassified or manhole gaskets, the size, shape, width, thickness and metal should be specified. For all unclassified handhole shapes, and manhole shapes other than oval, a template or sample is requested. For unlisted sizes and shapes a template or cover is required to assure proper fit.

TYPICAL COMPRESSION CURVES FOR SPIROTALLIC GASKETS

The Spirotallic Gasket gives best performance when compressed to a predetermined specific thickness. Its compressibility can be accurately controlled for a specific bolt loading by varying the density, i.e., the number of metal-asbestos plies or wraps per unit of gasket width.

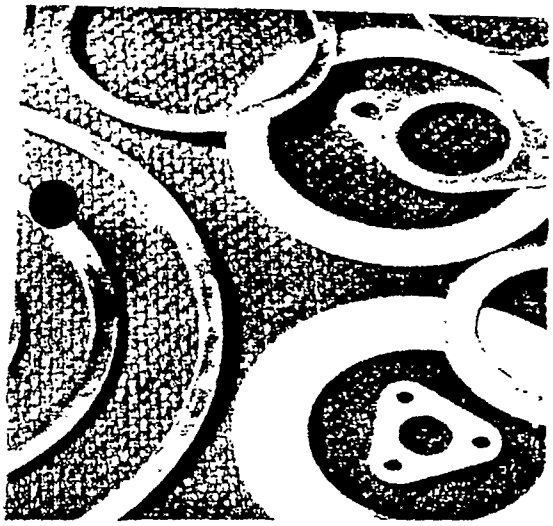
Filler thickness may be from 0.010 to 0.032 in. Two gasket thicknesses, 1/8 and 3/16 in., are standard and suitable for most applications. For 1/8-in. thick gaskets, compression to a thickness of 0.100 ±0.005 in. is recommended. For the 3/16-in. thick gasket, a compression to 0.130 ±0.005 in. is considered preferable.

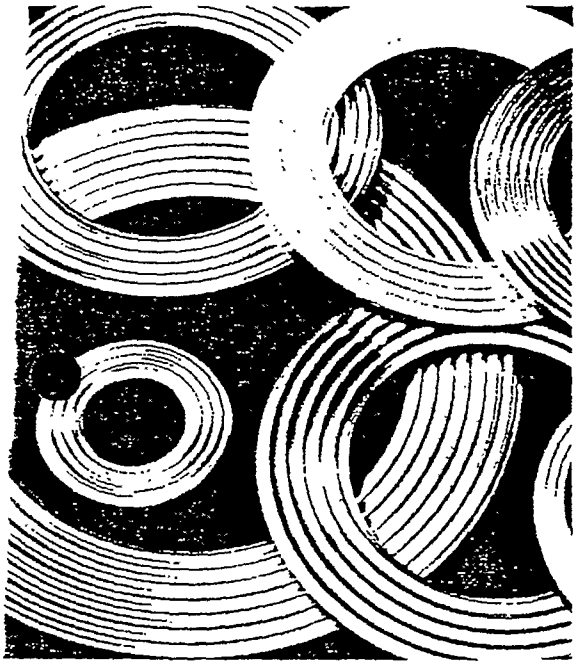


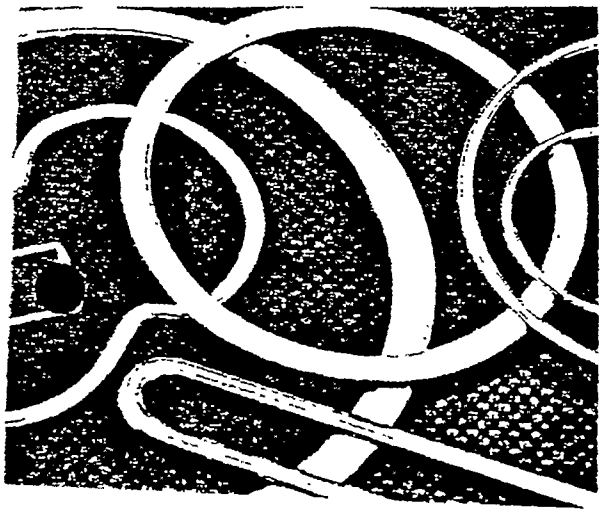
J-M CHEMPAC® SPIROTALLIC GASKETS

J-M Spirotallic 911, 912, 913 designs are also available with Dupont Teflon suspensoid-treated asbestos fillers or pure Teflon fillers for chemical and process applications requiring high corrosion and solvent resistance. Complete details on the Chempac series of 911, 912 and 913 Spirotallic Gaskets, as well as many other Chempac Packings, Sheets, Gaskets, and Teflon components, are available in the J-M Chempac Catalog, PK-185A.

FBW-253







Johns-Manville

WHERE recommended: J-M Metal Jacketed gaskets are ideally suited for smooth surface applications including heat exchangers, valve bonnets, gas mains, vacuum lines, cast iron flanges, autoclaves, boilers and glass-lined equipment. Used on circular and non-circular applications requiring assurance of 20 to 30 percent compressibility to compensate for flange misalignment, warpage, etc. Metal jacketed styles are designed for assemblies in which the elasticity of bolts or other factors can compensate for joint relaxation. For joints requiring close maintenance of the compressed thickness or which mechanically limit the compression (e.g. metal-to-metal), the metal jacketed design normally is not recommended.

HOW they work: J-M Metal Jacketed gaskets are made of a soft, conformable filler partially or wholly enclosed in a metal jacket. The primary seal against leakage is the inner metal lap where the gasket is thickest when compressed. This section flows, effecting the seal. Entire inner lap must be under compression. The outer lap, if any, when compressed between flange faces provides a secondary seal. For added resiliency and strength, some styles employ intermediate corrugations which act as labyrinth seals.

WHY suggested: J-M Metal Jacketed gaskets are more compressible than the corrugated group, and they offer compensation for flange irregularities or misalignments when high pressures are to be sealed. By selection of the proper style almost any size or configuration may be produced.

WHAT constructions are available: J-M metal jacketed gaskets are available in several cross sections each best suited for particular applications. These features are described under individual styles.

Standard metals used to make Metal Jacketed gaskets are lead, aluminum (grade 1100), copper, the brasses, soft steel, nickel, monel, inconel, and stainless steel types 405, 410, 302, 304, 316, 321, 347.

Fillers: Asbestos millboard and asbestos paper are standard. Normally limited to 850-900F, in non-critical service to 1200F. Teflon (virgin, reprocessed, or glass-filled) is often used to 500F, where extremely corrosive conditions exist.

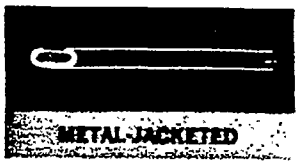
Metallic fillers are used to replace the non-metallic fillers in J-M 924 and J-M 926 when service temperatures exceed 900F.



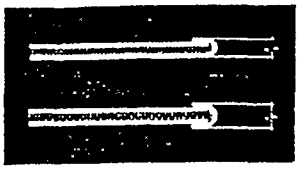
J-M 930 French Type (one-piece construction) gasket is ideally suited for narrow circular applications (i.e. valve bonnets, sight glasses, vacuum seals) requiring a positive unbroken metal gasket face across the full width. French Type gaskets are made by flanging a metal jacket over the inner edge and both faces of a soft filler leaving the outer edge exposed. Maximum width is limited by metal, diameter and gasket thickness. Refer to table at right for sizes in copper. For available sizes in metals other than copper, see your J-M Representative.

FBW-254

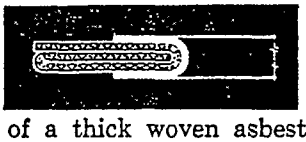
METAL-JACKETED Gaskets



THESE SEALS ARE THE PRACTICAL ANSWER TO THE PROBLEM OF IRREGULAR OR NON-CIRCULAR SHAPES



J-M 931 and J-M 932 French Types are modifications of J-M 930. The two-piece construction of J-M 931 and the three-piece construction of J-M 932 are recommended for wide or irregular shapes (cylinder heads, odd shaped valve bonnets) not requiring protection of filler material or additional flange support at outer edge. Tooling is less expensive than for the double-jacketed (J-M 923) type.



J-M 933 French Type is engineered specifically for glass-lined units or lightly bolted flanges. It is made of a thick woven asbestos filler with a one-piece metal jacket covering the inner edge and equal portions of both contact faces. J-M 933 also is available with an envelope of pure Teflon, either split or welded (for complete details, refer to PK-185A). For glass-lined equipment, the jacket material should be a softer metal, such as lead, aluminum, copper or silver. In dimensioning the J-M 933 gasket for glass-lined flanges, it is important that the metal jacket be fully in contact with the flat portion of the flange faces. The I.D. must be located outside of the radiused area of the flange bore. This will assure a positive seal between the flange jacket and the glass parts, and the soft gasket filler will be fully protected. For metal flanges, soft iron or steel, monel, nickel and stainless steels have been successfully used.

J-M 930 FRENCH TYPE COPPER ASBESTOS GASKETS (ONE PIECE CONSTRUCTION ONLY) DIMENSIONS - INCHES

I.D.	O.D.	THK.	I.D.	O.D.	THK.	I.D.	O.D.	THK.	I.D.	O.D.	THK.
3/16	3/8	1/16	7/8	1 5/16	1/16	1 11/16	2 1/8	1/16	2 15/16	3 3/8	1/16
1/4	7/16	1/16	57/64	1 1/4	1/16	1 23/32	2 1/32	1/16	2 31/32	3 3/8	1/16
17/64	27/64	1/16	29/32	1 19/64	1/16	1 3/4	2 1/4	1/16	3	3 1/2	1/16
9/32	7/16	1/16	15/16	1 7/16	1/16	1 25/32	2 5/16	1/16	3 1/32	3 11/32	1/16
21/64	1/2	1/16	1	1 3/8	1/16	1 13/16	2 1/4	1/16	3 3/64	3 31/64	1/16
11/32	9/16	1/16	1 1/32	1 13/32	1/16	1 27/32	2 1/4	1/16	3 1/16	3 15/32	1/16
3/8	5/8	1/16	1 1/16	1 3/8	1/16	1 7/8	2 3/16	1/16	3 1/8	3 3/8	1/16
25/64	5/8	1/16	1 3/64	1 21/64	1/16	1 29/32	2 5/16	1/16	3 3/16	3 1/2	1/16
13/32	21/32	1/16	1 1/8	1 1/2	1/16	1 15/16	2 5/16	1/16	3 13/64	3 1/2	1/16
7/16	9/16	1/16	1 5/32	1 1/2	1/16	1 61/64	2 1/4	1/16	3 7/32	3 1/2	1/16
7/16	11/16	1/16	1 3/16	1 5/16	1/16	2	2 3/8	1/16	3 1/4	3 3/4	1/16
15/32	3/4	1/16	1 13/64	1 1/2	1/16	2 1/64	2 23/64	1/16	3 21/64	3 5/8	1/16
1/2	13/16	1/16	1 7/32	1 39/64	1/16	2 1/16	2 7/16	1/16	3 3/8	4	1/16
33/64	45/64	1/16	1 1/4	1 3/4	1/16	2 1/8	2 1/2	1/16	3 7/16	3 7/8	1/16
17/32	13/16	1/16	1 17/64	1 43/64	1/16	2 3/64	2 31/64	1/16	3 1/2	3 7/8	1/16
35/64	51/64	1/16	1 9/32	1 5/8	1/16	2 3/16	2 19/32	1/16	3 9/16	4	1/16
9/16	7/8	1/16	1 5/16	1 13/16	1/16	2 1/4	2 3/4	1/16	3 5/8	4 1/16	1/16
19/32	7/8	1/16	1 3/8	1 3/4	1/16	2 19/64	2 27/32	1/16	3 3/4	4 1/16	1/16
5/8	15/16	1/8	1 25/64	1 47/64	1/16	2 5/16	2 7/8	1/16	3 25/32	4 7/32	1/16
41/64	7/8	1/16	1 13/32	1 23/32	1/16	2 3/8	3	1/16	4 1/32	4 5/16	1/16
21/32	63/64	1/16	1 7/16	1 3/4	1/16	2 7/16	2 3/4	1/16	4 1/16	4 5/16	1/16
11/16	1	1/16	1 15/32	1 23/32	1/16	2 1/2	2 15/16	1/16	4 1/4	4 5/8	1/16
23/32	1	1/16	1 1/2	2	1/16	2 17/32	2 15/16	1/16	4 1/2	5 1/2	3/32
3/4	1 1/8	1/16	1 49/64	1 55/64	1/16	2 9/16	2 15/16	1/16	4 9/16	4 55/64	1/16
49/64	1 7/64	1/16	1 17/32	1 7/8	1/16	2 5/8	3	1/16	5 1/16	5 1/2	1/16
25/32	1 1/8	1/16	1 9/16	1 7/8	1/16	2 21/32	3 1/16	1/16	5 1/2	6	3/32
51/64	1 1/8	1/16	1 19/32	2	1/16	2 11/16	3 1/16	1/16			
13/16	1 1/8	1/16	1 5/8	2 1/16	1/16	2 3/4	3 1/4	1/16			
53/64	1 7/64	1/16	1 41/64	2 1/16	1/16	2 27/32	3 1/4	1/16			
27/32	1 1/8	1/16	1 21/32	2 1/32	1/16	2 7/8	3 5/16	1/16			

The table above lists a few of many sizes that can be furnished in Style 930 (one piece) construction in copper. Each outside diameter shown is maximum for the corresponding inside diameter listed. Style 930 gaskets can be furnished with an outside diameter smaller than listed to the following minimum widths: 1/16" thick gaskets—3/32" wide, 3/32" thick gaskets—5/32" wide and 1/18" thick gaskets—3/16" wide. The table does not apply to metals other than copper or to thicknesses other than shown. Information on dimensions for other metals available upon request.



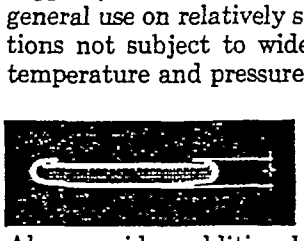
J-M 934 Inside-Open Type is the reverse of the French type gasket. This construction may be required for application where the outer edge of the gasket is exposed to the fluid pressure, or where a non-metallic gasket must be used but mechanical reinforcement is desirable around the outer edge. J-M 934 is made of a soft filler with a metal jacket over the outer edge and all or part of both faces.



J-M 920 Single Jacketed gaskets are used for relatively narrow applications similar to French type. Made by encasing a soft filler on one face and both edges with metal. This jacketed construction may be better suited for narrow faced closures because width-diameter limitations do not apply and J-M 920 is generally less costly to tool than French type. Non-circular as well as circular shapes can be furnished.

The available standard sizes of J-M 920 are shown on pages 24, 25 and 26. The chart lists the sizes produced most economically in copper, aluminum and soft iron. These sizes should be adapted whenever possible, in order to avoid delay in filling the order. For widths over 1/4", J-M 923 is suggested. Specifications HH-G-101A, AN-900, AN-123020-081 are available in some sizes. Information on request.

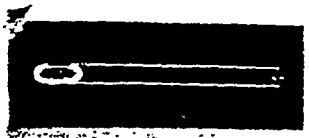
J-M 920 Boiler Gaskets are available in standard handhole and tube cap sizes, as shown in the table (see page 10). The light gauge metal jacket, together with the soft asbestos filler, provides a rugged yet resilient construction ideally suited for general use on relatively smooth surfaces in applications not subject to wide fluctuation in operating temperature and pressure.



J-M 923 Double Jacketed gasket is ideally used when complete protection of the filler material is required. Also provides additional support of the flange at the outer edge by addition of lapped-over jacket.

J-M 923 is constructed of a soft filler com-

FBW-255



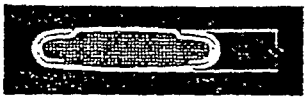
METAL-JACKETED

pletely enclosed by a metal shell and top washer. The enclosed edges and the added protection of the washer make J-M 923 gaskets more suitable than French type gaskets for certain non-circular applications. The additional thickness of the outer lap is helpful in preventing excessive distortion of light-weight flanges. Available in irregular, non-circular shapes, however, tooling of this gasket is more expensive than other types. For list of standard piping sizes, see page 27.

J-M 930 or J-M 920 is suggested when width is less than ¼".

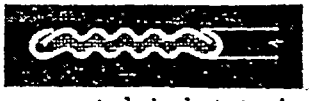


J-M 924 Jacketed (Overlapped) gasket is used when a completely enclosed gasket is required in widths less than those available in the plain double jacketed style. Generally not available smaller than 1-inch I.D., J-M 924 is constructed of an asbestos filler completely enclosed by a single metal shell overlapping on one face. J-M 924 also is available with a filler made from meshed metal wire which imparts more resilience than the non-metallic filler. Specific details are available upon request.



J-M 925 Double Shell, Double Jacketed gaskets are used when a gasket having greater strength and rigidity is required. It is made of a soft filler encased by two reversed and overlapping metal shells.

J-M 925 gaskets are available to order in the same metals and diameter range as J-M 923 for flange widths over ¼".



J-M 926 Corrugated-Jacketed gasket uses a corrugated jacket to increase its resilience. Used for circular and moderately non-circular (e.g. valve bonnet ovals) shapes in widths ⅜" and wider, J-M 926 employs an asbestos filler completely enclosed by a corrugated metal shell and top washer. If a slight leakage occurs across the inner edge, the concentric corrugations act as labyrinth seals. Sealability can be further improved by use of J-M Sealing Compound.

For standard sizes, refer to page 27.

J-M 920 STANDARD BOILER HANDHOLE AND TUBE CAP GASKETS
Classified by Make of Boiler

Make of Boiler and Gasket No. or Name	Actual Shape	Nominal Gasket Size, Inches	Actual Gasket Size, Inches	Width, Inches	Thick., Inches
BABCOCK & WILCOX					
24	Oval	4½ x 5½ I.D.	4 15/64 x 5 31/64 I.D.	¼	3/16
28	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	3/16	3/16
40 Oval	Diamond	3⅜ x 3¾ I.D.	3⅜ x 3¾ I.D.	⅛	⅛
41	Oblong	2⅛ x 2½ I.D.	2⅛ x 2½ I.D.	⅛	⅛
47	Round	2 I.D.	2 1/64 I.D. x 2 25/64 O.D.	3/16	3/64
48	Oval	3¾ x 4¾ I.D.	3 25/32 x 4 23/32 I.D.	7/32	⅛
79	Oblong	4⅛ x 4¾ I.D.	4⅛ x 4¾ I.D.	7/32	⅛
89	Round	3 1/16 I.D.	3 1/16 I.D. x 3¾ O.D.	5/32	⅛
92	Round	2 I.D.	2 I.D. x 2⅜ O.D.	3/16	3/32
Foreign Square	Square	3 21/32 x 3 21/32 I.D.	3 21/32 x 3 21/32 I.D.	7/32	¼
English Oval	Oval	3⅜ x 3¾ I.D.	3⅜ x 3¾ I.D.	3/32	⅛
English Oval	Oval	4 5/32 x 4 25/32 I.D.	4 5/32 x 4 25/32 I.D.	7/32	3/16
Nos. 62, 63, 66 Same as No. 24			Nos. 45, 46 Same as No. 47		
Nos. 44, 50, 54, 56, 57, 58, 59, 60, 76, 84, 85 Same as No. 40			Nos. 53, 6[illegible], 86, 87, 88 Same as No. 48		
Nos. 43, 49 Same as No. 41			Nos. 90, 95 Same as No. 89		
Nos. 4, 183 Same as No. 92					
Corrugated Steel, Oval			5¼ x 6⅛ O.D. with 1⅛" Dia. Center Hole		
Corrugated Steel, Round			2⅛ O.D. with 1⅛" Dia. Center Hole		
BADENHAUSEN — See Riley Stoker					
COMBUSTION ENGINEERING					
2	Round	2 I.D.	2 I.D. x 2⅜ O.D.	3/16	3/32
6	Round	4⅛ I.D.	4⅛ I.D. x 4⅜ O.D.	¼	⅛
8	Oval	3 13/16 x 4 7/16 I.D.	3 13/16 x 4 15/32 I.D.	3/16	3/16
21	Oblong	2⅛ x 2½ I.D.	2.104 x 2.480 I.D.	⅛	3/32
22	Oval	2⅛ x 2⅝ I.D.	2.114 x 2.640 I.D.	3/16	3/32
51	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	3/16	3/16
EDGEMOOR					
No. 2					
Burlington	Oval	4 1/16 x 5¼ I.D.	4 1/16 x 5¼ I.D.	5/16	3/16
No. 4	Oval	4 5/32 x 5 7/32 I.D.	4 5/32 x 5 7/32 I.D.	3/8	1/4
ERIE CITY	Pear	3⅜ x 4⅜ I.D.	3 7/16 x 4 7/16 I.D.	5/16	7/32
FOSTER WHEELER					
2¾" Tube	Oblong	2¾ x 3⅜ I.D.	2 25/32 x 3 13/32 I.D.	3/16	3/16†
2¾" Tube	Oblong	2¾ x 3⅜ I.D.	2 25/32 x 3 13/32 I.D.	7/32	3/32‡
3 5/16" Tube	Oblong	3 5/16 x 3 15/16 I.D.	3 11/32 x 3 31/32 I.D.	3/16	3/16†
3 5/16" Tube	Oblong	3 5/16 x 3 15/16 I.D.	3 11/32 x 3 31/32 I.D.	7/32	3/32‡
	Square	— Same as B&W #28			
FRANKLIN					
Oval	Oblong	3⅝ x 4⅝ I.D.	3⅝ x 4⅝ I.D.	5/16	¼
HEINE	Round	3⅝ I.D.	3⅝ I.D. x 4¼ O.D.	5/16	¼
	Oblong	3⅝ x 4⅝ I.D.	3⅝ x 4⅝ I.D.	5/16	¼
KEELER	Round	4¼ I.D.	4¼ I.D. x 4 25/32 O.D.	21/64	¼
MURRAY					
3½" Tube	Oblong	3⅝ x 4⅝ I.D.	3⅝ x 4⅝ I.D.	5/16	¼
RILEY STOKER					
WC-4	Oblong	3¾ x 5¼ I.D.	3¾ x 5¼ I.D.	¼	¼
WC-24	Oblong	3¾ x 5¼ I.D.	3¾ x 5¼ I.D.	¼	⅛
UNION	Pear	4¼ x 5¼ I.D.	4¼ x 5¼ I.D.	19/64	19/64

† — Round Cross-Section ‡ — Flat Cross-Section



J-M 929* is the J-M 926 gasket with a corrugated metal filler rather than an asbestos filler. This '3-Ply' design provides a more resilient construction that adapts to temperature cycling problems. Temperature usage is limited only by metal selected.

For standard sizes, refer to page 27.

*Patented

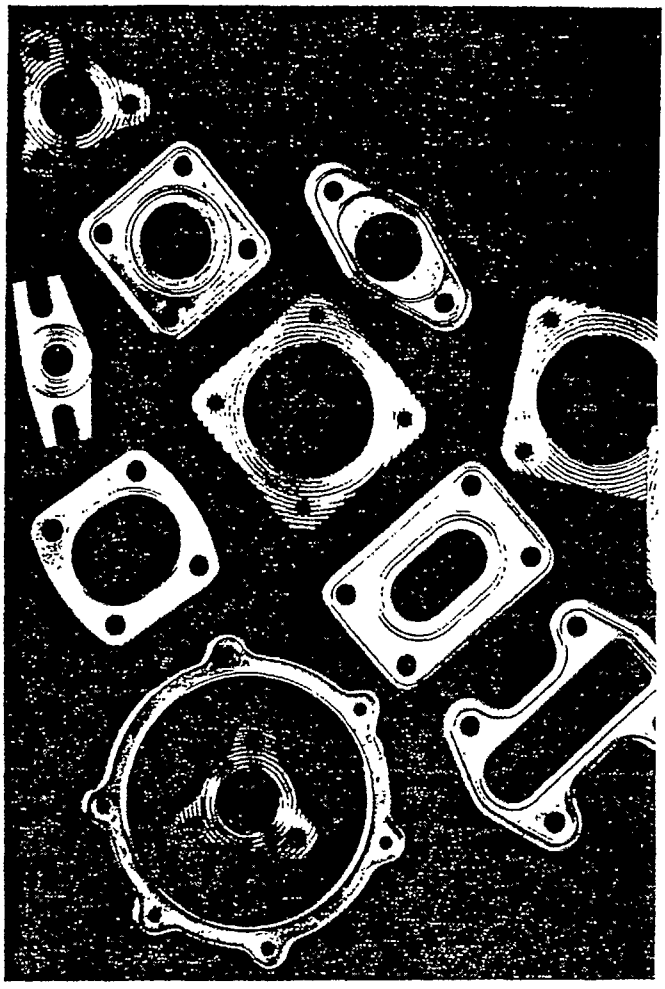
FBW-256

Johns-Manville
CORRUGATED
Gaskets



CORRUGATED

GASKETS THAT MAY BE THE LEAST EXPENSIVE APPROACH TO IRREGULAR OR NON-CIRCULAR SHAPES FOR LOW-PRESSURE APPLICATIONS.



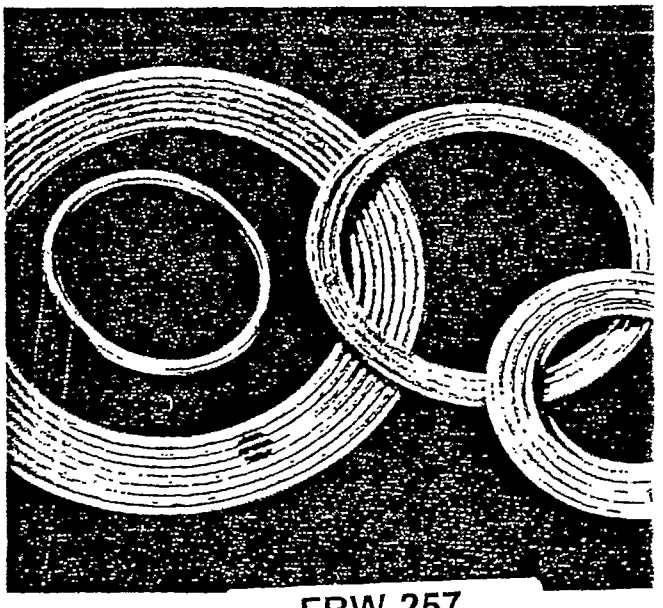
WHERE recommended: J-M Corrugated Gasket applications include valve bonnet joints, fuel or combustion line connections for aircraft gas turbines, steam chests, high-temperature exhaust gas ducts, glass-lined equipment, etc. Variations of the basic construction, which is best suited for smooth-faced complex or non-circular shapes at low pressures (500 psi), are: *with J-M Joint Sealing Compound* for use on rougher finishes at pressures to 1000 psi; *with asbestos cord* cemented into the corrugations for light-weight cast iron or large, rough or warped flanges to 600 psi; *with an asbestos cloth jacket* desirable on rough or warped flanges.

HOW they work: J-M Corrugated Gaskets require relatively light bolt force to flow the gasket material at points of contact with the flange. Corrugations afford some degree of resilience, depending on their pitch and depth, and the type and thickness of metal. They also supply a labyrinth effect, and act as support for gasket compound, asbestos cloth jackets or cord inserts.

WHY suggested: J-M Corrugated Gaskets are relatively inexpensive to tool and produce in non-standard sizes or irregular shapes. By proper material selection, they can be used at almost any temperature.

WHAT constructions are available: J-M Corrugated Gaskets are made of thin metal, corrugated or embossed concentric with the I.D., and used plain, with a coating of sealing compound, with an asbestos cloth jacket, or with asbestos cord cemented into the corrugations. These variations are described under individual styles.

Standard metals used to make J-M Corrugated Gaskets are soft steel, copper, monel, and stainless steel type 304. Available to order metals include aluminum, nickel, stainless steel types 405, 410, 302, 316, 321, 347, and Hastelloy. See page 5 for data on metals.



FBW-257



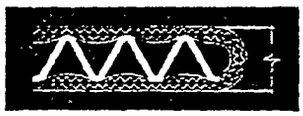
J-M 900 all-metal plain corrugated gaskets are used for low pressure applications requiring a thin, line contact type seal because of space or weight limitations. For such applications, metal thicknesses are 0.010″ to .031″ depending on metal and corrugation



CORRUGATED

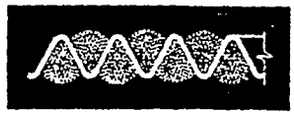
pitch. Thicknesses less than .010" are likely to rupture when corrugated. Although a minimum of three concentric corrugations are desirable on each gasket face, many applications exist that use only one. A slight flat inside the inner corrugation and beyond the outside corrugation stiffen the gasket and are desirable if space is available. For best performance, corrugations should be on both gasket faces rather than embossed on one face only. Corrugation pitch for other J-M 900 applications can range from .045" to ¼" and over-all gasket thickness will vary between 40% and 50% of the corrugation pitch. Temperature limits are determined by the metal used. Pressures to 500 psi.

See table below for dimensions for standard piping.



J-M 904 Flexeal gaskets, cloth covered J-M 900s, combine the conformability of a soft jacket and the line contact labyrinth, reinforcing characteristics of the corrugated metal filler. The jacket may be woven abestos cloth – plain or rubberized. The metal filler may be furnished in any of the usual gasket metals.

J-M 904-T6, a new modification of J-M 904, is made of a six-ply DuPont Teflon impregnated woven asbestos jacket (similar to J-M 117 Chempac) over a stainless steel J-M 900 core. This gasket was specifically developed for service between glass-lined flanges against aggressive chemicals at 150 psi pressures, where the conventional envelope-type gaskets are not suitable.



J-M 905 gaskets consist of a J-M Style 900 with asbestos cord cemented into the corrugations. The metal is generally .019" or .020" thick and the corrugation pitch 5/32", 3/16" or ¼", depending on the gasket width or application. The over-all gasket thickness is approximately 65 to 70 percent of the pitch.

J-M 905 is particularly effective as a replacement for asbestos millboard gaskets on large diameter flanges, handling flue and combustion gases at temperatures to 1150F under light pressures. The use of J-M 905 eliminates the breakage problem often encountered in the handling of asbestos millboard gaskets.

J-M 905 is not suitable for hot oil or vacuum service. Pressures to 600 psi.

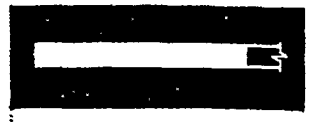
J-M 910 gaskets are the same construction as J-M 905 with the addition of a protective metallic coating which prevents sticking to flanges or damage to asbestos in handling. J-M 910 is designed for low-pressure standard piping and plumbing applications (For dimensions, see below). This gasket is made of .019" thick metal with corrugations of ¼" pitch – ⅛" high. One eight-inch asbestos cord is used, and the over-all gasket thickness is approximately 5/32". J-M 910 is not suitable for hot oil or vacuum service. When temperatures exceed 600F, J-M 905 gaskets should be used.

J-M 900 — J-M 910 STANDARD SIZES

Cast Iron Companion Flanges Gaskets to Fit Inside Bolt Holes			A. S. A. Steel Raised Face Flanges and Flanged Fittings Welding Neck and Lapped Joint Flanges Only				
Pipe Size Inches	Standard— 125-lb. Gasket Dimensions Inches	Extra-Heavy 250-lb. Gasket Dimensions Inches	Pipe Size Inches	150-lb. Gasket Dimensions Inches	300 lb. Gasket Dimensions Inches	400-lb. Gasket Dimensions Inches	600-lb. Gasket Dimensions Inches
1	1¼ x 2½	1¼ x 2¾	½	¾ x 1¾	¾ x 2	¾ x 2	¾ x 2
1¼	1½ x 2⅞	1½ x 3⅛	¾	1 x 2⅛	1 x 2½	1 x 2½	1 x 2½
1½	1¾ x 3¼	1¾ x 3⅝	1	1¼ x 2½	1¼ x 2¾	1¼ x 2¾	1¼ x 2¾
2	2¼ x 4	2¼ x 4¼	1¼	1½ x 2⅞	1½ x 3⅛	1½ x 3⅛	1½ x 3⅛
2½	2¾ x 4¾	2¾ x 5	1½	1¾ x 3¼	1¾ x 3⅝	1¾ x 3⅝	1¾ x 3⅝
3	3¼ x 5¼	3¼ x 5¾					
3½	3¾ x 6¼	3¾ x 6⅜					
4	4¼ x 6¾	4¼ x 7	2	2¼ x 4	2¼ x 4¼	2¼ x 4¼	2¼ x 4¼
4½	4¾ x 6⅞	4¾ x 7⅝	2½	2¾ x 4¾	2¾ x 5	2¾ x 5	2¾ x 5
5	5¼ x 7⅝	5¼ x 8⅜	3	3¼ x 5¼	3¼ x 5¾	3¼ x 5¾	3¼ x 5¾
			3½	3¾ x 6¼	3¾ x 6⅜	3¾ x 6¼	3¾ x 6¼
6	6¼ x 8⅝	6¼ x 9¾	4	4¼ x 6¾	4¼ x 7	4¼ x 6⅞	4¼ x 7½
7	7¼ x 9⅞	7¼ x 10⅞					
8	8¼ x 10⅞	8¼ x 12					
9	9¼ x 12⅜	9¼ x 13	5	5¼ x 7⅝	5¼ x 8⅜	5¼ x 8¼	5¼ x 9⅜
10	10¼ x 13¼	10¼ x 14⅛	6	6¼ x 8⅝	6¼ x 9¾	6¼ x 9⅝	6¼ x 10⅜
			8	8¼ x 10⅞	8¼ x 12	8¼ x 11⅞	8¼ x 12½
12	12¼ x 16	12¼ x 16½	10	10¼ x 13¼	10¼ x 14⅛	10¼ x 14	10 x 15⅝
14	14½ x 17⅝	14½ x 19	12	12¼ x 16	12¼ x 16½	12¼ x 16⅜	12 x 17⅞
15	15½ x 18⅞	15½ x 19⅞					
16	16½ x 20⅛	16½ x 21⅛					
18	18½ x 21½	18½ x 23⅜	14	14¼ x 17⅝	13½ x 19	13⅜ x 18⅞	13⅜ x 19¼
			16	16¼ x 20⅛	15½ x 21⅛	15¼ x 21	15 x 22⅛
20	20½ x 23¾	20½ x 25⅜	18	18¼ x 21½	17¼ x 23⅜	17¼ x 23¼	16¾ x 24
22	22½ x 25⅞	22½ x 27½	20	20¼ x 23¾	19¼ x 25⅜	19⅛ x 25⅜	18½ x 26¾
24	24½ x 28⅛	24½ x 30⅜	24	24¼ x 28⅛	23¼ x 30⅜	22⅞ x 30⅛	22¼ x 31

FBW-258

Johns-Manville
FLAT METAL
Gaskets



FLAT METAL

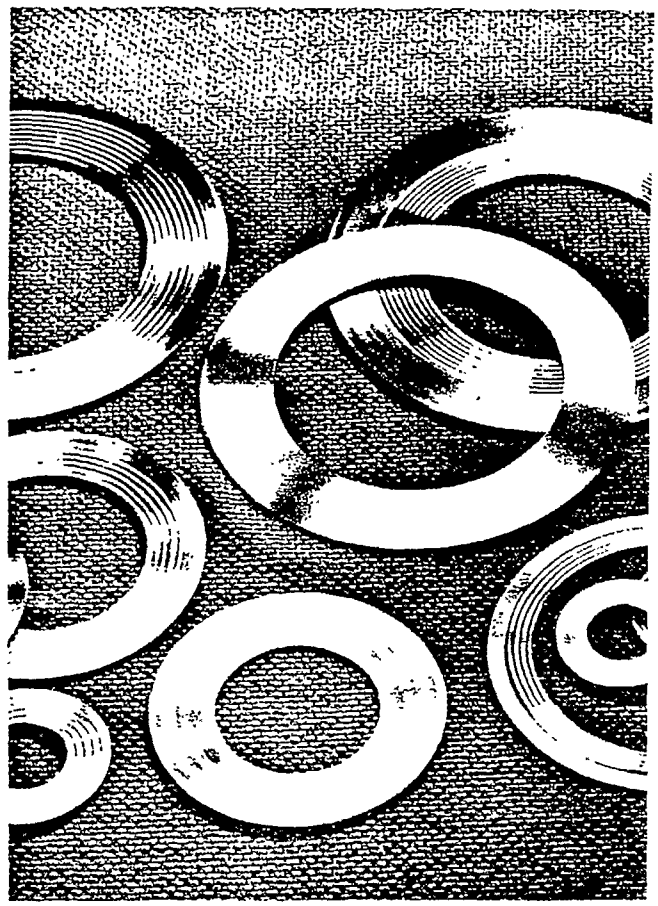
- THIN SEALING ELEMENTS CUT FROM SHEET METAL
- GIVE ECONOMICAL SERVICE, WHERE ADEQUATE BOLTING IS AVAILABLE.

WHERE recommended: Applications best-suited for J-M Flat Metal Gaskets include, for example, valve bonnets, ammonia fittings, heat exchangers, hydraulic presses, and tongue and groove joints. Plain solid gaskets give good service when compressibility is not required to compensate for flange surface finish, warpage or misalignment, and where sufficient clamping force is available for the gasket metal selected. Machined styles, with profiled cross-sections, are used when the bolting is not adequate to seat a flat gasket. Profiled gaskets with asbestos cord cemented into the concentric grooves are best suited for high-temperature and pressure service on uneven or rough surfaces.

HOW they work: J-M Flat Metal Gaskets seal by flow of the gasket surface caused by "brute force" compressive loads. Force on the actual gasket contact area must exceed the tensile strength of the gasket metal. Therefore, the surface finish of both flange and gasket must be carefully matched to assure the correct relationship.

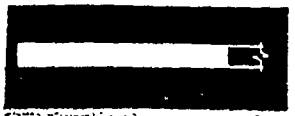
WHY suggested: J-M Plain, Metal Gaskets are relatively inexpensive to produce and can perform satisfactorily in a variety of applications over a wide temperature range. The machined types, with reduced surface area, may be the only answer to high-pressure, high-temperature or highly corrosive applications in flanges where bolting forces are too light for the plain flat style.

WHAT constructions are available: J-M Flat Metal Gaskets are made of flat metal, relatively thin in relation to width. They can be used as cut from sheet metal, or with the surface area reduced by machining to improve sealability. These variations are described under individual styles. Standard metals used to make Flat Metal Gaskets include any metal that is available in thicknesses and hardness suitable as a gasket material and that can be punched or otherwise cut into desired shape by dies, hand or circle shears, machined, sawed, etc.





FBW-259



FLAT METAL



J-M 940 plain solid gaskets can be fabricated in any desired configuration. Where bolting is sufficient, it is efficient and economical, particularly on flanges with concentric serrations. J-M 940 has great mechanical strength, heat conductivity and good resistance to high temperatures, pressures and chemical attack. Unless the gasket is finished machined, the width should be at least metal thickness plus 50 percent. There are no limitations on the flat metal gasket dimensions; however, width of the metal sheet commercially available may limit size and require welding to obtain gaskets beyond certain sizes.



J-M 941 Profile Gasket combines the desirable qualities of plain solid metal gaskets with the added advantages of reduced area of contact provided by the V-shaped ribbed surface. It is used when a solid metal gasket (generally 3/64" or thicker) is required because of pressure (radial strength), temperature or the highly corrosive attack of the confined fluid and bolting is not sufficient to seal J-M 940. J-M 941 is also recommended in screwed (attrition) closures where the relatively small contact area keeps friction down to a level low enough to seal the joint. Standard dimensions for raised face flanges, for large tongue and groove flanges, for large male and female flanges are listed on page 28.



J-M 942 is the J-M 941 profile gasket with twisted and treated asbestos cord cemented into the concentric grooves on both faces. The additional sealing function of the asbestos makes J-M 942 suitable for high-temperature and high-pressure service on rough or uneven surfaces.



J-M 943 and 944 consist of the J-M 941 profile gasket with a metal jacket of either the French type (for narrow gaskets) or the single-jacket type (for wider gaskets). Construction employs the principle of reduced contact area with the characteristics of an all-metal gasket. The smooth surface prevents scoring of the flange faces.

Note: These gaskets should not be ordered without prior consultation with a J-M Representative.



J-M 945 Serrated Gasket, made of heavy solid metal machined with spaced concentric ribs, is excellent for installations requiring a wide all-metal gasket with reduced contact area. Particularly suitable for high pressures and temperatures in standard raised face flanges. J-M 945 is recommended for use only with smooth finished flange faces. Standard serrated gaskets are available for A.S.A. raised face flanges, and are provided with a guide (J-M 945A) for centering the gasket within the bolt circle. Dimensional details upon request.



J-M 947 Bellowseal Gasket is essentially a self-sealing element which utilizes the pressure carried by the line to maintain tightness. It is so designed that the force created by the line pressure alone is sufficient to prevent leakage should the joint contact faces actually separate by an appreciable amount. J-M 947 is not intended as a substitute for an expansion joint. Made of two 1/32-inch metal discs, each serrated on one face and welded together around the inner rim. A ring of thin compressed asbestos sheet packing is placed on the serrations. This bellows construction gives the gasket sufficient flexibility to allow it to "breathe" with abnormal expansions and contractions of the pipe, flanges and bolts. J-M 947 is fabricated to order. Dimensional standards have been established for A.S.A. raised face flanges; however, special sizes are also available.



J-M 948 Multiseal Gasket is made of solid metal with raised cross-section ribs in a waffle-like pattern. The "multiseal" pattern results in a contact area of from 50 to 70 percent less than that of a plain solid J-M 940, depending upon the metal and coining pressure. Multiseal gaskets are available only in the softer metals, such as aluminum, copper and soft steel. The metal thickness is approximately 1/16" or 1/8" only, and the rib-spacing is 1/16-inch squares.

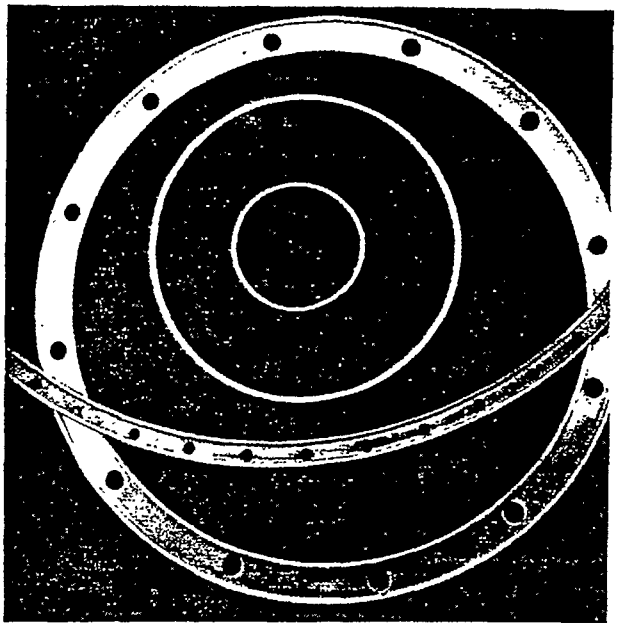
Note: This gasket should not be ordered without prior consultation with a J-M Representative.

FBW-260

Johns-Manville
ROUND CROSS-SECTION SOLID METAL
Gaskets



HERE ARE LINE CONTACT SEAL GASKETS THAT PROVIDE POSITIVE, GAS-TIGHT SEALS AT LOW PRESSURES.



WHERE recommended: J-M Round Cross-Section, Solid Metal Gaskets are used on valve bonnets, air or gas compressors, and the accessory connections in LPG storage vessels; however, they are essentially used on equipment designed specifically for them. Flanges are grooved or otherwise faced to accurately locate the gasket during the assembly, although there are some applications between flat faces. This group is especially useful in vacuum equipment where highly efficient gaskets are needed.

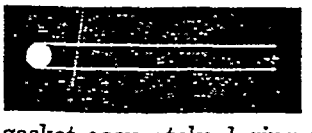
The three styles are the *plain round* cross-section for grooved flanges; the *jacketed round* cross-section for non-grooved flanges; and the *jacketed double, round* cross-section for full-faced applications where it helps minimize flange dishing.

HOW they work: J-M Round Cross-Section, Solid Metal Gaskets seal by line contact which provides initial high seating stress at low bolt loads. The contact faces increase in width as the gasket is compressed, effectively flowing into flange faces.

WHY suggested: J-M Round Cross-Section, Solid Metal Gaskets provide gas-tight seals for relatively low-pressure systems and with low initial bolt loading. Inexpensive.

WHAT constructions are available: J-M Round Cross-Section, Solid Metal Gaskets are generally made from wire formed to size and welded. The joint is polished to exact wire diameter. Available constructions are described under individual styles.

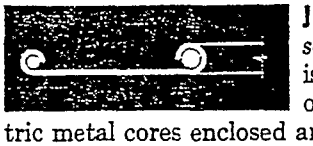
Standard metals (both wire and jackets) used to make J-M Round Cross-Section, Solid Metal Gaskets are aluminum, copper, soft iron or steel, monel, nickel, 300 series stainless steels, and copper coated steel (wire only). Wire diameters range from 1/16" to 3/8" and jacket thickness, .015" to .020"



J-M 949 is a round cross-section wire ring gasket. Flanges are usually grooved, tapered or otherwise faced to locate the gasket accurately during assembly, although some applications may be between flat faces. Although sometimes considered a gasket that should be only circular in shape, J-M 949 can be used in moderately non-circular shapes.

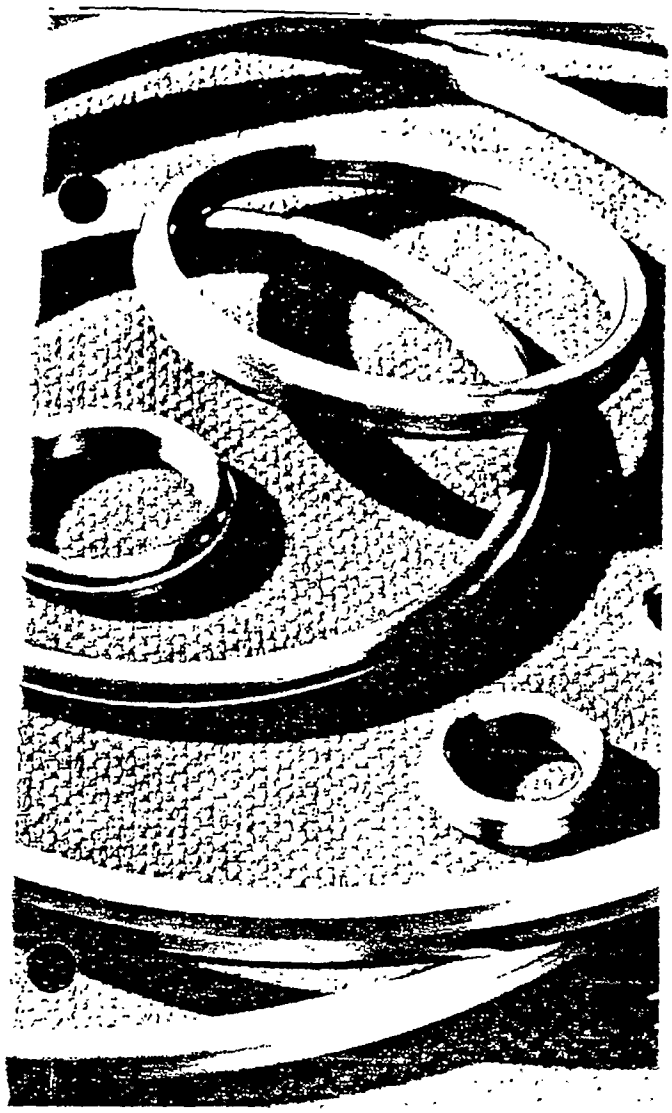


J-M 903 (*half-section*) is a J-M 949 gasket partially wrapped with a jacket of the same or softer metal for use between non-grooved flanges. The outer edge of the jacket provides means of centering on flange bolts. This construction also allows use of the soft metal jacket for sealability and the hard metal core for radial reinforcement.



J-M 903 (*full section*) gasket is constructed of two concentric metal cores enclosed and spaced by a jacket of the same or softer metal. The inner core wire cross-section is normally about 0.020" heavier than the outer core wire. This construction assures full initial seating load at the gasket I.D., but the outer bulb restricts the amount of flange bending. Bolt holes are in the connecting web of the jacket. J-M 903 gaskets are available in non-circular as well as circular configurations.

FBW-261



Johns-Manville HEAVY CRC

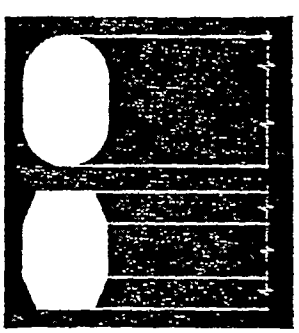
WHERE recommended: J-M Heavy Cross-Section Gaskets have almost universal acceptance in the petroleum and processing industries. This gasket group is designed for use in closures which are specially faced to accept them. Styles are machined to specialized cross-sections including Oval, Octagonal, Lens or Flare, Bridgemen and Delta. Uses include high-pressure oil field drilling and production equipment, pressure vessels, valve bonnets and piping systems.

HOW they work: J-M Heavy Cross-Section Gaskets generally seal by initial line contact or wedging action which causes surface flow of the gasket metal. Some of the styles are pressure-actuated (i.e. the higher the contained pressure rises, the tighter the seal).

WHY suggested: J-M Heavy Cross-Section Gaskets may be the only solution for high-pressure and high-temperature services. Provide an excellent mechanical joint.

WHAT constructions are available: J-M Heavy Cross-Section Gaskets are essentially rectangular or triangular shaped, machined from solid metal. Available constructions for specific applications are described under individual styles.

Standard metals used to make J-M Heavy Cross-Section Gaskets include any wrought or forged material that is suitable as a gasket. (Cast metals should not be considered.) Metals requiring heat treatment after final machining should not be considered.



J-M 950 and 951 V-Tite Gaskets are designed for API type ring joint flanges. Each of the two cross-sections — J-M 950 (Oval) and J-M 951 (Octagonal) — match standard and special grooves for applications almost entirely in the oil and petroleum industries, and liquid oxygen (LOX) service. The basic shapes are used at pressures to 10,000 psi. Most dimensions are standardized, but many specials are made to order for use in specially grooved flanges in piping, valve bonnets or any assemblies for higher pressures. V-Tite Gaskets are interchangeable in flanges of the newest flat bottom groove design; however, only the oval cross-section can be used in the old type, round-bottom groove. Of the two cross-section, J-M 951 should be used wherever possible because of its higher sealing efficiency. Every step in the manufacture of V-Tite Gaskets is meticulously controlled. Close tolerances are rigidly maintained for matching of rings with the flange grooves. By carefully controlled heat treatment the hardness of the finished gasket is kept below maximum allowable to assure proper flow and sealing without damaging the flange surfaces. The contact surfaces are smoothly finished to a high order of smoothness, free from objectionable ridges, tool or chatter marks that cause joint leakage. For standard sizes, see page 29.
Complies with A.S.A. B16:20 and *API 6 A*. J-M 950 and J-M 951 are fabricated in accordance with standards listed on next page.

Johns-Manville produces a wide selection of custom-designed as well as standard gaskets, in any material, dimension or cross-section, including the pressure-actuated "BX" and "RX" modifications of the octagonal cross-section (J-M 951).

"BX" and "RX" Ring Gaskets are designed for extreme pressure service (to 15,000 psi) required in today's oil field drilling and production.

Standard metals for these Ring Gaskets are low carbon steel and type 304 stainless steel. Also available in soft iron and type 316 stainless steel.

BX Ring Gaskets to Specification API 6 A: This gasket differs from the standard Oval or Octagonal

SS-SECTION, SOLID METAL Gaskets



MACHINED FROM SOLID METAL FOR HIGH-PRESSURE, HIGH-TEMPERATURE SERVICE, WHERE OPERATING CONDITIONS REQUIRE A SPECIAL JOINT DESIGN.

shape in that it is square in cross-section with tapers on each corner. Can be used only in API 6 BX flanges.

For standard API BX Ring Gasket sizes, see page 30.

RX Ring Gaskets to Specification API 6 A: Although these RX gaskets are similar to the standard Octagonal shape, their cross-section is designed to take advantage of the contained fluid pressure in effecting a seal. Interchangeable with standard Octagonal rings for oil field drilling and production applications in API 6 B flanges.

For standard RX Ring sizes, see page 30.

Note: All J-M V-Tite Gaskets complying with API 6 A carry the API monogram.

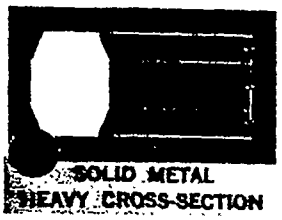


J-M 955 V-Tite Transition Rings are used for sealing ring type joints in which the mating flanges have different ring groove diameters. J-M 955 can be made in any standard ring joint gasket metal. Popular Transition combinations of J-M 955 are R23/R24, R26/R27, R45/R46, R49/R50, and R65/R66. Other sizes available on order. Made with oval or octagonal facings. When ordering, please specify which cross-section is preferred.

STANDARD SPECIFICATIONS FOR V-TITE GASKET METALS
In accordance with ASA B16.20 (Where applicable)

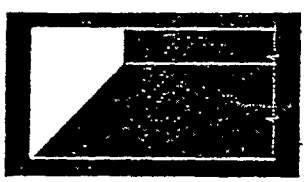
Metal	Maximum Hardness Brinell 3000 Kg	Maximum Hardness Rockwell "B"	Max. Service Temp.	Identification
Soft Iron	90†	50	1000°F	D
Low-Carbon Steel	120	68	1000°F	S
Type 502 Alloy (4-6% Chrome, ½% Moly)	130	72	1200°F	F 5
Type 410 Alloy (11-13% Chrome)	170	86	1300°F	S 410
Type 304 Alloy (18% Chrome, 8% Nickel)	160	83	Depends upon the Service Conditions	S 304
Type 316 Alloy (18% Chrome, 12% Nickel)	160	83		S 316
Type 347 Alloy (18% Chrome, 10% Nickel)	160	83		S 347
Monel	125	70		M
Nickel	120	68		N
Copper	**	**		CU

**Hardness as agreed upon. †500 Kg. load.





J-M 953 Lens Gasket is a line contact seal for high-pressure piping systems, with some application in pressure-vessel heads. The lens cross-section also is available in "bellows" construction which is pressure actuated in some applications depending on size and pressure. When ordering, drawings and complete material specifications must be supplied.



J-M 954 Bridgeman Gasket is pressure actuated for use as pressure-vessel head and valve bonnet gaskets for pressures 1500 psi and up. Also has been adapted to piping joints subject to extreme temperature shock conditions.

When ordering, drawings and complete material specifications must be supplied.

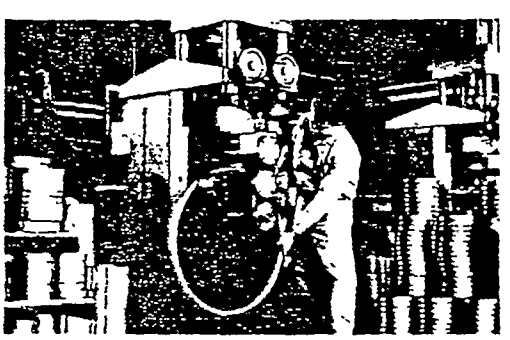


J-M 954 Delta Gasket is pressure actuated. The Delta cross-section is essentially a pressure vessel or valve bonnet gasket, useful in pressure range 5000 psi and up.

When ordering, drawings and complete material specifications must be supplied.

THE JOHNS-MANVILLE GOETZE PLANT IS SUPERBLY EQUIPPED...OFFERS OUTSTANDING SERVICE ON GASKETS AND OTHER METAL PARTS





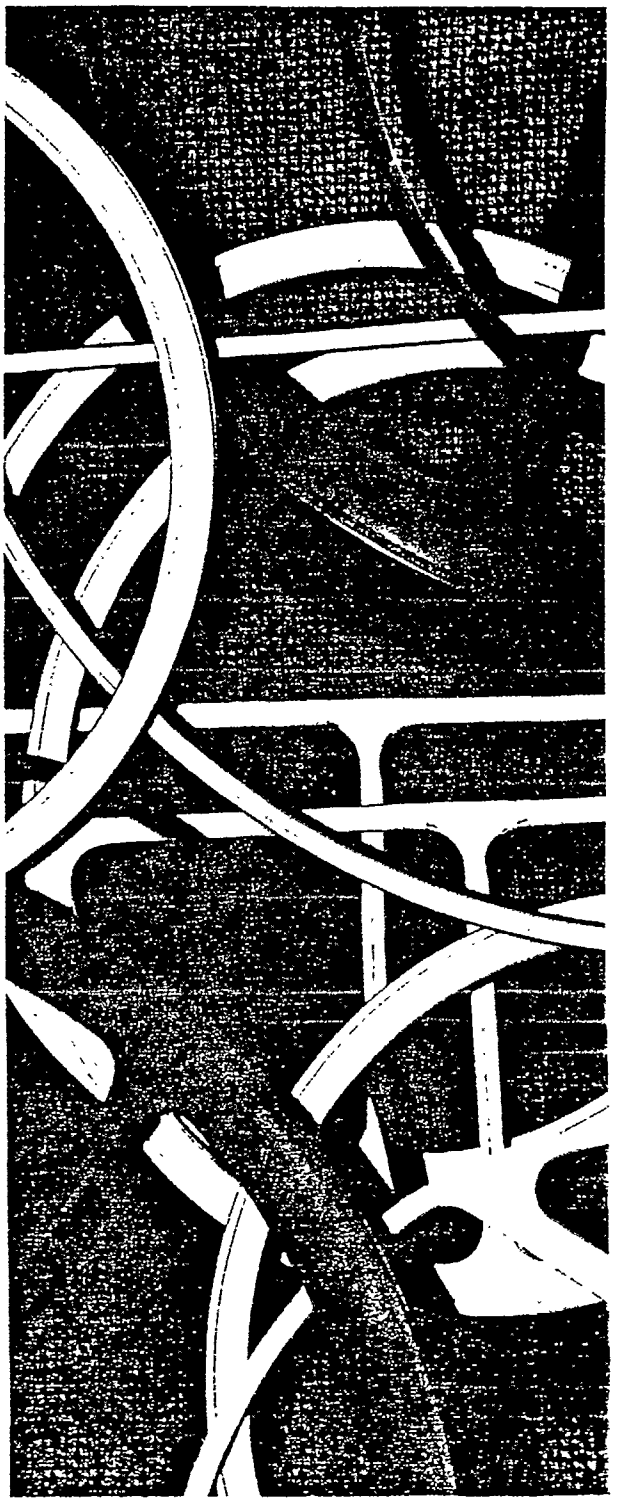
- New metal working service, now in operation, provides fast precision production of metal parts or components.
- Machined, stamped or rolled metal components can be produced efficiently, economically.
- Equipment and operators who can form, cut, pierce or shape thick or thin metals . . . hold tight tolerances . . . turn large thin sections . . . weld or join almost any known metal.
- Complete research and engineering facilities and technicians.

Your inquiries are invited on metal parts whether for gasketing or other applications.

FBW-264

Johns-Manville
HEAT EXCHANGER
Gaskets

J-M HEAT EXCHANGER GASKETS CAN BE PRODUCED TO YOUR EXACT REQUIREMENTS . . . TAILOR-MADE FROM THE MATERIALS YOU NEED . . . ACCURATELY MADE TO SIZE AND SHAPE TO SEAL EFFECTIVELY.



FBW-265

The double-jacketed construction (J-M 923) is generally employed; however, Heat Exchanger Gaskets also can be furnished in plain solid metal (J-M 940). Each is fabricated with meticulous care in every detail. Take the double-jacketed style as an example . . . there are no wrinkles on the outside corners, no cracks on the inside corners, lap widths are ample, rib widths are uniform. Above all, it is accurately made to close tolerances, can be depended on to fit and seal efficiently, and will stay on the job indefinitely without leaks or blowouts.

Attention to such important details is typical of the kind of care that goes into the forming of the custom-made gaskets. It is the secret of their dependable service, and the reason they pay off in terms of less down time.

For most efficient service, Johns-Manville recommends that the double-jacketed style be so designed and dimensioned as to allow at least ⅜" radius at all intersections to maintain a continuous metal lap at these points. Smaller radii or square corners will result in splitting of the metal.

A durable coating of red paint is applied (unless otherwise specified) on every soft iron gasket to resist rusting in storage or on the job awaiting installation.

Estimates and recommendations concerning Johns-Manville Heat Exchanger Gaskets will be furnished promptly upon receipt of detailed information, including blueprints.

J-M SPIROTALLIC® GASKETS

J-M STYLE 911 STANDARD SIZES

Large and Small Tongue & Groove Flanges — 150, 300, 400, 600, 900, 1500, 2500-lb. — LARGE: Pipe Size Inches	LARGE: Gasket Dimensions Inches	SMALL: Pipe Size Inches	SMALL: Gasket Dimensions Inches	Large Male and Female Flanges and Flanged Fittings: Pipe Size Inches	150, 300-lb. Gasket Dimensions Inches	400, 600, 900, 1500, 2500-lb. Gasket Dimensions Inches
½	1 x 1⅜	½	1 x 1⅜	½	1 x 1⅜	1 x 1⅜
¾	1⅝ x 1 1/16	¾	1⅝ x 1 1/16	¾	1⅝ x 1 1/16	1⅝ x 1 1/16
1	1½ x 2	1	1½ x 1⅞	1	1½ x 2	1⅜ x 2
1¼	1⅞ x 2½	1¼	1⅞ x 2¼	1¼	1⅞ x 2½	1¾ x 2½
1½	2⅛ x 2⅞	1½	2⅛ x 2½	1½	2⅛ x 2⅞	2 x 2⅞
2	2⅞ x 3⅝	2	2⅞ x 3¼	2	2⅞ x 3⅝	2½ x 3⅝
2½	3⅜ x 4⅛	2½	3⅜ x 3¾	2½	3⅜ x 4⅛	3 x 4⅛
3	4¼ x 5	3	4¼ x 4⅝	3	4¼ x 5	3⅝ x 5
3½	4¾ x 5½	3½	4⅜ x 5⅛	3½	4¾ x 5½	4⅛ x 5½
4	5 3/16 x 6 3/16	4	5 3/16 x 5 1/16	4	5 3/16 x 6 3/16	4⅝ x 6 3/16
5	6 5/16 x 7 5/16	5	6 3/16 x 6 13/16	5	6 5/16 x 7⅜	5 1/16 x 7 5/16
6	7½ x 8½	6	7½ x 8	6	7½ x 8½	6¾ x 8½
8	9⅜ x 10⅝	8	9⅜ x 10	8	9⅜ x 10⅝	8¾ x 10⅝
10	11¼ x 12¾	10	11¼ x 12	10	11½ x 12¾	10⅞ x 12¾
12	13½ x 15	12	13½ x 14¼	12	13⅝ x 15	12⅞ x 15
14	14¾ x 16¼	14	14¾ x 15½	14	14¾ x 16¼	14⅛ x 16¼
16	16¾ x 18½	16	16¾ x 17 5/16	16	16⅞ x 18½	16⅛ x 18½
18	19¼ x 21	18	19¼ x 20⅛	18	19¼ x 21	18⅛ x 21
20	21 x 23	20	21 x 22	20	21⅛ x 23	20¾ x 23
24	25¼ x 27¼	24	25¼ x 26¼	24	25¼ x 27¼	25¼ x 27¼

Cast Iron Companion Flanges — GASKETS TO FIT INSIDE BOLT HOLES: Pipe Size Inches	Standard 125-lb. Gasket Dimensions Inches	Extra Heavy 250-lb. Gasket Dimensions Inches
1	1⅞ x 2½	2 1/16 x 2¾
1¼	2¼ x 2⅞	2 7/16 x 3⅛
1½	2½ x 3¼	2⅞ x 3⅝
2	3¼ x 4	3 7/16 x 4¼
2½	3⅞ x 4¾	4⅛ x 5
3	4⅜ x 5¼	4 13/16 x 5¾
3½	5¼ x 6¼	5⅜ x 6⅜
4	5⅝ x 6¾	5⅞ x 7
4½	5¾ x 6⅞	6 7/16 x 7 5/16
5	6½ x 7⅝	7 1/16 x 8⅛
6	7½ x 8⅝	8½ x 9¾
7	8⅝ x 9⅞	9½ x 10⅞
8	9⅝ x 10⅞	10⅝ x 12
9	11 x 12⅜	11½ x 13
10	11¾ x 13¼	12½ x 14⅛
12	14⅜ x 16	14 13/16 x 16½
14	15⅞ x 17⅝	17¼ x 19
15	17⅛ x 18⅞	18 x 19⅞
16	18¼ x 20⅛	19¼ x 21⅛
18	19⅝ x 21½	21¼ x 23⅜
20	21⅝ x 23¾	23¾ x 25⅝
22	24 x 25⅞	25¾ x 27½
24	26½ x 28⅛	28⅞ x 30⅜

J-M STYLE 912 STANDARD SIZES
ASA RAISED FACE FLANGES AND FLANGED FITTINGS
FOR WELDING NECK AND LAPPED JOINT ONLY

Pipe Size Inches	Gasket Dimensions Inches	150-lb. Guide O.D.	300-lb. Guide O.D.	400-lb. Guide O.D.	600-lb. Guide O.D.
¼	9/16 x ⅞	1¾	1¾	1¾	1¾
½	⅞ x 1¼	1 13/16	2⅛	2⅛	2⅛
¾	1⅛ x 1⅝	2 1/16	2⅝	2⅝	2⅝
1	1⅜ x 1 29/32	2 5/16	2⅞	2⅞	2⅞
1¼	1¾ x 2 11/32	2 15/16	3¼	3¼	3¼
1½	2 x 2 23/32	3 5/16	3¾	3¾	3¾
2	2½ x 3 11/32	4 1/16	4 5/16	4 5/16	4 5/16
2½	3 1/16 x 3 27/32	4 13/16	5 1/16	5 1/16	5 1/16
3	3¾ x 4 23/32	5 5/16	5¾	5¾	5¾
3½	4¼ x 5 1/32	6 5/16	6 7/16	6 5/16	6 5/16
4	4¾ x 5 27/32	6 13/16	7 1/16	6 15/16	7 1/16
4½	5⅛ x 6 15/32	6 15/16	7 11/16	....	....
5	5¾ x 6 31/32	7 11/16	8 1/16	8 5/16	9 1/16
6	6⅞ x 8 1/32	8 11/16	9 13/16	9 11/16	10 1/16
8	8⅞ x 10 5/16	10 3/16	12 1/16	11 5/16	12 1/16
10	11 x 12 7/16	13 5/16	14 3/16	14 1/16	15 1/16
12	13 x 14 11/16	15 7/16	16 7/16	16 1/16	17 5/16
14	14¼ x 15 15/16	17 1/16	19 1/16	18 3/16	19 5/16
16	16¼ x 18 3/16	20 3/16	21 3/16	21 1/16	22 3/16
18	18¼ x 20 11/16	21 5/16	23 7/16	23 5/16	24 1/16
20	20½ x 22 13/16	23 11/16	25 13/16	25 7/16	26 13/16
24	25¼ x 26 15/16	28 3/16	30 7/16	30 1/16	31 1/16

THICKNESS: Style 912 gaskets are 1/16 nominal.

J-M STYLE 914 HANDHOLE AND MANHOLE STANDARD SIZES

GASKET DIMENSIONS — INCHES

Handhole

OVAL I.D.	OVAL Wdth	OBLONG I.D.	OBLONG Wdth	I.D.	Wdth
2½ x 3½	3/16	4 x 5	½	2½ x 3½	3/8
2½ x 3½	3/8	4 x 6	3/8	2½ x 3½	½
2½ x 3½	½	4 x 6	½	3 x 4	5/16
3 x 4	5/16	4 x 6	¾	3 x 4	3/8
3 x 4	3/8	4½ x 5⅛	3/8	3 x 4½	5/8
3 x 4	½	4½ x 5⅛	½	3½ x 4½	3/8
3⅜ x 4¼	5/16	4¼ x 5¼	3/8	4 x 5	3/8
3½ x 4½	3/8	4¼ x 5¼	½	4 x 5	½
3½ x 4½	½	6 x 8	½	4½ x 6	3/8
4 x 5	3/8	6 x 8	¾	4½ x 6	½

Manhole (OVAL)

I.D.	Width	I.D.	Width
9 x 12	¾	11 x 14	1¼
9 x 14	¾	11 x 15	½
10 x 14	1	11 x 15	¾
10 x 14	1¼	11 x 15	1
10 x 15	1	11 x 15	1¼
10 x 15	1¼	12 x 16	½
10 x 16	1	12 x 16	¾
10 x 16	1¼	12 x 16	⅞
11 x 14	¾	12 x 16	1
11 x 14	1	12 x 16	1¼

NOTE: Style 914 Standard Handhole and Tube Cap Sizes, classified by make of boiler, are listed on pages 22-23.

FBW-266

J-M SPIROTALLIC GASKETS

J-M STYLE 913 STANDARD SIZES
ASA RAISED FACE FLANGES and FLANGED FITTINGS (see NOTE 3)
(Dimensions based on API STANDARD 601, see NOTES 1 and 2)

Pipe Size Inches	150, 300-lb I.D.	150, 300-lb O.D.	150-lb Guide O.D.	300-lb Guide O.D.	400, 600-lb I.D.	400, 600-lb O.D.	400-lb Guide O.D.	600-lb Guide O.D.	900-lb I.D.	900-lb O.D.	900-lb Guide O.D.	1500, 2500-lb I.D.	1500, 2500-lb O.D.	1500 lb Guide O.D.	2500-lb Guide O.D.
¼	½	⅞	1¼	1¼	½	⅞	1¼	1¾	...	...	...	...	...	...	...
½	¾	1¼	1⅞	2⅛	¾	1¼	2⅛	2⅛	¾	1¼	2½	¾	1¼	2½	2¾
¾	1	1 11/16	2¼	2⅝	1	1 11/16	2⅝	2⅝	1	1 11/16	2¾	1	1 11/16	2¾	3
1	1¼	1⅞	2⅝	2⅞	1¼	1⅞	2⅞	2⅞	1¼	1⅞	3⅛	1¼	1⅞	3⅛	3⅜
1¼	1 23/32	2⅜	3	3¼	1 23/32	2⅜	3¼	3¼	1 13/16	2⅜	3½	1 13/16	2⅜	3½	4¼
1½	1 31/32	2¾	3⅜	3¾	1 31/32	2¾	3¾	3¾	1⅞	2¾	3⅞	1⅞	2¾	3⅞	4⅝
2	2 1/4	3⅜	4⅛	4⅜	2 1/4	3⅜	4⅜	4⅜	2 5/16	3⅜	5⅛	2 5/16	3⅜	5⅛	5¼
2½	3⅛	3⅞	4⅞	5⅛	3⅛	3⅞	5⅛	5⅛	2¾	3⅞	6½	2¾	3⅞	6½	6⅝
3	4	4¾	5⅜	5⅞	4	4¾	5⅞	5⅞	3¾	4¾	6⅝	3⅝	4¾	6⅞	7¾
3½	4½	5¼	6⅜	6½	4 1/16	5¼	6⅜	6⅜	4 1/16	5¼	7½	4 1/16	5¼	7⅜	...
4	5	5⅞	6⅞	7⅛	4¾	5⅞	7	7⅛	4¾	5⅞	8⅛	4⅝	5⅞	8¼	9¼
4½	5½	6½	7	7¾	5 5/16	6½	7⅜	8¼	5 5/16	6½	9⅜	5 5/16	6½	9⅛	...
5	6⅛	7	7¾	8½	5 13/16	7	8⅜	9½	5 13/16	7	9¾	5⅝	7	10	11
6	7 3/16	8¼	8¾	9⅞	6⅞	8¼	9¾	10½	6⅞	8¼	11⅜	6¾	8¼	11⅛	12½
8	9 5/16	10⅜	11	12⅛	8⅞	10⅜	12	12⅝	8⅞	10⅜	14⅛	8½	10⅜	13⅞	15¼
10	11 5/16	12½	13⅜	14¼	10 13/16	12½	14⅛	15¾	10 13/16	12½	17⅛	10⅝	12½	17⅛	18¾
12	13⅜	14¾	16⅛	16⅝	12⅞	14¾	16½	18	12⅞	14¾	19⅝	12¾	14¾	20½	21⅝
14	14⅝	16	17¾	19⅛	14¼	16	19	19⅜	14¼	16	20½	14¼	16	22¾	...
16	16⅝	18¼	20¼	21¼	16¼	18¼	21⅛	22¼	16¼	18¼	22⅝	16¼	18¼	25¼	...
18	18 11/16	20¾	21⅝	23½	18½	20¾	23⅜	24⅛	18¼	20¾	25⅛	18¼	20¾	27¾	...
20	20 11/16	22¾	23⅜	25¾	20½	22¾	25½	26⅞	20¼	22¾	27½	20¼	22¾	29¾	...
24	24¾	27	28¼	30½	24¾	27	30¼	31⅛	24¼	27	33	24¼	27	35½	...

THICKNESS: Style 913 gaskets are 1/16" nominal. Guide Rings are 1/16".

NOTE 1 API Standard 601 does not include dimensions for ¼", ½", ¾", 3½", 4½" or 5" Pipe Sizes.

NOTE 2 Gasket O.D. Dimensions are "overall"; therefore, are ⅛" larger than those shown in API Standard 601.

NOTE 3 To determine suitability of dimensions for the particular flange type or bore, use the following table. It shows maximum bore of flange for which gasket dimensions are recommended.

	PIPE SIZE (inches)						
FLANGE TYPE	150-lb	300-lb	400-lb	600-lb	900-lb	1500-lb	2500-lb
WN-STDW*	¼–24	¼–24	¼–24	¼–24	½–24	½–24	½–12
Nozzles**	1–24	1–24	1–12	1–12	1–12	1–12	1–12
WN 10-10S	3–24	3–24	4–24	4–24	3–24	N.S.	N.S.
Slip-On	3–24	3–24	3 & 24 only	3 & 24 only	N.S.	N.S.	N.S.

*Sizes 2½" and smaller must be installed concentric with flange bore standard weight pipe to avoid possible protrusion of gasket into bore.

**Sizes 1" through 1½" require same care in installation as described in footnote (*). Sizes 14" and larger, 400* and up, not recommended for use with nozzles.

Symbols used in table are:

WN-STDW — Welding Neck Flange bored for standard weight or heavier pipe.

Nozzle — A manufacturer's standard "Welding Neck." Bore equals nominal size (inches).

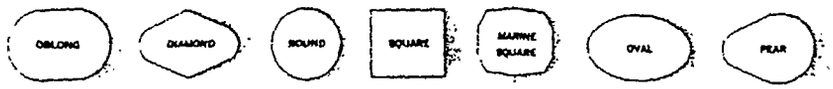
WN 10-10S — Welding Neck Flange bored for schedule 10-S pipe through 12"; bore for schedule 10 pipe over 12".

Slip-On — Slip-On or "Screw-On" Flange (Bore is essentially O.D. of Pipe).

N.S. — Not suitable for this flange rating.

FBW-267

AVAILABLE SHAPES: J-M SPIROTALLIC BOILER GASKETS



J-M STYLE 914 STANDARD HANDHOLE AND TUBE CAP SIZES
(classified by Make of Boiler)

Make of Boiler and Gasket No. or Name	Actual Shape	Nominal Gasket Size, Inches	Actual Gasket Size, Inches	Width Inches
AMERICAN ENGINEERING				
	Round	3⅜ I.D.	3⅜ I.D. x 3¾ O.D.	
	Oblong	3⅜ x 3¾ I.D.	3⅜ x 3¾ I.D.	3/16
BABCOCK & WILCOX				
No. 2	Round	3 I.D.	3 I.D. x 3 9/16 O.D.	
No. 24	Oval	4½ x 5½ I.D.	4 35/64 x 5 31/64 I.D.	7/32
No. 24	Oval	4½ x 5½ I.D.	4 35/64 x 5 31/64 I.D.	¼
No. 28	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	7/32
No. 28	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	¼
British No. 28	Square	4¾ x 4¾ I.D.	4¾ x 4¾ I.D.	¼
Foreign No. 28	Square	119mm x 119mm I.D.	119mm x 119mm I.D.	6.35 mm
No. 31	Oval	4 x 5 I.D.	4 3/32 x 5 1/16 I.D.	¼
No. 32	Round	3 I.D.	3 1/64 I.D. x 3½ O.D.	
No. 33	Round	2½ I.D.	2½ I.D. x 3 O.D.	
No. 40 Oval	Diamond	3⅜ x 3¾ I.D.	3⅜ x 3¾ I.D.	3/16
No. 41	Oblong	2⅛ x 2½ I.D.	2⅛ x 2½ I.D.	3/16
No. 47	Round	2 I.D.	2 1/64 I.D. x 2 25/64 O.D.	
No. 48	Oval	3¾ x 4¾ I.D.	3 25/32 x 4 23/32 I.D.	¼
No. 70	Round	3¼ I.D.	3 5/16 I.D. x 3 11/16 O.D.	
No. 79	Oblong	4⅛ x 4¾ I.D.	4⅛ x 4¾ I.D.	7/32
No. 89	Round	3 7/16 I.D.	3 7/16 I.D. x 3¾ O.D.	
	Round	4½ I.D.	4 1/32 I.D. x 4 17/32 O.D.	
Foreign—Oval	Oval	4 3/32 x 4 23/32 I.D.	4 3/32 x 4 23/32 I.D.	7/32
Foreign—Square	Square	3 21/32 x 3 21/32 I.D.	3 21/32 x 3 21/32 I.D.	3/16
Foreign—Square	Square	93mm x 93mm I.D.	93mm x 93mm I.D.	4.0mm

Nos. 62, 63, 66 Same as No. 24
Nos. 4, 45, 46, 92, 183 Same as No. 47
Nos. 44, 50, 54, 56, 57, 58, 59, 60, 76, 84, 85 Same as No. 40
Nos. 53, 61, 86, 87, 88 Same as No. 48
Nos. 43, 49 Same as No. 41
Nos. 90, 95 Same as No. 89

BADENHAUSEN				
W-C4	Oblong	3 11/16 x 5 11/16 I.D.	3 23/32 x 5 23/32 I.D.	21/64
W-C4	Oblong	3 11/16 x 5 11/16 I.D.	3 23/32 x 5 23/32 I.D.	3/8
W-C7	Round	3¼ I.D.	3 5/32 I.D. x 3 15/16 O.D.	
W-C10	Square	4 x 4 I.D.	4 x 4 I.D.	21/64
W-C14	Square	5 7/16 x 5 7/16 I.D.	5 7/16 x 5 7/16 I.D.	21/64
W-C14	Square	5 7/16 x 5 7/16 I.D.	5 7/16 x 5 7/16 I.D.	3/8
W-C18	Round	2 I.D.	2 I.D. x 2⅝ O.D.	
W-C22	Oval	3½ x 4½ I.D.	3 17/32 x 4 17/32 I.D.	21/64
W-C25	Oblong	3 11/16 x 5 11/16 I.D.	3 21/32 x 5 21/32 I.D.	21/64
CASEY-HEDGES (See also Combustion Engineering)	Diamond	4 x 5 I.D.	4 x 5 I.D.	5/16
	Diamond	4¼ x 5 I.D.	4¼ x 5 I.D.	5/16
COMBUSTION ENGINEERING				
No. 1	Round	1½ I.D.	1½ I.D. x 1⅞ O.D.	
No. 2	Round	2 I.D.	2 I.D. x 2⅜ O.D.	
No. 3	Round	2½ I.D.	2⅝ I.D. x 3 O.D.	
No. 4	Round	3⅛ I.D.	3⅛ I.D. x 3½ O.D.	
No. 5	Round	3⅝ I.D.	3⅝ I.D. x 4⅛ O.D.	
No. 6	Round	4⅛ I.D.	4⅛ I.D. x 4⅝ O.D.	
No. 7	Round	1¾ I.D.	1¾ I.D. x 2⅛ O.D.	
No. 8	Oval	3 7/16 x 4 7/16 I.D.	3 7/16 x 4 7/16 I.D.	3/16

Make of Boiler and Gasket No. or Name	Actual Shape	Nominal Gasket Size, Inches	Actual Gasket Size, Inches	Width Inches
COMBUSTION ENGINEERING (Cont.)				
No. 21	Oblong	2⅛ x 2½ I.D.	2⅛ x 2½ I.D.	3/16
No. 21	Oblong	2⅛ x 2½ I.D.	2⅛ x 2½ I.D.	7/32
No. 22	Oval	2⅛ x 2⅝ I.D.	2⅛ x 2 21/32 I.D.	3/16
No. 22	Oval	2⅛ x 2⅝ I.D.	2⅛ x 2 21/32 I.D.	7/32
No. 23	Oblong	2¾ x 3⅜ I.D.	2¾ x 3 13/32 I.D.	3/16
No. 24	Diamond	3 x 3⅜ I.D.	3 x 3 15/16 I.D.	¼
No. 27	Diamond	3⅜ x 3¾ I.D.	3⅜ x 3¾ I.D.	3/16
No. 28	Oblong	3⅜ x 3⅜ I.D.	3 11/32 x 3⅜ I.D.	3/16
No. 28	Oblong	3⅜ x 3⅜ I.D.	3 11/32 x 3⅜ I.D.	7/32
No. 29	Diamond	3⅜ x 4¼ I.D.	3⅜ x 4¼ I.D.	¼
No. 29	Diamond	3⅜ x 4¼ I.D.	3⅜ x 4¼ I.D.	9/32
No. 30	Diamond	3⅝ x 4½ I.D.	3⅝ x 4½ I.D.	¼
No. 30	Diamond	3⅝ x 4½ I.D.	3⅝ x 4½ I.D.	3/8
No. 31	Diamond	4¼ x 5⅛ I.D.	4¼ x 5⅛ I.D.	7/32
No. 31	Diamond	4¼ x 5⅛ I.D.	4¼ x 5⅛ I.D.	¼
No. 32	Oval	4½ x 5½ I.D.	4½ x 5½ I.D.	¼
No. 33	Diamond	3¾ x 4⅝ I.D.	3¾ x 4⅝ I.D.	¼
No. 51	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	7/32
No. 51	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	¼
No. 52	Square	4⅞ x 5 3/16 I.D.	4⅞ x 5¼ I.D.	3/16
No. 52	Square	4⅞ x 5 3/16 I.D.	4⅞ x 5¼ I.D.	¼
L-741	Round	3⅜ I.D.	3⅜ I.D. x 4 O.D.	
EDGEMOOR				
No. 1	Oval	4 x 5 3/16 I.D.	4 x 5 3/16 I.D.	13/32
No. 2 Burlington	Oval	4¼ x 5¼ I.D.	4 1/16 x 5¼ I.D.	5/16
No. 4	Oval	4 3/32 x 5 7/32 I.D.	4 3/32 x 5 7/32 I.D.	⅜
ERIE CITY				
	Round	3½ I.D.	3½ I.D. x 4¼ O.D.	
	Oval	2⅝ x 3⅝ I.D.	2⅝ x 3⅝ I.D.	⅜
	Oval	3 x 4 I.D.	3 x 4 I.D.	⅜
	Oblong	3½ x 4½ I.D.	3 15/32 x 4 15/32 I.D.	⅜
	Oblong	4½ x 9 I.D.	4½ x 9 I.D.	⅜
	Pear	3½ x 4⅝ I.D.	3½ x 4⅝ I.D.	5/16
	Pear	3½ x 4⅝ I.D.	3½ x 4⅝ I.D.	11/32
FOSTER WHEELER				
	Round	2 I.D.	2 1/16 I.D. x 2 11/16 O.D.	
	Round	2½ I.D.	2 7/16 I.D. x 3 O.D.	
	Round	4 3/32 I.D.	4⅛ I.D. x 4¾ O.D.	
4" Tube	Oval	4 3/16 x 5 3/16 I.D.	4 3/16 x 5 3/16 I.D.	5/16
4" Tube	Oval	4 3/16 x 5 3/16 I.D.	4 3/16 x 5 3/16 I.D.	⅜
2¼" Tube	Oblong	2¾ x 3⅜ I.D.	2 23/32 x 3 13/32 I.D.	3/16
2¾" Tube	Oblong	2¾ x 3⅜ I.D.	2 23/32 x 3 13/32 I.D.	7/32
3⅝" Tube	Oblong	3 5/16 x 3 15/16 I.D.	3 11/32 x 3 31/32 I.D.	3/16
3⅝" Tube	Oblong	3 5/16 x 3 15/16 I.D.	3 11/32 x 3 31/32 I.D.	7/32
	Oblong	3⅜ x 3 11/16 I.D.	3⅜ x 3¾ I.D.	3/16
	Oblong	3 x 4 I.D.	3 1/16 x 4 1/16 I.D.	¼
	Oblong	3 x 4 I.D.	3 1/16 x 4 1/16 I.D.	5/16
	Diamond	4 x 5¼ I.D.	4 x 5 7/32 I.D.	¼
	Diamond	4 x 5¼ I.D.	4 x 5 7/32 I.D.	⅜
	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	7/32
	Square	4 13/16 x 5 I.D.	4 13/16 x 5 I.D.	¼
Marine	Square	4 13/16 x 5 1/16 I.D.	4 29/32 x 5 7/32 I.D.	¼

FBW-268

J-M STYLE 914 STANDARD HANDHOLE AND TUBE CAP SIZES
(classified by Make of Boiler)

Make of Boiler and Gasket No. or Name	Actual Shape	Nominal Gasket Size, Inches	Actual Gasket Size, Inches	Width Inches
FRANKLIN	Round	3 11/16 I.D.	3 23/32 I.D. x 4 3/16 O.D.	5/16
	Oblong	3 3/8 x 4 5/8 I.D.	3 3/8 x 4 5/8 I.D.	
GEARY				
3 1/2" Tube	Oblong	3 11/16 x 4 11/16 I.D.	3 47/64 x 4 23/32 I.D.	9/32
3 1/2" Tube	Oblong	3 11/16 x 4 11/16 I.D.	3 47/64 x 4 23/32 I.D.	5/16
4" Tube	Oblong	4 x 5 I.D.	4 3/16 x 5 3/16 I.D.	3/8
4" Tube	Oblong	4 x 5 I.D.	4 3/16 x 5 3/16 I.D.	13/32
HEDGES-WALSH-WEIDNER (See also Combustion Engineering)	Oblong	3 3/8 x 4 1/8 I.D.	3 3/8 x 4 1/8 I.D.	3/16
	Diamond	3 3/4 x 4 5/8 I.D.	3 3/4 x 4 5/8 I.D.	1/4
HEINE	Round	3 5/8 I.D.	3 5/8 I.D. x 4 1/4 O.D.	
	Oval	4 1/4 x 5 1/8 I.D.	4 1/4 x 5 1/8 I.D.	1/4
	Oblong	3 5/8 x 4 5/8 I.D.	3 5/8 x 4 5/8 I.D.	5/16
	Diamond	3 5/8 x 4 1/4 I.D.	3 5/8 x 4 1/4 I.D.	1/4
INTERNATIONAL	Oval	2 3/4 x 3 3/4 I.D.	2 5/8 x 3 5/8 I.D.	13/32
	Oval	3 x 4 1/2 I.D.	2 7/8 x 4 3/8 I.D.	7/16
	Oblong	3 1/4 x 4 1/4 I.D.	3 1/4 x 4 1/4 I.D.	7/16
	Oblong	4 x 6 I.D.	4 x 6 I.D.	7/16
	Pear	3 3/4 x 4 3/4 I.D.	3 3/4 x 4 3/4 I.D.	3/8
KEELER	Round	4 1/4 I.D.	4 1/4 I.D. x 4 29/32 O.D.	
	Diamond	4 1/4 x 5 3/8 I.D.	4 3/16 x 5 3/8 I.D.	5/16
	Diamond	4 1/4 x 5 3/8 I.D.	4 3/16 x 5 3/8 I.D.	3/8
	Pear	4 1/8 x 5 1/4 I.D.	4 1/4 x 5 3/16 I.D.	3/8
MURRAY				
3 1/2" Tube	Oblong	3 5/8 x 4 5/8 I.D.	3 5/8 x 4 5/8 I.D.	5/16
4" Tube	Oblong	4 x 5 I.D.	4 1/16 x 5 1/16 I.D.	5/16
	Oblong	2 1/2 x 4 I.D.	2 15/32 x 4 I.D.	5/16
	Oblong	3 1/2 x 4 1/2 I.D.	3 1/2 x 4 1/2 I.D.	5/16
	Oblong	3 11/16 x 4 5/8 I.D.	3 11/16 x 4 11/16 I.D.	3/8
	Oval	4 x 6 I.D.	4 x 6 I.D.	7/16
OIL CITY				
3 1/2" Tube	Oblong	3 11/16 x 4 11/16 I.D.	3 47/64 x 4 23/32 I.D.	5/16
4" Tube	Oblong	4 x 5 I.D.	4 3/16 x 5 3/16 I.D.	3/8
4" Tube	Oblong	4 x 5 I.D.	4 3/16 x 5 3/16 I.D.	13/32
OIL WELL SUPPLY	Oblong	2 1/2 x 3 1/2 I.D.	2 1/2 x 3 1/2 I.D.	5/16
	Oblong	3 x 4 I.D.	3 x 4 I.D.	5/16
	Oblong	3 1/4 x 4 13/16 I.D.	3 1/4 x 4 13/16 I.D.	3/8
	Oblong	3 1/2 x 4 1/2 I.D.	3 1/2 x 4 1/2 I.D.	5/16
	Oblong	4 1/16 x 5 1/16 I.D.	4 1/32 x 5 1/32 I.D.	5/16
PACIFIC	Oblong	3 x 4 I.D.	3 x 4 I.D.	5/16

Make of Boiler and Gasket No. or Name	Actual Shape	Nominal Gasket Size, Inches	Actual Gasket Size, Inches	Width Inches
PAGE	Oval	2 3/4 x 3 3/4 I.D.	2 3/4 x 3 51/64 I.D.	5/16
	Oval	2 3/4 x 3 3/4 I.D.	2 3/4 x 3 51/64 I.D.	3/8
RILEY				
W-C4	Oblong	3 11/16 x 5 11/16 I.D.	3 23/32 x 5 23/32 I.D.	21/64
W-C4	Oblong	3 11/16 x 5 11/16 I.D.	3 23/32 x 5 23/32 I.D.	3/8
W-C7	Round	3 1/4 I.D.	3 9/32 I.D. x 3 15/16 O.D.	
W-C10	Square	4 x 4 I.D.	4 x 4 I.D.	21/64
W-C14	Square	5 7/16 x 5 7/16 I.D.	5 7/16 x 5 7/16 I.D.	21/64
W-C14	Square	5 7/16 x 5 7/16 I.D.	5 7/16 x 5 7/16 I.D.	3/8
W-C18	Round	2 I.D.	2 I.D. x 2 5/8 O.D.	
W-C22	Oval	3 1/2 x 4 1/2 I.D.	3 17/32 x 4 17/32 I.D.	21/64
W-C25	Oblong	3 11/16 x 5 11/16 I.D.	3 21/32 x 5 21/32 I.D.	21/64
SEABOARD				
Water Screen	Round	3 1/2 I.D.	3 1/2 I.D. x 3 15/16 O.D.	
Water Screen	Oblong	4 1/8 x 4 7/8 I.D.	4 1/8 x 4 7/8 I.D.	3/16
Water Screen	Oblong	4 1/8 x 4 7/8 I.D.	4 1/8 x 4 7/8 I.D.	7/32
SPRINGFIELD	Oval	3 1/4 x 4 1/4 I.D.	3 1/4 x 4 1/4 I.D.	3/8
	Square	5 1/2 x 5 1/2 I.D.	5 1/2 x 5 1/2 I.D.	11/32
	Square	5 1/2 x 5 1/2 I.D.	5 1/2 x 5 1/2 I.D.	7/16
	Square	5 5/8 x 5 5/8 I.D.	5 5/8 x 5 5/8 I.D.	11/32
	Square	7 3/8 x 7 3/8 I.D.	7 3/8 x 7 3/8 I.D.	5/16
	Square	7 1/2 x 7 1/2 I.D.	7 1/2 x 7 1/2 I.D.	3/8
SUPERHEATER (See also Combustion Engineering)	Oblong	3 3/16 x 3 3/4 I.D.	3 3/16 x 3 3/4 I.D.	3/16
UNION	Oval	3 1/2 x 4 1/2 I.D.	3 1/2 x 4 1/2 I.D.	3/8
	Pear	3 1/2 x 4 1/2 I.D.	3 15/32 x 4 15/32 I.D.	5/16
	Pear	3 1/2 x 4 1/2 I.D.	3 1/2 x 4 1/2 I.D.	9/32
	Pear	3 3/4 x 4 3/4 I.D.	3 3/4 x 4 3/4 I.D.	5/16
	Pear	3 3/4 x 4 3/4 I.D.	3 3/4 x 4 3/4 I.D.	3/8
	Pear	4 1/4 x 5 1/4 I.D.	4 1/4 x 5 1/4 I.D.	5/16
VOGT	Round	3 3/16 I.D.	3 3/8 I.D. x 4 1/4 O.D.	
	Round	4 1/16 I.D.	4 1/8 I.D. x 4 7/8 O.D.	
	Oval	3 3/8 x 4 1/4 I.D.	3 7/16 x 4 5/16 I.D.	3/16
	Oval	3 3/4 x 5 I.D.	3 3/4 x 5 I.D.	9/32
	Oval	4 1/4 x 5 I.D.	4 1/4 x 5 I.D.	5/16
	Oval	4 1/4 x 5 1/8 I.D.	4 5/16 x 5 1/16 I.D.	3/16
WARD (See also Combustion Engineering)	Square	4 13/16 x 5 3/16 I.D.	4 13/16 x 5 3/16 I.D.	1/4
	Square	4 15/16 x 4 13/16 I.D.	4 15/64 x 4 15/16 I.D.	1/4
	Square	5 x 5 1/4 I.D.	5 x 5 1/4 I.D.	1/4
WICKES	Round	4 1/8 I.D.	4 1/8 I.D. x 4 7/8 O.D.	
	Pear	4 1/4 x 5 1/16 I.D.	4 1/4 x 5 1/16 I.D.	5/16
	Oval	3 1/2 x 4 1/2 I.D.	3 1/2 x 4 1/2 I.D.	5/16

FBW-269

J-M SINGLE-JACKETED GASKETS

J-M STYLE 920 SINGLE-JACKETED STANDARD SIZES
(Standard Sizes in Inches)
COPPER, ALUMINUM AND SOFT IRON

I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK
*3/16	5/16	1/16	*1/2	1	1/16	21/32	1 1/4	3/32	13/16	1 5/16	3/32	*1	1 3/4	3/32	*1 11/64	1 35/64	3/32	1 5/16	2 1/2	3/32	*1 1/2	2 7/8	3/32
*3/16	5/16	3/32	*1/2	1 1/16	3/32	*11/16	7/8	5/64	*13/16	1 1/4	1/16	1	1 15/16	3/32	*1 5/16	1 3/8	5/64	1 5/16	2 9/16	3/32	1 1/2	2 15/16	3/32
7/32	9/16	1/16	*1/2	1 1/8	3/32	*11/16	7/8	3/32	*13/16	1 1/4	3/32	*1	2	3/32	*1 3/16	1 7/16	3/32	1 5/16	2 11/16	3/32	1.507	1.728	3/32
*1/4	3/8	3/64	1/2	1 3/16	3/32	*11/16	29/32	1/16	13/16	1 5/16	3/32	1	2 1/16	3/32	1 3/16	1 1/2	3/32	1.338	1.653	3/32	*1 33/64	1 55/64	3/32
*1/4	1/2	3/32	1/2	1 1/4	3/32	*11/16	29/32	5/64	13/16	1 11/32	3/32	*1	2 1/8	3/32	1 3/16	1 5/16	3/32	1 11/32	1 1/2	5/64	*1 33/64	2 1/64	3/32
*1/4	9/16	1/16	*1/2	1 1/4	1/8	*11/16	15/16	3/32	13/16	1 11/32	3/32	1	2 3/16	3/32	1 3/16	1 5/8	3/32	1 11/32	1 5/8	3/32	1 33/64	2 1/8	3/32
*17/64	3/4	1/16	1/2	1 3/4	3/32	*11/16	1	5/64	13/16	1 1/32	3/32	1	2 1/4	3/32	1 3/16	1 9/64	3/32	1 11/32	1 7/8	3/32	*1 17/32	1 27/32	3/32
*17/64	.396	1/16	1/2	1 1/2	1/16	*11/16	1	3/32	13/16	1 1/16	3/32	1	2 3/4	3/32	1 3/16	1 3/4	3/32	1 3/8	1 13/16	5/64	*1 17/32	1 7/8	3/32
*9/32	9/16	1/16	*1/2	1 1/2	3/32	*11/16	1 1/16	3/32	13/16	1 5/8	3/64	1	3	3/32	1 3/16	1 7/8	3/32	1 3/8	1 29/32	5/64	*1 17/32	2	3/32
*9/32	9/16	3/32	1/2	1 3/4	3/32	*11/16	1 1/8	3/32	13/16	1 5/8	3/32	1 1/64	1 31/64	3/32				*1 3/8	1 5/8	3/32	*1.535	1.850	3/32
*5/16	7/16	1/16	*33/64	7/8	1/16	11/16	1 3/16	3/32	13/16	1 15/16	3/32	1 1/32	1 9/32	1/16	1 3/16	2 3/16	3/32	*1 3/8	1 11/16	3/32	1 9/16	1 11/16	5/64
*5/16	7/16	3/32	*33/64	7/8	3/32	11/16	1 5/16	3/32	*.815	1 1/4	3/32	1 1/32	1 9/32	3/32	1 3/16	2 1/4	3/32	*1 3/8	1 3/4	3/32	1 9/16	1 25/32	5/64
*21/64	9/16	5/64	.529	.810	1/16	11/16	1 3/8	3/32	*.820	1 1/4	3/32	*1 1/32	1 11/32	3/32	1 3/16	2 5/8	3/32	*1 3/8	1 7/8	3/32	1 9/16	1 13/16	3/32
*21/64	5/8	1/16	17/32	23/32	1/16	11/16	1 7/8	5/64	27/32	1 3/32	3/32	1 1/32	1 11/32	3/32	1 13/64	1 27/64	3/32	1 3/8	1 29/32	3/32	*1 9/16	1 7/8	3/32
*21/64	5/8	3/32	*17/32	3/4	1/16	11/16	1 1/16	3/32	7/8	1	3/64	*1 1/32	2	3/32	*1 7/32	1 7/16	3/32	1 3/8	1 15/16	3/32	1 5/16	1 13/16	3/32
*23/64	19/32	3/32	*17/32	3/4	3/32	11/16	1 1/16	3/32	*7/8	1 1/16	1/16	1.037	1.535	3/32	1 7/32	1 17/32	3/32	1 3/8	2	3/32	1 5/16	2	5/64
*3/8	1/2	1/16	17/32	1 1/16	3/32	11/16	1 5/8	3/32	*.880	1.060	1/16	1 3/64	1.334	3/32	1 1/4	1 3/8	1/16	1 3/8	2 1/16	3/32	1 5/16	2 1/16	3/32
*3/8	5/16	3/32	*9/16	1 1/16	1/16	11/16	1 7/8	3/32	7/8	1 1/8	3/32	*1 1/16	1 1/4	1/16	*1 1/4	1 1/4	1/16	1 3/8	2 1/8	3/32	1 5/16	2 3/16	3/32
*3/8	5/8	3/32	*9/16	1 1/4	3/32	11/16	2 5/16	3/32	7/8	1 5/16	3/32	*1 1/16	1 1/4	3/32	*1 1/4	1 3/16	3/32	1 3/8	2 3/16	3/32	1 5/16	2 1/4	7/64
*3/8	11/16	3/32	*9/16	1 5/16	1/16	.710	.927	3/32	7/8	1 1/4	1/16	*1 1/16	1 5/16	1/16	*1 1/4	1 1/2	3/32	1 3/8	2 3/8	3/32	1 5/16	2 1/2	3/32
3/8	3/4	1/16	*9/16	1 3/16	3/32	.710	.927	1/8	*7/8	1 1/4	3/32	*1 1/16	1 5/16	3/32	1 1/4	1 17/32	3/32	1 3/8	2 1/2	3/32	1 5/16	2 23/32	3/32
3/8	3/4	3/32	*9/16	7/8	5/64	*23/32	61/64	3/32	*7/8	1 5/16	3/32	1 1/16	1 3/8	3/32	*1 1/4	1 9/16	3/32	1 3/8	3 3/16	3/32	1 9/16	3 1/16	3/32
3/8	7/8	5/64	*9/16	7/8	3/32	23/32	31/32	3/32	*7/8	1 3/8	3/32	*1 1/16	1 3/16	5/64	1 1/4	1 19/32	3/32	1 3/8	3 3/8	3/32	1 5/16	3 3/4	3/32
3/8	7/8	3/32	9/16	1 5/16	1/16	3/4	7/8	5/64	*7/8	1 3/8	1/8	*1 1/16	1 7/16	3/32	*1 1/4	1 3/8	3/32	*1 13/32	1 3/4	3/32	1 5/8	1 3/4	1/16
*3/8	1	3/32	*9/16	1	5/64	**3/4	15/16	5/64	7/8	1 7/16	3/32	*1 1/16	1 7/16	1/8	1 1/4	1 23/32	3/32	1 3/32	2	3/32	1 5/8	1 13/16	1/16
3/8	1 1/4	3/32	*9/16	1	3/32	*3/4	15/16	3/32	7/8	1 1/2	3/32	1 1/16	1 31/64	3/32	*1 1/4	1 3/4	5/64	1.417	1.614	3/32	*1 5/8	1 7/8	3/32
*25/64	9/16	1/16	9/16	1 1/8	5/64	3/4	31/32	5/64	7/8	1 5/16	3/32	*1 1/16	1 1/2	3/32	*1 1/4	1 3/4	3/32	1 27/64	1 39/64	3/32	1 5/8	1 13/16	3/32
*25/64	9/16	3/32	9/16	1 1/8	3/32	*3/4	1	3/32	7/8	1 11/16	3/32	*1 1/16	1 9/16	3/32	1 1/4	1 13/16	3/32	1 7/16	1 5/8	3/64	*1 5/8	2	3/32
*13/32	5/8	5/64	*9/16	1 17/64	1/16	*3/4	1 1/32	5/64	7/8	1 3/4	3/32	1 1/16	1 3/4	3/32	1 1/4	1 15/16	3/32	*1 7/16	1 11/16	3/32	1 5/8	2 1/16	3/32
*13/32	5/8	3/32	*9/16	1 11/64	3/32	*3/4	1 1/16	3/32	7/8	1 13/16	1/64	1 1/16	1 13/16	3/32	1 1/4	2	3/32	*1 7/16	1.730	1/16	1 5/8	2 3/32	3/32
*13/32	11/16	3/32	9/16	1 3/8	3/32	*3/4	1 1/8	3/32	7/8	1 13/16	1/8	1 1/16	1 7/8	3/32	1 1/4	2 1/8	3/32	*1 7/16	1.735	3/32	*1 5/8	2 1/8	3/32
*13/32	3/4	3/32	9/16	1 23/32	3/32	*3/4	1 3/16	3/32	7/8	1 7/8	3/32	1 1/16	2	3/32	1 1/4	2 3/16	3/32	*1 7/16	1 3/4	3/32	1 5/8	2 3/16	3/32
*13/32	1	1/16	9/16	1 13/16	3/32	*3/4	1 7/32	3/32	7/8	2 1/16	3/32	1 1/16	2 1/16	3/32	1 1/4	2 1/4	3/32	1.437	1.805	3/32	*1 5/8	2 1/4	3/32
*13/32	1	1/8	.572	3/4	5/64	*3/4	1 1/4	3/32	7/8	2 1/16	7/64	1 1/16	2 3/16	3/32	1 1/4	2 3/8	3/32	1 7/16	1 13/16	3/32	1 5/8	2 5/16	3/32
13/32	1 1/8	3/32	19/32	15/16	1/16	*3/4	1 1/4	1/8	7/8	2 1/8	3/32	1 1/16	2 1/16	3/32	1 1/4	2 15/32	3/32	1 7/16	1 7/8	3/32	1 5/8	2 3/8	3/32
*13/32	1 1/4	3/32	5/8	3/4	1/16	3/4	1 5/16	3/32	7/8	2 1/4	3/32	1 3/32	2 7/32	1/16	1 1/4	2 1/2	3/32	1 7/16	1 15/16	3/32	1 5/8	2 5/8	3/32
*13/32	1 1/4	1/8	*5/8	13/16	5/64	3/4	1 3/8	3/32	29/32	1 5/32	5/64	1 3/32	1 3/8	3/32	1 1/4	2 5/8	3/32	1 7/16	1 63/64	3/32	1 5/8	2 3/4	3/32
7/16	5/8	5/64	*5/8	13/16	3/32	3/4	1 3/8	1/8	*29/32	1 1/8	3/32	*1 3/32	1 15/32	3/32	1 1/4	3 5/8	3/32	1 7/16	2 1/8	3/32	1 5/8	2 7/8	3/32
7/16	5/8	3/32	5/8	25/32	1/16	3/4	1 1/2	3/32	29/32	1 1/4	3/32	1 3/32	1 27/32	3/32				1 7/16	2 9/16	3/32	1 49/64	1 15/16	3/32
*7/16	11/16	3/32	5/8	27/32	3/32	3/4	1 3/4	3/32	29/32	1 9/16	3/32	1 1/8	1 1/4	5/64	1 3/32	1 19/32	3/32	1 7/16	2 13/16	7/64	*1 49/64	1 63/64	3/32
*7/16	3/4	1/16	*5/8	7/8	3/32	*3/4	2	3/32	15/16	1 1/8	5/64	*1 1/8	1 5/16	5/64	*1 3/32	1 5/8	3/32	*1 29/64	1 7/8	1/8	1.640	2.140	5/64
*7/16	3/4	3/32	5/8	7/8	1/8	*3/4	2	1/64	*15/16	1 3/16	3/32	*1 1/8	1 3/8	3/32	1 3/32	2	3/32	*1 13/32	1 31/32	3/32	1 21/32	2	3/32
7/16	13/16	3/32	5/8	29/32	5/64	3/4	2 1/16	3/32	15/16	1 1/4	3/32	1 1/8	1 7/16	3/32	1 3/32	2 3/32	3/32	*1 13/32	1 31/32	3/32	1 11/16	2 1/8	3/32
7/16	7/8	3/32	5/8	29/32	3/32	3/4	2 1/4	3/32	*15/16	1 11/32	3/32	1 1/8	1 29/64	3/32	*1 9/64	1 1/16	1/8	*1 1/2	1 3/4	1/16	*1 11/16	1 13/16	3/32
7/16	1	3/32	5/8	15/16	5/64	.760	1.062	1/16	15/16	1 1/2	3/32	1 1/8	1 15/32	3/32	1 5/16	1 1/2	3/32	*1 1/2	1 3/4	3/32	1 11/16	2	3/32
15/32	21/32	3/32	5/8	15/16	3/32	49/64	63/64	5/64	15/16	1 5/8	3/32	*1 1/8	1 1/2	3/32	*1 5/16	1 1/16	3/32	*1 1/2	1 13/16	3/32	1 11/16	2 1/16	3/32
*15/32	11/16	5/64	*5/8	1	5/64	49/64	1 7/64	3/32	15/16	1 11/16	3/32	*1 1/8	1 5/8	3/32	*1 5/16	1 1/16	1/8	1 1/2	1 27/32	3/32	1 11/16	2 1/8	3/32
*15/32	11/16	3/32	*5/8	1	3/32	25/32	1 1/16	5/64	*15/16	1 3/4	3/32	1 1/8	1 11/16	3/32	1 5/16	1 5/8	3/32	1 1/2	1.850	3/32	*1 13/16	2 3/16	3/32
15/32	3/4	3/32	*5/8	1 1/16	3/32	25/32	1 1/16	3/32	15/16	3 5/8	3/32	1 1/8	1 3/4	3/32	*1 5/16	1 11/16	3/32	*1 1/2	1 7/8	3/32	1 11/16	2 5/16	3/32
*1/2	5/8	1/16	*5/8	1 1/8	3/32	25/32	1 1/8	1/16	*1	1 3/16	3/32	1 1/8	1 7/8	3/32	1 5/16	1 3/4	3/32	*1 1/2	1 15/16	3/32	1 11/16	2 7/16	3/32
*1/2	11/16	3/32	*5/8	1 1/4	3/32	25/32	1 1/8	3/32	1	1 1/4	1/16	*1 1/8	1 15/16	3/32	1 5/16	1 13/16	3/32	1 1/2	1 31/32	3/32	1 11/16	2 1/2	3/32
*1/2	3/4	1/16	*5/8	1 5/16	7/64	25/32	1 1/4	3/32	*1	1 1/4	3/32	1 1/8	2	3/32	1 5/16	1 27/32	3/32	*1 1/2	2	3/32	1 11/16	2 11/16	3/32
*1/2	3/4	3/32	5/8	1 3/8	3/32	25/32	1 3/8	5/64	1	1 5/16	3/32	1 1/8	2 1/8	3/32	1 5/16	1 7/8	3/32	1 1/2	2 1/32	3/32	*1 13/16	1 31/32	1/16
1/2	13/16	1/16	*5/8	1 3/8	1/16	25/32	1 3/8	3/32	*1	1 3/8	3/32	1 1/8	2 3/16	7/64	1 5/16	2	3/32	1 1/2	2 1/16	3/32	*1 3/4	2	3/32
*1/2	13/16	3/32	5/8	1 1/2	3/32	25/32	1 17/32	3/32	*1	1 13/32	3/32	1 1/8	2 1/4	3/32	1 5/16	2 1/8	3/32	1 1/2	2 1/8	3/32	*1 3/4	2 1/16	3/32
1/2	27/32	3/32	5/8	1 3/4	3/32	13/16	15/16	5/64	1	1 7/16	3/32	1 1/4	2 5/16	3/32	1 5/16	2 3/16	3/32	1 1/2	2 5/32	3/32	1 3/4	2 1/8	5/64
1/2	.865	3/32	*41/64	7/8	3/32	*13/16	1	3/32	1	1 1/2	5/64	1 1/4	2 3/4	3/32	1 5/16	2 7/32	3/32	1 1/2	2 1/4	3/32	1 3/4	2 3/8	3/32
*1/2	7/8	1/16	*41/64	1	5/64	.812	1.047	1/16	*1	1 1/2	3/32	1 5/32	2 1/16	3/32	1 5/16	2 1/4	3/32	1 1/2	2 3/16	3/32	*1 3/4	2 3/16	3/32
*1/2	7/8	3/32	*41/64	1	3/32	*13/16	1 1/16	3/32	1	1 5/8	3/32	*1 5/32	1 1/2	3/32	1 5/16	2 5/16	3/32	1 1/2	2 1/2	3/32	1 7/8	2 1/4	3/32
1/2	15/16	3/32	21/32	15/16	3/32	*13/16	1 1/8	3/32	*1	1 11/16	3/32	*1 5/32	1 5/8	3/32	1 5/16	2 7/16	3/32	1 1/2	2 5/8	3/32	1 3/4	2 3/8	3/32

*Denotes sizes produced most economically. These sizes should be adopted wherever practical.

FBW-270

J-M STYLE 920 SINGLE-JACKETED STANDARD SIZES
(Standard Sizes in Inches)
COPPER, ALUMINUM AND SOFT IRON

I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK
1¾	2½	3/32	2	2⅜	1/8	2 5/16	3¼	3/32	2⅜	3½	3/32	2 23/32	3 7/32	3/32	3	5⅝	7/64	3⅜	3¾	3/32	*3¾	4¾	1/16
1¾	2⅝	3/32	*2	2 1/16	3/32	2.215	2.395	3/32	2 25/64	2 49/64	3/32	2 23/32	3 15/32	3/32	*3 1/32	3⅜	3/32	3⅜	3⅞	3/32	3¾	4¾	3/32
1¾	2 11/16	3/32	2	2½	3/32	2 7/32	2 13/32	3/32	2 13/32	2⅞	3/32	2¾	2 15/16	5/64	3 1/32	3 7/16	3/32	3⅜	3 15/16	3/32	3¾	5	3/32
1¾	2¾	3/32	2	2 9/16	3/32	2 7/32	2 17/32	3/32	2.420	2.940	5/64	2¾	3	3/32	3 3/64	3 47/64	3/32	3⅜	4 3/32	3/32	3¾	5	1/4
1¾	2 7/8	3/32	2	2⅝	3/32	2¼	2½	3/32	2 1/16	2 11/16	3/32	2¾	3⅛	3/32	3 1/16	3⅝	3/32	3⅜	4⅛	3/32	3¾	5½	3/32
*1¾	3¼	3/32	2	2 11/16	3/32	2¼	2 9/16	3/32	2 7/16	2¾	3/32	*2¾	3 3/16	1/16	*3 1/16	3⅜	3/32	3⅜	5¼	3/32	3.755	4.055	3/32
*1¾	3⅝	3/32	2	2¾	3/32	2¼	2 19/32	3/32	2 7/16	2⅞	3/32	2¾	3¾	3/32	3 1/16	3 25/64	3/32	3 13/32	3 17/32	3/32	3.757	4.180	3/32
1 49/64	2⅛	3/32	2	2 13/16	3/32	*2¼	2⅝	3/32	2 7/16	2 15/16	3/32	2¾	3¼	3/32	3 1/16	3½	3/32	3 7/16	3 11/16	3/32	3 49/64	4 13/64	5/64
1 49/64	2 7/64	3/64	2	2⅞	3/32	2¼	2 11/16	3/32	2 7/16	3	3/32	2¾	3⅝	3/32	3 1/16	3⅝	3/32	*3 7/16	3¾	3/32	3.767	4.126	7/64
1 25/32	1 29/32	1/16	2	3	3/32	2¼	2¾	1/16	2 7/16	3 1/16	3/32	2¾	3½	3/32	3 1/16	3¾	3/32	3 7/16	3 15/16	3/32	3 25/32	4 5/32	3/32
1 25/32	1 31/32	1/16	2	3⅛	3/32	*2¼	2¾	3/32	2 29/64	2 45/64	5/64	2¾	3½	1/8	3⅛	3⅜	3/32	3 7/16	4 3/16	3/32	*3 13/16	4 1/16	3/32
1.783	2.043	3/32	2	3¼	3/32	2¼	2 13/16	3/32	2 15/32	2 17/32	5/64	2¾	3 43/64	3/32	3⅛	3⅜	3/32	3 7/16	4 5/16	3/32	3 13/16	4⅛	3/32
1 13/16	2	3/32	2	3⅝	3/32	2¼	2⅞	3/32	2 15/32	3 13/32	3/32	2¾	3¾	3/32	3⅛	3 15/32	3/32	*3.440	3.688	3/32	3 13/16	4⅜	3/32
*1 13/16	2 1/16	3/32	2	4¼	3/32	2¼	2 29/32	3/32	2½	2⅝	1/16	2¾	3 1/16	3/32	3⅛	3½	3/32	3½	3¾	3/32	3 13/16	4 7/16	3/32
*1 13/16	2⅛	3/32	2	4 5/16	3/32	2¼	3 1/16	3/32	2½	2 11/16	3/32	2 25/32	3 3/32	3/32	3⅛	3⅝	3/32	*3½	3¾	1/8	3 13/16	4 1/16	3/32
1 13/16	2 3/16	3/32	*2 1/64	2 3/64	3/32	2¼	3 3/32	5/64	2½	2¾	3/32	2 13/16	3	5/64	3⅛	3 11/16	3/32				3⅞	4 1/16	5/64
1 13/16	2⅜	1/8	*2 1/64	2 5/64	3/32	2¼	3⅛	3/32	2½	2⅞	3/32	2 13/16	3⅛	3/32	3⅛	3¾	3/32	3½	3⅞	3/32	*3⅞	4⅛	3/32
1 13/16	2¼	3/32	*2 1/64	2 3/64	5/64	2¼	3¼	3/32	*2½	2 15/16	3/32	2 13/16	3⅜	3/32	3⅛	3⅞	3/32	3½	3 15/16	3/32	3⅞	4 3/16	3/32
1 13/16	2 5/16	3/32	2½	2 15/64	5/64	2¼	3⅜	7/64	2½	3	3/32	2 13/16	3 13/32	5/64	3⅛	4 5/16	3/32	3½	3 15/16	1/16	3⅞	4 7/32	3/32
1 13/16	2½	3/32	*2 1/32	2⅜	3/32	2¼	3½	3/32	2½	3⅛	3/32	2 13/16	3⅜	3/32	*3.140	3.640	5/64	3½	4	3/32			
1 13/16	2 15/16	7/64	*2 1/32	2⅜	3/32	2¼	3¾	3/32	2½	3¼	3/32	2 13/16	3 11/16	7/64	3⅝	3⅜	3/32	*3½	4 27/64	3/32	3⅞	4 11/16	1/8
1 13/16	3 3/16	7/64	2 1/16	2⅜	3/32	2¼	4	3/32	2½	3½	3/32	2 13/16	3 13/16	3/32	3 5/32	3 13/32	3/32	3½	4¼	3/32	3⅞	4 13/16	3/32
1 13/16	3¼	3/32	*2 1/16	2⅝	3/32	2 9/32	2 15/32	1/16	2½	3 11/32	3/32	2 13/16	4	3/32	3⅝	3½	3/32	3½	5⅜	3/32	3⅞	4 15/16	3/32
1 13/16	3 7/16	3/32	2 1/16	2⅞	3/32	2 9/32	2½	3/32	2½	3⅝	7/64	2 27/32	3½	3/32	3 5/32	3 31/32	3/32	3½	5 1/16	3/32	3⅞	7 1/8	7/64
1 13/16	4⅛	3/32	2 1/16	2 1/16	3/32	*2 9/32	2⅝	3/32	2½	3⅝	1/8	2 27/32	3⅝	3/32	*3 1/16	3 7/16	3/32	3 11/32	3 27/32	3/32	3 29/32	4 5/16	1/8
1 27/32	2 9/32	3/32				2 9/32	2 27/32	3/32	2½	3 11/16	3/32	2 7/8	3	5/64	3⅜	3½	3/32	*3⅜	3 13/16	3/32	3 15/16	4⅛	5/64
1⅞	2⅛	3/32	2 1/16	2 17/32	3/32	2 9/32	3 3/32	3/32	2½	3¾	3/32				3 3/16	3⅝	7/64	3 1/16	3 13/16	1/8	3 15/16	4 3/16	3/32
1.875	2.125	1/8				*2 11/64	2 43/64	3/16	2½	3⅞	3/32	2⅞	3⅜	3/32	3⅜	3¾	3/32	3⅜	3 59/64	3/32	3 15/16	4¼	3/32
1⅞	2⅜	3/32	2 1/16	2¾	3/32	2 5/16	2 17/32	3/32	2½	4	7/64	2⅞	3½	3/32	*3 11/64	3 27/64	3/32	3⅜	3 15/16	3/32	3 15/16	4 9/32	7/64
*1⅞	2¼	1/16	2 1/16	2⅞	3/32	2 5/16	2 9/16	3/32	2½	4⅛	3/32	2⅞	3 5/16	3/32	3 13/64	3 35/64	3/32	3⅜	4⅜	3/32	3 15/16	4½	3/64
*1⅞	2¼	3/32	2 1/16	3¼	3/32	2 5/16	2⅝	3/32	2½	7	3/32	2⅞	3⅜	3/32	3 7/32	3 17/32	3/32	3⅜	4¾	3/32	3 15/16	4 11/16	3/32
1⅞	2 5/32	3/32	2 1/16	3⅜	7/64	2 5/16	2 23/32	3/32	2 17/32	2 55/64	5/64	2⅞	3½	3/64	3⅜	3 19/32	3/32	3⅜	5½	7/64	3 15/16	6⅞	3/32
1⅞	2⅜	3/32	2 1/16	3⅝	3/32	2 5/16	2¾	3/32	2 17/32	2⅞	5/64	2⅞	3⅝	3/32	3 7/32	3⅝	3/32	3 13/64	3 51/64	3/32	3.94	4.40	3/64
1⅞	2 13/32	3/32	2 1/16	3 11/16	7/64	2 5/16	2 13/16	3/32	2 17/32	2 15/16	3/32	*2⅞	4	3/32	3¼	3½	7/64	3 37/64	3 29/32	7/64	3 31/32	4⅜	3/32
1⅞	2½	3/32	*2 1/16	4	3/32	2 5/16	2 13/16	1/8	2 13/32	2 31/32	3/32	2⅞	4 1/8	3/32	3¼	3⅝	3/32	3 15/32	3 25/32	3/32	3 31/32	4 13/32	3/32
1⅞	2½	1/8	2 1/16	4¼	3/32	2 5/16	2⅞	3/64	2.536	3 1/32	1/4	2⅞	4⅝	3/32	*3¼	3¾	3/32	3 19/32	3 31/32	3/32	*4	4¼	3/32
1⅞	2 5/8	3/32	2 3/32	2 17/32	3/32	2 5/16	3	3/32	2 9/16	2 49/64	3/32	2 29/32	3¼	3/32	*3¼	3¾	1/8	3⅝	3⅞	3/32	*4	4 5/16	3/32
1⅞	2 13/16	3/32	2 1/16	2⅜	3/32	2 5/16	3 1/16	3/64	2 9/16	2 15/16	3/32	2 15/16	3 1/16	5/64	3½	3 13/16	3/32	3⅝	3 29/32	3/32	*4	4 11/32	3/32
1⅞	2⅞	7/64	2 1/16	2⅞	3/32	*2 5/16	3 1/16	1/4	2 9/16	3 1/8	3/32	2 15/16	3 3/16	3/32	3¼	3⅞	3/32	3⅝	3 15/16	3/32	4	4⅜	3/32
1⅞	2 15/16	3/32	*2 1/16	2 15/32	3/32	2 5/16	3 1/8	3/32	2 9/16	3¼	3/32	2 15/16	3¼	3/32	3¼	4	3/32	3⅝	3 15/16	1/8	4	4½	3/32
1.885	2¼	3/32	2 1/16	2½	3/64	2 5/16	3¼	3/64	2 9/16	3 5/16	3/32	2 15/16	3⅜	3/32	3¼	4 3/16	3/32	3⅝	4	3/32	4	4⅜	3/32
*1 57/64	2 15/64	3/32	*2 1/16	2 9/16	3/64	2 5/16	3¾	3/32	2 37/64	2 15/16	3/32	2 15/16	3 7/16	3/32	3¼	4¼	3/32	3⅝	4 3/32	3/32	4	4¾	3/32
1 29/32	2⅛	3/32	2 1/16	2⅝	3/32	2.315	2.747	3/32	2⅝	2 27/32	3/32	2 15/16	3½	3/32	3¼	4½	3/32	3⅝	4⅛	3/32	4	5	7/64
1 29/32	2 5/8	3/32	2 1/16	2 11/16	3/64	2 11/32	2⅝	3/32	2⅝	2⅞	3/32	2 15/16	3⅝	3/32	3¼	5	3/32	3⅝	4¼	3/32	4 1/32	4 19/32	3/32
1 15/16	2 5/32	7/64	2 1/16	2¾	3/32	2 11/32	2 11/16	5/64	2⅝	3	3/32	2 31/32	3 15/32	3/32	3 17/64	3 33/64	3/32	3⅝	4¾	3/32	*4 1/16	4 5/16	3/32
1 15/16	2 3/16	3/32	2 1/16	2 13/16	3/64	2⅜	2⅝	3/32	*2 5/8	3 1/16	3/32	2.972	3.299	7/64	3 5/16	3 9/16	3/32	3⅝	5⅛	3/32	4 1/16	4⅜	3/32
*1 15/16	2¼	3/32	2 1/16	2¾	3/32	*2 3/8	2 5/8	1/4	*2 5/8	3 3/32	3/32	2 49/64	3 29/64	3/32	3 5/16	3 5/8	3/32	3 11/32	4 1/32	3/32	4 1/16	4 7/16	3/32
*1 15/16	2 5/16	3/32	2 1/16	2 15/16	3/64	*2 3/8	2¾	3/32	2⅝	3 1/8	3/32	*3	3¼	3/32	*3 5/16	3 21/32	3/32	3 11/32	4 9/32	3/32	4 1/16	4¾	3/32
*1 15/16	2⅜	3/32	2 1/16	3¼	3/64	2 3/8	2 13/16	3/32	2⅝	3 3/16	3/32	3	3 5/16	3/32	3 5/16	3¾	3/32	3 11/32	4¼	5/64	4 3/32	4 9/16	3/32
1 15/16	2 1/16	3/32	2 1/16	3⅜	3/32	2⅜	2 27/32	3/32	2⅝	3¼	3/32	3	3⅜	3/32	3 5/16	3 13/16	3/32	3 21/32	4 11/32	3/64	4 3/32	5 5/32	3/32
1 15/16	2½	3/32	2 1/16	3⅝	5/64	*2 3/8	2⅞	3/32	2⅝	3⅜	3/32	3	3 15/32	3/32	3 5/16	3⅞	3/32	3 11/16	3 27/32	3/32	4 1/8	4⅜	3/32
1 15/16	3⅝	3/32	2 1/16	3¾	3/32	*2 3/8	2⅞	1/8	2⅝	3 1/32	3/32	*3	3 1/2	3/32	3 5/16	3 15/16	3/32	3 11/16	3 15/16	3/32	4 1/8	4 7/16	3/32
1 61/64	2 7/64	3/32	2 1/16	4	3/32				2⅝	3⅝	3/32	3	3 1/16	3/32	*3 5/16	4⅜	3/32	3 11/16	4 3/16	3/32	4 1/8	4 1/2	3/32
1 31/32	2 1/16	3/32	2 1/16	4¼	3/32	*2 3/8	2 43/64	3/16	2 21/32	2 29/32	1/16	3	3 1/16	3/32	3 5/16	4 1/16	3/32	3 23/32	4 5/32	3/32	*4 1/8	4 5/8	3/32
1 31/32	4⅜	3/32	2 3/32	2 13/32	3/32	2⅜	3	3/32	*2 21/32	2 31/32	3/32	3	3⅝	3/32	3⅝	5 1/16	3/32	3¾	4	3/32	4 1/8	4¾	7/64
2	2 3/16	3/32	2 3/16	2 7/16	3/32	2⅜	3 1/16	3/32	*2 11/16	2 13/16	3/32	3	3¼	3/32	3 11/32	3 25/32	3/32	3¾	4¼	3/32	4 1/8	4⅜	3/32
*2	2¼	3/32	2 3/16	2⅝	3/32	2⅜	3 1/8	3/32	2 11/16	3	3/32	3	3 25/32	3/32	3 11/32	3 15/16	3/32	3¾	4¼	1/8	4 9/64	4 23/64	3/32
2	2¼	1/8	2 3/16	2 11/16	3/32	2⅜	3¼	3/32	2 11/16	3 1/16	3/32	3	3⅞	3/32	3 3/8	3 15/16	3/64	3¾	4 5/16	3/32	*4 5/32	4⅝	5/64
2	2 5/16	3/32	2 3/16	2¾	3/32	2⅜	3 3/8	3/32	2 11/16	3⅜	3/32	3	4	3/32	*3 3/8	3 15/16	7/64	3¾	4 7/16	7/64	4⅜	4⅝	3/64
*2	2⅜	3/32	2 3/16	3	3/32	2⅜	3 7/16	3/32	2 23/32	3	3/32	3	5	3/32	3.374	3.732	7/64	3¾	4½	3/32	4⅝	4 15/16	3/32

*Denotes sizes produced most economically. These sizes should be adopted wherever practical.

J-M STYLE 920 SINGLE-JACKETED STANDARD SIZES
(Standard Sizes in Inches)
COPPER, ALUMINUM AND SOFT IRON

I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK	I.D.	O.D.	THK
4 13/64	4 41/64	3/32	4 11/16	5 3/16	7/64	5 5/16	5 11/16	3/32	6 1/16	6 1/2	3/32	6 49/64	7 3/32	3/32	7 5/8	7 15/16	3/32	8 15/16	9 5/16	3/32			
4 5/32	4 13/32	3/32	4 11/16	5 3/16	7/64	5 5/16	5 13/16	3/32	6 3/32	6 13/32	3/32	6 25/32	7	3/32	7 41/64	7 53/64	3/32	8.989	9 21/64	3/32	11 13/64	11 1/2	3/32
4 1/4	4 1/2	3/32	4 11/16	5 1/2	3/32	5 5/16	6 1/4	3/32	6 7/64	6 25/64	3/32	6 13/16	7 3/16	3/32	7 11/16	8 1/32	3/32	9	9 1/4	3/32	11 1/4	11 1/2	3/32
4 1/4	4 5/16	3/32	4 23/32	5 7/32	3/32	5 11/32	5 21/32	3/32	6 1/8	6 3/8	3/32	6 13/16	7 5/16	3/32	7 11/16	8 1/8	3/32	9	9 5/16	3/32	11 1/4	11 5/16	3/32
4 1/4	4 5/8	3/32	4 3/4	4 15/16	5/64	5 11/32	5 27/32	1/4	6 1/8	6 7/16	3/32	6 13/16	7 3/8	3/32	7 23/32	8 1/32	3/32	9	9 11/32	3/32	11 1/4	11 3/4	3/32
4 1/4	4 11/16	3/32	4 3/4	5	3/32	5 11/32	6 1/32	3/32	6 1/8	6 13/32	3/32	6 27/32	7 1/4	3/32	7 23/32	8 1/4	3/32	9	9 3/8	3/32	11 1/4	12 3/4	3/32
4 1/4	4 3/4	3/32	*4 3/4	5 1/16	3/32	5 3/8	5 5/8	3/32	6 1/8	6 5/8	3/32	6 7/8	7 3/16	3/32	7 3/4	8	3/32	9	9 7/16	3/32	11 7/64	11 3/4	3/32
4 1/4	4 7/8	3/32	4 3/4	5 3/16	3/32	*5 3/16	5 11/16	3/32	6 1/8	6 11/16	3/32	6 7/8	7 13/64	3/32	7 3/4	8 1/16	3/32	9	9 1/2	7/64	11 3/8	11 3/4	3/32
4 1/4	5	7/64	4 3/4	5 1/4	3/32	5 3/8	5 3/4	3/32	6 1/8	7 3/16	3/32	6 7/8	7 1/2	3/32	7 13/16	8	3/32	9	9 5/8	3/32	11 1/2	12	3/32
4 1/4	5 1/4	3/32	4 3/4	5 1/2	3/32	5 3/8	5 13/16	3/32	6 1/8	7 5/16	3/32	6 29/32	7 5/32	3/32	7 13/16	8 3/16	3/32	9 1/64	9 39/64	3/32	11 1/16	11 7/8	3/32
4 5/16	5 5/16	3/32	4 3/4	5 1/4	7/64	5 3/8	6 3/8	3/32	6 3/16	6 5/8	3/32	6 29/32	7 13/32	3/32	7 7/8	8 1/8	3/32	9 1/16	9 3/8	3/32	11 11/16	12	3/32
4 11/32	4 23/32	3/32	4 13/16	5 1/16	3/32	5 7/16	5 27/32	3/32	6 7/32	6 17/32	3/32	6 15/16	7 3/16	3/32	7 7/8	8 7/64	3/32	9 1/16	9 7/16	3/32	11 3/4	12 1/16	3/32
4 3/8	4 5/8	3/32	4 13/16	5 1/8	3/32	5 15/32	5 27/32	3/32	6 7/32	6 29/32	3/32	6 15/16	7 1/4	3/32	7 7/8	8 5/16	3/32	9 1/16	9 5/16	3/32	11 3/4	12 5/16	3/32
4 3/8	4 11/16	3/32	4 13/16	5 3/16	3/32	5 1/2	5 7/8	3/32	6 1/4	6 1/2	3/32	6 31/32	7 11/32	3/32	7 7/8	8 1/4	3/32	9 1/8	9 3/8	3/32	12	12 5/8	3/32
4 3/8	4 3/4	3/32	4 13/16	5 1/4	3/32	5 1/2	6 1/16	3/32	6 1/4	6 5/8	3/32	7	7 1/4	3/32	7 7/8	8 5/16	3/32	9 1/8	10 7/16	3/32	12 3/8	12 3/4	3/32
4 3/8	4 15/16	3/32	4 7/8	5 1/8	3/32	5 1/2	7	3/32	6 1/4	6 11/16	3/32	7	7 5/16	3/32	7 7/8	8 3/8	3/32	9 3/16	9 1/2	3/32	12.495	12 53/64	3/32
4 3/8	5	3/32	4 7/8	5 3/16	3/32	5 53/64	5 3/4	7/64	6 1/4	6 3/4	3/32	7	7 3/8	3/32	7 7/8	8 7/16	3/32	9 1/4	9 11/16	3/32	12 53/64	12 13/16	3/32
4 3/8	5 5/16	3/32	4 7/8	5 1/4	3/32	5 11/32	5 31/32	3/32	6 1/4	6 15/16	3/32	7	8 3/16	3/32	7 7/8	8 1/2	3/32	9 1/4	9 13/16	3/32	12 5/8	12 7/8	3/32
4 13/32	4 21/32	3/32	4 7/8	5 11/32	3/32	5 11/32	6 1/32	3/32	6 1/4	7	3/32	7 1/32	7 5/16	3/32	7 57/64	8 1/16	3/32	9 5/32	9 5/16	3/32	21 23/32	13 3/32	3/32
4 13/32	4 11/16	3/32	4 57/64	5 7/64	3/32	5 5/16	5 7/8	3/32	6 1/4	9 3/4	3/32	7 1/16	7 7/16	3/32	7 57/64	8 23/64	3/32	9 5/16	9 15/16	3/32	12.739	13 13/64	3/32
4 13/32	4 23/32	3/32	4 59/64	5 1/4	3/32	*5 5/16	5 13/16	3/32	6 5/16	7 5/16	3/32	7 1/16	7 11/16	3/32	7 29/32	8 1/8	3/32	9 5/16	10	3/32	12 3/4	13 3/16	3/32
4 7/16	4 9/16	5/64	4 15/16	5 3/16	3/32	*5 9/16	6 7/16	3/32	6 5/16	7 7/16	3/32	7 1/16	7 3/4	3/32	7 15/16	8 1/4	3/32	9 3/8	9 3/4	3/32	12 3/4	13 3/8	3/32
4 7/16	4 11/16	3/32	4 15/16	5 1/4	3/32	5 9/16	6 1/2	3/32	6 3/8	6 11/16	3/32	7 3/32	7 7/16	3/32				9 3/8	10	3/32	12 13/16	13 3/16	3/32
4 7/16	4 13/16	3/32	4 15/16	5 5/16	3/32	5 9/16	6 11/16	3/32	6 3/8	6 3/4	3/32	7 3/32	7 13/16	3/32	8	8 3/16	3/32	9 3/8	10 5/8	3/32	12 13/16	13 1/4	3/32
4 7/16	5 1/16	3/32	*4 15/16	5 3/8	1/8	5 5/8	5 7/8	3/32	6 13/32	6 13/16	3/32	7 1/8	7 1/2	3/32	8	8 3/4	3/32	9 7/16	9 3/4	3/32	14 1/4	14 11/16	3/32
4 7/16	5 5/16	3/32	4 15/16	5 15/16	3/32	5 5/8	5 31/32	3/32	6 7/16	6 11/16	3/32	7 1/8	7 5/8	3/32	8	8 13/16	3/32	9 7/16	9 13/16	3/32	14.239	14 45/64	3/32
4 1/2	5 3/8	3/32	4.980	5.381	1/8	5 11/16	5 15/16	5/64	6 1/2	6 23/32	3/32	7 1/8	7 11/16	3/32	*8 1/32	8 15/32	3/32	9 15/32	9 27/32	3/32	14 1/4	15	3/32
4 15/32	4 23/32	3/32	5	5 1/4	7/64	5 11/16	6	3/32	6 7/16	6 3/4	3/32	7 1/8	7 3/4	3/32	*8 3/64	8 29/64	3/32	9 1/2	9 7/8	3/32	15 1/4	16 1/32	3/32
4 1/2	4 23/32	3/32	5	5 5/16	3/32	5 11/16	6 3/16	3/32				7 3/16	7 1/2	3/32	8 1/16	8 7/16	3/32						
4 1/2	4 3/4	3/32	5	5 3/16	3/32	5 11/16	6 5/16	3/32	6 7/16	6 15/16	3/32	7 3/16	7 7/16	3/32	8 3/32	8 1/2	3/32	9 33/64	9 7/8	3/32	16 3/4	18 1/2	3/32
4 1/2	4 7/8	3/32	5	5 1/2	3/32	5 23/32	6 1/8	3/32	6 7/16	7	3/32	7 3/16	7 5/8	3/32	8 3/32	8 21/32	3/32	9 17/32	9 13/16	3/32	17 1/2	17 15/16	3/32
4 1/2	4 7/8	1/16	5	5 7/16	3/32	5 47/64	6 1/16	3/32	6 23/64	6 47/64	3/32	7 3/16	7 11/16	3/32	8 1/8	8 1/2	3/32	9 5/8	9 7/8	3/32			
4 1/2	5	3/32				5 3/4	6	3/32	6 15/32	6 5/8	3/32	7 13/64	7 13/32	3/32	8 1/8	8 9/16	3/32	9 1/4	10 3/16	3/32			
4 1/2	5 1/8	3/32	5	6 3/4	3/32	5 3/4	6 3/16	3/32	*6 15/32	6 11/16	3/32	7 13/64	7 43/64	3/32	8.185	8 29/64	3/32	9.875	10 13/64	3/32			
4 1/2	5 7/16	1/8	5 1/32	5 11/32	3/32	5 3/4	6 5/8	3/32			:	7 7/32	7 13/32	3/32	8 3/16	8 1/2	3/32	9 7/8	10 1/4	3/32			
4 1/2	5 3/4	3/32	5 1/16	5 1/4	3/32	5 3/4	6 3/4	3/32	6 1/2	6 13/16	3/32	7 7/32	7 5/8	3/32	8 3/16	9 7/16	3/32	9 57/64	10 3/16	3/32			
*4 1/2	6	1/16	5 1/16	6 1/64	3/32	5 49/64	6 43/64	7/64	6 1/2	6 7/8	3/32	7 7/32	7 29/32	3/32	8 13/64	8 1/2	3/32	9 15/16	10 5/16	3/32			
4 1/2	6 3/16	7/64	5 5/32	5 19/32	3/32	5 49/64	6 1/8	7/64	6 1/2	6 15/16	3/32	7 1/4	7 1/2	3/32	8 7/32	8 5/8	3/32	9.989	10 21/64	3/32			
4 33/64	5 55/64	1/8	5 1/8	5 3/8	3/32	5 49/64	6 11/64	7/64	6 1/2	7	3/32	7 1/4	7 5/8	3/32	8 1/4	8 13/16	3/32	10	10 1/4	3/32			
4 17/32	4 29/32	3/32	5 1/8	5 7/16	3/32	5 13/16	6 1/16	3/32	6 53/64	6 47/64	3/32	7 1/4	7 11/16	3/32	8 1/4	8 7/8	3/32	10	10 5/16	3/32			
4 9/16	4 13/16	3/32	5 1/8	5 1/2	3/32	5 13/16	6 1/8	3/32	6 9/16	7	3/32	7 1/4	7 15/16	3/32	8 1/4	8 7/8	3/16	10	10 5/8	3/32			
4 9/16	4 7/8	3/32	5.14	5.64	5/64	5 13/16	6 3/16	3/32	6 19/32	7 3/32	3/32	7 5/16	7 9/16	3/32	8 1/4	9 13/16	3/32	10 1/16	10 3/8	3/32			
4 9/16	4 15/16	3/32	5 3/32	5 23/32	3/32	5 13/16	6 1/2	3/32	6 5/8	6 3/4	3/32	7 5/16	7 5/8	3/32	8 5/16	9 1/16	3/32	10 1/16	10 7/16	3/32			
*4 9/16	5 3/16	7/64	5 3/16	5 5/8	3/32	5 7/8	6 1/8	3/32	6 5/8	6 7/8	3/32	7 5/16	7 11/16	3/32	8 3/16	8 11/16	3/32	10 1/16	10 5/8	3/32			
4 9/16	5 7/16	7/64	5 3/16	5 11/16	3/32	*5 7/8	6 7/32	3/32	6 5/8	7	3/32	7 5/16	8 3/16	3/32	8 1/2	8 15/16	3/32	10 1/4	11 1/8	3/32			
*4 9/16	5 7/16	7/64	5 3/16	6 3/16	3/32	5 7/8	6 1/4	3/32	6 5/8	7 1/16	3/32	7 3/8	7 5/8	3/32	8 9/16	9 3/16	3/32	10 17/64	10 5/8	3/32			
4 5/8	6 1/8	7/64	5 3/16	6 7/8	7/64	5 15/16	6 1/4	3/32	6 5/8	7 1/4	3/32	7 3/8	7 3/4	3/32	8.568	8 61/64	3/32						
4.570	5.030	3/32	5 7/32	5 15/32	7/64	5 15/16	6 7/16	7/64	6 5/8	8 3/8	3/32	7 7/16	7 3/4	3/32	8.610	8 7/8	3/32	10 1/2	10 29/32	3/32			
4.605	4.979	3/32	5 1/4	5 7/16	7/64	5 15/16	6 7/8	3/32	6 21/32	7 3/32	3/32	7 7/16	7 15/16	3/32	8 5/8	8 15/16	3/32	10 1/2	11 1/8	3/32			
*4 5/8	4 15/16	7/64	5 1/4	5 1/2	1/16	5 21/32	6 7/32	3/32	6 11/16	7 1/16	3/32	7 7/16	8 1/16	3/32	8 5/8	9	3/32	10.693	11 1/64	3/32			
4 5/8	5	3/32				6	6 1/32	3/32	6 11/16	7 1/8	3/32	7 1/2	7 7/8	3/32	8 5/8	9 1/8	3/32	10 3/4	11	3/32			
4 5/8	5 1/8	3/32	5 1/4	5 5/16	3/32	6	6 1/4	3/32	6 11/16	7 3/16	3/32	7 1/2	7 15/16	3/32	8 5/8	9 1/8	3/32	10 49/64	10 63/64	3/32			
4 5/8	5 3/16	7/64	5 1/4	5 5/8	3/32	6	6 5/16	3/32	6 11/16	8 1/16	3/32	7 1/2	8	3/32	8 7/32	9 1/16	3/32	10 13/16	11 3/16	3/32			
4 5/8	5 1/16	3/32	5 1/4	5 21/32	3/32	6	6 7/16	7/64	6 3/4	7	3/32	7 1/2	8 1/8	3/32	8.685	9 1/64	3/32	10 13/16	12 1/16	3/32			
4 5/8	5 7/8	3/32	5 1/4	5 11/16	3/32	6	6 5/8	3/32	6 3/4	7 1/16	3/32	7 1/2	8 1/2	3/32	8 11/16	9	3/32	10 27/32	11 7/32	3/32			
4.64	5.14	5/64	5 1/4	5 3/4	3/32	*6.010	6 1/2	3/32	6 3/4	7 1/8	3/32	7 1/2	8 3/4	3/32	8 13/16	9 1/64	3/32	10 7/8	11 1/4	3/32			
4 21/32	5 1/32	3/32	5 1/4	5 15/16	7/64				6 3/4	7 3/16	3/32	*7 1/16	7 29/32	3/32	8 11/16	9 1/16	3/32	11.114	11 29/64	3/32			
4 11/16	4 15/16	3/32	5 1/4	6	3/32	6 1/32	6 13/32	3/32	6 3/4	7 1/4	3/32	*7 1/16	7 15/16	3/32	8 11/16	9 5/32	3/32	11 1/8	11 7/8	3/32			
4 11/16	5	3/32	5 19/64	5 21/32	3/32	6 1/16	6 5/16	3/32	6 3/4	8 1/2	3/32	7 1/16	8	3/32	8 45/64	9	3/32	11 1/64	11 3/16	3/32			
			5 5/16	5 7/8	3/32	6 1/16	6 7/16	3/32	*6 49/64	7 1/16	3/32	7 1/4	7 7/8	3/32	8 13/16	9 5/16	3/32	11 1/64	11 53/64	3/32			

*Denotes sizes produced most economically. These sizes should be adopted wherever practical.

FBW-272

J-M STYLES 923, 926 and 929 STANDARD SIZES

J-M 923 ONLY

Cast Iron Companion Flanges Gaskets to Fit Inside Bolt Holes Copper or Aluminum Gaskets Only

Pipe Size Inches	Standard — 125-lb. Gasket Dimensions Inches	Extra Heavy — 250-lb. Gasket Dimensions Inches
1	1¾ x 2½	2 x 2¾
1¼	2 x 2⅞	2⅛ x 3⅛
1½	2⅞ x 3¼	2⅝ x 3⅝
2	3 x 4	3¼ x 4¼
2½	3¾ x 4¾	3¾ x 5
3	4¼ x 5¼	4⅝ x 5¾
3½	5⅛ x 6¼	5⅛ x 6⅜
4	5⅜ x 6¾	5½ x 7
4½	5½ x 6⅞	6⅛ x 7⅜
5	6⅛ x 7⅜	6¾ x 8⅜
6	7 x 8⅝	8⅛ x 9¾
7	8⅛ x 9⅞	9⅛ x 10⅞
8	9⅛ x 10⅞	10 x 12
9	10⅜ x 12⅜	11 x 13
10	11 x 13¼	11¾ x 14⅛
12	13¾ x 16	14 x 16½
14	15⅜ x 17⅝	16¼ x 19
15	16½ x 18⅞	17⅛ x 19⅞
16	17⅜ x 20⅛	18½ x 21⅛
18	18¾ x 21½	20½ x 23⅜
20	20¾ x 23¾	22½ x 25⅜
22	22⅞ x 25⅞	24½ x 27½
24	25⅛ x 28⅛	27 x 30⅜

Large and Small Tongue and Groove Flanges

Pipe Size Inches	150, 300, 400, 600, 900, 1500 and 2500 lbs. Large Gasket Dimensions Inches	Small Gasket Dimensions Inches
½	1 x 1⅜	1 x 1⅜
¾	1⅛ x 1⅛	1⅛ x 1⅛
1	1½ x 2	1½ x 1⅞
1¼	1⅞ x 2½	1⅞ x 2¼
1½	2⅛ x 2⅞	2⅛ x 2½
2	2⅞ x 3⅝	2⅞ x 3¼
2½	3⅜ x 4⅛	3⅜ x 3¾
3	4¼ x 5	4¼ x 4⅝
3½	4¾ x 5½	4¾ x 5⅛
4	5⅛ x 6⅛	5⅛ x 5⅛
5	6⅛ x 7⅛	6⅛ x 6⅛
6	7½ x 8½	7½ x 8
8	9⅜ x 10⅝	9⅜ x 10
10	11¼ x 12¾	11¼ x 12
12	13½ x 15	13½ x 14¼
14	14¾ x 16¼	14¾ x 15½
16	16¾ x 18½	16¾ x 17⅝
18	19¼ x 21	19¼ x 20⅛
20	21 x 23	21 x 22
24	25¼ x 27¼	25¼ x 26¼

J-M STYLES 923, 926 and 929 STANDARD SIZES

(Gasket Thickness: 923 approx. 1/8", 926 approx. 9/64", 929 approx. 3/32")

	Gasket Dimensions, Inches										Large Male-Female Flanges	
	150 lbs.		300 lbs.		400 lbs.		600 lbs.		900 lbs.	1500 lbs.		Gasket Dimen. Inches
Pipe Size Inches	Slip-on Screw-on Flange	Welding Neck Lap Joint Flange	Slip-on Screw-on Flange	Welding Neck Lap Joint Flange	Slip-on Screw-on Flange	Welding Neck Lap Joint Flange	Slip-on Screw-on Flange	Welding Neck Lap Joint Flange	Welding Neck Lap Joint Flange	Welding Neck Lap Joint Flange	Pipe Size Inches	150, 300, 400, 600, 900, 1500 & 2500 lbs. Welding Neck and Lap Joint Only
½	⅞ x 1⅜	¾ x 1¾	⅞ x 2⅛	¾ x 2	⅞ x 2⅛	¾ x 2	⅞ x 2⅛	¾ x 2	.....	.....	½	⅝ x 1⅜
¾	1⅛ x 2⅛	1 x 2⅛	1⅛ x 2⅛	1 x 2½	1⅛ x 2⅜	1 x 2½	1⅛ x 2⅜	1 x 2½	.....	.....	¾	⅞ x 1⅛
1	1⅜ x 2⅜	1¼ x 2½	1⅜ x 2⅜	1¼ x 2¾	1⅜ x 2⅜	1¼ x 2¾	1⅜ x 2⅜	1¼ x 2¾	1 x 3	1 x 3	1	1⅜ x 2
1¼	1⅞ x 2⅞	1½ x 2⅞	1⅞ x 3⅛	1½ x 3⅛	1⅞ x 3⅛	1½ x 3⅛	1⅞ x 3⅛	1½ x 3⅛	1⅜ x 3⅛	1⅜ x 3⅛	1¼	1¾ x 2½
1½	2⅛ x 3⅛	1¾ x 3¼	2⅛ x 3⅛	1¾ x 3⅝	2⅛ x 3⅛	1¾ x 3⅝	2⅛ x 3⅛	1¾ x 3⅝	1⅝ x 3¾	1⅝ x 3¾	1½	2⅛ x 2⅞
2	2⅝ x 4⅛	2¼ x 4	2⅝ x 4¼	2¼ x 4¼	2⅝ x 4¼	2¼ x 4¼	2⅝ x 4¼	2¼ x 4¼	2⅛ x 5½	2⅛ x 5½	2	2⅝ x 3⅝
2½	3⅛ x 4⅛	2¾ x 4¾	3⅛ x 5	2¾ x 5	3⅛ x 5	2¾ x 5	3⅛ x 5	2¾ x 5	2½ x 6⅜	2½ x 6⅜	2½	3⅛ x 4⅛
3	3⅜ x 5⅛	3¼ x 5¼	3⅜ x 5¾*	3¼ x 5¾	3⅜ x 5¾*	3¼ x 5¾	3⅜ x 5¾*	3¼ x 5¾	3⅛ x 6½	3 x 6¾	3	4 x 5
3½	4⅛ x 6¼	3¾ x 6¼	4⅛ x 6⅜	3¾ x 6⅜	.....	3¾ x 6¼	.....	3¾ x 6¼	3⅝ x 7⅜	3⅜ x 7¼	3½	4½ x 5½
4	4⅝ x 6¾	4¼ x 6¾	4⅝ x 7	4¼ x 7	.....	4¼ x 6⅞	.....	4¼ x 7½	4⅛ x 8	3⅞ x 8⅛	4	5⅛ x 6⅛
5	5⅝ x 7⅝	5¼ x 7⅝	5⅝ x 8⅜	5¼ x 8⅜	.....	5¼ x 8¼	.....	5¼ x 9⅜	5 x 9⅝	4⅝ x 9⅞	5	6⅛ x 7⅞
6	7 x 8⅝	6¼ x 8⅝	7 x 9¾	6¼ x 9¾	.....	6¼ x 9⅝	.....	6¼ x 10⅜	6 x 11¼	5⅝ x 11	6	7½ x 8½
8	9⅜ x 10⅞	8¼ x 10⅞	9⅜ x 12	8¼ x 12	.....	8¼ x 11⅞	.....	8¼ x 12½	7¾ x 14	7¼ x 13¾	8	9⅜ x 10⅝
10	11⅛ x 13¼	10¼ x 13¼	11⅛ x 14⅛	10¼ x 14⅛	.....	10¼ x 14	.....	10 x 15⅜	9⅞ x 17	9 x 17	10	11 x 12¾
12	13⅛ x 16	12¼ x 16	13⅛ x 16½	12¼ x 16½	.....	12¼ x 16⅜	.....	12 x 17⅞	11⅞ x 19½	10⅝ x 19½	12	13¼ x 15
14	14½ x 17⅝	14¼ x 17⅝	14½ x 19	13½ x 19	.....	13⅜ x 18⅞	.....	13⅛ x 19¼	12½ x 20⅜	.....	14	14¼ x 16¼
16	16½ x 20⅛	16¼ x 20⅛	16½ x 21⅛	15½ x 21⅛	.....	15¼ x 21	.....	15 x 22⅛	14¼ x 22½	.....	16	16¼ x 18½
18	18½ x 21½	18¼ x 21½	18½ x 23⅜	17¼ x 23⅜	.....	17¼ x 23¼	.....	16¾ x 24	16 x 25	.....	18	18½ x 21
20	20½ x 23¾	20¼ x 23¾	20½ x 25⅜	19¼ x 25⅜	.....	19⅛ x 25⅜	.....	18½ x 26¾	17¾ x 27⅜	.....	20	20¼ x 23
24	24½ x 28⅛	24¼ x 28⅛	24½ x 30⅜	24¼ x 30⅜	.....	22⅞ x 30⅛	.....	22¼ x 31	21¼ x 32⅞	.....	24	24¼ x 27¼

*Also available in 3⅛ x 5⅛.

FBW-273

J-M 941 PROFILE METAL STANDARD SIZES

Pipe Size Inches	For Large Tongue & Groove Flanges: 150, 300, 400, 600, 900, 1500 & 2500 lbs.		For Large Male and Female Flanges: 150-lb. Slip-On, Lapped Joint Screw-On, Welding Neck		300-lb. Slip-On, Lapped Joint Screw-On, Welding Neck		400-lb. Slip-On, Lapped Joint Screw-On, Welding Neck		600-lb. Lapped Joint Welding Neck		900, 1500, 2500-lb. Lapped Joint Welding Neck	
	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
½	1	1⅜	⅞	1⅜	⅞	1⅜	⅞	1⅜	¾	1⅜	¾	1⅜
¾	1 5/16	1 11/16	1 5/16	1 11/16	1 5/16	1 11/16	1 5/16	1 11/16	1 5/16	1 11/16	1 5/16	1 11/16
1	1½	2	1 7/16	2	1⅜	2	1⅜	2	1 1/16	2	1 1/16	2
1¼	1⅞	2½	1 15/16	2½	1⅞	2½	1⅞	2½	1 15/16	2½	1⅜	2½
1½	2 1/16	2⅞	2 1/16	2⅞	2 1/16	2⅞	2 1/16	2⅞	1⅝	2⅞	1⅝	2⅞
2	2⅞	3⅝	2⅞	3⅝	2 11/16	3⅝	2 11/16	3⅝	2 1/16	3⅝	2 1/16	3⅝
2½	3⅜	4⅛	3⅜	4⅛	3⅛	4⅛	3⅛	4⅛	2⅝	4⅛	2⅝	4⅛
3	4¼	5	4¼	5	3¾	5	3¾	5	3¼	5	3¼	5
3½	4¾	5½	4½	5½	4¼	5½	4¼	5½	3½	5½		
4	5 3/16	6 3/16	5 3/16	6 3/16	4 13/16	6 3/16	4 11/16	6 3/16	4 7/16	6 3/16	4 3/16	6 3/16
5	6 5/16	7 5/16	6 5/16	7 5/16	6 1/16	7 5/16	5 13/16	7 5/16	5⅝	7 3/16	5⅛	7 5/16
6	7½	8½	7½	8½	7¼	8½	6¾	8½	6	8½	6	8½
8	9⅜	10⅝	9⅞	10⅝	9⅛	10⅝	8⅞	10⅝	8⅛	10⅝	7⅞	10⅝
10	11¼	12¾	11½	12¾	11	12¾	11	12¾	10	12¾	10	12¾
12	13½	15	13¾	15	13	15	13	15	12	15	12	15
14	14¾	16¼	14¾	16¼	14¼	16¼	14¼	16¼	13¼	16¼	13¼*	16¼
16	16¾	18½	17	18½	16¼	18½	16¼	18½	15¼	18½	15¼*	18½
18	19¼	21	19¼	21	18¼	21	18¼	21	17¼	21	17¼*	21
20	21	23	21	23	20¼	23	20¼	23	19¼	23	19¼*	23
24	25¼	27¼	25	27¼	24¼	27¼	24¼	27¼	23¼	27¼	23¼"	27¼

*900 and 1500 lb. only

J-M 941 PROFILE METAL GASKETS
For Raised Face, Forged Steel Flanges

Pipe Size	150 lb. Slip on, Lapped joint Screw on, Welding Neck		300 lb. Slip on, Lapped joint Screw on, Welding Neck		400 lb. Slip on, Lapped joint Screw on, Welding Neck		600 lb. Lapped joint Welding Neck*		900 lb. Lapped joint Welding Neck		1500 lb. Lapped joint Welding Neck		2500 lb. Lapped joint Welding Neck	
	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.	I.D.	O.D.
½	⅞	1 15/16	⅞	2 5/16	⅞	2 3/16	¾	2 5/16	¾	2 9/16	¾	2 5/16	¾	2 13/16
¾	1 5/16	2 5/16	1 5/16	2 11/16	1 5/16	2 11/16	1 5/16	2 11/16	1 5/16	2 13/16	1 5/16	2 13/16	1 5/16	3 1/16
1	1 7/16	2 11/16	1⅜	2 15/16	1⅜	2 15/16	1 1/16	2 15/16	1 1/16	3 3/16	1 1/16	3 3/16	1 1/16	3 7/16
1¼	1 15/16	3 1/16	1⅞	3 5/16	1⅞	3 5/16	1 1/4	3 5/16	1⅜	3 9/16	1⅜	3 9/16	1⅜	4 3/16
1½	2 1/16	3 7/16	2 1/16	3 13/16	2 1/16	3 13/16	1 5/16	3 13/16	1⅝	3 15/16	1⅝	3 15/16	1⅝	4 11/16
2	2⅞	4 3/16	2 11/16	4⅜	2 11/16	4⅜	2 1/16	4⅜	2 1/16	5⅝	2 1/16	5⅝	2 1/16	5¾
2½	3⅜	4 15/16	3⅛	5⅛	3⅛	5⅛	2⅝	5⅛	2⅝	6½	2⅝	6½	2⅝	6⅝
3	4¼	5 7/16	3¾	5⅞	3¾	5⅞	3¼	5⅞	3¼	6⅝	3¼	6⅞	3¼	7¾
3½	4½	6⅜	4¼	6½	4¼	6⅜	3½	6⅜	..	..	..	..	..	..
4	5 3/16	6⅞	4 13/16	7⅛	4 11/16	7	4 7/16	7⅝	4 3/16	8⅛	4 3/16	8¼	4 3/16	9¼
5	6 5/16	7¾	6 1/16	8½	5 13/16	8⅜	5⅝	9½	5⅛	9¾	5⅛	10	5⅛	11
6	7½	8¾	7¼	9⅞	6¾	9¾	6	10½	6	11⅜	6	11⅛	6	12½
8	9⅞	11	9⅛	12⅛	8⅞	12	8⅛	12⅝	7⅞	14⅛	7⅞	13⅞	7⅞	15¼
10	11½	13⅜	11	14¼	11	14⅛	10	15¾	10	17⅛	10	17⅛	10	18¾
12	13¾	16⅛	13	16⅝	13	16½	12	18	12	19⅝	12	20½	12	21⅝
14	14¾	17¾	14¼	19⅛	14¼	19	13¼	19⅜	13¼	20½	13¼	22¾	..	..
16	17	20¼	16¼	21¼	16¼	21⅛	15¼	22¼	15¼	22⅝	15¼	25¼	..	..
18	19¼	21⅝	18¼	23½	18¼	23⅜	17¼	24⅛	17¼	25⅛	17¼	27¾	..	..
20	21	23⅞	20¼	25¾	20¼	25½	19¼	26⅞	19¼	27½	19¼	29¾	..	..
24	25	28¼	24¼	30½	24¼	30¼	23¼	31⅛	23¼	33	23¼	35½	..	..

*Gasket dimensions listed for ½" through 3½"—400-lb. flanges may be used in the corresponding sizes of 600-lb. flanges if gaskets are required for 600-lb. slip-on or screw-on flanges in these pipe sizes.

FBW-274

J-M V-TITE GASKETS

J-M STYLES 950 and 951 STANDARD API and ASA (B16.20) RING SIZES
HEAVY CROSS SECTION SOLID METAL V-TITE GASKETS

A.S.A. and A.P.I. Ring Number	Gasket Dimensions, Inches					Size of Flange, Inches							Gasket Weights, Lbs.	
					Height of Ring	General Use					Oil Field Use			
	Center to Center	Inside Diameter	Outside Diameter	Width of Ring	Oval	Octagonal	150 Lbs.	300 to 600 Lbs.	900 Lbs.	1500 Lbs.	2500 Lbs.	720, 960, 2000, 3000 Lbs.	5000 Lbs.	Oval Rings	Octagonal Rings
R11	1 1/16	1 3/32	1 3/8	1/4	1/16	3/8		1/2						.111	.104
R12	1 1/16	1 1/4	1 7/8	1/4	1/8	1/2			1/2	1/2				.216	.200
R13	1 1/16	1 3/8	2	1/4	1/8	1/2		3/4			1/2			.234	.216
R14	1 3/4	1 7/16	2 1/16	1/4	1/8	1/2			3/4	3/4				.242	.224
R15	1 7/8	1 9/16	2 3/16	1/4	1/8	1/2	1							.260	.240
R16	2	1 11/16	2 5/16	1/4	1/8	1/2		1	1	1	3/4	1	1	.278	.256
R17	2 1/4	1 13/16	2 9/16	1/4	1/8	1/2	1 1/4							.311	.288
R18	2 3/8	2 1/16	2 11/16	1/4	1/8	1/2		1 1/4	1 1/4	1 1/4	1	1 1/4	1 1/4	.328	.304
R19	2 5/16	2 1/4	2 7/8	1/4	1/8	1/2	1 1/2							.354	.328
R20	2 1/2	2 3/8	3	1/4	1/8	1/2		1 1/2	1 1/2	1 1/2		1 1/2	1 1/2	.372	.344
R21	2 23/32	2 1/32	3 3/32	1/8	1/16	5/8					1 1/4			.660	.643
R22	3 1/4	2 13/16	3 5/16	1/4	1/8	1/2	2							.450	.415
R23	3 1/4	2 11/16	3 11/16	1/2	11/16	5/8		2			1 1/2	2		.755	.734
R24	3 3/4	3 1/16	4 1/16	1/2	11/16	5/8			2	2			2	.870	.846
R25	4	3 11/16	4 5/16	1/4	1/8	1/2	2 1/2							.553	.510
R26	4	3 9/16	4 7/16	1/2	11/16	5/8		2 1/2			2	2 1/2		.930	.904
R27	4 1/4	3 13/16	4 11/16	1/2	11/16	5/8			2 1/2	2 1/2			2 1/2	1.050	.960
R28	4 3/8	3 7/8	4 7/8	1/2	3/4	11/16					2 1/2			1.255	1.230
R29	4 1/2	4 1/16	4 13/16	1/4	1/8	1/2	3							.622	.575
▲R30	4 5/8	4 3/16	5 1/16	1/2	11/16	5/8		3						1.075	1.047
R31	4 7/8	4 7/16	5 5/16	1/2	11/16	3/8		3	3			3		1.130	1.100
R32	5	4 1/2	5 1/2	1/2	3/4	11/16					3			1.435	1.405
R33	5 1/16	4 7/16	5 1/2	1/4	1/8	1/2	3 1/2							.718	.664
R34	5 3/16	4 3/4	5 7/8	1/2	11/16	5/8		3 1/2	3 1/2			3 1/2		1.200	1.170
R35	5 3/8	4 13/16	5 13/16	1/2	11/16	5/8				3			3	1.250	1.210
R36	5 7/8	5 9/16	6 3/16	1/4	1/8	1/2	4							.813	.735
R37	5 7/8	5 7/16	6 5/16	1/2	11/16	5/8		4	4			4	3 1/2	1.360	1.330
R38	6 1/16	5 9/16	6 1/16	5/8	7/8	1 1/16					4			2.56	2.52
R39	6 3/8	5 13/16	6 13/16	1/2	11/16	5/8				4			4	1.480	1.440
R40	6 3/4	6 1/16	7 1/16	1/4	1/8	1/2	5							.935	.865
R41	7 1/8	6 11/16	7 5/16	1/2	11/16	5/8		5	5			5		1.66	1.61
R42	7 1/2	6 3/4	8 1/4	3/4	1	1 1/16					5			4.21	4.16
R43	7 5/8	7 1/16	7 13/16	1/4	1/8	1/2	6							1.055	.975
R44	7 5/8	7 1/16	8 1/16	1/2	11/16	5/8				5			5	1.77	1.73
R45	8 1/16	7 7/8	8 3/4	1/2	11/16	5/8		6	6			6		1.93	1.88
R46	8 1/16	7 13/16	8 13/16	1/2	3/4	11/16				6			6	2.39	2.33
R47	9	8 1/4	9 3/4	3/4	1	1 1/16					6			5.06	4.99
R48	9 3/4	9 7/16	10 1/16	1/4	1/8	1/2	8							1.350	1.240
R49	10 3/8	10 1/16	11 1/16	1/2	11/16	5/8		8	8			8		2.47	2.40
R50	10 3/8	10	11 1/4	5/8	7/8	1 1/16				8			8	4.40	4.32
R51	11	10 1/16	11 7/8	7/8	1 1/8	1 1/2					8			8.05	8.17
R52	12	11 11/16	12 5/16	1/4	1/8	1/2	10							1.66	1.53
R53	12 3/4	12 1/16	13 1/16	1/2	11/16	5/8		10	10			10		3.00	2.88
R54	12 3/4	12 1/8	13 3/8	5/8	7/8	1 1/16				10			10	5.29	5.18
R55	13 1/2	12 3/8	14 3/8	1 1/8	1 1/16	1 3/8					10			16.23	17.04
R56	15	14 1/4	15 5/16	1/4	1/8	1/2	12							2.07	1.92
R57	15	14 1/16	15 1/16	1/2	11/16	5/8		12	12			12		3.48	3.38
R58	15	14 1/8	15 7/8	7/8	1 1/8	1 1/16					12			11.00	11.13
R59	15 5/8	15 1/16	15 13/16	1/4	1/8	1/2	14							2.16	2.00
R60	16	14 3/4	17 1/4	1 1/4	1 1/16	1 1/2							12	23.10	23.50
R61	16 1/2	16 1/16	16 13/16	1/2	1/8	5/8		14					14	3.83	3.73
R62	16 1/2	15 7/8	17 1/8	3/8	7/8	1 1/8			14					6.84	6.71
R63	16 1/2	15 1/2	17 1/2	1	1 1/16	1 1/4				14				16.20	16.67
R64	17 7/8	17 5/8	18 1/16	1/4	1/8	1/2	16							2.47	2.29
R65	18 1/2	18 1/16	18 13/16	1/2	1/16	5/8		16					16	4.30	4.18
R66	18 1/2	17 7/8	19 1/8	3/8	7/8	1 1/8			16					7.67	7.53
R67	18 1/2	17 3/8	19 3/8	1 1/8	1 1/16	1 3/8				16				22.30	23.40
R68	20 3/8	20 1/16	20 13/16	1/4	1/8	1/2	18							2.82	2.60
R69	21	20 1/8	21 1/16	1/2	1/16	5/8		18					18	4.87	4.74
R70	21	20 1/4	21 3/4	3/4	1	1 1/16			18					11.80	11.64
R71	21	19 7/8	22 1/8	1 1/8	1 1/16	1 3/8				18				25.20	26.50
R72	22	21 1/16	22 1/16	1/4	1/8	1/2	20							3.04	2.81
R73	23	22 1/2	23 1/2	1/2	3/4	1 1/16		20					20	6.60	6.47
R74	23	22 1/4	23 3/4	3/4	1	1 1/16			20					12.95	12.75
R75	23	21 3/4	24 1/4	1 1/4	1 1/16	1 1/2				20				33.30	35.30
R76	26 1/2	26 1/16	26 13/16	1/4	1/8	1/2	24							3.66	3.38
R77	27 1/4	26 5/8	27 7/8	3/8	7/8	1 1/8		24						11.30	11.10
R78	27 1/4	26 1/4	28 1/4	1	1 1/16	1 1/4			24					27.10	27.58
R79	27 1/4	25 7/8	28 3/8	1 3/8	1 3/4	1 5/8				24				48.70	49.75
R80	24 1/4	23 13/16	24 1/16	1/4		1/2	22*								3.11
R81	25	24 1/16	25 1/16	1/16		3/4		22*							8.55
R82	2 1/4	1 13/16	2 1/16	1/16		5/16							1 †		.508
R83															
R84	2 1/2	2 1/16	2 1/16	1/16		5/16							1 1/2†		.564
R85	3 1/8	2 5/8	3 5/8	1/2		1 1/8							2 †		.978
R86	3 1/16	2 1/16	4 1/16	5/8		1 1/8							2 1/2†		1.447
R87	3 1/16	3 1/16	4 1/16	5/8		1 1/8							3 †		1.597
R89	4 1/8	4 1/16	5 5/16	3/4		1 1/8							4 †		2.735
R89	4 1/2	3 3/4	5 1/4	3/4		1 1/8							3 1/2†		2.528
R90	6 1/16	5 1/4	7	7/8		1 1/16							5 †		4.55
R91	10 1/4	9	11 1/2	1 1/4		1 1/2							10 †		15.05
R92	9	8 1/16	9 1/16	1/16	1/16	5/16								2.07	2.02
R93	29 1/2	28 3/4	30 1/4	3/4		1 1/8		26*							16.33
R94	31 1/2	30 3/4	32 1/4	3/4		1 1/8		28*							17.44
R95	33 1/4	33	34 1/2	3/4		1 1/8		30*							18.69
R96	36	35 1/8	36 7/8	7/8		1 1/16		32*							26.65
R97	38	37 1/8	38 7/8	7/8		1 1/16		34*							28.13
R98	40 1/4	39 3/8	41 1/8	7/8		1 1/16		36*							29.79
R99	9 1/4	8 11/16	9 11/16	1/4		1/8									2.08
R100	R100 through R105, Information on Request.*														

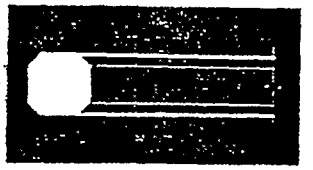
*Pipe Line Flanges to MSS SP-44.
† 10,000 lb. Oil Field Use. (Also RX Gaskets, page 30.)
▲ R-30 for Lapped Joint Only.

FBW-275

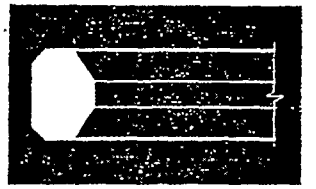
BX and RX RING SIZES FOR API 6BX and 6B FLANGES

BX GASKETS FOR API 6BX FLANGES

API Ring Number	Nominal Flange Bore (in.)			Gasket Weight lbs.
	5,000 psi	10,000 psi	15,000 psi	
BX-150		1 11/16	1 11/16	0.295
BX-151		1 13/16	1 13/16	0.337
BX-152		2 1/16	2 1/16	0.425
BX-153		2 9/16	2 9/16	0.632
BX-154		3 1/16	3 1/16	0.875
BX-155		4 1/16		1.22
BX-156		7 1/16	7 1/16	4.14
BX-157		9		6.55
BX-158		11		9.60
BX-159		13 5/8		14.41
BX-160	13 5/8			6.75



J-M 951 BX RING



J-M 951 RX RING

RX GASKETS FOR API 6B FLANGES

API Ring Number	API Groove Number	Size of Flange, Inches				Gasket Weight lbs.
		720-960 2000 lbs.	2900 lbs.	3000 lbs.	5000 lbs.	
RX 20	R-20	1½		1½	1½	0.527
RX 23	R-23	2				1.15
RX 24	R-24			2	2	1.33
RX 26	R-26	2½				1.42
RX 27	R-27			2½	2½	1.50
RX 31	R-31	3		3		1.73
RX 35	R-35				3	1.91
RX 37	R-37	4		4		2.09
RX 39	R-39				4	2.27
RX 41	R-41	5		5		2.54
RX 44	R-44				5	2.72
RX 45	R-45	6		6		2.96
RX 46	R-46				6	3.66
RX 47	R-47				8*	8.56
RX 49	R-49	8		8		3.79
RX 50	R-50				8	5.36
RX 53	R-53	10		10		4.56
RX 54	R-54				10	6.45
RX 57	R-57	12		12		5.36
RX 63	R-63				14	26.40
RX 65	R-65	16				6.63
RX 66	R-66			16		9.39
RX 69	R-69	18				7.52
RX 70	R-70			18		20.14
RX 73	R-73	20				11.63
RX 74	R-74			20		22.10
RX 82	R-82		1			0.790
RX 84	R-84		1½			0.880
RX 85	R-85		2			0.880
RX 86	R-86		2½			1.79
RX 87	R-87		3			1.98
RX 88	R-88		4			3.22
RX 89	R-89		3½			2.98
RX 90	R-90		5			6.82
RX 91	R-91		10			17.10
RX 99	R-99	8*		8*		3.31

*Crossover flange connection

STANDARD SPECIFICATIONS FOR BX and RX GASKET METALS

STANDARD SPECIFICATIONS

In accordance with API 6A.

Maximum Working Temperature — 250°F.

METAL	Brinell Hardness Number[1] Max.	Rockwell "B" Scale[2] Max.	Identification
Soft Iron[3]	90	50	D
Low-carbon Steel[3]	120	68	S
Type 304 Stainless Steel	150	83	S304
Type 316 Stainless Steel	160	83	S316

1. Brinell hardness measured with 3,000-KG load except soft iron, which is measured with 500-KG load.
2. Rockwell "B" measured with 100-KG and 1/16" diameter ball.
3. Soft iron and steel gaskets to be cadmium plated 0.0002" to 0.0005" maximum.

FBW-276

ENGINEERING QUESTIONNAIRE

JOHNS-MANVILLE

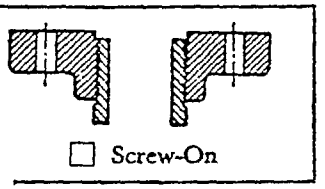
PLEASE FILL OUT VERY CAREFULLY

Johns-Manville District ..... Date: .....

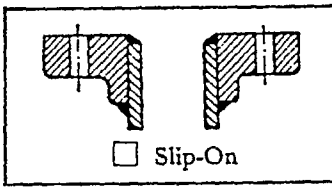
Customer: ..... Address: .....

1. Substance to be sealed: .....
   (If a chemical or other corrosive substance, the concentration should be stated)
2. Pressure to be sealed—Operating: .....lbs. Test: .....lbs.
3. Operating temperature range: ..... Cycle time: .....
4. Flange Data: (a) Nominal Size .....(b) Nominal Pressure Rating: .....

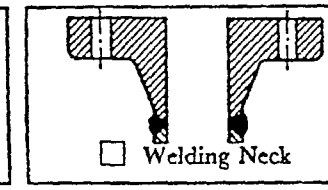
(c) Flange Type (Check One):



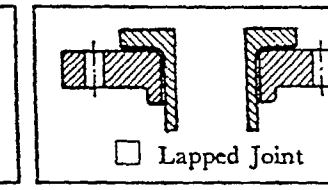
☐ Screw-On



☐ Slip-On

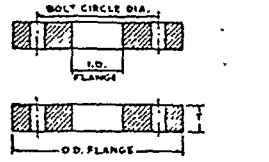


☐ Welding Neck



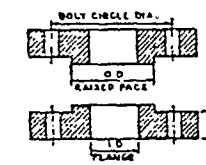
☐ Lapped Joint

(d) Flange Facing: If flanges are to American standards, just check representative facing below; otherwise fill in *all* dimensional and bolting data requested.



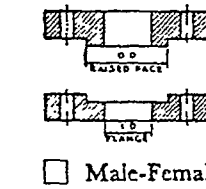
☐ Flat Face

Give: I.D. Flange .....
O.D. Flange .....
Flange Thick. (T) .....
Bolt Circle Dia. .....
Number Bolts .....
Size Bolts .....



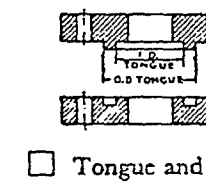
☐ Raised Face

Give: I.D. Raised Face .....
O.D. Raised Face .....
Flange Thick. (T) .....
Bolt Circle Dia. .....
Number Bolts .....
Size Bolts .....



☐ Male-Female

Give: I.D. Flange .....
O.D. Raised Face .....
O.D. Recessed Face .....
Height Raised Face .....
Depth Recess .....
Flange Thick. (T) .....
Number Bolts .....
Size Bolts .....



☐ Tongue and Groove

Give: I.D. Tongue .....
O.D. Tongue .....
I.D. Groove .....
O.D. Groove .....
Height Tongue .....
Depth Groove .....
Flange Thick. (T) .....
Number Bolts .....
Size Bolts .....

(e) Materials of which flanges are made: ..... (f) Materials of which bolts are made: .....

(g) Contact surface finish: .....(h) Condition of contact surface: .....
(i.e., smooth, serrated, phonograph, etc.) (i.e., new, good, poor, etc.)

NOTE: *For flanges of special shape or facing an accurately dimensioned sketch must be furnished and all bolting data included.*

5. Limitations on gasket thickness: .....6. How often must joint be opened: .....
7. What gasket design and material was previously used and with what result: .....
   .....
8. Number of gaskets required for each size: .....
9. Miscellaneous data: .....

FBW-277

Printed in U

Joint Sealing Compounds

SPECIAL J-M COMPOUNDS FOR SEALING THREADED, FLANGED, AND GASKETED JOINTS.
(They are not Cements or Adhesives)

Plastiseal Expanding Joint Compound is recommended for coating pipe threads and gasketed joints on lines handling high-pressure steam, oil, gasoline, kerosene, alcohol, tar, creosote, ammonia, brine, acids, air and gas.

Soluble only in water (which may be used as thinner) and chemically inert, Plastiseal will not shrink or become brittle. It expands under heat to form a permanently tight joint.

Plastiseal is recognized throughout the country as the standard thread and gasket compound for Dowtherm heaters and lines.

Plastiseal "F", made by adding asbestos fiber, is recommended for critical service requiring a compound with more bulk reinforcement. Proven more satisfactory for gas turbine applications at temperatures in excess of 1600F.

Aquaseal Waterproof Joint Compound is recommended for coating pipe threads and gasketed joints on lines handling water, especially drinking water, natural or manufactured gas, air and low-pressure steam (300°-350°F).

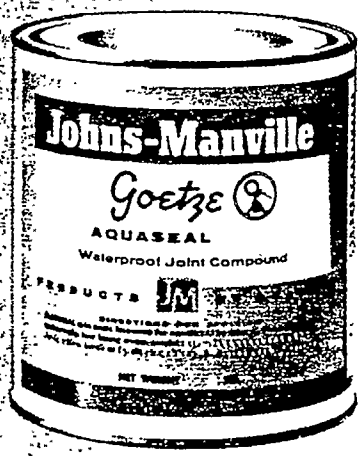
Insoluble in water, Aquaseal is putty-like, non-corrosive, non-injurious and non-contaminating. The lubricating and rust-preventing qualities simplify the breaking and reassembling of joints.

PACKAGING — PLASTISEAL and AQUASEAL		
CANS	BUCKETS	DRUMS
1 lb.*	10 lb.	350 lb.
5 lb.*	30 lb.	500 lb.
	60 lb.	

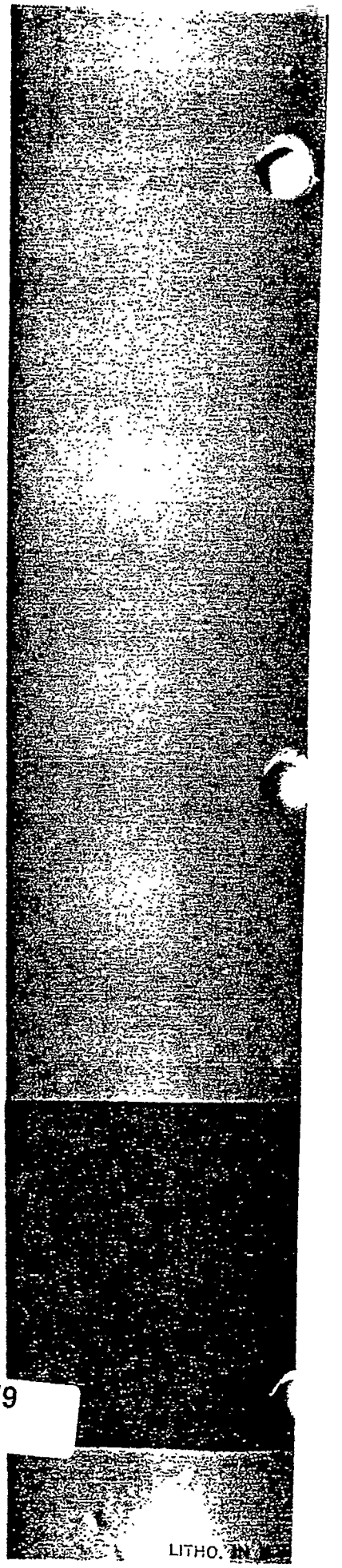
*Plastiseal "F" available only in this form.







FBW-278



Johns-Manville

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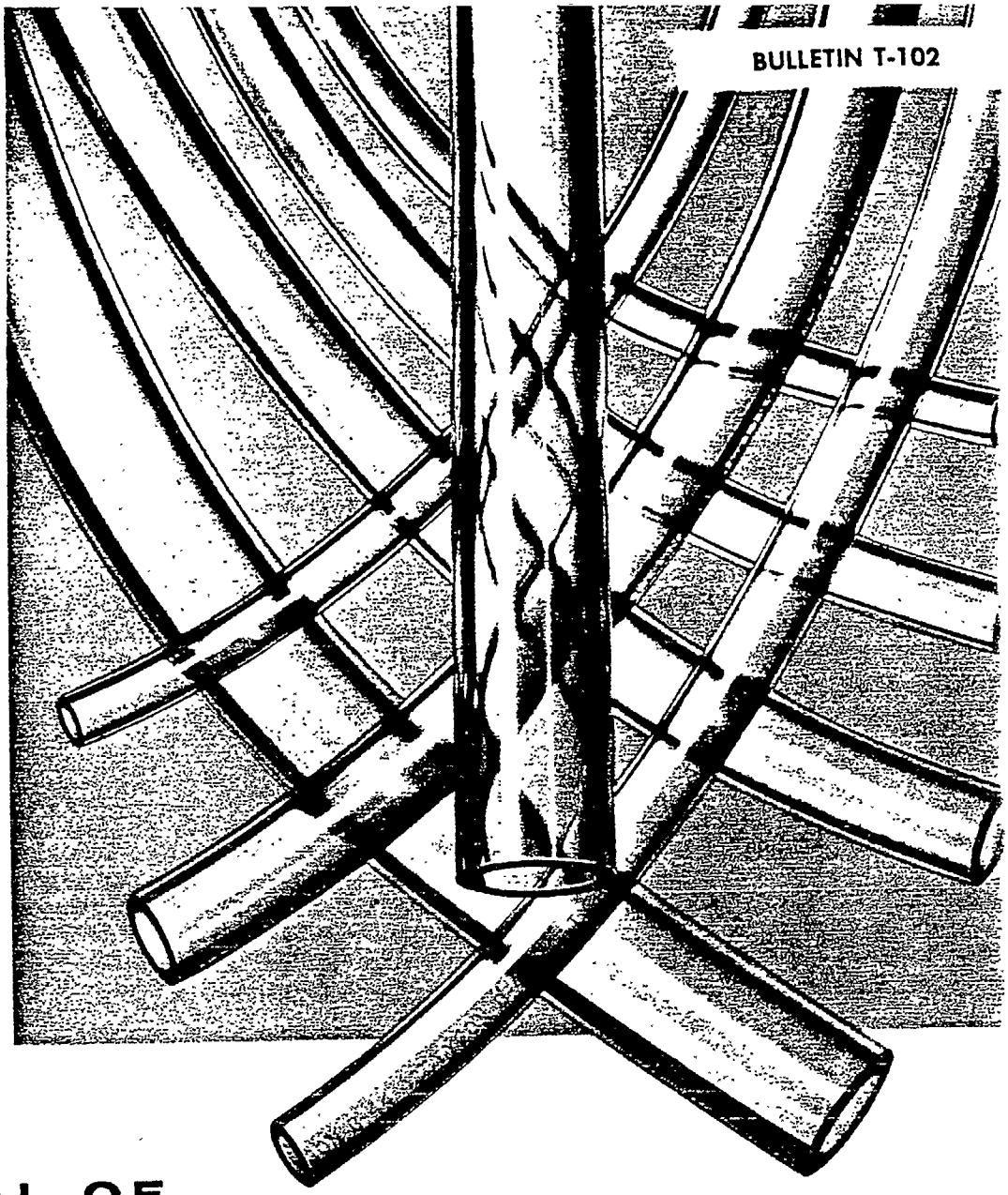
CANADIAN JOHNS-MANVILLE CO., LIMITED · 565 LAKESHORE ROAD EAST, PORT CREDIT, ONTARIO

JOHNS-MANVILLE INTERNATIONAL CORP., 22 EAST 40th ST., NEW YORK, N. Y. · CABLE: JOHNMANVIL

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LITHO. IN

BULLETIN T-102



A MANUAL OF TYGON® *flexible plastic* TUBING

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FBW-280

NORTON PLASTICS AND SYNTHETICS DIVISION • AKRON, OHIO

TYGON is the registered trademark covering a group of versatile modified vinyl materials which are produced exclusively by Norton Company. Although Tygon can be furnished in several forms—in flexible or semi-rigid sheets, in solution for use as a protective coating, and in tubing, cord or other extrusions—this manual is concerned with Tygon Tubing. It is designed to aid in the selection of the proper size and formulation, and contains information which will help to insure quick, easy installation and long, trouble-free service life.

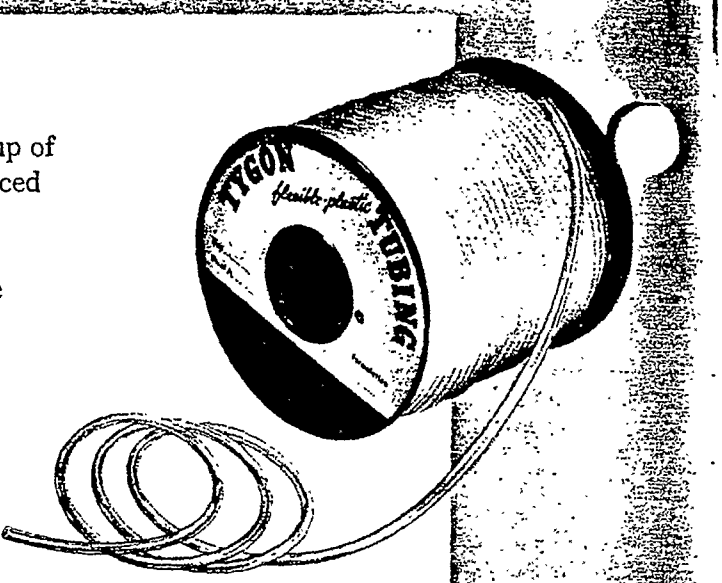
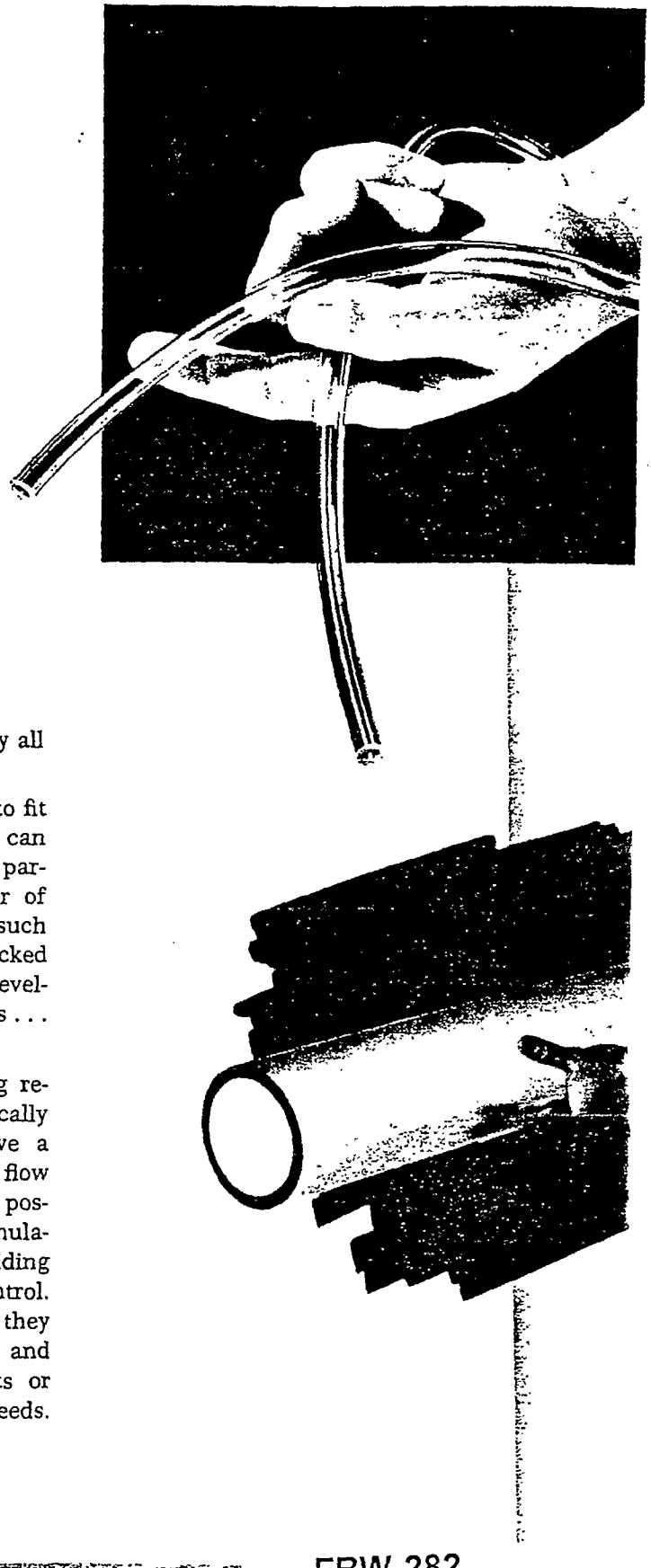


TABLE OF CONTENTS

	Page No.
Beverage Hose	8
Chemical Plant Hose	
Flexible	11
Semi-Rigid	10
Chemical Resistance Characteristics (See also specific formulations, pp 6-13)	18-19
Clamps	23
Clarity, Maintenance of	24
Cleaning	24
Coupling & Joining Methods	22-23
Cutting Tygon	22
Elasticity	14
FDA "Food Additive Amendment"	18
Fittings	20
Food and Beverage Hose	8
Fuel Hose	13
Gasoline Tubing	13
Heat Sealing	22
"Inner-Braided" Tubing	20
Installing Tygon	22-23
Laboratory Tubing	6
Low Temperature Tubing	12
Lubricant Handling Tubing	13
Milk & Dairy Products Tubing	9
"Outer Braid-Reinforced" Tubing	20
Packing	26
Para-Tube	21
Physical Properties (See also specific formulations, pp 6-13)	16-17
Pressure Capacities	15, 20
Quality Control	4
Sizes	26
Solvent Sealing	22
Special Formulations	5
Standard Formulations	5
Sterilizing Procedures	25
Storage	25
Surgical & Hospital Tubing	7
Temperature, Effect of	14, 17
Temperature Limitations	16
Tests, Toxicity & Animal Implants (Formulation S-50-HL)	7
3-A Plastics Standard	9, 18
Vacuum Tubing	21
Vapor Pressure (Formulation R-3603)	6, 21
"Y"-fittings	23

FBW-281

TYGON *flexible plastic* TUBING



Today's Tygon Tubing is a far cry from that originally marketed for laboratory tubing in 1939. Yet, that first milky-white Tygon Tubing, available only in a limited number of sizes, provided such outstanding advantages that it quickly replaced rubber as the accepted standard in laboratories throughout the world.

Although there originally was but one Tygon formulation, it was soon realized that there could be no such thing as a "general purpose" tubing. Because no single tubing can possibly provide optimum values in all physical, chemical and electrical characteristics, any so-called "general purpose" tubing is necessarily a compromise and, as such, is unfit for virtually all critical applications.

Just as steel can be alloyed to change its properties to fit a specific need, so too the basic Tygon formulation can be modified to provide the properties required by a particular use. As a result, there are today a number of different Tygon Tubing formulations. Eight have such widespread usage that they are produced and stocked as standard tubings. Over 140 others have been developed . . . each with its own particular characteristics . . . and can be quickly produced on order.

In general, all Tygon Tubings have an outstanding resistance to a wide range of corrosives . . . are physically tough, abrasion-resistant and non-aging . . . have a smooth, dense bore which provides outstanding flow characteristics, prevents interior build-up and makes possible simple flush-cleaning. Almost all Tygon formulations are either crystal clear or transluscent, providing the advantages of visual inspection and flow control. Nearly all Tygon Tubings are flexible and, because they are available in continuous lengths, are quickly and easily put into service with a minimum of joints or couplings, can be readily moved to meet changing needs.

FBW-282

QUALITY CONTROL the most important "ingredient" in the manufacture of TYGON TUBING

Through the years, users of Tygon Tubing have frequently commented that every length can *always* be *depended* upon to meet exactly the physical, chemical and electrical standards of its particular formulation.

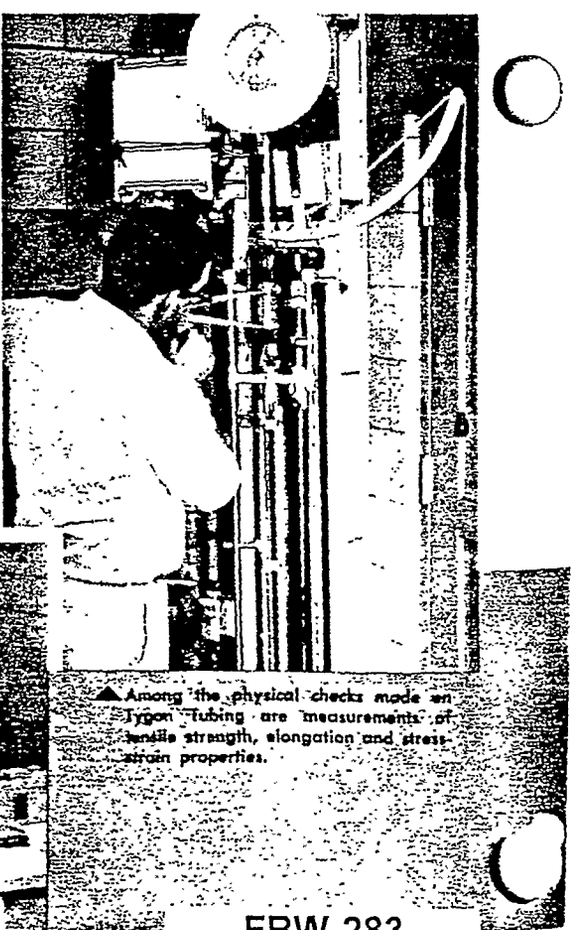
The satisfaction . . . indeed, the enthusiasm . . . of Tygon users is a result of the highly developed quality control methods which govern the production of every foot of Tygon Tubing.

Suppliers are required to assign code numbers to every drum, carton or can of raw material and to certify that the contents have been tested and found to meet the rigid specifications established by Norton. Samples are taken from each batch of Tygon after every manufacturing operation . . . compounding, mixing, extruding... and subjected to exhaustive laboratory checks. Production cards, carrying the code numbers of all ingredients used, travel with each batch through the entire manufacturing process. This facilitates pinpointing the source of any trouble that might be caused by faulty raw materials and makes it possible to prevent additional difficulties with future batches.

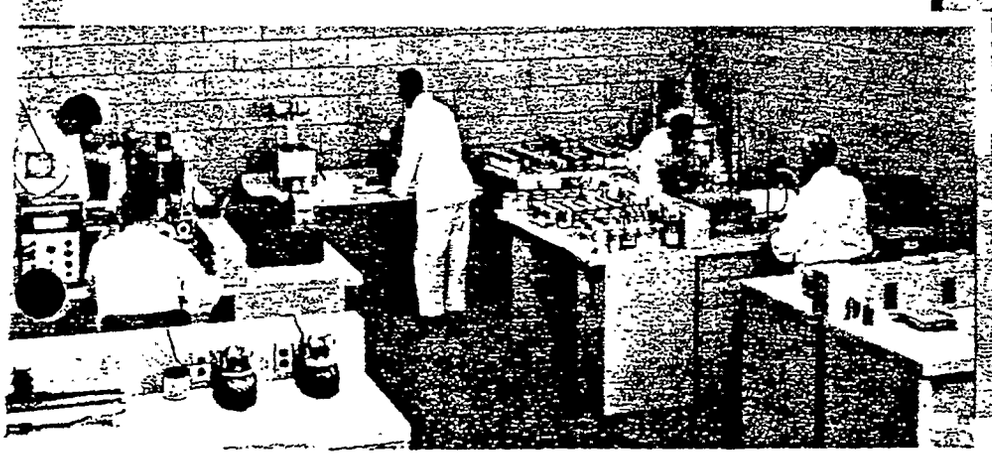
The uninitiated never fail to be amazed at the thoroughness of Tygon's quality control program. However, because of the critical uses to which so much Tygon Tubing is put, we, as well as the user, *must be sure* that each length meets all of the exacting requirements of the usage for which it was developed.



Checking the refractive index of a Tygon formulation or one of its component materials is just one step in the thorough quality control program.



▲ Among the physical checks made on Tygon Tubing are measurements of tensile strength, elongation and stress-strain properties.



Here is a portion of the modern, completely equipped laboratory, where competent personnel run the chemical and physical tests which are a vital part of Tygon's highly spe-

FBW-283

STANDARD TYGON TUBING FORMULATIONS			
Formulation Number	Application	Formulation Number	Application
R-3603	Laboratory Tubing	R-2400	Semi-Rigid General Utility Chemical Hose
S-50-HL	Surgical and Hospital Tubing	R-3400	Flexible General Utility Chemical Hose
B-44-3	Food and Beverage Hose	R-2807	Flexible Low Temperature Hose
B-44-4X	Processed Milk and Milk Products Hose	R-4000	Fuel and Lubricant Tubing

Each of these eight standard Tygon Tubing formulations has certain superior properties which make it ideally suited to the use for which it was developed.

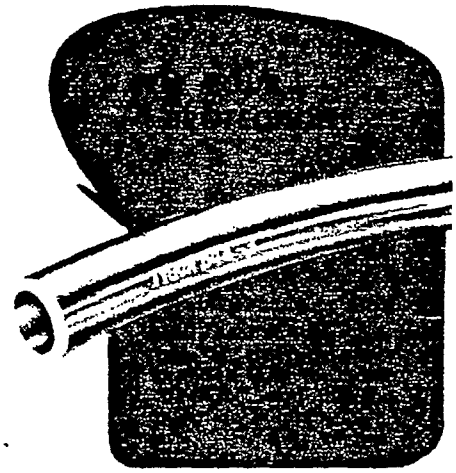
The eight pages which follow contain detailed information on the standard formulations, which are manufactured and stocked in the sizes shown on page 26.

To save time in stockrooms, borders of all labels on Packettes and cartons are color-coded. There's a different color for each of the standard formulations, plus a ninth — tan — color for special and non-standard formulations. A handy color code identification chart for hanging in the stockroom is available free on request.

SPECIAL TYGON TUBING FORMULATIONS

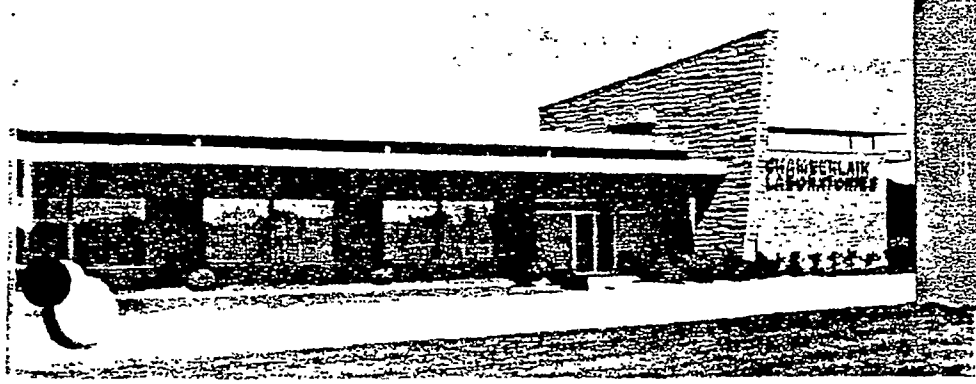
If one of the standard Tygon Tubing formulations cannot fulfill your tubing requirements, possibly one of the more than 140 special formulations may meet your needs exactly. Though they are not normally stocked, they can be quickly produced on order. Typical of these formulations are:

- those for use with high concentrations of hydrogen peroxide . . .
- clear tubing for use as manometer tubings in wind tunnel and aircraft testing . . .
- high durometer compounds developed for platens of business machines and typewriters . . .
- special pharmaceutical formulations for intravenous units, etc. . . .
- tubing for use as dental air and water lines . . .
- special formulations for oxygen transmission . . .
- stethescope and hearing aid tubing



SPECIAL RESEARCH AND DEVELOPMENT FACILITIES

If you have an application for Tygon Tubing which cannot be adequately met with one of the many formulations which have already been compounded, we can develop . . . and assign exclusively to your use . . . a Tygon Tubing that will meet almost any requirement within the natural limitations of the basic material, if the manufacturing volume is sufficiently great to justify the research.



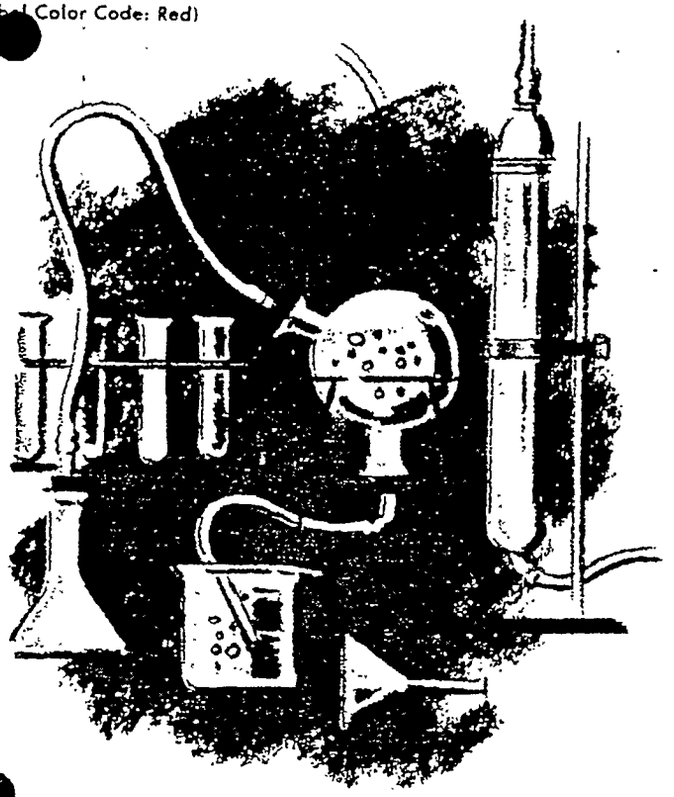
Staffed by highly trained engineers and scientists, modern, completely equipped Chamberlain Laboratories is our wholly owned research and development center.

FBW-284

ORMULATION
R-3603

LABORATORY TUBING

abel Color Code: Red)



Developed to handle an extremely wide range of chemicals, Tygon R-3603 Tubing has long been the preferred tubing for general laboratory applications.

Soft and flexible, Tygon R-3603 Tubing is extremely easy to use. It slips over tubulatures quickly and easily, grips tightly to glass or metal (often eliminating the need for clamps), and bends readily to sharp radius curves to speed and simplify set-ups.

Of prime importance is the broad range of chemicals which Formulation R-3603 will handle. Though other formulations may show greater resistance to certain chemicals (R-2400, for example, is superior in its resistance to strong oxidants), none can match the over-all range of chemicals which R-3603 can handle safely. Even where it is subject to attack by a specific chemical, R-3603 can be used intermittently (up to two hours of continuous contact), provided it is cleaned by thorough flushing with water after each exposure.

Tygon Tubing, Formulation R-3603, has a low vapor pressure — a maximum of 3×10^{-2} mm of mercury at 140°C. and 1×10^{-7} mm at 21°C. (A vapor pressure chart for Tygon R-3603 Tubing is available and will be sent without charge or obligation on request.)

Non-toxic and non-contaminating to solutions, the interior walls of R-3603 are highly polished to prevent build-up and to facilitate cleaning, thus reducing the chances of contaminating following solutions. Tygon Tubing, Formulation R-3603, is crystal clear, permitting visual inspection of flow at any point.

FORMULATION R-3603

Color	Crystal Clear
Durometer Hardness (Shore A)	60-64
Tensile Strength, psi	1450-1500
Low Temperature Range:	Flexible at —20°F. Brittle at —50°F.
High Temperature Range:	
Dry Heat	200°F.
Steam	Fair
Elongation Percent	400
Odor	Slight
Taste	None
Toxicity	Non-toxic
Flameproofness	Burns
Dielectric Strength (Rapid Rise Method)	349 v/m

BEFORE IMMERSION		AFTER 7 DAYS IMMERSION			AFTER 14 DAYS AT ROOM TEMP.		
Solution	Durometer Hardness	Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %	Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %
30% Sulfuric acid	63-63	75-66	— 1.98	+ 0.86			
3% Sulfuric acid	63-63	66-66	— 0.06	+ 0.11			
10% Sodium hydroxide	63-63	66-66	— 2.42	0.00			
95% Ethyl alcohol	63-63	68-68	— 6.23	— 3.67			
Ethyl acetate, C.P.	63-63	16-16	+102.68	—96.32			
Toluene	63-63	47-50	— 0.24	+ 0.78			
% Sodium chloride	63-63	65-66	— 2.08	— 0.76			
illed water	63-63	66-66	— 0.27	+ 0.11			
10% Nitric acid	63-63	67-67	— 0.04	+ 0.15			
10% Hydrochloric acid	63-63	68-67	— 2.10	+ 0.03			
5% Acetic acid	63-63	76-76	— 3.22	+ 0.31			
Oleic acid, C.P.	63-63	90-90	— 3.57	—10.83			
28% Ammonium hydroxide	63-63	64-63	— 8.44	+ 0.39			
3% Hydrogen peroxide	63-63	66-67	— 4.91	+ 0.06			
Gasoline	63-63	96-94	— 24.31	—27.68			
Engine oil, 10W	63-63	68-69	— 4.39	— 2.85			

SURGICAL and HOSPITAL TUBING

FORMULATION S-50-HL

(Label Color Code: Chartreu

Although it was developed especially to meet the critical requirements of use in heart-lung machines, artificial hearts, artificial kidneys, tumor perfusion machines and similar apparatus, crystal-clear Tygon Tubing, Formulation S-50-HL, has also become the standard of excellence for flexible tubing in a multitude of other applications, such as drain and wash tubing, for blood transfusions, for the administration of parenterals, etc. In addition, it is widely used in clinical and biological laboratories.

Tygon S-50-HL Tubing is absolutely tasteless and odorless. Its dense, glass-smooth bore prevents interior build-up and provides outstanding flow characteristics. Its wall retains its shape, will not collapse to restrict solution flow. Tygon S-50-HL can be safely and easily sterilized by steam, chemical or gas methods.

As flexible as rubber, Tygon Tubing, Formulation S-50-HL, has a flex life 10 to 12 times longer than that of rubber. Hence, it is widely used in peristaltic pumps.

Occasionally, a highly specific and exacting need arises with slightly different physical or chemical requirements than those provided by S-50-HL. For example, a slightly stiffer material might be required. In these instances, variations of the basic formula have been developed. Typical of such special formulations are those used in the manufacture of catheters, blood bags, blood filters, containers, drug packaging components, trusses, etc.

FORMULATION S-50-HL

Color	Crystal Clear
Durometer Hardness (Shore A)	68
Tensile Strength, psi	2200
Low Temperature Range:	Flexible at 0°F.
	Brittle at —40°F.
High Temperature Range:	
Dry Heat	215°F.
Steam	30 min. at 15 lbs.
Elongation Percent	400
Odor	None
Taste	None
Toxicity	Non-toxic
Flameproofness	Self-extinguishing
Dielectric Strength (Rapid Rise Method)	386v/m



ASSURED SAFETY

Prior to its introduction, Tygon Tubing, Formulation S-50-HL, was subjected to extensive toxicity and animal implant tests by a highly regarded independent laboratory to confirm its absolute safety.

Tests run:

- ACUTE TOXICITY
- BLEB REACTIVITY
- TISSUE REACTION — ACUTE
  - (A) SUBCUTANEOUSLY
  - (B) INTRAMUSCULARLY
- PYROGENICITY
- NEUROLOGICAL TISSUE REACTION — ACUTE
- CORONARY RESPONSE
- CIRCULATORY RESPONSE
- 90-DAY CHRONIC OR SUBACUTE TISSUE REACTION
  - (A) SUBCUTANEOUSLY
  - (B) INTRAMUSCULARLY
- 90-DAY CHRONIC NEUROLOGICAL TISSUE REACTION
- BLOOD COMPATIBILITY TESTS

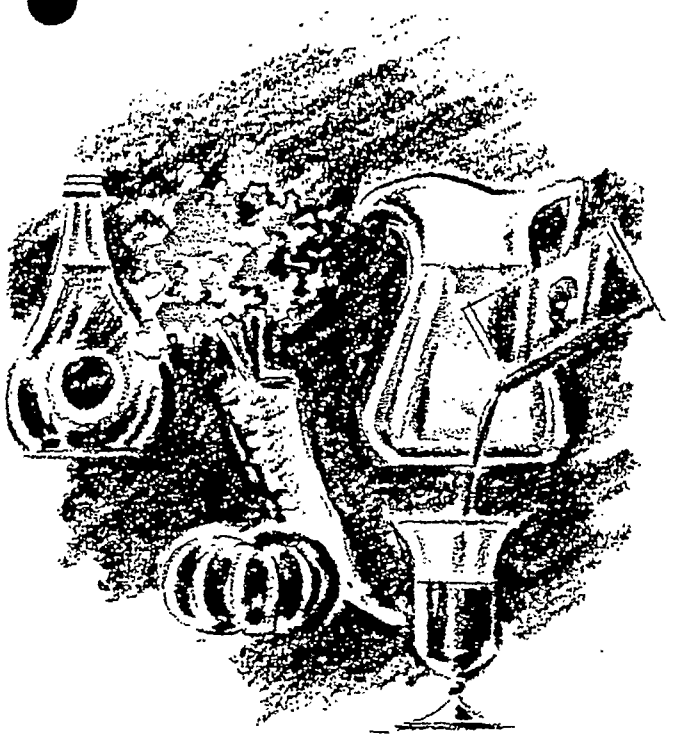
A manuscript containing reproductions of the actual reports on these tests is available on request to Norton Plastics and Synthetics Division, Akron, Ohio 44309.

FBW-286

FORMULATION B-44-3

FOOD AND BEVERAGE HOSE

(Color Code: Mint Green)



FORMULATION B-44-3

Color	Clear
Durometer Hardness (Shore A)	68-75
Tensile Strength, psi	2200-2300
Low Temperature	Flexible at 0°F.
	Brittle at —40°F.
High Temperature:	
Dry Heat	215°F.
Steam	30 min. at 15 lbs.
Elongation Percent	400
Odor	None
Taste	None
Toxicity	Non-toxic
Flameproofness	Self-extinguishing
Dielectric Strength (R.R. Method)	356 v/m

Tygon Tubing, Formulation B-44-3, was developed specifically to meet the critical requirements of handling semi-liquid and liquid foods and beverages, such as syrups, fruit juices, tomatoes, etc. Completely safe and non-toxic, Tygon B-44-3 Tubing complies fully with the FDA's "Food Additive Amendment." It will not affect the taste or odor of even the most flavor-sensitive products. Non-aging and non-oxidizing, Tygon B-44-3 has been approved by many state and municipal laboratories as well as by leading food processors.

The clarity of Tygon B-44-3 permits observation of flow and visual inspection for cleanliness. Its smooth, dense bore (smoother than rubber and virtually all stainless steels) cannot trap bacteria-harboring food particles, is easily flush-cleaned, is not affected by any commercially-available cleaner or sanitizer.

Lightweight, flexible, easy-to-handle Tygon Tubing, Formulation B-44-3, requires a minimum of couplings and fittings, is readily curved around corners and obstructions to speed set-ups, simplify revisions as needs change. Furthermore, Tygon's flexibility can save up to ⅓ the footage needed by rigid pipe.

The unique advantages of Tygon Tubing, Formulation B-44-3, have been thoroughly proven in countless installations as permanent transfer lines, as "quick-and-easy" temporary lines, and in conjunction with rigid piping systems to give them a new measure of versatility.

	BEFORE IMMERSION	AFTER 7 DAYS IMMERSION			AFTER 14 DAYS AT ROOM TEMP.		
Solution	Durometer Hardness	Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %	Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %
30% Sulfuric acid	74	72	— 0.85	+ 0.01	72	+ 0.42	— 0.06
3% Sulfuric acid	72	71	+ 0.34	+ 0.10	71	— 0.81	— 0.12
10% Sodium hydroxide	75	73	— 0.90	— 0.90	73	— 0.98	— 1.52
95% Ethyl alcohol	74	74	— 0.84	— 6.85	75	— 10.85	— 11.16
Ethyl acetate, C.P.	75	22	+96.96	+102.94	91	Dis.	— 36.28
Toluene	75	51	+13.22	— 0.48	86	— 22.18	— 31.29
10% Sodium chloride	74	71	0.00	+ 0.12	71	+ 0.42	— 0.05
Distilled water	75	71	0.00	+ 0.10	72	0.00	— 0.20
10% Nitric acid	75	73	— 0.88	— 0.09	73	0.00	— 0.39
10% Hydrochloric acid	75	72	+ 0.89	— 0.08	73	— 0.44	— 0.22
3% Acetic acid	75	73	— 0.44	+ 0.22	73	— 0.44	— 0.21
Oleic acid, C.P.	74	73	— 1.36	— 2.13	73	— 2.10	— 2.23
10% Ammonium hydroxide	75	72	— 0.45	— 1.27	72	— 1.79	— 2.37
3% Hydrogen peroxide	75	71	— 1.33	+ 0.16	73	— 0.80	— 0.18
Gasoline	75	72	— 3.96	— 9.41	76	— 13.22	— 14.50
Engine oil, 10W	75	72	— 2.39	— 2.05	73	— 3.72	— 1.97

FBW-287

PROCESSED MILK AND MILK PRODUCTS HOSE

FORMULATION B-44-4X

(Label Color Code: Blue)

Glass-clear, flexible Tygon Tubing, Formulation B-44-4X, meets or surpasses every physical, chemical and sanitary requirement of handling processed milk and milk products.

Completely safe and non-toxic, it complies fully with all FDA requirements, and meets all criteria in the 3-A Plastics Standard. Moreover, Tygon B-44-4X Tubing will not affect the taste or odor of any product with which it is used.

Like all Tygon Tubing formulations, B-44-4X is all-plastic, devoid of "loading" or "filler" materials. Its high density composition results in an extremely smooth, tough interior surface with excellent resistance to leaching or erosion. This dense, smooth bore also provides extremely fine flow characteristics, makes simple flush-cleaning practical. (Its excellent wetting properties facilitate complete drainage.) All common dairy cleaners and sanitizers — including milkstone cleaners — can be used with Tygon Tubing, Formulation B-44-4X.

As flexible as rubber, and available in continuous lengths, Tygon B-44-4X Tubing can be put into service in minutes, quickly and easily changed over when needs change. Because it can be curved around obstacles and corners, costly couplings and fittings are virtually eliminated, and generally a much shorter length is required than with rigid pipe. Its clarity makes possible visual inspection and control of flow.

Physically tough and abrasion-resistant, non-aging and non-oxidizing, Tygon Tubing, Formulation B-44-4X, assures the user a long, economical, trouble-free service life.



FORMULATION B-44-4X

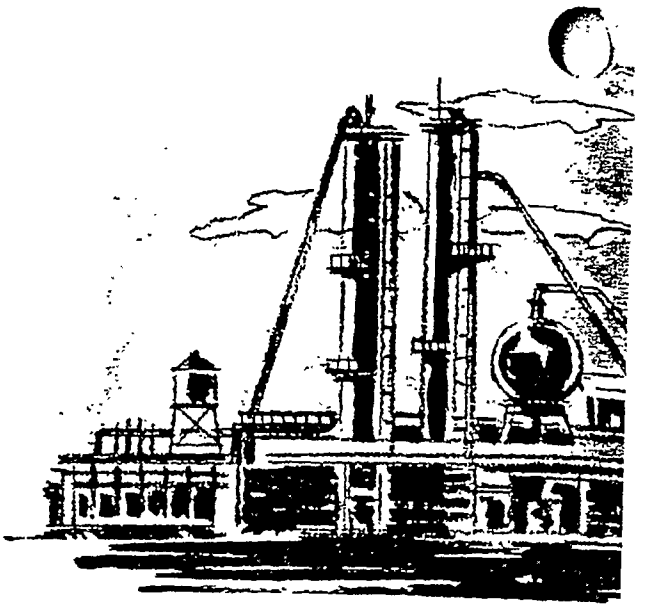
Color	Clear
Durometer Hardness (Shore A)	65-69
Tensile Strength, psi	1900-1950
Low Temperature	Flexible at 0°F.
	Brittle at —40°F.
High Temperature:	
Dry Heat	215°F.
Steam	30 min. at 15 lbs.
Elongation Percent	370-380
Odor	None
Taste	None
Toxicity	Non-toxic
Flameproofness	Self-extinguishing
Dielectric Strength (R. R. Method)	384 v/m

FORMULATION
R-2400

abel Color Code: Yellow)

Semi-Rigid

GENERAL UTILITY CHEMICAL HOSE



Tygon Tubing, Formulation R-2400, provides the best resistance to the widest range of corrosives of any standard Tygon formulation, as a glance at the chemical resistance tables on pages 18 and 19 will show.

Tygon R-2400 Tubing also has the highest tensile strength of all the standard formulations and, with its durometer (Shore A) of 95-97, is the stiffest. This latter characteristic has made it widely used in installations where a certain rigidity is required along with a high degree of corrosion resistance.

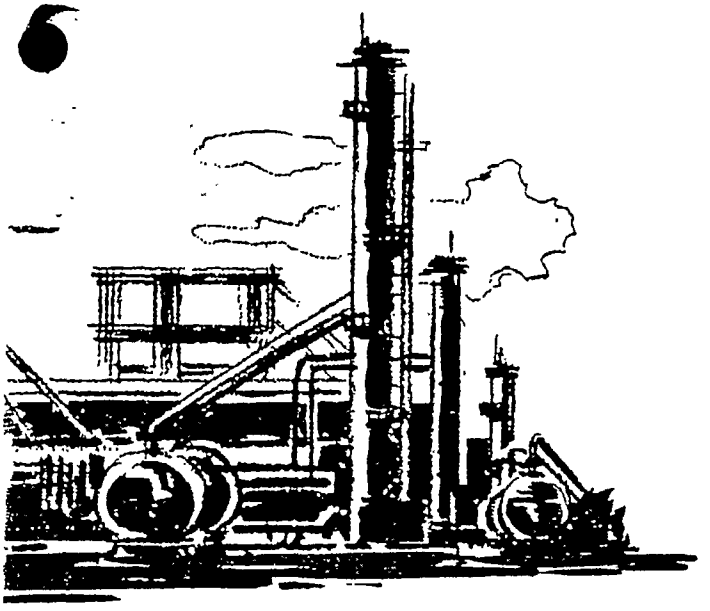
Non-aging and non-oxidizing, Tygon R-2400 has good resistance to sunlight and weathering. Its black color protects light-sensitive materials transmitted through it. It is self-extinguishing, as well as having better than average electrical characteristics. Tygon R-2400 Tubing is not suitable for use with foods, beverages or drugs.

FORMULATION R-2400

Color	Black
Durometer Hardness (Shore A)	95-97
Tensile Strength, psi	3000-3100
Low Temperature	Flexible at 60°F. Brittle at 40°F.
High Temperature Range:	
Dry Heat	215°F.
Steam	30 min. at 15 lbs.
Elongation Percent	250
Odor	Slight
Taste	Slight
Toxicity	Not to be used in contact with foods, beverages, drugs
Flameproofness	Self-extinguishing
Dielectric Strength (Rapid Rise Method)	387 v/m

Solution	BEFORE IMMERSION Durometer Hardness	AFTER 7 DAYS IMMERSION Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %	AFTER 14 DAYS AT ROOM TEMP. Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %
30% Sulfuric acid	95	96	— 1.05	— 0.007	89	— 3.66	+ 0.002
3% Sulfuric acid	95	96	— 1.13	+ 0.095	89	— 4.23	+ 0.02
10% Sodium hydroxide	95	95	— 1.06	+ 0.028	89	— 4.21	0.00
95% Ethyl alcohol	95	82-82	+ 0.985	+ 2.44	81	— 3.11	+ 1.08
Ethyl acetate, C.P.	95	25-34	+ 194.3	+ 122.2	86	— 19.22	— 19.205
Toluene	95	57-56	+ 22.85	+ 14.355	86	— 19.52	— 19.935
10% Sodium chloride	95	95	— 0.49	+ 0.07	89	— 3.18	+ 0.01
Distilled water	95	95	— 2.01	+ 0.06	89	— 3.16	+ 0.02
10% Nitric acid	95	96	— 0.995	+ 0.09	89	— 5.2	+ 0.03
10% Hydrochloric acid	95	95	— 2.00	+ 0.02	89	— 3.65	+ 0.015
3% Acetic acid	95	95	— 1.49	+ 0.10	89	— 4.22	+ 0.02
Oleic acid, C.P.	95	95	— 1.02	+ 0.01	89	— 3.62	— 0.015
10% Ammonium hydroxide	95	94-93	— 1.02	+ 0.195	89	— 4.24	+ 0.05
3% Hydrogen peroxide	95-94	95	— 1.02	+ 0.11	89	— 5.25	+ 0.02
Gasoline	95	89	+ 2.28	+ 0.36	81-80	— 2.54	+ 1.615
Engine oil, 10W	95	95	— 1.52	— 0.02	89	— 4.36	0.00

FBW-289



Flexible
GENERAL UTILITY CHEMICAL HOSE

Developed for general chemical handling applications, Tygon Tubing, Formulation R-3400 combines suppleness and flexibility with the best chemical resistance properties of any standard Tygon formulation except R-2400.

Its flexibility makes it quick and easy to put into service — ideal for both permanent and temporary installations. It is resistant to sunlight (ultraviolet light), ozone and weathering. Its black color protects any light-sensitive materials which may be piped through it. However, Tygon R-3400 Tubing should not be used in contact with foods, beverages and drugs.

Although it has a more limited temperature range than R-2400, it has better low temperature characteristics. It is also considerably more abrasion-resistant than R-2400 and shows less tendency to take a permanent set, or to cold flow.

FORMULATION R-3400

Color	Black
Durometer Hardness (Shore A)	68-72
Tensile Strength, psi	2000-2100
Low Temperature	Flexible at 30°F. Brittle at 10°F.
High Temperature Range:	
Dry Heat	200°F.
Steam	30 min. at 15 lbs.
Elongation Percent	350
Odor	Slight
Taste	Slight
Toxicity	Not to be used in contact with foods, beverages, drugs
Flameproofness	Self-extinguishing
Dielectric Strength (Rapid Rise Method)	348 v/m

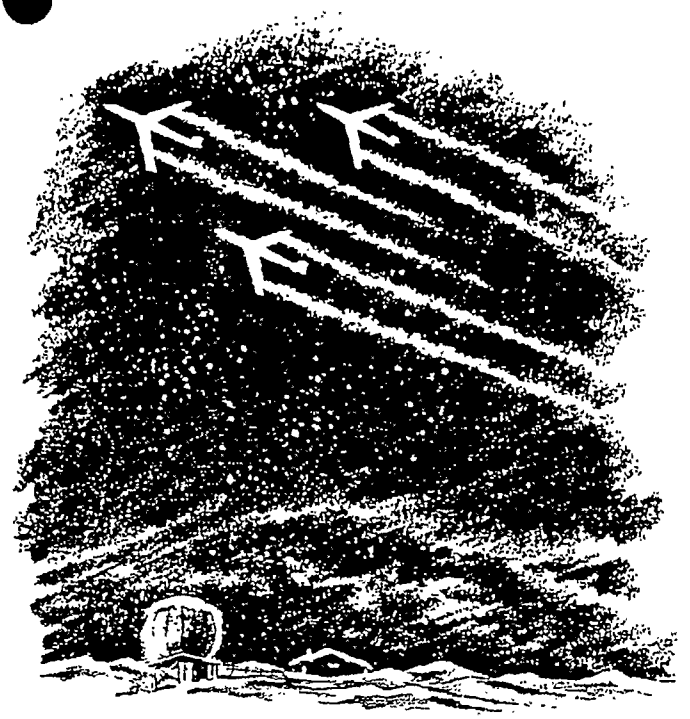
Solution	BEFORE IMMERSION Durometer Hardness	AFTER 7 DAYS IMMERSION Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %	AFTER 14 DAYS AT ROOM TEMP. Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %
30% Sulfuric acid	69	75	— 1.99	+ 0.02	74	— 2.55	+ 0.015
3% Sulfuric acid	69	75	— 1.87	+ 0.68	74	— 1.94	+ 0.55
10% Sodium hydroxide	69	75	+ 4.74	— 0.02	74	+ 4.95	— 0.025
95% Ethyl alcohol	69	78	+ 3.95	— 1.51	77-76	— 4.19	— 7.39
Ethyl acetate, C.P.	69	30	—124.98	+92.56	86	—34.34	—34.19
Toluene	69	57	— 8.14	— 2.32	90	—22.61	—34.89
10% Sodium chloride	69	75	— 3.19	+ 0.09	74	—26.01	— 2.10
Distilled water	69	76	— 1.94	+ 0.185	72	— 2.21	— 1.48
10% Nitric acid	69	73	— 0.75	+ 0.245	74	— 1.54	+ 0.115
10% Hydrochloric acid	69	72	— 0.595	+ 0.08	74	— 1.37	+ 0.06
3% Acetic acid	69	73	— 2.11	— 1.50	74	— 2.29	— 0.83
Oleic acid, C.P.	69	76	— 1.86	— 1.45	75	— 4.97	— 1.45
10% Ammonium hydroxide	69	71	— 2.11	+ 0.455	75	— 5.67	+ 0.045
3% Hydrogen peroxide	69	72	— 1.93	+ 0.165	75	— 1.86	+ 0.03
Gasoline	69	66	— 1.32	— 5.59	75-76	— 8.54	—12.85
Engine oil, 10W	69	72	— 2.18	— 0.465	75-74	— 8.26	— 0.43

FBW-290

FORMULATION
R-2807

(Label Color Code: Dark Green)

FLEXIBLE
LOW TEMPERATURE TUBING



Tygon Formulation R-2807 retains its flexibility at temperatures as low as 50°F. below zero. (In fact, standard ASTM test methods have established its brittle point at —68°F.)

R-2807 is a black tubing of medium durometer hardness which provides excellent chemical resistance (though not over as broad a range as other Tygon formulations). It is not suitable for food products or solutions where freedom from contamination is important.

R-2807 is a good example of how, in order to achieve an optimum value in one characteristic, other properties must be compromised to some extent. (That is why there can be no "general purpose" tubing for critical applications.) In the case of R-2807, its low temperature flexibility is counterbalanced by its inability to withstand higher temperatures: it is not suitable for use at temperatures much above 150°F.

For applications where clearness is equally as important as low temperature flexibility, a special Tygon Formulation, S-2807-S, has been developed. Its use is confined almost exclusively to manometer tubing in aircraft and wind tunnel testing apparatus.

FORMULATION R-2807

Color	Black
Durometer Hardness (Shore A)	67-70
Tensile Strength, psi	1800-1900
Low Temperature Range:	Flexible at —50°F. Brittle at —68° F.
High Temperature Range:	
Dry Heat	150°F.
Steam	Poor
Elongation Percent	375
Odor	Slight
Taste	None
Toxicity	Not to be used in contact with foods, beverages, etc.
Flameproofness	Burns
Dielectric Strength (Rapid Rise Method)	385 v/m

Solution	BEFORE IMMERSION Durometer Hardness	AFTER 7 DAYS IMMERSION Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %	AFTER 14 DAYS AT ROOM TEMP. Durometer Hardness	Change in Weight from Original, %	Change in Volume from Original, %
30% Sulfuric acid	69	72-71	— 1.32	+ 0.06	72	— 1.18	+ 0.03
3% Sulfuric acid	69	72-72	— 1.30	+ 0.09	72	— 1.15	— 0.005
10% Sodium hydroxide	69	72	— 1.77	— 0.225	72	— 2.005	— 0.28
95% Ethyl alcohol	69	80	— 17.83	— 17.525	95	— 24.25	— 22.62
Ethyl acetate, C.P.	69	67	+ 140.48	+ 135.36	52	— 28.94	— 25.92
Toluene	69	82	+ 2.22	0.00	88	— 29.17	— 25.44
10% Sodium chloride	69	72	— 1.67	— 0.10	72	— 0.38	— 0.115
Distilled water	69	72-72	— 1.70	+ 0.135	72	— 2.20	— 0.045
10% Nitric acid	69	72	+ 0.99	+ 0.205	70	— 1.61	+ 0.36
10% Hydrochloric acid	69	73-73	— 3.33	+ 0.11	70-71	— 0.985	+ 0.025
5% Acetic acid	69	72	+ 1.24	+ 2.55	70	0.00	+ 0.215
Oleic acid, C.P.	69	67	— 16.24	— 13.89	52	— 13.775	— 13.87
10% Ammonium hydroxide	69	72	+ 0.80	+ 1.215	70	— 17.89	— 0.075
3% Hydrogen peroxide	69	72-74	— 2.23	— 0.985	71	— 11.455	— 1.125
Gasoline	69	86	— 17.32	— 17.525	95	— 24.375	— 21.88
Engine oil, 10W	69	85	— 15.10	— 12.735	88	— 25.885	— 12.735

FBW-291

FORMULATION R-4000

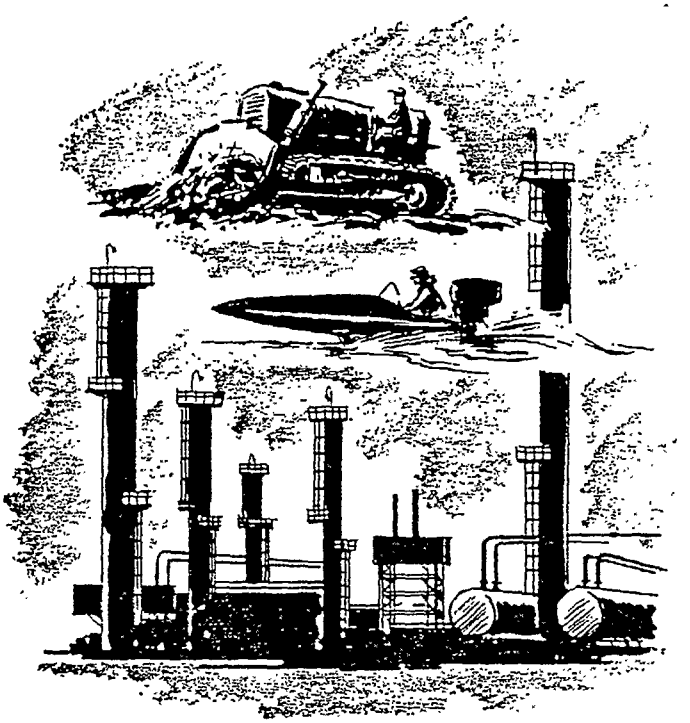
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FUEL AND LUBRICANT TUBING

Tygon Formulation R-4000 was developed specifically to provide a tubing which will maintain its physical properties in contact with fuels, lubricants and oils. As such, it is suitable for use with straight run or leaded gasolines or with gasolines in which additives such as boron, tricresyl-phosphate or organic manganese are used. It may be used with kerosene, heating oils, cutting compounds, glycol-based coolants, etc. It not only resists swelling when used to handle these products, but its minimum extractability also safeguards the liquid or vapor against adulteration.

A transparent tubing that is readily identifiable by its yellow color, R-4000's resistance to acids and alkalies has been sacrificed to gain its outstanding resistance to oils and aromatics. However, in low concentrations in weak acids and alkalies, it does exhibit fair to good properties, although alkalies of all types and concentrations create case hardening, with a resulting loss of flexibility. Solvent resistance is similar to that of other Tygon formulations. Tygon R-4000 Tubing should not be used where non-toxicity is desired.

A series of modifications of R-4000 has been developed to meet special physical requirements. These special formulations have the same chemical properties as R-4000 but vary in such physical characteristics as tensile strength, temperature range, flexibility, etc.



FORMULATION R-4000

Color	Transparent Yellow
Durometer Hardness (Shore A)	55
Tensile Strength, psi	2000
Low Temperature Range	Flexible at 10°F. Becomes Brittle at —20°F.
High Temperature Range:	
Dry Heat	215°F.
Steam	Fair
Elongation Percent	400
Odor	Slight
Taste	Slight
Toxicity	Not to be used in contact with foods, beverages, etc.
Flameproofness	Burns

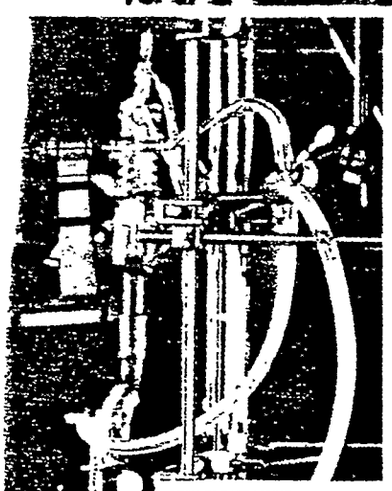
FBW-292

COMBINED WITH THE GENERAL DESCRIPTIVE MATTER RECEDING SECTION, THE DETAILED INFORMATION DATA ON THE FOLLOWING SIX PAGES WILL ENABLE READER TO SELECT THE SIZE AND STANDARD FORMU- ON WHICH SUITS HIS NEEDS.

ELASTICITY • TEMPERATURE • CHEMICAL RESISTANCE CH PHYSICAL PROPERTIES

...considerations in selecting the prop formulation of TYGON TUBING







ELASTICITY — Though Tygon Tubing has considerable "stretch", it is not as elastic as rubber and will not always return to its original dimensions when stretched beyond certain limits. Thus, it is well to avoid any unnecessary stretching by ordering tubing with the same inside diameter as the outside diameter of the fitting over which it is to fit. The Tygon Tubing will fit snugly due to its high polish and natural tack.

TEMPERATURE — All formulations of Tygon Tubing are thermoplastic in nature: they soften at higher temperatures and harden at low temperatures. When returned to their normal operating range, they regain their basic characteristics unimpaired, though if extreme deformation has occurred at elevated temperatures it may be difficult to restore the tubing's former shape.

There is considerable variation in the working temperatures of the various Tygon formulations. These are shown in Chart I on page 16, as well as the pages devoted to the specific formulations. Temperatures above room temperature progressively reduce tensile strength and increase chance of rupture. (See Chart III, page 17.)

PRESSURE — The maximum working pressure of Tygon Tubing varies with the different formulations. It is also affected by *temperature* (as shown above) and by three other factors:

Size and Wall Thickness. As wall thickness increases relative to bore size, working pressure also increases. Conversely, if bore size is increased, with a constant wall thickness, working pressure is reduced.

Time. If a pressure greater than the maximum recommended pressure is constantly maintained, the diameter of the tubing will gradually increase. Sooner or later, depending upon the pressure, the tubing will rupture.

Material Transmitted. Some solvents will cause Tygon Tubing to swell, thus reducing the normal tensile strength and increasing the chance of rupture.

· PRESSURE HARACTERISTICS

ber size and

SUGGESTED MAXIMUM WORKING PRESSURES FOR STANDARD TYGON TUBING FORMULATIONS

The chart at the right contains maximum suggested working pressures, at room temperature, for Tygon Tubing Formulation B-44-3.

To figure maximum working pressures of other Tygon Tubing formulations, multiply the appropriate figure in the table's right-hand column by the factor listed below:

R-3603 — value shown times .75
B-44-4X — value shown times .85
S-50-HL — value shown times .80
R-2807 — value shown times .85
R-2400 — value shown times 1.30
R-3400 — value shown times 1.10

Though Tygon Tubing is normally stocked in a number of sizes with 1/32" wall, this wall thickness is not shown in the table at right because it is not generally used for pressure applications. A complete list of all standard sizes of Tygon Tubing appears on page 26.

For higher pressures, Norton Plastics and Synthetics Division manufactures Tygon "Inner-Braided" and "Outer Braid-Reinforced" Tubings. These tubings are described on page 20 of this brochure.

Tubing Bore or Inside Diam. (Inches)	Outside Diameter (Inches)	Wall Thickness (Inches)	Maximum Suggested Working Pressure at Room Temp. (Lbs.)
1/16	3/16	1/16	75
3/32	7/32		70
1/8	1/4		65
5/32	9/32		65
3/16	5/16		55
1/4	3/8		55
5/16	7/16		50
3/8	1/2		45
7/16	9/16		40
1/2	5/8		30
3/16	3/8	3/32	65
1/4	7/16		60
5/16	1/2		60
3/8	9/16		50
7/16	5/8		45
1/2	11/16		40
9/16	3/4		40
5/8	13/16		35
11/16	7/8		30
3/16	7/16	1/8	75
1/4	1/2		70
5/16	9/16		70
3/8	5/8		60
7/16	11/16		50
1/2	3/4		45
9/16	13/16		45
5/8	7/8		40
11/16	15/16		40
3/4	1		35
7/8	1 1/8		30
1	1 1/4		25
1 1/8	1 3/8		25
1 1/4	1 1/2		20
1/2	13/16	5/32	60
9/16	7/8		55
5/8	15/16		50
11/16	1		45
3/4	1 1/16		35
7/8	1 3/16		35
1	1 5/16		30
3/4	1 1/8	3/16	50
1	1 3/8		40
1 1/8	1 1/2		35
1 1/4	1 5/8		35
1 1/2	1 7/8		30
3/4	1 1/4	1/4	55
1	1 1/2		45
1 1/4	1 3/4		45
1 1/2	2		40
1 3/4	2 1/4		40
2	2 1/2		35
2 1/4	2 3/4		35
2 1/2	3		30
3	3 1/2		25
2	2 3/4	3/8	40
2 1/2	3 1/4		35
3	3 3/4		30
2	3	1/2	50
3	4		40
4	5		30

FBW-294

PHYSICAL PROPERTIES OF STANDARD T

CHART 1

- Physical properties of standard Tygon Tubing formulations averaged on the basis of repeated tests made from normal production runs over a given time period. Unless otherwise noted, all tests were at room temperature.

	R-3603	B44-3	S-50-HL	R-2807	R-2400	R-3400	R-4000
Tensile, psi	1450-1500	2200-2300	2200	1800-1900	3000-3100	2000-2100	2000
Elongation, Percent	400	400	400	375	250	350	400
Durometer Hardness, Shore A	60-64	68-75	68	67-70	95-97	68-72	55
Low Temperature Flex.							
Brittle at	−50°F.	−40°F.	−40°F.	−68°F.	40°F.	10°F.	−20°F.
Flex. at	−20°F.	0°F.	0°F.	−50°F.	60°F.	30°F.	10°F.
Maximum Recommended Operating Temperature	165°F.	180°F.	180°F.	140°F.	180°F.	165°F.	180°F.
High Temp. Resistance:							
Dry Heat	200°F.	215°F.	215°F.	150°F.	215°F.	200°F.	215°F.
Steam	Fair	30 min. at 15 lbs.	30 min. at 15 lbs.	Poor	30 min. at 15 lbs.	30 min. at 15 lbs.	Fair
Color	Clear	Clear	Clear	Black	Black	Black	Transparent Yellow
Odor	Slight	None	None	Slight	Slight	Slight	Slight
Taste	None	None	None	None	Slight	Slight	Slight
Toxicity	Non-toxic	Non-toxic	Non-toxic	(3)	(3)	(3)	(3)
Flameproofness	Burns	(1)	(1)	Burns	(1)	(1)	Burns
Aging Characteristics	Excellent Non-oxidizing	Excellent Non-oxidizing	Excellent Non-oxidizing	Excellent Non-oxidizing	Excellent Non-oxidizing	Excellent Non-oxidizing	Excellent Non-oxidizing
Chemical Resistance:							
Strong Acids	Good	Good	Fair	Good	Excellent	Excellent	Fair
Weak Acids	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Good
Strong Alkalies	Fair	Fair	Poor	Good	Excellent	Good	Poor
Weak Alkalies	Excellent	Excellent	Fair	Excellent	Excellent	Excellent	Fair
Solvents	(2)	(2)	(2)	(2)	(2)	(2)	Good (2)

(1) Self-extinguishing.
(2) Depends upon types of solvents.
(3) Not to be used in contact with foods, beverages, drugs.

CHART 2

- Physical properties of standard Tygon Tubing formulations as reflected by American Society of Testing Materials test methods. Unless otherwise noted, all tests were made at room temperature.

	ASTM Method	R-3603	B44-3	S-50-HL	R-2807	R-2400	R-3400	R-4000
Durometer Hardness, Shore A	D676-58T	60	68	68	67	95	70	55
Tensile Strength, psi	D412-51T	1500	2200	2200	1900	3000	2000	2000
Ultimate Elongation, Percent	D412-51T	400	400	400	385	250	350	400
Permanent Set, Percent	D412-51T	35.0	55.0	71.0	25.0	149.0	53.0	32.0
Tear Resistance, lbs./in.	D624-54	190	300	300	200	600	230	185
Abrasion Resistance, Wear Factor (MG. Lost/1000 Cycles)	Taber	4.0	7.0	7.0	20.0	30.0	7.0	7.8
Compression Set, Const. Defl., Percent	D395-55	66.0	67.0	67.0	62.0	58.0	64.0	63.0
Compression Set, Const. Load, Percent	D395-55	11.0	11.0	11.0	9.0	5.0	9.0	9.0
Brittle Point	D746-57T	−50°F.	−40°F.	−40°F.	−68°F.	40°F.	10°F.	−20°F.
Specific Gravity	D792-50	1.183	1.269	1.205	1.215	1.331	1.294	1.258
Burning Rate, In./min.	D635-56T	2.2	Self-extinguishing	Self-extinguishing	2.1	Self-extinguishing	Self-extinguishing	2.0
Water Absorption, Percent	D570-57T	0.12	0.25	0.20	0.36	0.10	0.18	0.61

'YGON TUBING FORMULATIONS

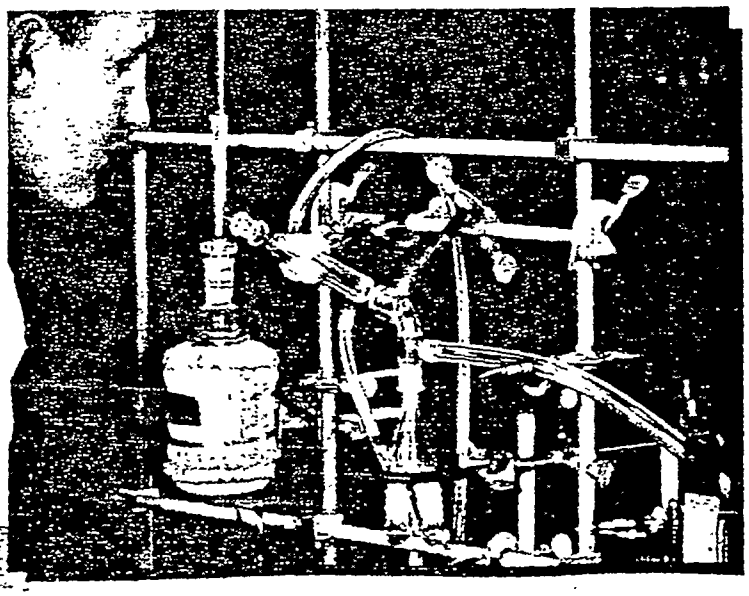
CHART 3

• Effect of Heat and Age on Tensile Strength, Durometer Hardness, and Elongation.

	ASTM Method	R-3603	B44-3	R-2807	R-2400	R-3400	R-4000
Tensile, psi., Original	None	1500	2200	1900	3000	2000	2000
Tensile, psi., Aged 72 hrs. at 25°C	None	1500	2050	1900	3100	2100	1950
Tensile, psi., Aged 72 hrs. at 82°C	None	1500	2000	1800	3000	2000	1950
Elongation, Percent, Original	None	400	400	375	250	350	400
Elongation, Percent, Aged 72 hrs. at 25°C	None	400	410	380	250	300	350
Elongation, Percent, Aged 72 hrs. at 82°C	None	400	400	380	250	300	350
Durometer Hardness, A, Original	None	60	68	67	95	70	55
Durometer Hardness, Aged 72 hrs. at 25°C	None	60	68	67	95	70	55
Durometer Hardness, Aged 72 hrs. at 82°C	None	62	60	68	95	70	55







FBW-296

CHEMICAL RESISTANCE CHARACTERISTICS OF S

Based on the results of both laboratory and field tests, the ratings contained in the accompanying chart reflect the relative abilities of five standard Tygon Tubing Formulations to withstand a specific corrosive. Though we believe it to be thoroughly reliable, no guarantee is expressed or should be implied.

As previously noted throughout this manual, the various Tygon Tubings vary in their ability to resist chemical attack. The table shows, for example, that whereas all formulations may be used with dilute sodium hydroxide, reports indicate that only Formulations R-3603, R-2400 and R-3400 have proven satisfactory for use with concentrated sodium hydroxide. Again, Formulations R-3603, R-2400 and R-3400 are shown as suitable for handling both wet and dry chlorine gas, while R-2807 will handle only wet chlorine gas.

It is important to remember that all ratings are based on room temperature. Higher temperatures may affect the ability of Tygon Tubing to withstand the attack of some chemicals, particularly those rated "C".

Tygon Tubing Formulations B-44-3 and B-44-4X meet or surpass every practical physical, chemical and sanitary requirement for handling liquid foods and beverages (B-44-3) and processed milk and milk products (B-44-4X). Both of these formulations are completely harmless and non-toxic, comply fully with the FDA's "Food Additive Amendment". In addition, Formulation B-44-4X meets all criteria in the 3-A Plastics Standard. Both B-44-3 and B-44-4X are odorless and tasteless — will not affect even the most flavor-sensitive products. However, a few alcoholic and carbonated beverages, if they remain in *prolonged* contact with Tygon (as standing overnight in lines), may lose a portion of their original bouquet. Consequently, we recommend that tests be conducted prior to such use.

Code

X—Satisfactory.
C—Use only after test in your own plant.
N—Not suitable.

Formulations	B44-3 Crystal Clear	R-3400 Black	R-2400 Black	R-3603 Clear	R-2807 Black
Acetaldehyde	N	N	N	N	N
Acetates (low mol. wt.)	N	N	N	N	N
Acetic acid (less than 5%)	X	X	X	X	X
Acetic acid (more than 5%)	X	X	X	X	C
Acetic anhydride	C	C	C	N	N
Acetone	N	N	N	N	N
Acetyl bromide	N	N	N	N	N
Acetyl chloride	N	N	N	N	N
Air	X	X	X	X	X
Alcohols	X	X	X	X	X
Aliphatic hydrocarbons	X	X	X	X	X
Aluminum chloride	X	X	X	X	X
Aluminum sulfate	X	X	X	X	X
Alums	X	X	X	X	X
Ammonia (gas-liquid)	C	X	X	X	C
Ammonium acetate	X	X	X	X	X
Ammonium carbonate	X	X	X	X	X
Ammonium chloride	X	X	X	X	X
Ammonium hydroxide	C	X	X	X	C
Ammonium nitrate	X	X	X	X	X
Ammonium phosphate	X	X	X	X	X
Ammonium sulfate	X	X	X	X	X
Amyl acetate	N	N	N	N	N
Amyl alcohol	X	X	X	X	X
Amyl chloride	C	C	C	C	C
Aniline	C	C	C	N	N
Aniline hydrochloride	C	C	C	N	N
Animal oils	X	X	X	X	C
Antimony salts	X	X	X	X	X
Aqua regia	N	N	N	N	N
Aromatic hydrocarbons	Use R-4000 (See Note 3)				
Arsenic salts	X	X	X	X	X
Barium salts	X	X	X	X	X
Benzaldehyde	N	N	N	N	N
Benzene	C	X	X	C	N
Benzene sulfonic acid	C	C	C	C	N
Benzoic acid	X	X	X	X	X
Benzyl alcohol	X	X	X	X	X
Bleaching liquors	X	X	X	X	X
Boric acid	X	X	X	X	X
Bromine[1]	X	X	X	X	X
Butane	C	C	C	C	N
Butanol	X	X	X	X	X
Butyl acetate	N	N	N	N	N
Butyric acid	Use R-4000				

STANDARD TYGON TUBING FORMULATIONS

Formulations	B44-3 Crystal Clear	R-3400 Black	R-2400 Black	R-3603 Clear	R-2807 Black
Calcium salts	X	X	X	X	X
Carbon bisulfide	N	N	N	N	N
Carbon dioxide	X	X	X	X	X
Carbon tetrachloride	C	C	C	C	C
Chloracetic acid	N	N	N	N	N
Chlorbenzene	N	N	N	N	N
Chlorine (wet)	C	X	X	X	X
Chlorine (dry)	C	X	X	X	N
Chloroform	C	C	C	C	C
Chlorsulfonic acid	C	C	C	C	C
Chromic acid	X	X	X	X	X
Chromium salts	X	X	X	X	X
Copper salts	X	X	X	X	X
Cresol	C	N	N	N	N
Cyclohexanone	N	N	N	N	N
Essential oils	C	X	X	X	C
Ethers	C	C	C	C	C
Ethyl acetate	N	N	N	N	N
Ethyl alcohol	C	C	C	C	C
Ethyl bromide	N	N	N	N	N
Ethyl chloride	N	N	N	N	N
Ethylamine	N	N	N	N	N
Ethylene chlorohydrin	N	N	N	N	N
Ethylene di-chloride	N	N	N	N	N
Ethylene glycol	X	X	X	X	X
Fatty acids	C	X	X	X	C
Ferric chloride	X	X	X	X	X
Ferric sulfate	X	X	X	X	X
Ferrous chloride	X	X	X	X	X
Ferrous sulfate	X	X	X	X	X
Fluoborate salts	X	X	X	X	X
Fluoboric acid	X	X	X	X	X
Fluo-silicic acid	X	X	X	X	X
Formaldehyde	X	X	X	X	X
Formic acid	X	X	X	X	X
Freon	N	N	N	N	N
Gasoline (non-aromatic)	Use R-4000				
Gasoline (high aromaticity)	Use R-4000 (See Note 3)				
Glucose	X	N	N	X	X
Glue	X	X	X	X	X
Glycerine	X	X	X	X	X
Hydriodic acid	X	X	X	X	X
Hydro-bromic acid[1]	X	X	X	X	X
Hydrochloric acid (dil.)	X	X	X	X	X
Hydrochloric (med. conc.)	X	X	X	X	X
Hydrochloric (conc.)	C	X	X	X	X
Hydrocyanic acid	X	X	X	X	X
Hydrofluoric acid	C	X	X	X	X
Hydrogen peroxide (dil.)	X	X	X	X	X
Hydrogen peroxide (conc.)	See note 2				
Hydrogen sulfide	X	X	X	X	X
Hypochlorous acid	X	X	X	X	X
Iodin[1] and solutions[1]	X	X	X	X	X
Kerosene	Use R-4000				
Ketones	N	N	N	N	N
Lacquer solvents	N	N	N	N	N
Lactic acid	C	X	X	X	C
Lead acetate	X	X	X	X	X
Linseed oil	X	X	X	X	X
Magnesium chloride	X	X	X	X	X
Magnesium sulfate	X	X	X	X	X
Malic acid	X	X	X	X	X
Manganese salts	X	X	X	X	X
Mercury salts	X	X	X	X	X
Mixed acid (40% sulphuric, 15% nitric)	C	C	X	C	C
Naphtha	C	C	C	C	N
Natural gas	X	X	X	X	X
Nickel salts	X	X	X	X	X
Nitric acid (dil.)	X	X	X	X	X
Nitric acid (med. conc.)	C	X	X	X	X
Nitric acid (conc.)	C	C	X	C	X
Nitrobenzene	N	N	N	N	N
Nitrogen oxides	X	X	X	X	X
Nitrous acid	X	X	X	X	X
Oils, animal	Use R-4000				
Oils, mineral	Use R-4000				
Oils, vegetable	C	N	N	C	N
Oleic acid	N	X	X	C	C
Oxalic acid	X	X	X	X	X
Oxygen (gas)	X	X	X	X	X
Perchloric acid	N	N	N	N	N
Phenol	C	C	C	C	C
Phosphoric acid (ortho.)	X	X	X	X	X
Phthalic acid	X	X	X	X	C
Plating solutions	X	X	X	X	X
Potassium carbonate	X	X	X	X	X
Potassium chlorate	X	X	X	X	X
Potassium hydroxide	C	X	X	X	X
Potassium Iodide[1]	X	X	X	X	X
Pyridine	N	N	N	N	N
Silver nitrate	X	X	X	X	X
Soap solutions	X	X	X	X	X
Sodium bicarbonate	X	X	X	X	X
Sodium bisulfate	X	X	X	X	X
Sodium bisulfite	X	X	X	X	X
Sodium borate	X	X	X	X	X
Sodium carbonate	X	X	X	X	X
Sodium chlorate	X	X	X	X	X
Sodium chloride	X	X	X	X	X
Sodium ferrocyanide	X	X	X	X	X
Sodium hydrosulfite	X	X	X	X	X
Sodium hydroxide (dil.)	X	X	X	X	X
Sodium hydroxide (med. conc.)	C	X	X	X	X
Sodium hydroxide (conc.)	C	X	X	X	C
Sodium hypochlorite	X	X	X	X	X
Sodium nitrate	X	X	X	X	X
Sodium silicate	X	X	X	X	X
Sodium sulfide	X	X	X	X	X
Sodium Sulphite	X	X	X	X	X
Stearic acid	X	X	X	X	X
Sulfur chloride	C	C	C	C	C
Sulfur dioxide	X	X	X	X	X
Sulfur trioxide	X	X	X	X	X
Sulfuric acid (dil.)	X	X	X	X	X
Sulfuric acid (med. conc.)	X	X	X	X	X
Sulfuric acid (conc.)	C	C	C	C	C
Sulfurous acid	X	X	X	X	X
Tannic acid	X	X	X	X	X
Tanning extracts	X	X	X	X	X
Tartaric acid	X	X	X	X	X
Tin salts	X	X	X	X	X
Titanium salts	X	X	X	X	X
Toluol	N	N	N	N	N
Trichloracetic acid	N	N	N	C	C
Tri-sodium phosphate	X	X	X	X	X
Turpentine	X	X	X	X	C
Urea	X	X	X	X	X
Uric acid	X	X	X	X	X
Water	X	X	X	X	X
Water (brine)	X	X	X	X	X
Xylol	N	N	N	N	N
Zinc chloride	X	X	X	X	X

FOOD PRODUCTS

	B44-3
Alcohol	C
Beer	C
Brandy	C
Butter	X
Carrot	X
Certo	X
Chocolate Syrup	X
Citric Acid	X
Fish	X
Fruit Juices	X
Karo Syrup	X
Mayonnaise	X
Milk ..... Use B-44-4X	X
Milk of Magnesia	X
Molasses	X
Sauerkraut	X
Sea Foods	X
Sugar	X
Tomato	X
Vegetable Oil	X
Vinegar	X
Whiskey	C
Wines	C

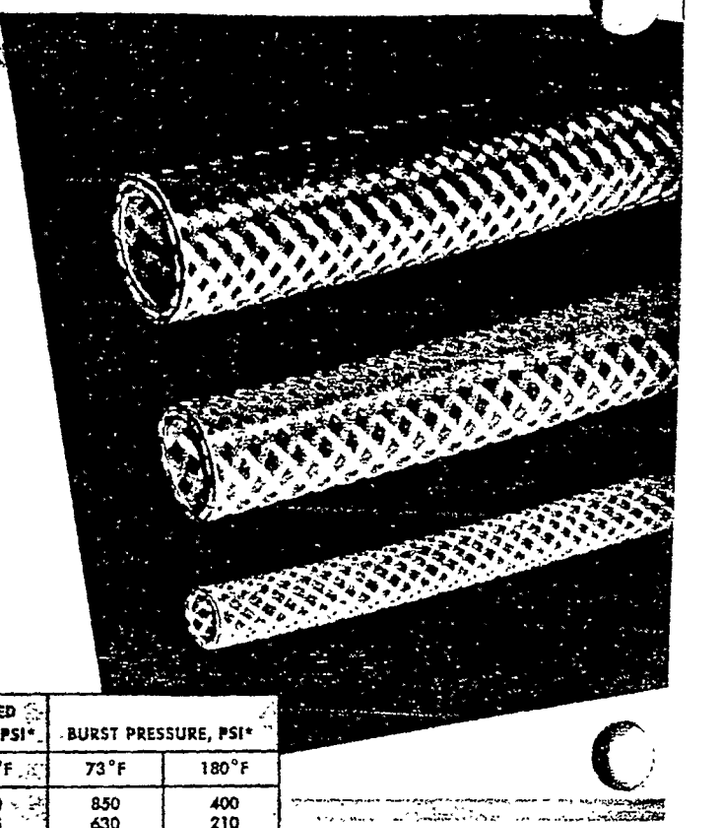
[1] May absorb small quantities and impart characteristic color to tubing.

[2] A special Tygon Formulation R-3604 is available for use with concentrated hydrogen peroxide.

[3] Use only after test in your own plant.

FBW-298

TYGON TUBINGS FOR SPECIAL PHYSICAL REQUIREMENTS



TYGON "INNER-BRAIDED" TUBING

Tygon Tubing, Formulation B-44-4X, is available in 9 sizes with tough Dacron* braid embedded in a diamond pattern within its walls. Designated Tygon "Inner-Braided" Tubing, its maximum working pressures are, size for size, about four times greater than those of conventional Tygon B-44-4X Tubing.

Despite the braid, Tygon "Inner-Braided" Tubing retains all the advantages of visual inspection and control of flow, and its flexibility remains virtually unchanged from that of regular Tygon.

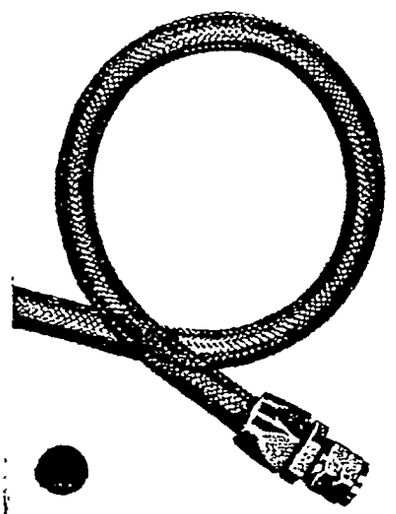
Tygon "Inner-Braided" Tubing is completely odorless, tasteless and non-toxic. Because the braid is *within* the walls, its outer surface is smooth and sanitation problems inherent in tubings with exterior braid reinforcing are eliminated.

*Reg. T.M. — E. I. DuPont de Nemours Co. (Inc.)

"INNER-BRAIDED" TUBING SIZE			MAX. RECOMMENDED WORKING PRESSURE, PSI*		BURST PRESSURE, PSI*	
I.D.	O.D.	WALL	73°F	180°F	73°F	180°F
1/4"	3/8"	1/16"	210	100	850	400
3/8"	1/2"	1/16"	155	65	630	210
1/2"	11/16"	3/32"	180	65	710	255
5/8"	7/8"	1/8"	150	50	590	205
3/4"	1"	1/8"	135	75	530	290
1"	1-1/4"	1/8"	90	40	355	150
1-1/2"	2"	1/4"	105	40	415	165**
2"	2-3/4"	3/8"	80	30	315	125**
3"	3-3/4"	3/8"	45	20	175	70**

*Note safety factor of 4 to 1 ratio of Burst Pressure to Working Pressure.
**Preliminary tests only as of this printing.

FBW-299



TYGON "OUTER BRAID-REINFORCED" TUBING

Tygon Tubing can also be furnished with an outer reinforcing braid of either plastic or stainless steel. Either can also be supplied with an oversheathing of Tygon when exterior cleanliness is important.

"Braid-Reinforced" Tygon Tubing is stocked in Formulation B-44-3 with plastic braid in the following sizes (I.D., O. D. measured over outer braid, and Wall Thickness): 1/4" x 7/16" x 3/32"; 3/8" x 9/16" x 3/32"; 1/2" x 11/16" x 3/32"; 3/4" x 1-1/16" x 5/32"; and 1" x 1-5/16" x 5/32" . . . and with stainless steel braid in these sizes: 1/4" x 13/32" x 5/64"; and 3/8" x 19/32" x 7/64". Size 1/4" x 7/16" x 3/32" is also stocked in Formulation R-3400.

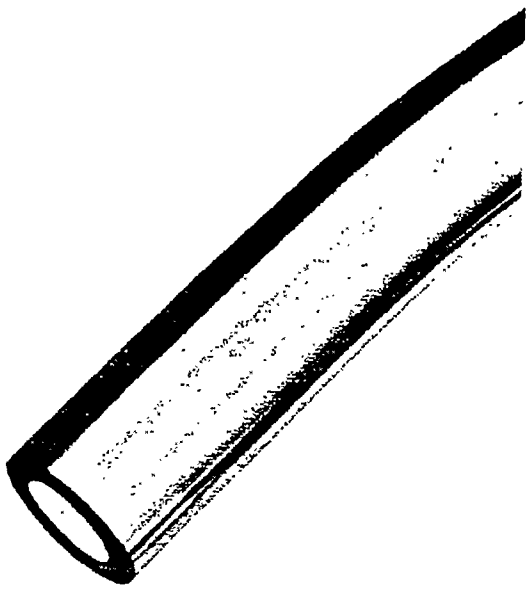
On special order, when volume is sufficient, we can also provide other sizes and formulations with either plastic or stainless steel braid reinforcing.

A word about Fittings

Selecting fittings for use with Tygon "Inner-Braided" Tubing or "Outer Braid-Reinforced" Tubing is as simple as choosing them for rubber hose. Although we do not produce fittings, we will be glad to recommend manufacturers of fittings that are suitable.

TYGON VACUUM TUBING

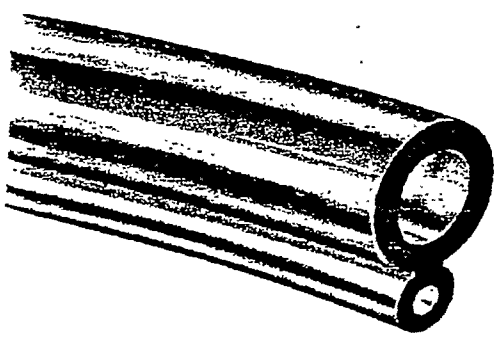
Tygon Tubing, Formulation R-3603, is available in certain bore sizes with extra heavy walls for use as vacuum tubing. Each size will withstand full vacuum at normal room temperature and up to 27 inches of mercury at 140°F. Chemically inert, the tubing can be used in corrosive atmospheres, will not swell closed if vacuum pump oil should happen to back up into it. Because of its low vapor pressure — a maximum of 3×10^{-2}mm of mercury at 140°C and 1×10^{-7}mm at 21°C — Tygon Vacuum Tubing will not affect the results of any analytical tests made on gases or vapors transported through it under vacuum. (A vapor pressure chart for Tygon R-3603 Tubing is available and will be sent free on request.) Crystal clear and not wetted by mercury (it has a convex meniscus), lengths of Tygon Vacuum Tubing are ideally suited for use in making manometers.

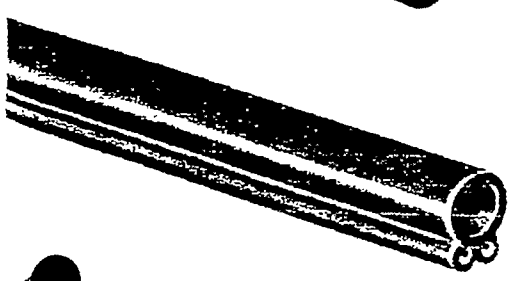


Six sizes are available:

I.D. (In.)	O.D. (In.)	WALL THICKNESS (In.)
3/16	9/16	3/16
1/4	5/8	3/16
3/8	7/8	1/4
1/2	1-1/8	5/16
5/8	1-3/8	3/8
3/4	1-1/2	3/8
1	2	1/2

When ordering, please specify "Tygon Vacuum Tubing" and give I.D., O.D. and Wall Thickness.

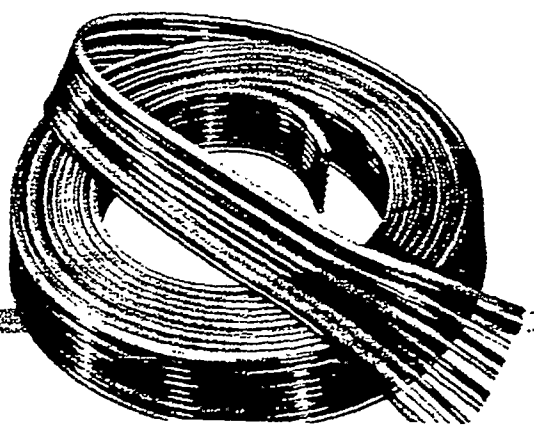




TYGON PARA-TUBE

Tygon Para-Tube consists of up to ten lengths of tubing, of the same or different diameters, joined side by side. It can be supplied, when desired, with each of the tubings of a different color to provide a convenient means of color coding as to use. If required, Tygon Para-Tube can be furnished such that individual tubings can be quickly and easily separated or detached.

Available only on special order, Para-Tube can be supplied in any Tygon formulation and in any standard Tygon Tubing size or combination of sizes.

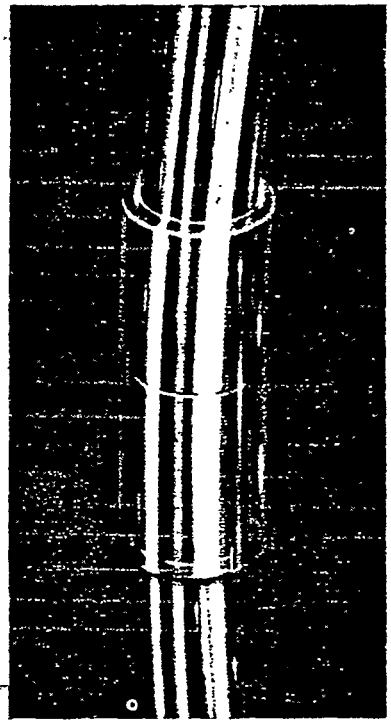


FBW-300

PUTTING TYGON TUBING INTO SERVICE

Tygon Tubing is quickly and easily installed . . . readily moved to meet changing needs. Because of its flexibility, it will curve around corners, snake around obstructions, occupying a minimum of space. Because it is available in continuous lengths, Tygon Tubing requires few joints or couplings.

Putting Tygon Tubing into service requires only the simplest of tools and equipment. It is readily cut with any sharp knife. When working with large bore and/or thick-walled tubing, cutting is made easier by lubricating the blade with a soapy water solution. A small amount of solvent or a means of softening the tubing ends with heat is also required if Tygon-to-Tygon couplings are necessary.



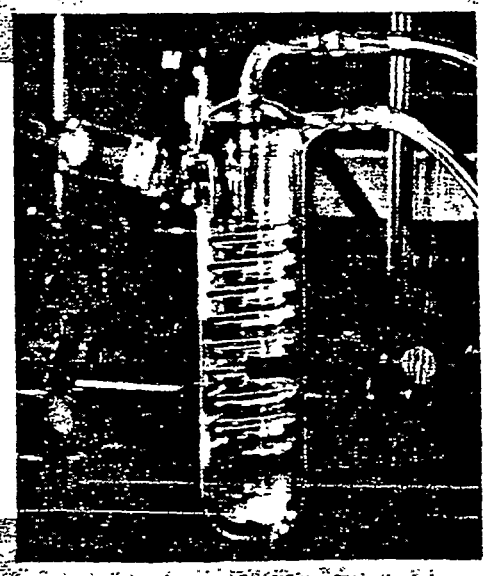
COUPLINGS

Two lengths of Tygon Tubing are easily joined together, either by heat-sealing or solvent-sealing.

In the former method, a soldering iron or heated knife can be used to soften the Tygon at the ends to be coupled. A little experimentation will soon show the proper temperature (approx. 210°F.) . . . high enough to make a positive connection, yet not so hot that the Tygon will become charred.

A good method of making a tight Tygon-to-Tygon coupling is to utilize a "sleeve" of Tygon Tubing whose inside diameter is the same as the outside diameter of the two lengths to be joined. After making sure that the ends of these latter two are cut square, dip them into a solvent of the ketone type, such as our Tygobond 50, leaving them immersed for about a minute to allow the tubing ends to soften. Then, slip these two ends inside the "sleeve" until they touch (illustration). After a few hours drying time, the joint will be as strong as the tubing itself.

FBW-301

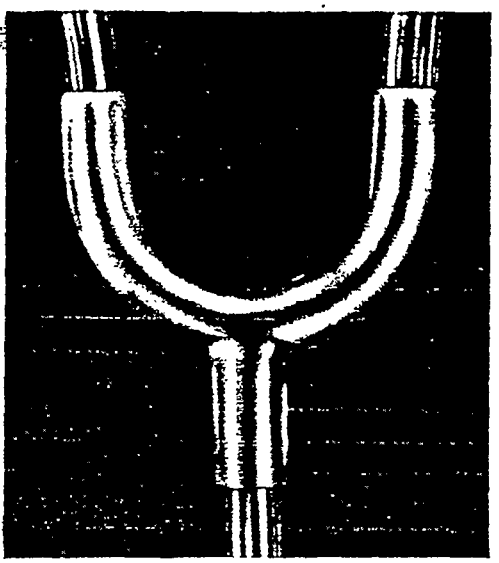


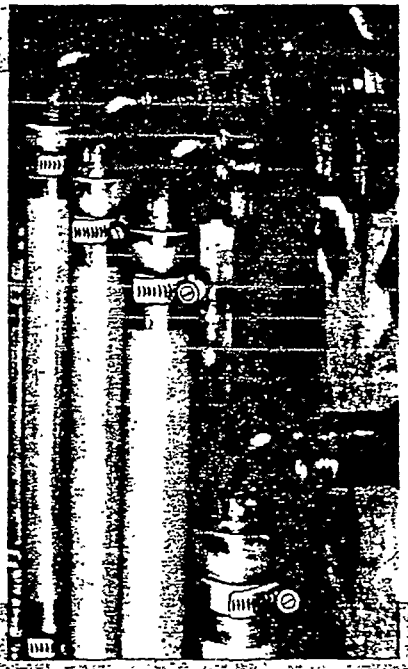
CONNECTIONS TO METAL OR GLASS FITTINGS

Tygon's natural tack will sometimes make it difficult to slip the tubing over metal, glass or other fittings in making a connection. If this should happen, simply dip the end of the tubing into soap and water, or one of the synthetic wetting agents. This will have the effect of lubricating the Tygon, allowing it to slip on easily.

"Y" FITTINGS

For set-ups requiring branch lines and multiple connections, "Y" fittings made of Tygon are available. Eight sizes are manufactured, with inside diameters approximating the outside diameters of standard tubing sizes. When a permanent connection is desired, "Y" fittings are easily and quickly joined to the tubing by using a ketone-type solvent such as our Tygobond 50. Table of "Y" fitting sizes is given on page 26. Standard Tygon "Y" fittings are available only in gray color. Special colors are readily available on request.





CLAMPS

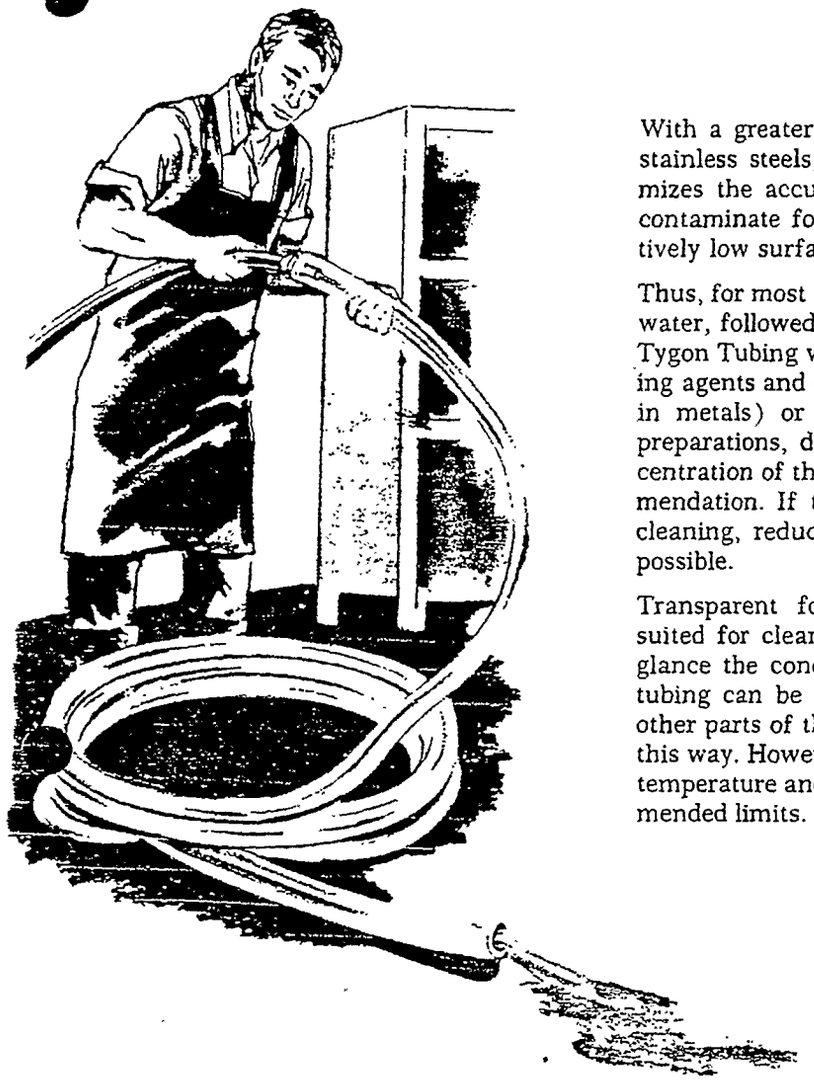
Selecting a clamp for use with Tygon Tubing is as simple as picking one for use with rubber hose. Generally, a simple collar clamp will serve very satisfactorily. Stainless steel fittings are usually preferred in food handling applications. An added convenience is afforded by clamps furnished with thumb screws for hand tightening. It need hardly be mentioned to avoid clamps with sharp or ragged edges, since these may cut the tubing as the clamp is tightened. We'll gladly furnish the names of manufacturers of clamps and fittings upon request.

FBW-302

EFFECT OF CONTACT BETWEEN TYGON AND DISSIMILAR MATERIALS

With few exceptions, Tygon Tubing neither affects nor is affected by other materials, even with prolonged contact. It is compatible with all thermo-plastics except polystyrene and acrylics; it can be used safely with all thermosetting plastics and resins. Though it is compatible with both natural and synthetic rubber, Tygon may absorb some of the color from rubber stocks colored with organic dyes. However, this color transfer does not affect the physical or chemical properties of Tygon in any way. Tygon may become discolored when in contact at high temperatures with zinc, copper or high carbon steel. Because the plasticizers used in Tygon Tubing may soften some types of finishes, care should be exercised when Tygon Tubing is in contact with painted, lacquered, varnished or enameled wood or metal surfaces.

CARE, CLEANING AND S



CLEANING

With a greater surface smoothness than rubber and most stainless steels, Tygon Tubing's smooth, dense bore minimizes the accumulation of minute particles which might contaminate following solutions. In addition, Tygon's relatively low surface tension facilitates complete drainage.

Thus, for most applications a simple flushing with soap and water, followed by a clear water rinse, is ample. However, Tygon Tubing will withstand virtually all commercial cleaning agents and bactericides without danger of corrosion (as in metals) or oxidation (as in rubber). In using these preparations, do not increase the temperature or the concentration of the solution beyond the manufacturer's recommendation. If the tubing shows excessive swelling during cleaning, reduce pressure and temperature as quickly as possible.

Transparent formulations of Tygon Tubing are ideally suited for cleaned-in-place piping because they show at a glance the condition of the line. In addition, because the tubing can be cleaned with the same methods applied to other parts of the equipment, much time and work is saved this way. However, care must be exercised to hold pressure, temperature and concentration of the solution within recommended limits.

FBW-303

MAINTAINING CLARITY IN CLEAR FORMULATIONS

Though all Tygon Tubing formulations are comparatively tough and abrasion-resistant, dragging the tubing over concrete surfaces or sharp objects should be avoided if maximum clarity is desired, because the resulting minute scratches may somewhat affect clearness and gloss.

Contact with paint, rubber, oils, greases, hand creams and perspiration, or prolonged exposure to strong sunlight, may slightly affect the clarity of Tygon Tubing. Certain strong sanitizing agents, such as those containing iodine or bromine, may also have a tendency to cause some staining. However, these are surface discolorations and in no way affect the performance or life of the tubing which, except in extreme cases, will continue to provide the convenience of visual flow inspection.

After exposure to moisture, a slight cloudiness may be noted. This is simply a film of moisture on the interior surface and clarity will return in a short time if the tubing is allowed to dry and is thoroughly

L[illegible]ATION OF TYGON TUBING

STEAM STERILIZATION

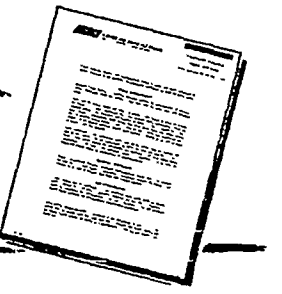
Tygon Formulation S-50-HL, B-44-3 and B-44-4X may be safely sterilized by autoclaving at 15 lbs. of steam for 30 minutes. The "open end" method of sterilization should be used. A preferred method is to place the tubing, coiled loosely and wrapped in gauze or placed on wood or other non-metallic support, in an autoclave. It must not be kinked or under internal pressure. Although the tubing may appear fogged immediately after sterilization, it will regain its natural clarity as it cools and dries. The clearing may be accelerated by forced drying for approximately 1 hour at 125°F. dry heat.

Following the initial sterilization, a shrinkage of 2% to 4% may be noted. However, no further shrinkage should occur with subsequent sterilizations.

CHEMICAL AND GAS STERILIZATION

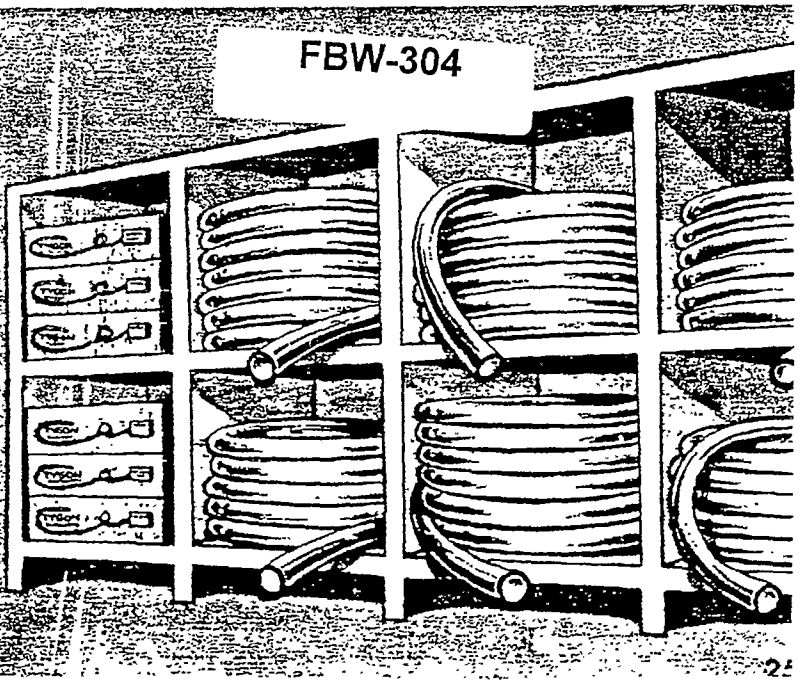
Tygon's exceptional chemical resistance characteristics ideally suit it to sterilizing with any of a large number of germicides. It can also be sterilized in a gas sterilizer using gases based on ethylene oxide. Operation of the gas sterilizer should follow the manufacturer's recommended procedures.

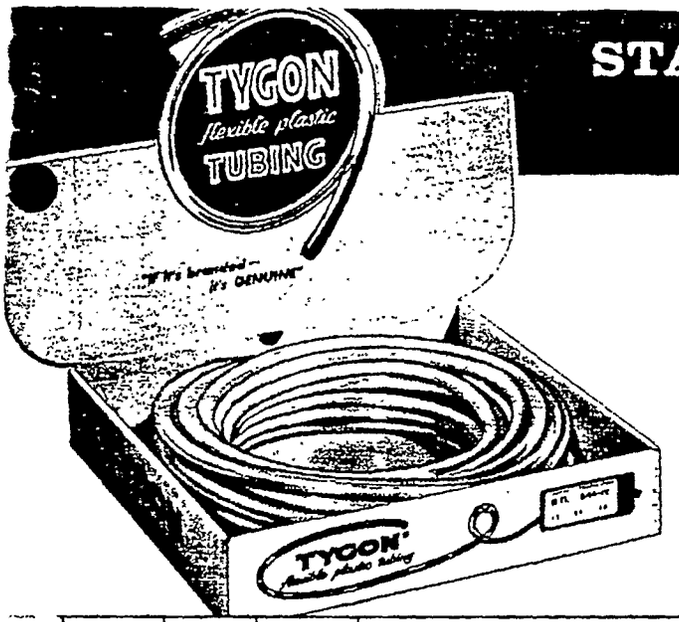
A special Technical Data Sheet, "Sterilizing Procedures for Tygon Tubing," has been prepared covering steam, chemical and gas sterilization. A copy will be sent free on request.



STORAGE

Tygon Tubing is simple to store, presenting no unusual problems. It is well, however, to avoid kinking the tubing, as by hanging it over a nail or sharp edge. The preferred method for larger sizes is to store it either loosely coiled or laid out straight, on a clean, dry shelf, free from contact with painted surfaces, rubber, oils and greases. Smaller sizes can be stored in the original cartons. It is a good idea to expose the tubing to dry storage after cleaning, with ends open to permit thorough drying.





STANDARD STOCK SIZES OF TYGON TUBING

Tygon Tubing is available in the sizes and lengths shown below in standard packages for "off-the-shelf" shipment. However, other lengths of standard tubing sizes can be supplied promptly from the factory. Such special orders will be packaged in the most convenient manner.

Special, non-stock sizes from .005" I.D. through 6" I.D. can also be supplied on special order.

"PACKETTE CARTON"
FIBREBOARD CARTON • METAL REEL

Inside Diameter (inches)	Outside Diameter (inches)	Wall Thickness (inches)	STANDARD PACKAGES				Inside Diameter (inches)	Outside Diameter (inches)	Wall Thickness (inches)	STANDARD PACKAGES			
			Metal Reel	50' Packette	100' Packette	Fibreboard Carton				Metal Reel	50' Packette	100' Packette	Fibreboard Carton
1/16	1/8	1/32	2000'	X	.....	.....	5/8	7/8	1/8	.....	X	X	.....
1/16	3/16	1/16	1500'	X	.....	.....	5/8	15/16	5/32	.....	X	X	.....
3/32	5/32	1/32	2000'	X	.....	.....	11/16	7/8	3/32	.....	X	X	.....
3/32	7/32	1/16	1000'	X	.....	.....	11/16	15/16	1/8	.....	X	X	.....
1/8	3/16	1/32	1500'	X	.....	.....	11/16	1	5/32	.....	X	X	.....
1/8	1/4	1/16	500'	X	.....	.....	3/4	1	1/8	.....	X	X	.....
5/32	7/32	1/32	1000'	X	.....	.....	3/4	1-1/16	5/32	.....	X	.....	1-100' length
5/32	9/32	1/16	500'	X	.....	.....	3/4	1-1/8	3/16	.....	X	.....	1-100' length
3/16	1/4	1/32	500'	X	.....	.....	3/4	1-1/4	1/4	.....	X	.....	1-100' length
3/16	5/16	1/16	500'	X	.....	.....	7/8	1-1/8	1/8	.....	X	.....	1-100' length
3/16	3/8	3/32	500'	X	.....	.....	7/8	1-3/16	5/32	.....	X	.....	1-100' length
3/16	7/16	1/8	.....	X	X	.....	1	1-1/4	1/8	.....	X	.....	1-100' length
1/4	5/16	1/32	500'	X	.....	.....	1	1-5/16	5/32	.....	X	.....	1-100' length
1/4	3/8	1/16	500'	X	.....	.....	1	1-3/8	3/16	.....	X	.....	1-100' length
1/4	7/16	3/32	.....	X	X	.....	1	1-1/2	1/4	.....	X	.....	1-100' length
1/4	1/2	1/8	.....	X	X	.....	1-1/8	1-3/8	1/8	.....	X	.....	1-100' length
5/16	7/16	1/16	.....	X	X	.....	1-1/8	1-1/2	3/16	.....	X	.....	1-100' length
5/16	1/2	3/32	.....	X	X	.....	1-1/4	1-1/2	1/8	.....	.....	.....	1- 50' length
5/16	9/16	1/8	.....	X	X	.....	1-1/4	1-5/8	3/16	.....	.....	.....	1- 50' length
3/8	1/2	1/16	.....	X	X	.....	1-1/4	1-3/4	1/4	.....	.....	.....	1- 50' length
3/8	9/16	3/32	.....	X	X	.....	1-1/2	1-7/8	3/16	.....	.....	.....	1- 50' length
3/8	5/8	1/8	.....	X	X	.....	1-1/2	2	1/4	.....	.....	.....	1- 50' length
7/16	9/16	1/16	.....	X	X	.....	1-3/4	2-1/4	1/4	.....	.....	.....	1- 50' length
7/16	5/8	3/32	.....	X	X	.....	2	2-1/2	1/4	.....	.....	.....	1- 50' length
7/16	11/16	1/8	.....	X	X	.....	2	2-3/4	3/8	.....	.....	.....	1- 50' length
1/2	5/8	1/16	.....	X	X	.....	2	3	1/2	.....	.....	.....	1- 50' length
1/2	11/16	3/32	.....	X	X	.....	2-1/4	2-3/4	1/4	.....	.....	.....	1- 50' length
1/2	3/4	1/8	.....	X	X	.....	2-1/2	3	1/4	.....	.....	.....	See Note 1
1/2	13/16	5/32	.....	X	X	.....	2-1/2	3-1/4	3/8	.....	.....	.....	1- 50' length
9/16	3/4	3/32	.....	X	X	.....	3	3-1/2	1/4	.....	.....	.....	See Note 1
9/16	13/16	1/8	.....	X	X	.....	3	3-3/4	3/8	.....	.....	.....	1- 50' length
9/16	7/8	5/32	.....	X	X	.....	3	4	1/2	.....	.....	.....	1- 50' length
5/8	13/16	3/32	.....	X	X	.....	4	5	1/2	.....	.....	.....	See Note 2

Note 1. *Because of the relatively thin wall this size is stocked in 50' lengths, packed flat on a fibre rim.*
Note 2. *This size is packed in a 50' length in a wooden crate.*
Packaging in lengths other than shown above, available on request.
Special Colors: *On sufficiently large orders, any of the clear Tygon formulations can be supplied in virtually any desired color.*

VACUUM TUBING SIZES — See page 21

"INNER-BRAIDED" AND "BRAID-REINFORCED" TUBING SIZES — See page 20

FBW-305

STANDARD "Y" FITTING SIZES

Inside Diameter (inches)

3/16, 1/4, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4

Packaged in bulk lots of 6 or more of a size (minimum per order).

STANDARD STOCK SIZES TYGON SOLID CORD

(All Formulations)

Diameter (inches)

1/16, 1/8, 3/16, 1/4, 5/16, 3/8, 7/16, 1/2

OTHER TYPES OF TUBING

In addition to Tygon, Norton Plastics and Synthetics Division produces various other tubings to meet difficult or critical requirements.

One, for example, is Fluran F-5000 Tubing. Made of Norton's modified fluoroelastomer, Fluran F-5000 Tubing provides maximum operating temperatures ranging from +400°F. in continuous service to +600°F. in intermittent use, a low temperature brittle point near —40°F., and an extremely broad range of resistance to corrosives, solvents, oil and fuels.

Another widely used type is Tygothane polyurethane tubing, with the greatest abrasion resistance, as well as the highest gum tensile and tear strength, of any synthetic elastomer.

Whatever your problems involving fluid or gas transmission, call on Norton. We'll be happy to put our extensive experience to work for you.

OTHER CORROSION-RESISTANT TYGON PRODUCTS

TYGON GASKETING

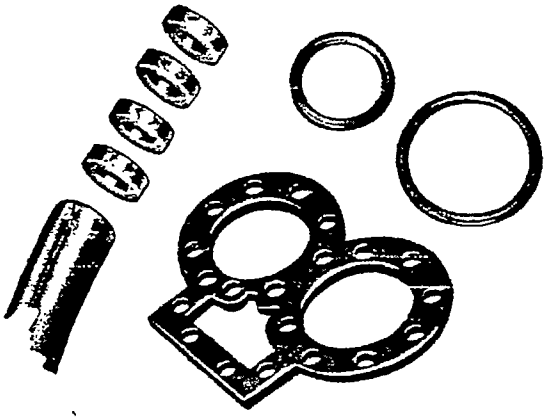
Tygon is widely used as gasketing, particularly in applications where corrosion destroys ordinary gasket materials and where products must be protected from contamination. Though the various standard and special Tygon formulations offer a wide range of physical, chemical and electrical properties, Formulations R-3400 and R-2807 are generally used when corrosion is a factor. Formulation R-4000 is recommended for use with fuels, oils and lubricants. B-44-3 or B-44-4X should be used in applications involving foods or beverages or when a clear gasket is desired.

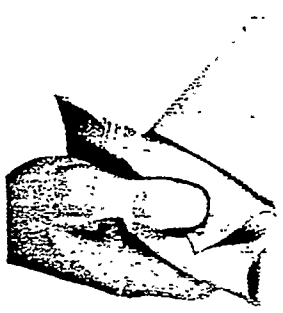
Tygon gaskets can be cut from calendered, extruded or press-polished sheeting, available in thicknesses of from 1/64" to 1/2". Small ring gaskets and sealing grommets may be sliced, to the proper thickness, from tubing of the appropriate diameter. Larger ring gaskets can be simply made from Tygon Tubing or solid cord by cutting to the proper length and joining the ends together by heat- or solvent-sealing.

Norton can also supply Tygon molded gaskets of almost any size, shape and degree of intricacy.

Tygon reinforced with fiberglass or fabric and Tygon-filled materials can also be supplied upon special order.

For more information on Tygon Gasketing, write for free Bulletin.





TYGON LININGS

Tygon Lining material provides outstanding chemical resistance. It is tough, semi-hard, wear-resistant, smooth, non-oxidizing and non-conductive. It is ideal for lining tanks and equipment and for use as an impermeable membrane with corrosion-resistant masonry construction. Available 3/32" or 3/16" thick in standard gray or non-toxic white, Tygon Linings are applied by licensed applicators in their shops or in the field.

For more information on Tygon Linings, write for free Bulletin.