

PLAINTIFF'S EXHIBIT

FBW-15

70
C A T A L O G

Johns-Manville PACKINGS

for pumps, valves
pressure vessels



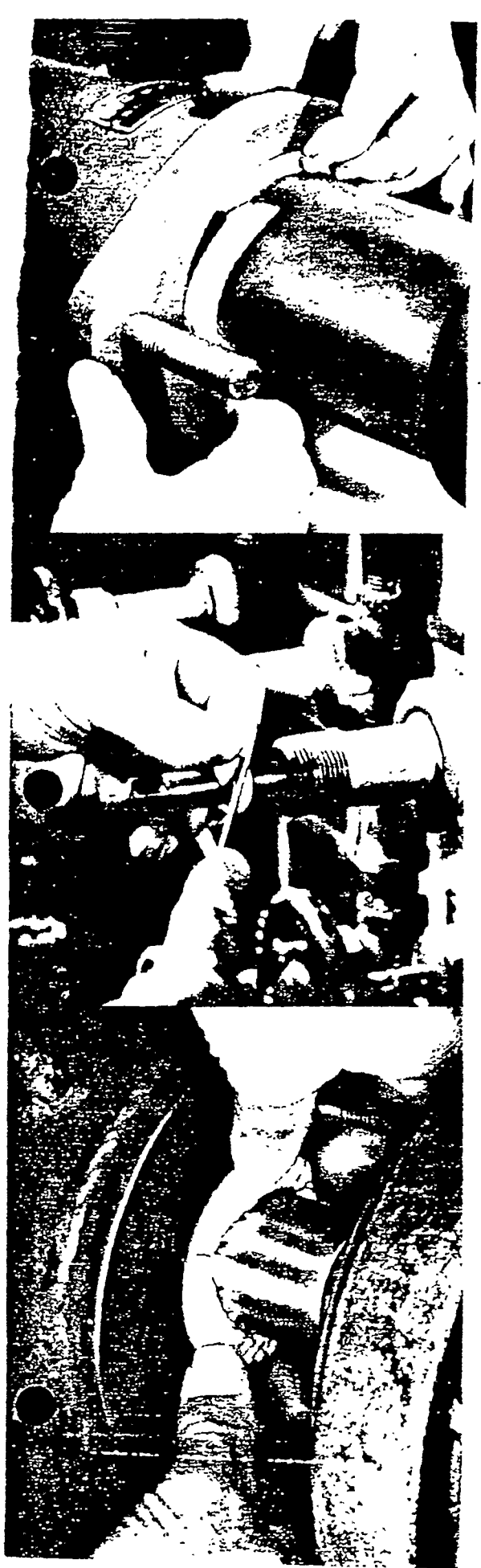
F. B. Wright Company

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Dearborn, Michigan

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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.

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

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

SEE NEXT PAGE FOR

3

J-M RECOMMENDATION CHART

How to simplify Packing Selection

FOR EFFICIENT, ECONOMICAL PERFORMANCE

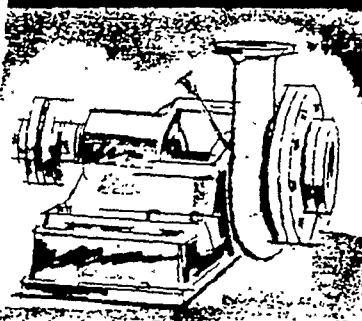
Most packing requirements fall in two classifications, pumps, and valves. Thus, the chart given below will help you locate the correct answer to most packing questions.

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.

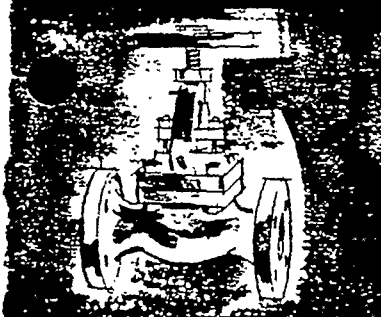
General Utility Packing recommendations are given at the bottom of this page. In case of any doubt, consult your J-M Packing Distributor or Service Representative to assist in a study of requirements and let him make specific recommendations.

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

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.

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.

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:

$$W = PLdVf \quad (1)$$

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:

$$Q = PLdVf/J \quad (2)$$

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 **T** 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.

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 **T** stem use. Same as J-M 2009, but not lubricated with special wax and oil.

J-M Chempac 2006 Packing is the most popular Chempac **X** 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 1/4" and up, Interlocked; under 1/4" plaited construction. Square cross-section. Impregnated with Teflon suspensoid. Contains an inert oil.

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, **T** 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.

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 **T** 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.

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-**T** over-braid construction as J-M 2012 but is not lubricated with oil. Ideal for valves and expansion joints to 500 F.

Basically a valve packing.

*NOTE: Chempac cannot be used against molten alkali metals or fluorine at elevated temperatures and pressures. Also, blue asbestos 'can break 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-**X** 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.

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 **T** 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.

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 **X** 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.

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 **X** Teflon yarns, Interlocked structure, with no further treatment.

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 **T** asbestos yarns twisted together to form a round cross-section and impregnated with TFE. Ideal for packing small valves and instruments.

Temperatures to 500 F.

J-M Chempac Valve Stem Packing is made of Commercial **T** 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: ¼", ⅜", ½", ⅝", ¾" and 1", either in standard case lots of a size, or in mixed sizes, one size to each display box.

Temperatures to 500 F.

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 ¾".
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. 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: 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", 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

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 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.

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.

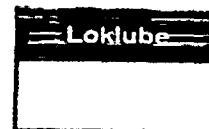
Ordinary lubricants, which melt at 160-190F, "ooze" out—either in routine operations, or if the gland has been tightened too much. For instance, when new packings are installed, and adequate leakage has been allowed for during the break-in period, another maintenance man often follows and tightens the gland excessively to stop the leakage. The temperature rises—the lubricant melts and is forced out of the packing, which shrinks and fails.

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.



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 keystoneing, 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.

*Johns-Manville Trademark
*Patent applied for

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 ¾".
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

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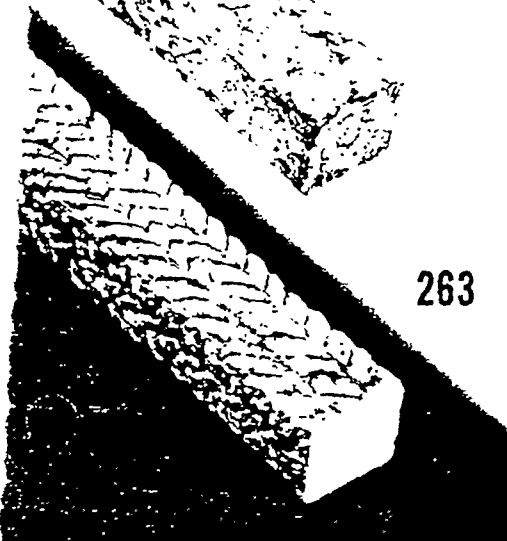
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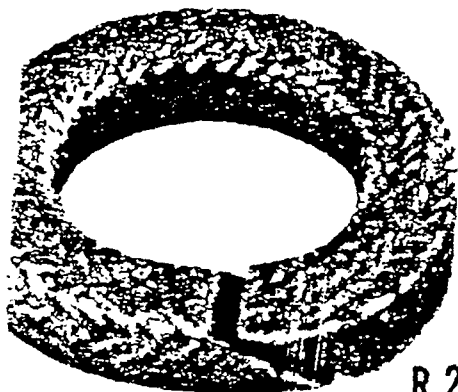
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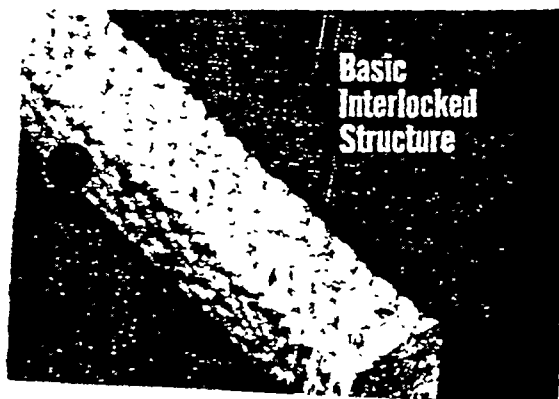
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263



R 255



Basic
Interlocked
Structure

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.

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 3600 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.

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.

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.

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 derivatives 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.

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

P&G J-M 254 Interlocked Packing is designed and lubricated for use on centrifugal pumps and valves handling severe caustic solutions.

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.

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

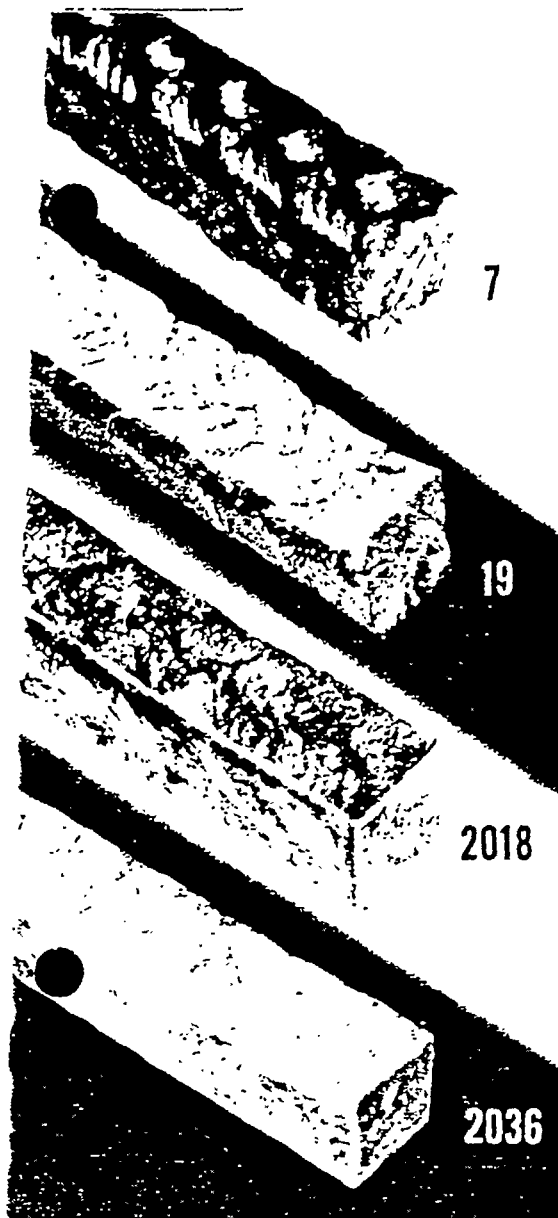
Coils:	All sizes: 5, 10, 25 and 50 pound spools. Up to and including ½": 1 pound spools. To order Coil, show prefix "C" and size. Example: C255 1" I.D. x 1½" O.D. x ¼" depth.
Rings, Die Formed:	Die formed skive joint, approximately square cross section. To order Rings, show prefix "R", I.D. and O.D. and depth. Example: R255 1" I.D. x 1½" O.D. x ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. To order Sets, show prefix "S", 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 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 255 1" I.D. x 1½" O.D. x ¼" depth.
Sets:	A specified number of rings, assembled and wrapped as a set. Example: H'C 255 1" I.D. x 1½" O.D. x ¼" depth x 5 ring

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.

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.

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.

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.



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**

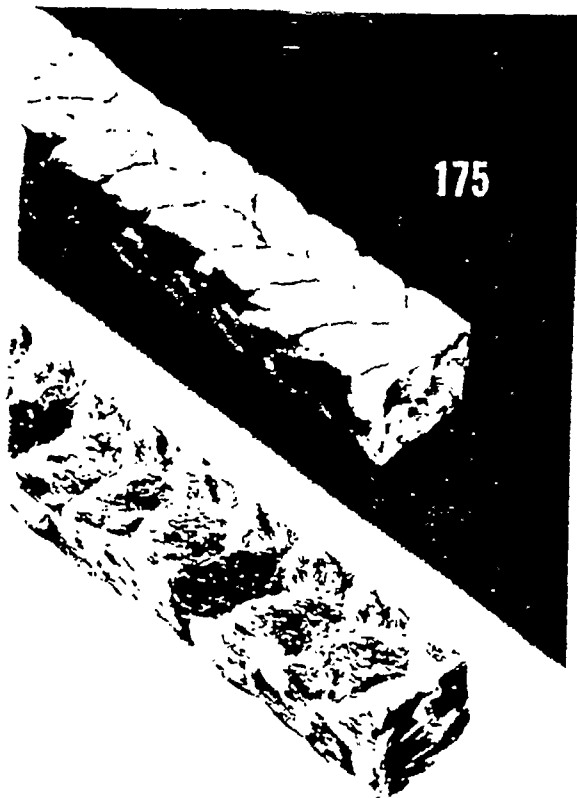
Speeds to 3600 rpm; temperatures to 450 F.

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 ¾".
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



175

189

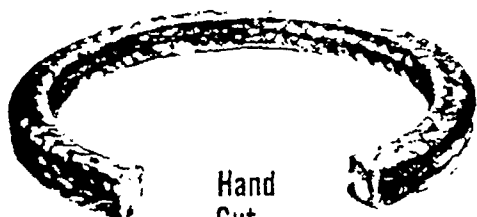
Johns-Manville produces a variety of packings braided from select plant fibers. They are suitable for sealing rods, or outside packed plungers of reciprocating pumps, as well as accumulators, plungers and rams on other hydraulic equipment handling cold water.

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.

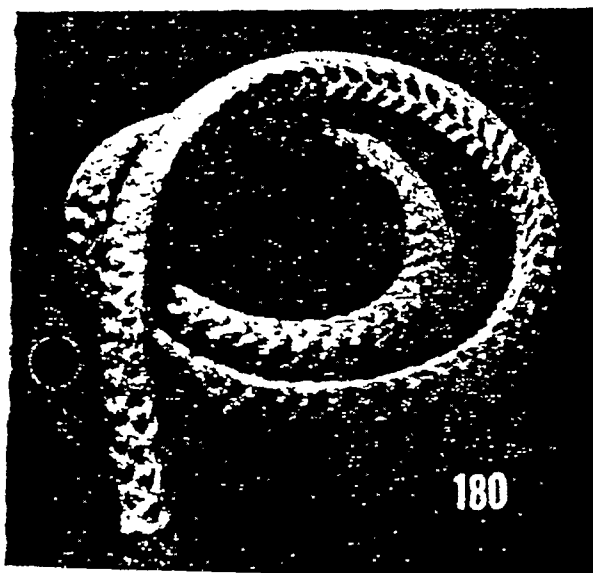
J-M Navalon® Packings, described below, are constructed of ramie rovings. A maximum amount of lubricant is absorbed by these fibers. Ramie fibers have excellent strength which improves with wetting. Also they are extremely stable and will not swell or expand in service as will flax.

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.



Hand
Cut
Ring



180

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. 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.

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.

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.

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.

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.

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.

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.

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.

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	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"
	Coils per box	4	4	4	4	4	4	3	3	2
Spools:	Feet per box	150	125	109	93	80	66	60	36	19
	1/4" and 3/8" on 1 lb. spools 1/2" to 2" on 25 or 50 lb. spools on special order 1" and up on 50 lb. spools Style 180 1/4" thru 1/2" on 1 lb. spools 3/4" thru 1 1/2" on 25 lb. spools 1 3/4" thru 2" 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 $\frac{1}{4}$ " 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.

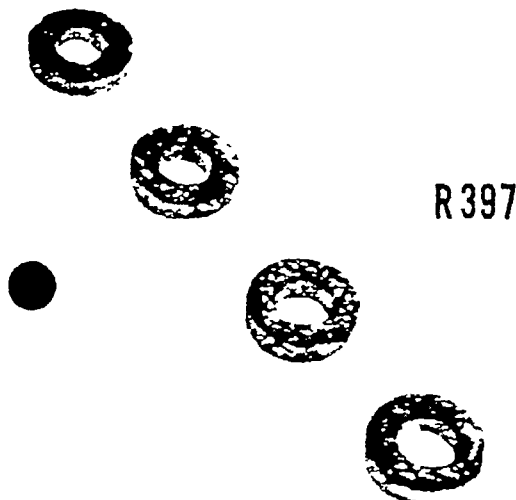
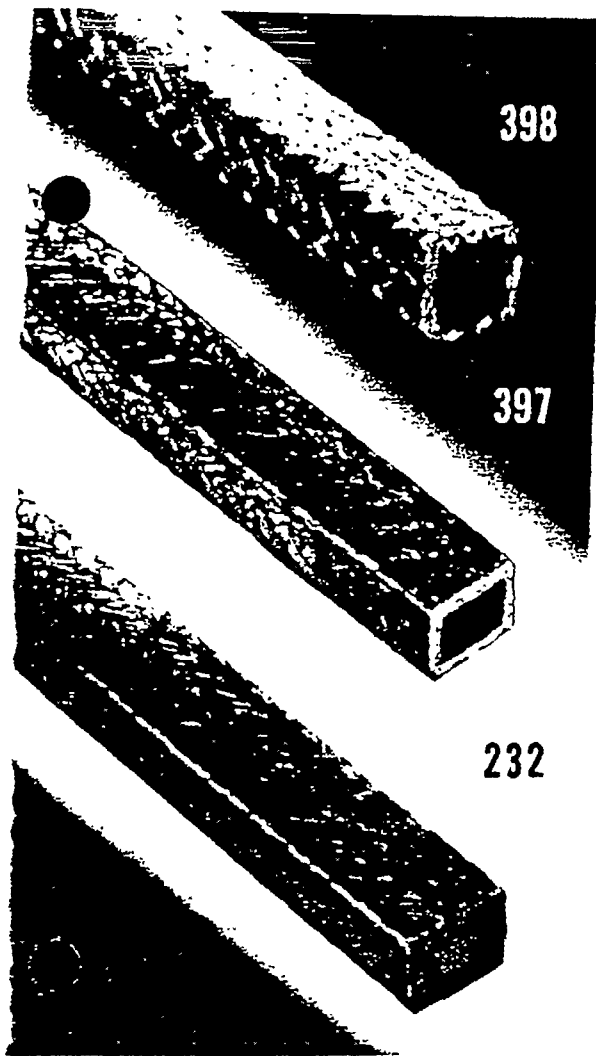
Styles embodying a heavy grease type core are designed to handle high centrifugal shaft speeds where lubrication is a problem, as in gasoline pumps or pumps having no facilities for supplemental lubrication.

J-M 398 Thermocore Packing is designed for service in 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 $\frac{1}{4}$ " 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 $\frac{1}{4}$ " 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 **G** 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 ½ 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).

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 **G** 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.

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 **G** 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.

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 **G** 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.

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 ½"
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

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.

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.

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.

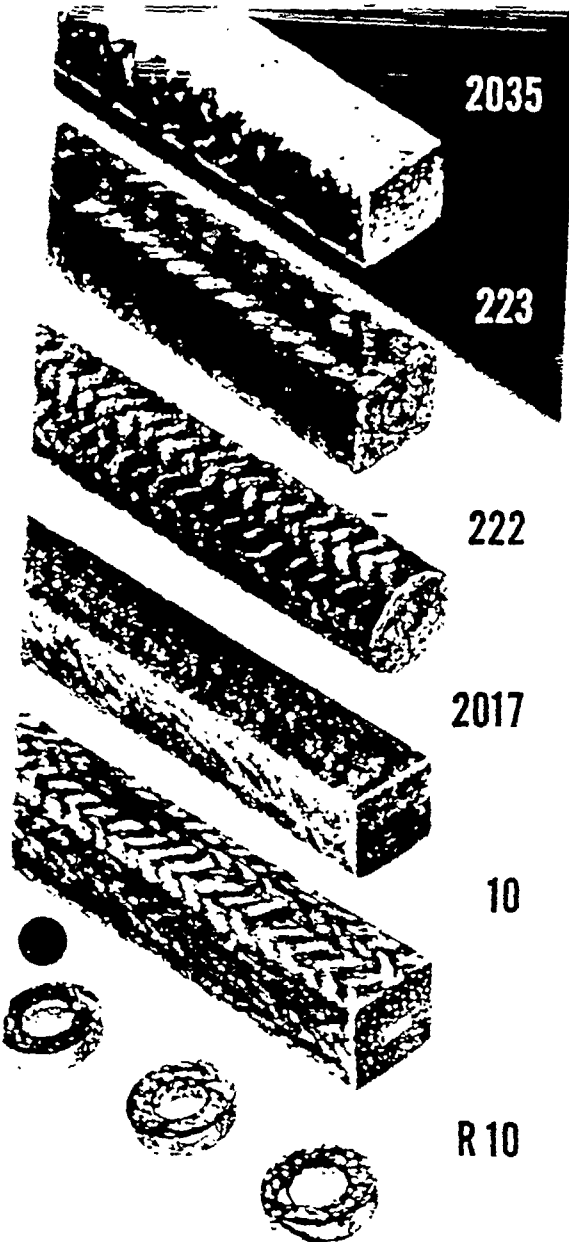
J-M 2020 Braided Packing is made of special white asbestos yarns, braid-over-braid and squared. It is impregnated with a combination of petroleum base oils and waxes, with a low saponification number.

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.



REFERENCE SYMBOLS

Indicate service classification or condition

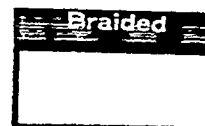
General	O
Caustic	C
Pulp & Paper	P
Solvent	S
Food and Related Services	F
Chempac (TFE Impregnated Asbestos)	T
Most Corrosive requiring Teflon filament or Blue Asbestos Packings	X

Chemical table appears on page 49

FBW-189

Braided Packings

- recommended for general utility
- soft, adaptable strong materials



J-M 10 Jewett Braided Packing has long been recognized **G** 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.

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 as- **F**bestos 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.

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- **G**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.

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, oscil- **S**lating shafts, and centrifugal shafts rotating up to 1800 rpm, handling gasoline, solvents and other thin liquids.

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 de- **S**signed to handle variations in stuffing box design. Otherwise it is similar to J-M 323 above. It is recommended for valve stem service primarily.

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 **G**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.

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 **X**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.

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.

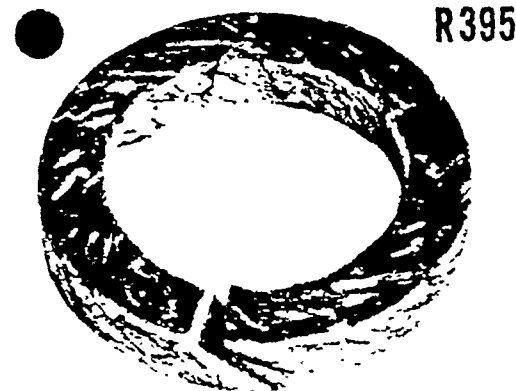
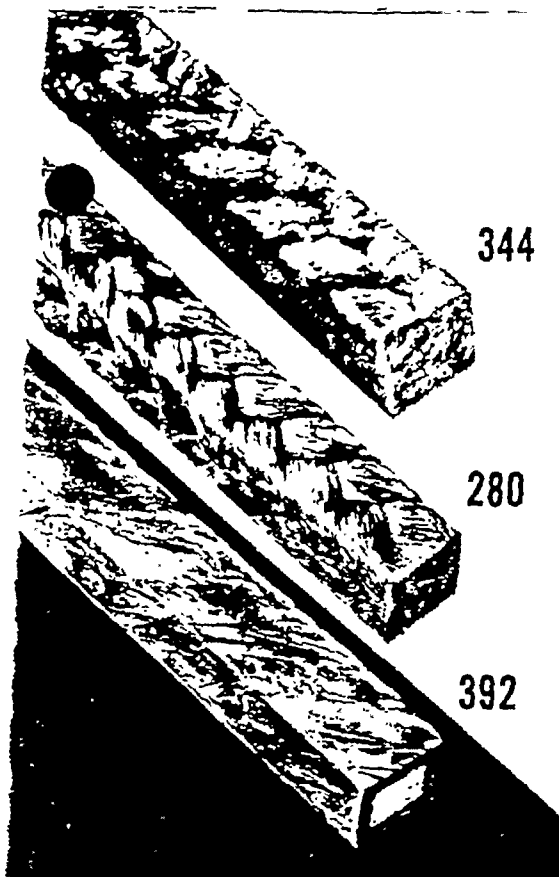
Speeds to 1800 rpm; temperatures to 750 F.

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 ¾".
	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", 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 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.

J-M 344 is made in a square plaited structure, each strand composed of knitted copper mesh twisted together with 95/95% 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 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.

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.*

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.

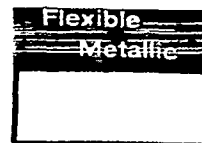
J-M 379 Asbestos-Metallic Packing, lead-alloy ribbon type, is designed for acid service on centrifugal shafts. It is used as end rings with J-M 640 plastic center rings.

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, **S** 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.

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, **G** 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.

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.

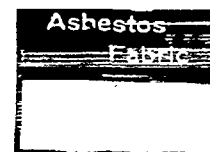
PV limit = 1,000,000; pH range = 10 to 4.

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		1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5
Spiral	Length (ft.) 391, 392, 393 & 395	18	17	16	16	16	16	16	15 1/2	15 1/2	15 1/2	15 1/2	15 1/2
	Length (ft.) 280, 344, 360 & 379	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2
Spiral	Number of Spirals per box	1	1	1	1	1	1	1	1	1	1	1	1
Spiral	Inside Diameter of Spiral (inches)	1 5/8	1 5/8	2	2	2 1/2	2 1/2	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 1 1/2" ID x 2 1/4" 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 1 1/2" ID x 2 1/4" 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.

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

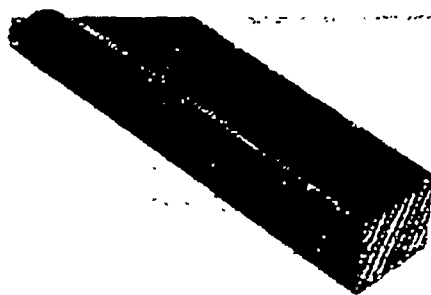
	Forms	1/4	3/8	1/2	3/4	1	1 1/4	1 3/8	1 1/2	2	2 1/4	2 3/8	2 1/2	3	3 1/4
Coil	Number of 12 1/2 ft. lengths per box	8	6	5	4	4	3	3	3	2	2	2	2	2	2
Coil	Feet per box	100	75	62 1/2	50	50	37 1/2	37 1/2	37 1/2	25	25	25	25	25	25
Coil	Weight per box	4.5	5.4	6.3	6.8	8.8	8.4	10.0	13.9	11.6	14.5	20.5	23.8	27.2	42.5
Spiral	Number of 12 1/2 ft. lengths per box	2	2	1	1	1	1	1	1	1	1	1	1	1	1
Spiral	Feet per box	25	25	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2
Spiral	Inside diameter of Spiral	1 1/4	1 1/4	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 1/2	4 1/2
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

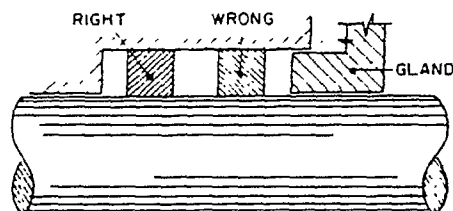


J-M Rubber and Duck Packings

- handles cold water, hot water to 250 F.
- compensates for swelling
- seals against off-center motion



271



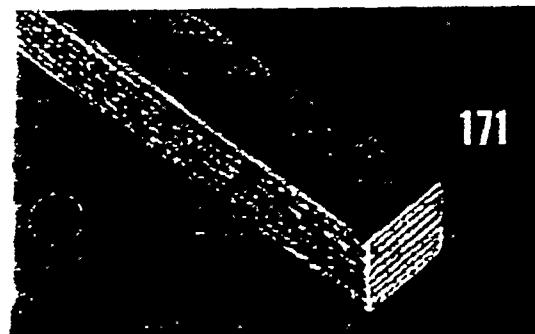
Johns-Manville rubber and duck packings are recommended for use against hot water to 250 F and low pressure steam. Some styles, however, may also be used for other media such as light oils, ammonia, cold water and light aqueous solutions in reciprocating and slow rotary service.

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.

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.



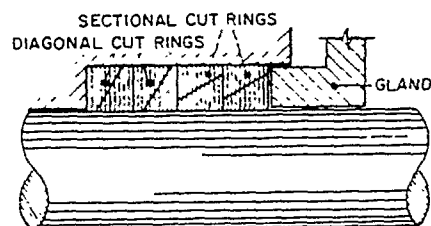
171

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.

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.

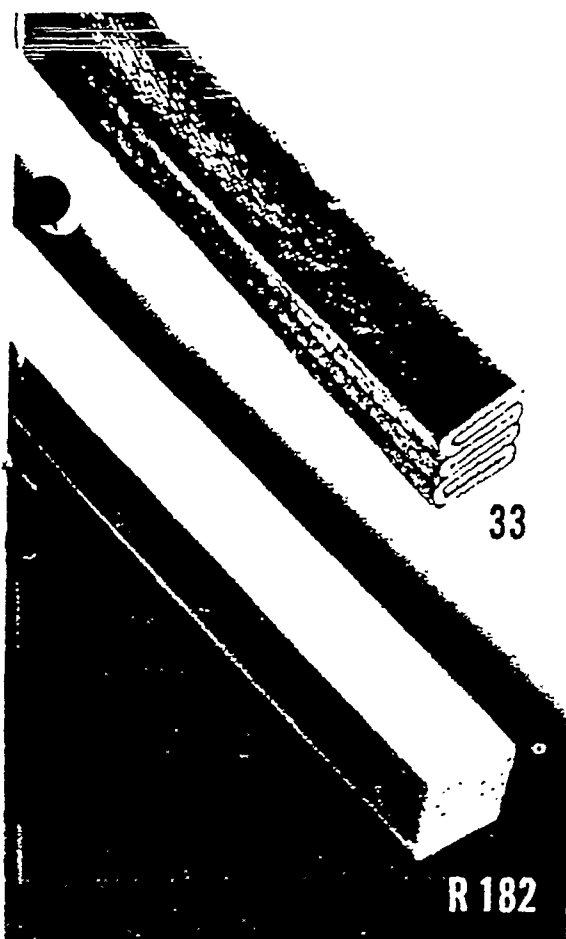
Made of closely woven duck plies laminated with Neoprene and special ammonia-resistant lubricant. Has a graphite finish.

Temperatures to 250 F.

FORMS FURNISHED — COILS and SPIRALS														
See page 49 for size range and weights														
	Forms	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3
No. of lengths per box 171, 172, & 271	Coil	8	6	5	4	4	3	3	3	2	2	2	2	2
Feet per box 171, 172	Coil	120	90	75	60	60	45	45	45	30	30	30	30	30
Feet per box 271	Coil	100	75	62 1/2	50	50	37 1/2	37 1/2	37 1/2	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
Feet per box 171, 172	Spiral	60	30	15	15	15	15	15	15	15	15	15	15	15
Feet per box 271	Spiral	50	25	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2	12 1/2
Inside diameter	Spiral	1"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2"	2 1/2"	3"	3 1/2"	4"	4"	4"

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 1/2" thick slab; no joint; with Sectional Cut, when specified "SC". Cut from 1/2" thick slab; no joint; Diagonal Cut, when specified "DC".

All styles furnished in 15-foot lengths except Style 271 which is furnished in 12 1/2-foot lengths



Johns-Manville Piston Packing

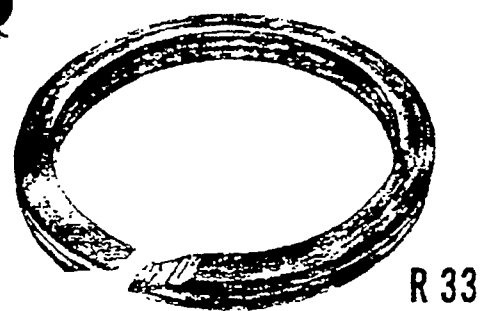


- provide completely satisfactory seal
- minimize friction and scoring
- increase efficiency of equipment

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 hydrocarbons of a corrosive nature. 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. 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		1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2
Coil—All Styles	Number of lengths per box	8	6	5	4	4	3	3	3	2	2	2
Coil—Rubber & Duck	Feet per box, 15 ft. lengths	120	90	75	60	60	45	45	45	30	30	30
Coil—= 33 Universal	Feet per box, 12 ft. lengths	96	72	60	48	48	36	36	36	24	24	24
Spiral—Rubber & Duck	Feet per box, 15 ft. lengths	15	15	15	15	15	15	15	15	15	15	15
Spiral—Rubber & Duck	Inside diameter of spiral	1	1	1 1/4	1 1/2	1 3/4	2	2	2 1/2	3	3 1/2	3 1/2
Spiral—= 33 Universal	Feet per box, 12 ft. lengths	12	12	12	12	12	12	12	12	12	12	12
Spiral—= 33 Universal	Inside diameter of spiral	1 1/4	2	2	2 1/2	2 1/2	3	4	5	5	5	5

RINGS—RUBBER & DUCK

Standard	Cut from slab stock 1/2" thick; step joint
Solid	Cut from slab stock 1/2" thick; no joint; when specified.
Coil	Cut from coil stock; step joint; when specified.

RINGS = 33 UNIVERSAL

Standard	Cut from Spiral only; skive joint.
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Coils 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

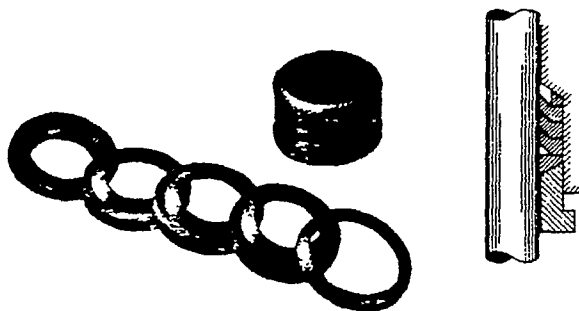
- low friction, efficient sealing, under severe operating conditions

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.

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.

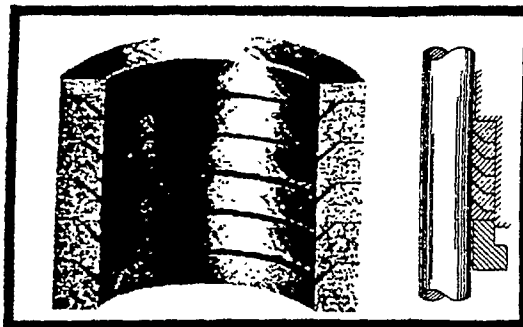
J-M 46 Conepac Packing is a general service packing used in valves and also in slow speed reciprocating or rotary service.

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.

236
397

J-M Cumpac Soot Blower Packing is especially recommended for Soot Blower service and is furnished to fit all popular Soot Blower sizes.



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.

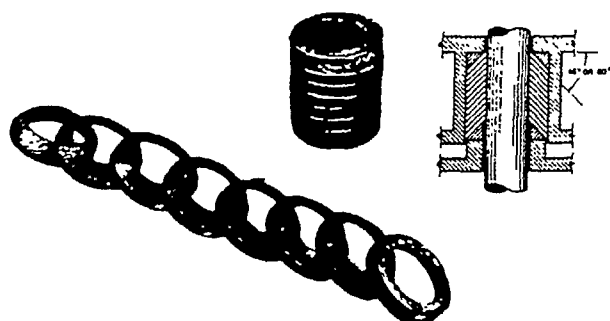
- J-M styles are available in the following set sizes to fit various makes of soot-blowers

	I.D.	O.D.	SET DEPTH
DIAMOND			
IK	2 3/8	3 1/8	3 1/2
IR	2	2 1/16	2 1/4
G9B	2 5/16	3 1/16	2 1/8
COPES-VULCAN			
RW2E Swivel	2 3/8	3	4
RW2E Cam	1 3/4	2 1/2	2 1/4
ROT2E Retractable	1 3/4	2 1/2	2 1/4
E 4 Rotary	1 3/16	2 13/16	1 7/8
WY2	2.35	3	1 15/16
PM3-2	2 3/8	3	1 3/4
BAYER			
Type S	1 13/16	2 1/2	2 15/16
VH	2 1/32	3 1/4	2 1/4

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**

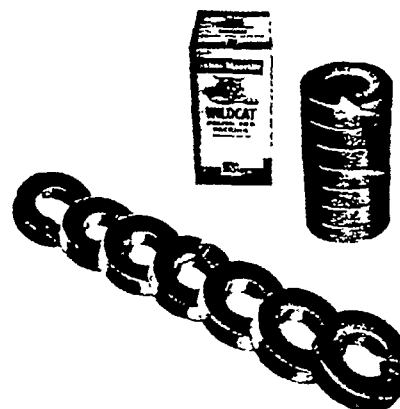
J-M 3869 consists of a layer of lead and commercial grade asbestos, plied on a diagonal to the shaft, with a neoprene base compound. The strong diagonal ply structure results in sealability with the least pressure on the shaft. The lead ply provides an excellent bearing surface and adds strength to the 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 secured by sending a drawing with initial order

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 **G** packing for sealing gases and hot, dry air.

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 **G** on hot blast stove clean-out doors, boiler explosion doors, and similar applications handling hot gases.

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 **G** construction but withstands higher temperatures. It is made of 95/98% asbestos yarns with copper insert.

For constant temperatures to 800 F; short term temperatures to 1000 F.

J-M 216 Braided Groove Packing, the most rugged of the **G** braided groove packings, is designed to withstand repeated opening and closing of doors and covers.

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 **G** general service groove packing. It is excellent for autoclaves, whether bolted or quick-opening types.

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 **S** 164, except that Viton cement is used, making it suitable for hot creosote service, particularly in the Wood Preserving Industry.

For constant temperatures to 500 F.

J-M 176 Folded Groove Packing is designed especially for **G** sealing around converter bottoms, also has wide range usage as an adaptable groove packing that possesses high mechanical strength and heat resistance.

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, **G** but is denser and offers more wear resistance, the yarns having a copper wire insert.

For constant temperatures to 500 F; short term temperatures to 800 F.

J-M 128 Folded Groove Packing is recommended where **G** maximum strength and resistance to constant 500 F temperatures are required.

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 **G** denser, the yarns having a copper wire insert for more wear resistance.

For constant temperatures to 500 F.

J-M 165 Moulded Autoclave Packing is designed to with- **G** stand severe mechanical usage at temperatures to 300 F in autoclave and similar service.

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 **G** 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.

Furnished in 10 and 12 pound boxes.

For temperatures to 250 F.

J-M 2559 100% Inconel Packing will withstand high **G** temperatures and resist corrosion caused by most gases, alkalies and acids. It also has exceptional ability to absorb vibration and shock.

J-M 2559 is plaited square from strands of twisted Inconel wire mesh.

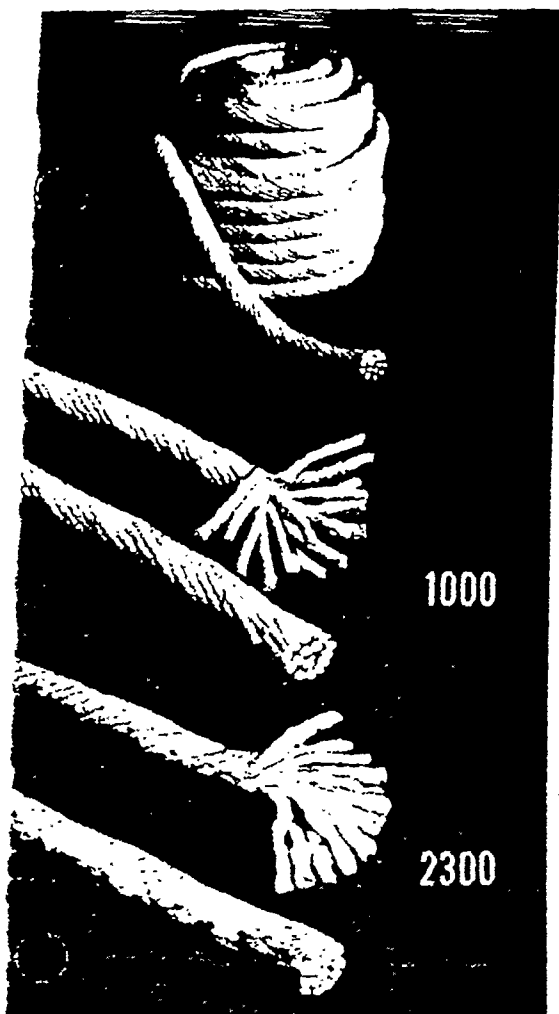
For temperatures to 2000 F.

J-M 3123 Inconel-Asbestos Packing is the same as J-M **G** 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.

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



Twisted
Asbestos
and Refractory
Rope

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

Commercial grade white Chrysotile asbestos fiber. Gives economical service against constant temperatures to 500 F.

G

J-M Thermo-Pac 750

AAA (95/98%) white Chrysotile asbestos fiber. A soft rope, made of high-purity asbestos twisted roving. Withstands temperatures to 750 F.

G

J-M Thermo-Pac 1000

Pure 95/100% 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.

G

J-M Thermo-Pac 2300

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.

G

J-M Thermo-Pac 2700

Refractory Alumina-Silica-Chromia fiber. Recommended for extremely high-temperature operations, up to 2700 F.

G

J-M Thermo-Pac BLUE

Pure African Crocidolite asbestos fiber. Recommended for severe acid service. Resists corrosion under extreme acid conditions in temperatures up to 1000 F.

X

In the past, sizes under 1/4" have been called "Wick." Generally, these small sizes of rope have been relatively softer and less dense than sizes 1/4" and up, traditionally designated "Rope." In the new Thermo-Pac line, for added simplicity, all sizes are called "Rope." However, sizes less than 1/4" will continue to be soft and light density products.

FBW-200

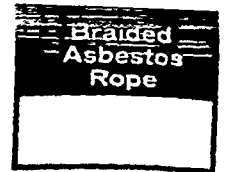
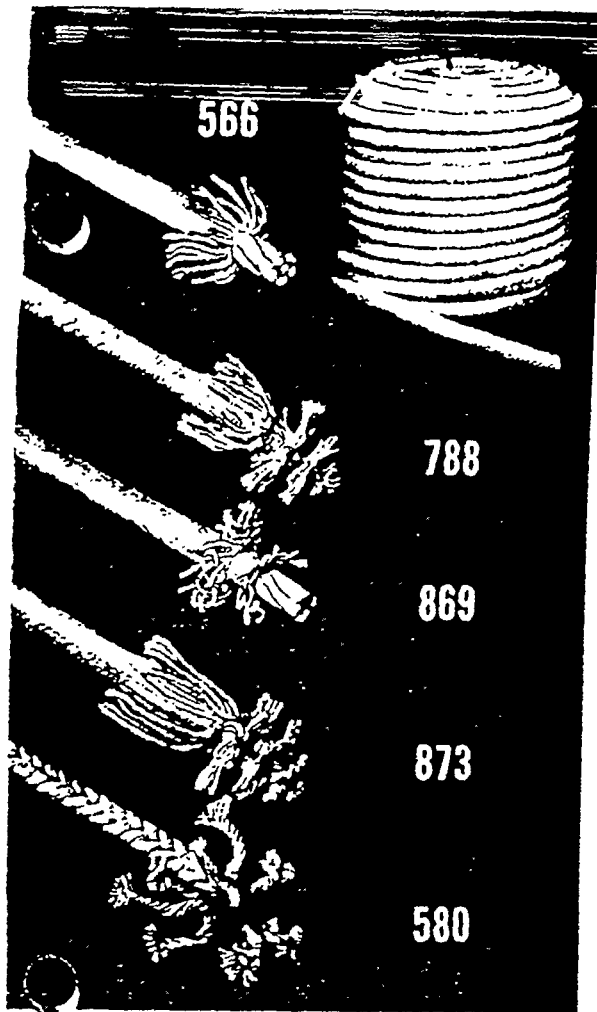
Johns-Manville Trademark

FORMS FURNISHED

See Page 49 for Size Range and Weights

Sizes 3/4" and up	10, 25 and 50 pound balls
Sizes under 3/4"	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

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.

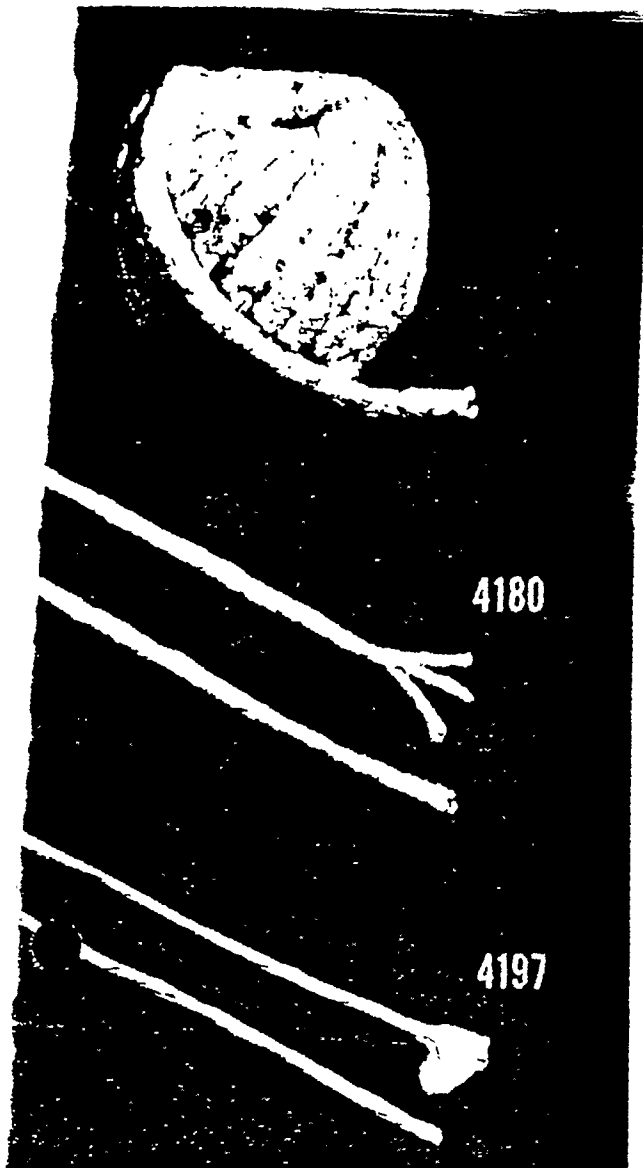
BRAIDED ASBESTOS ROPE

Style No.	Construction	Cross-Section	Density
95/98% Pure Asbestos . . . service to 750F			
857	Braided jacket over twisted core One jacket thru $\frac{1}{4}$ " Two jackets $\frac{1}{8}$ " and up	Round	Soft
788	Braided jacket over jacket	Round	Dense
869	Braided jacket over twisted core One jacket thru $\frac{5}{8}$ " Two jackets $\frac{3}{4}$ " 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 $\frac{1}{4}$ " Two jackets $\frac{7}{8}$ " and up	Round	Soft
702	Braided jacket over jacket	Round	Dense
787	Braided jacket over twisted core One jacket thru $\frac{5}{8}$ " Two jackets $\frac{3}{4}$ " and up	Square	Soft
733	Braided jacket over jacket	Square	Dense
580	Solid Plaited	Square	Soft
581	Solid Plaited with 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 runoff 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.

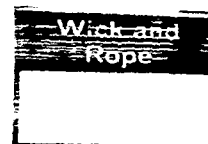
For general maintenance work, J-M Wick will serve as gasketing on light, rough or uneven flanges where a conventional gasket could not be used.

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.

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	1/4"	1.66	Lightest Weight
—	195		3	3/8"	1.25	
500	—		2	3/4"	.84	
500	—		1	1 1/4"	.37	
—	535	Commercial Grade Asbestos	4	1/4"	1.49	Wire Wiping Wick
—	4180	Commercial Grade Asbestos	3	1/4"	2.50	Stranded
—	4180		4	3/8"	3.50	Stranded
750	—	98-98 1/2% Pure Asbestos	4	1/4" - 3/4"	1.75	Stranded
Blue	—	100% Blue Asbestos	Multiple	1/4"	.66	Acid service
500	—	Commercial Grade Asbestos	1	1/4"	1.80	Softest
—	4197	98-99% Pure Asbestos	1	1/4"	2.00	Soft
—	4198	98-99 1/2% Pure Asbestos	1	1/4"	2.00	Hard
—	4199	98-99 1/2% Pure Asbestos	1	1/4"	2.00	Most popular and versatile
1000	—	98-99 1/2% Pure Asbestos	3	1/4"	2.50	
1000	—		2	3/8"	1.50	
—	—		1	1/4"	.74	

FBW-202



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.

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.

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 $\frac{1}{8}$ " size is desired, rather than the three-ply construction of J-M Thermo-Pac 1000.

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.

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.

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.

J-M 4186 Rope is similar to J-M 4185, but is used where greater density and strength are required. Temperatures to 500 F.

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 $\frac{1}{4}$ " 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.

J-M 4200 Rope in the $\frac{1}{4}$ " size is used where a more tightly twisted, stronger, more dense product is needed than J-M Thermo-Pac 1000 in the small $\frac{1}{4}$ " size. Temperatures to 1000 F.

FORMS FURNISHED
See Page 49 for Size Range and Weights

Sizes $\frac{1}{4}$ " and up 10, 25 and 50 pound balls

Sizes $\frac{1}{8}$ " 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 **G** for long term sealing of low pressure gases. Containing no compound, it has a wide range of applications in services handling hot, dry gases.

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 **G** 122 when greater tensile strength is needed to maintain the proper position between flanges.

J-M 121 is made by weaving yarns of commercial grade white asbestos, containing a brass wire reinforcement, to the proper width and thickness.

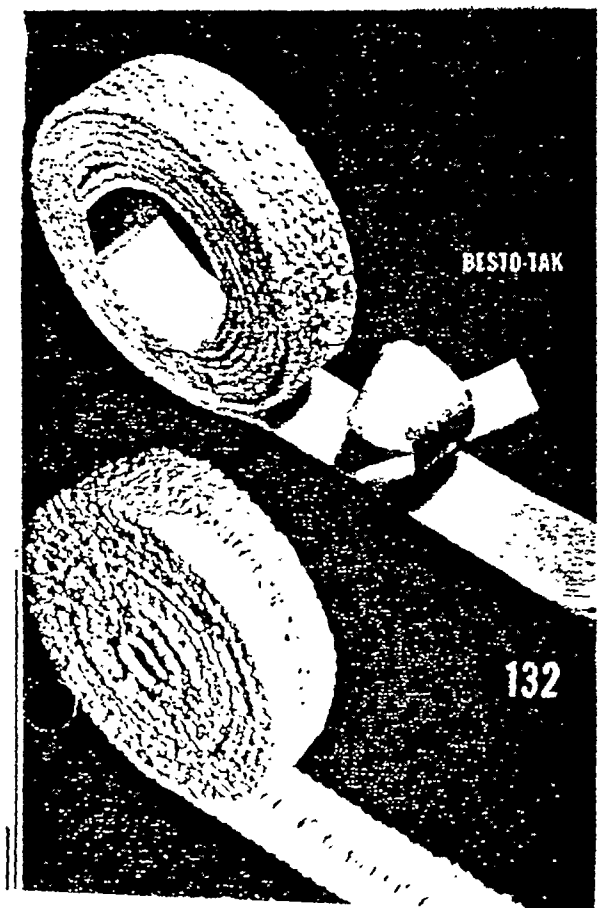
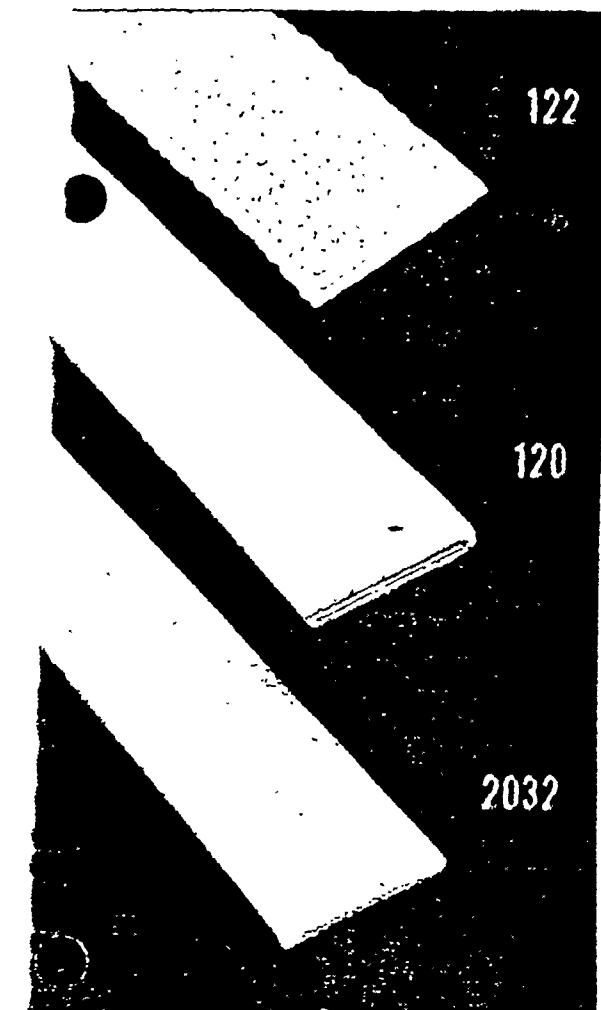
#122 Underwriters Grade, AA, AAA and AAAA Grades, for higher temperature service, available on special order.

J-M 120 Gasketing Tape is the most popular gasketing **G** tape treated with compounds. It is widely used in steam service.

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.

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.

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.

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.

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.

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.

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.

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.

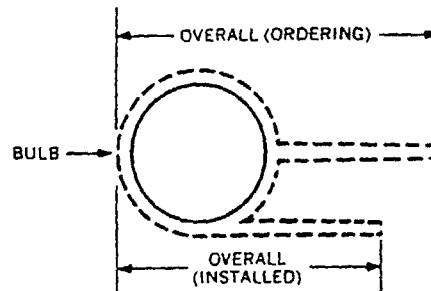
J-M Inconel Gasketing Tape is made entirely of Inconel and is most widely used in Aviation service, Missile construction and high-temperature boiler construction. J-M Inconel Tape is made of knitted wires, enclosed in a jacket of Inconel wires, and formed to the required width and thickness.

FORMS FURNISHED	
See Page 49 for Size Range and Weights	
FOLDED TAPES	
Styles 120, 119	$\frac{1}{8}$ " thru $\frac{3}{4}$ " thick: 150 foot rolls. $\frac{1}{4}$ " thru $\frac{3}{8}$ " thick: 75 foot rolls. $\frac{3}{8}$ " and up thick: 50 foot rolls.
WOVEN TAPES	
Styles 121, 122, 131, 132, 2031, 2032, 141, 142	1" wide and up, in thicknesses to $\frac{3}{4}$ " : 100 ft. rolls. Less than 1" wide, in thicknesses to $\frac{3}{4}$ " : 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
$\frac{3}{8} \times \frac{7}{8}$	$\frac{3}{8} \times 2\frac{1}{4}$	$\frac{5}{8} \times 1\frac{3}{4}$	1 x $1\frac{1}{2}$
$\frac{3}{8} \times 1\frac{1}{4}$	$\frac{1}{2} \times 1$	$\frac{5}{8} \times 1\frac{1}{4}$	1 x $2\frac{1}{2}$
$\frac{3}{8} \times 1\frac{3}{8}$	$\frac{1}{2} \times 1\frac{1}{4}$	$\frac{3}{4} \times 1\frac{5}{8}$	$1\frac{1}{4} \times 2\frac{3}{8}$
$\frac{3}{8} \times 1\frac{3}{4}$	$\frac{1}{2} \times 1\frac{3}{4}$	$\frac{3}{4} \times 2\frac{5}{8}$	$1\frac{1}{2} \times 2\frac{1}{4}$

STYLE 192 ONLY SIZES (in inches)			
$\frac{3}{8} \times 1\frac{5}{8}$	$\frac{5}{8} \times 1\frac{3}{4}$	1 x 2	
$\frac{3}{8} \times 2\frac{3}{8}$	$\frac{5}{8} \times 2\frac{3}{4}$	$1\frac{1}{4} \times 1\frac{3}{8}$	
$\frac{1}{2} \times 1\frac{1}{2}$	$\frac{3}{4} \times 1\frac{3}{4}$		
$\frac{1}{2} \times 2\frac{1}{4}$	$\frac{3}{4} \times 2\frac{1}{4}$		
QUANTITIES: 100 feet and up, per size.			

SPECIAL TADPOLE TAPE STYLES WITH ASBESTOS CORES†

STYLE	COVER	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

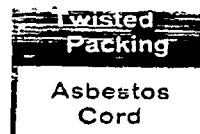
FORMS FURNISHED

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 **G** 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. 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 **S** and all types of petroleum base derivatives. 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 Asbestos Cord

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 **G** strands of strong commercial grade white asbestos yarns to the desired size. *Temperatures to 450 F.*

J-M 274 Asbestos Cord is made by twisting together **G** 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. *Temperature to 450 F.*

J-M 276 is made by twisting Underwriters Grade white **G** asbestos yarns together in a firm cord. J-M 276 is always furnished without starch or other treatment. *Temperatures to 500 F.*

J-M 487 Asbestos Cord is made of 95/98% asbestos yarns **G** twisted together. It is used above the temperature limits of J-M 274 or J-M 285.

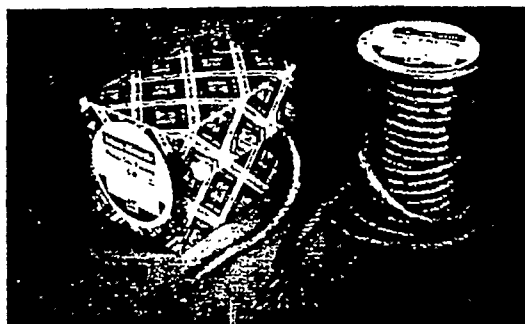
J-M 487 is suitable in chemical services where the purer asbestos yarn is required. It is also used to pack small low pressure valves handling chemicals. *Temperatures to 800 F.*

Note: For J-M Styles 285, 274, 487

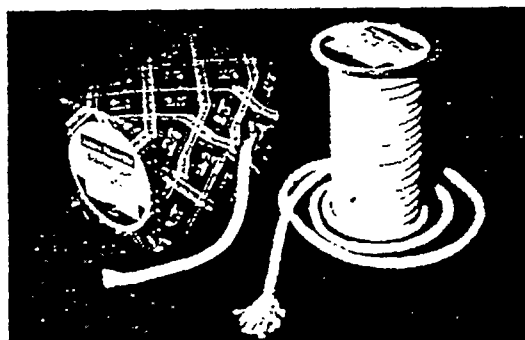
- a) all styles furnished unsized as standard
- b) sizes up to and including ¼" furnished with wax sizing when specified
- c) sizes over ¼" furnished with starch sizing when specified

J-M 2016 Twisted Packing is used on valves handling low **X** pressure acids that are too severe for conventional valve stem packings.

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.*



- withstands corrosives, heat, flame
- suspends parts for metal plating



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 ¼", ⅜" and ½" sizes.

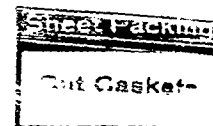
Asbestos Cord All sizes. 5, 10, 25 or 50 pound spools.

All sizes ½", ¾" 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

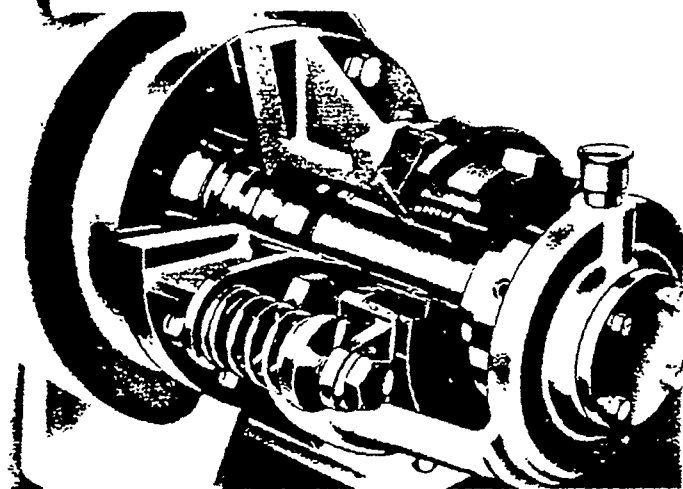
Service	Style	Description	Thick. In.
COMPRESSED			
General conditions, such as superheated or saturated steam, air, hot or cold water, ammonia, oil, some acids, alkalis and other chemicals.	50 51	Compressed asbestos fiber and heat-resisting compounds. Treated with J-M Parting Agent.	1/64 thru 1/4
Controlled swell in oil.	50	Compressed asbestos fiber sheet, softer and less dense than No. 50.	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 1/2
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 1/2
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 1/2
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 1/4" thk.	78	High tensile, long fiber asbestos bonded with Buna-N synthetic rubber.	1/64 thru 1/2
Most acids, where relatively hard, dense gasket required.	84	Blue African asbestos bonded with acid-resisting binder.	1/32 thru 1/2
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.	570 576 578	Cork and rubber compositions, ground cork combined in Neoprene or Nitrile binders.	1/32 thru 1/2
WOVEN			
For rough flanges against gasoline, oil and petroleum derivatives.	96	Same as No. 100 except for impregnation with petroleum-resistant compound of neoprene.	1/32 thru 1/4
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 1/4
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 1/4
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 1/2
FELTED			
High temperature service.	219	Long fiber asbestos thoroughly felted, bonded with heat resistant rubberless binder.	1/32 thru 1/2
Recommended for use with gaseous and gaseous 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 1/2
RUBBER			
General conditions against hot and cold water, air, medium or low pressure saturated steam.	107 104	Highest quality special heat-resisting rubber compound. Compound of CR neoprene rubber.	1/32 thru 1/2

Other J-M Cut Rubber Gaskets:
 Style No. 123—CR neoprene Rubber Sheet
 Style No. 125—C-1 Synthetic Rubber Diaphragm Sheet
 Style No. 126—NBR nitrile Buna N Rubber Sheet

Style No. 111—CR neoprene Sheet for Oil
 Style No. 112—Black CR Proof Rubber
 Style No. 113—NR natural Rubber for Mild Acid
 Style No. 114—SBR Black Rubber for Mild Acid
 Style No. 115—C-1 Rubber Diaphragm Sheet
 Style No. 125—NBR nitrile Buna N Rubber Sheet
 Style No. 127—NBR nitrile Buna N Rubber Sheet

FBW-210

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 $\frac{3}{8}$ " to $9\frac{3}{4}$ " 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.

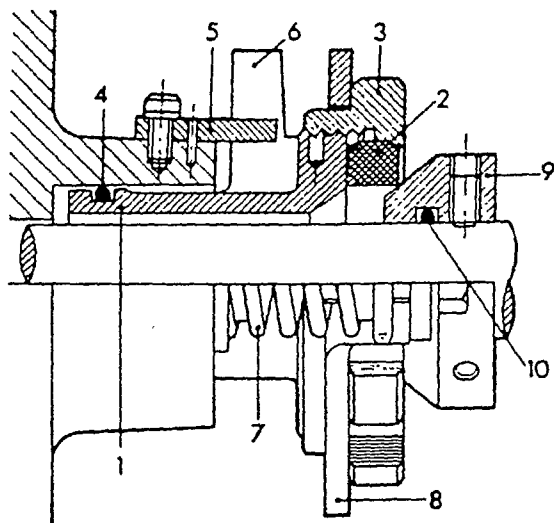
FBW-211

Johns-Manville **Mechanical Seals**

**Mechanical
Seals**

**Die Formed
Rings**

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 $\frac{1}{8}$ " to 9 $\frac{1}{2}$ " in diameter and is diagrammatically presented in the accompanying illustration.

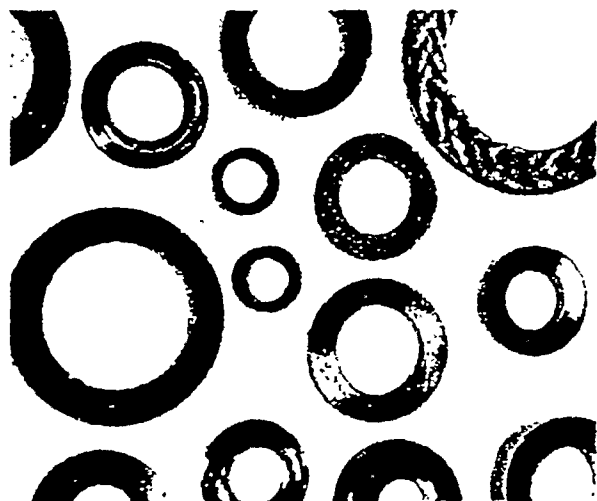
The Gland Sleeve (1), which has a replaceable End Seal in halves (2) held in position by the Gland Nut (3), is fitted into the stuffing box and it is sealed by the 'O' Ring (4). An Anti-rotation Stud (5) fitted into the stuffing box passes between two guide lugs (6) on the Gland Sleeve.

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.

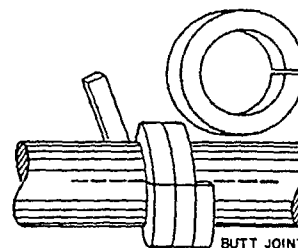
Mechanical Condition of Equipment—It pays to use high quality equipment that is properly maintained. If bearings, shafts, sleeves or guides are in bad condition, the result is poor sealing, short packing life.

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 $\frac{1}{16}$ " 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 $2\frac{1}{2}$ " and the inside of the stuffing box $3\frac{1}{16}$ ", the size of coil packing to use would be $\frac{1}{2}$ " rather than $\frac{3}{16}$ ".
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



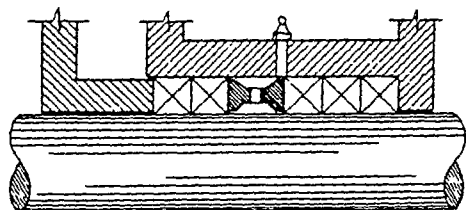
be cut on the shaft itself outside the stuffing box if there is room. Hold the coil packing tightly and firmly on the mandrel but do not stretch it excessively. Cut the ring and try it in the stuffing box to make certain that it fills the packing space properly, with no gap in the joint at the O.D. of 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.

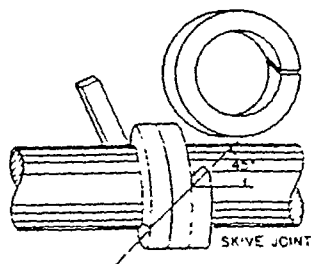


9. If the stuffing box has a lantern ring, make sure the lantern ring, as installed, is slightly behind the lubricant fitting so it will move under the fitting as follower pressure is applied.
10. Replace packing when leakage cannot be controlled by further take-up on the follower.

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 cut-

ting 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	Amyl acid phosphate	S-G	06	Butyl ether	T-S
09	Acetate solvents	S	07	Amyl alcohol	S-G	09	Butyl sebacate	T-S
012	Acetates, esters & petroleum derivatives	S	09	Amyl chloride	S-G	01C	Butylene	G
02A	Acetic acid	T	09	Amyl nitrate	S-G	08	Butylamine	T-S
02A	Acetic acid, glacial	T	08	Aniline	T	03B	Butyric acid	G
02A	Acetic acid (hydroxy crude)	T	012	Aniline dyes	T-G	03B	Butyric acid, to 150F	G
02D	Acetic anhydride	T-S	08	Aniline Hydrochloride	T	13	Calcium bisulfide	G
05	Acetone	T-S	012	Antibiotic fermentation broth—	G	13	Calcium bisulfite	G
05	Acetophenone	T-S	012	Antibiotic fermentation broth—	G	13	Calcium carbonate slurry	G
01E	Acetyl chloride	T	012	Antibiotic fermentation broth—	G	13	Calcium chloride	G
01C	Acetylene	G	07	Anti-freeze water & alcohols or glycols	S	12	Calcium hydroxide (Note #2)	P
01C	Acetylene gas	G	13	Antimony trichloride	T	13	Calcium hypochlorite	G
012	Acetylene with water	G	11	Aqua regia	X	13	Calcium phosphate slurry	G
012	Acetylene gas with water or liquid H.C.	G	14	Argon gas	G	012	Calgon	F
15	Acid sludge	X-T	01D	Arcoflex	T-S	012	Campene	S
08	Acrylonitrile	S	01D	Arcoflex 1242	T-S	012	Candleilla wax & varsol mixture	G
07	Alcohol, ethyl	S-G	01D	Arcoflex 1248	T-S	07	Cane sugar liquors & cane juice	F
012	Alcohol & lub. oil	S	01D	Arcoflex 1254	T-S	09	Carbinol	S-G
07	Alcohol methyl	G	01B	Aromatic fuels	T-S	011	Carbitol acetate	S
04	Aldehyde	T-S	012	Asphalt-emulsified	S	01A	Carbollic acid	T
01A	Alkanes	T-G	13	Barium chloride solution 0-20%	G	01A	Carbon bisulfide	T-S
02A, 02B	Alkyl arylsulfonic acid	T	13	Barium hydroxide	G	14	Carbon dioxide (dry)	G
01B	Alkyl benzene	T-S	13	Barium nitrate solutions	G	01A	Carbon dioxide (wet)	G
012	Alkylate light	S	13	Barium sulphide	G	01E	Carbon disulfide	T-S
05	Allyl acetone	T-S	012	Beer (Note #1)	T	01E	Carbon tetrachloride wet	T-S
08	Allyl amine	G	012	Beer and beer mash (Note #1)	T	01E	Carbon tetrachloride, anhydrous	T-S
01E	Allyl chloride	G	012	Beer wort (Note #1)	T	11	Carbonic acid	G
08	Alpha Picoline	G	012	Beet sugar liquors	F	14	Carbon monoxide	G
13	Alum solution	G	04	Benzaldehyde	T-S	010	Castor oil	C
13	Aluminum chloride	G	01B	Benzene (Benzol)	T-S	012	Caustics	G
12	Aluminum hydroxide	G	012	Benzene & gas mixtures	T-S	010	Cellulosolve acetate	S
08	Amine: Diethanol amine	T-S	01A	Benzene (petroleum ether)	T-S	010	Chinawood oil	G
08	Amine: Monoethanol amine	T-S	08	Benzoic acid solution	G	15	Chlorox	C
012	Amine-fat condensate	S-G	07	Benzonitrile	G	01E	Chloroxel	T
08	Amines	T-S	01D	Benzyl alcohol	S-G	14	Chloric acid	T
14	Ammonia, anhydrous	G	01D	Benzyl chloride	T-S	01D	Chlorinated hydrocarbons	T
12	Ammonia, aqua	G	13	Bichloride of mercury	G	01D	Chlorinated polyphenyl	G
14	Ammonia gas	G	13	Bittern	G	01D	Chlorinated toluene	T-S
12	Ammonia, liquid	G	012	Black liquor	C	14	Chlorinated water	F
012	Ammonia, liquors & oil	G	012	Black sulphate liquors, to boiling	C	14	Chlorine, anhydrous liquid	T
13	Ammonium acid phosphate	G	012	Blood	F	14	Chlorine (dry)	T
13	Ammonium bifluoride	X-G	012	Boiler feed water	G	14	Chlorine (wet)	T
13	Ammonium bicarbonate	G	012	Bonderite solution	S-G	14	Chlorine gas (Chlorine Institute Sizes) (Note #3)	T
13	Ammonium bromide	G	13	Borax solution	G	01E	1-Chloro-1-nitropropane	S
13	Ammonium carbonate	G	11	Boric acid	F-G	02A	Chloroacetic acid	T
13	Ammonium chloride	G	13	Boron trichloride	T	01D	Chlorobenzene	T
13	Ammonium fluoride	G	13	Boron trifluoride	T	01D	Chlorobenzene, to boiling	T
12	Ammonium hydroxide	G	13	Brine (acid)	G	01E	Chloroethane	T
12	Ammonium nitrate	G	13	Brine, calcium chloride	C-G	01E	Chloroform	S
13	Ammonium nitrate, molten	G	13	Brine, copper chloride	G	06	Chloromethyl ether	T-S
13	Ammonium oxalate	G	13	Brine, sea water	G	01E	2-Chloropropane	T-S
13	Ammonium persulfate	G	13	Brine, sodium	G	11	Chlorosulfonic acid	T
13	Ammonium phosphate, dibasic	G	14	Bromine	T	01D	Chlorotoluene	T-S
13	Ammonium phosphate, monobasic	G	01D	Bromobenzene	T	01E	Chlorotrifluoroethylene	T
13	Ammonium phosphate, tribasic	G	012	Bunker "C" fuel oil	S	13	Chrome alum	G
13	Ammonium sulfate	G	01C	Butadiene	T-S	11	Chromic acid	T
13	Ammonium sulfite	G	01A	Butane	T-S	02C	Citric acid	F
13	Ammonium sulphate, to boiling	G	0-2	Butter milk	F	15	Clay slurries	G
13	Ammonium thiocyanate	G	09	Butyl acetate	T-S	012	Coca-Cola syrup	F
13	Ammonium thiohydride	G	07	Butyl alcohol	S-G	012	Cocoa butter	F
09	Amyl acetate	T-S	01E	Butyl chloride	T-S	0-2	Cocoonut, fatty acid	F

CHEMICALS / PACKINGS • class • liquid • packing (continued)

13	Copper cyanide	T-G	02B	Gulfic acid	S-G	13	Mercury salts	G
13	Copper nitrate	G	012	Gas oil	S	13	Mercurous nitrate	G
13	Copper sulfate (blue vitrol)	G	01A	Gasoline	S	05	Mesityl oxide	T-S
13	Copperas (Greens)	G	01B	Gasoline (aromatic)	S	07	Methanol	S-G
012	Core oils	G	01A	Gasoline (automotive grades)	S	09	Methyl acetate	S-G
010	Cottonseed oil	G	01A	Gasoline (benzene)	S	09	Methyl acrylate	S-G
012	Cressate	T	01A	Gasoline (ethyl)	S	07	Methyl alcohol	S-G
011	Cresol, meta	S	01A	Gasoline (100 Octane)	S	01E	Methial	T
011	Cresylic acid	S	01B	Gasoline (Hi-test)	S	01E	Methallyl chloride	T-S
13	Cuprous ammonia acetate	S	01A	Gasoline with mercaptan	S	07	Methyl alcohol	G
13	Cupric chloride	G	01A	Gasoline with H ₂ S	S	01E	Methyl bromide	T
13	Cyanide	T-S	012	Gelatin	F	012	Methyl cellosolve	S-G
14	Cyanogen chloride	G	012	Gerger ole	F	01E	Methyl chloride	S-G
08	Cyanohydrin	F	02C	Glacial acetic acid	T	012	N-methyl chloro-ethane	S
01A	Cyclohexane	S	13	Glaubers salt	G	06	Methyl ether	S
05	Cyclohexanone	S	012	Glue	G	05	Methyl ethyl ketone	T
012	DDT Solutions (kerosene solvent)	S	012	Glue (acid)	G	09	Methyl formate	S-G
012	DDT Solutions (toluene solvent)	S	012	Glue sizing	G	05	Methyl iso-butyl ketone	T-S
010	DNC (Dinitrochloro benzene)	T	012	Glucose	F	09	Methyl methacrylate (Note #5)	T-S
012	De-Butanizer reflux	S-G	07	Glycerine (glycerol)	G-F	09	Methyl propionate	S
012	De-Ethanolizer charge	S	012	Grain mash	G-F	08	Methylamide (hot)	S
012	De-Propanizer reflux	S	012	Grease	G	01E	Methylene chloride	S-G
012	Developer Solution	T	012	Green liquor	G	012	Milk	F
05	Diacetone	S-G	01E	Halowax 1000	G	01A	Mineral oil	S
012	Dibutyl cellosolve adipate	S-G	01A	Heptane	S	01A	Mineral spirits	S
09	Dibutyl phthalate	S	05	Hexachlore acetane	S	012	Micellus	T
09	Dibutyl sebacate	S	01A	Hexane	S	11	Mixed acids (HNO ₃ -H ₂ SO ₄)	X
01E	Dichlorobutane	T-S	05	Hazone (milk)	T-S	012	Melasses	F
01E	Dichloroethane	S	012	Hollingshead H-2	G	08	Mono ethanalamine (with copper sulphate)	S-G
06	Dichloroethyl ether	T-S	11	Hydrofluoric acid	T	01D	Monochloro-benzene	S
01E	Dichlorohexafluorocyclobutane	T-S	11	Hydrobromic acid	T	012	Mustard	F
01E	Dichloropropylene	S	01A	Hydrocarbons (light)	S	01A	Naphtha	S
01D	Dichlorotoluene	S	11	Hydrochloric acid	T	01A	Naphtha, sour or gasoline (trace H ₂ S)	S
01A	Dicyclopentadiene	S	15	Hydrocyanic acid	T-S	01A	Naphtha, Vmp	S
012	Diesel fuel	S-G	11	Hydrofluoric acid (anhydrous)	T	02B	Naphthalene sulphonic acid	T-S
08	Diethanolamine	S-G	11	Hydrofluosilicic acid	T-S	01B	Naphthalene	S
01A	Diethyl carbitol	S	02D	Hydroformic acid	T-S	02B	Naphthalenic acid, to hot	T-S
012	Diethyl carbonate	S	14	Hydrogen	G	012	Natural gas	S
012	Diethyl cellosolve	S	14	Hydrogen cyanide	T-S	13	Nickel chloride	G
08	Diethylamine	S	14	Hydrogen fluoride	X	13	Nickel sulfate	G
07	Diethylene glycol	S-G	15	Hydrogen peroxide	T-S	012	Nicotine sulfate	G
08	Diethylenetriamine	S	15	Hydrogen sulfide	S	11	Nitrating acids	X
04	Dimethyl formaldehyde	S-G	15	Hydrogen sulfide & organic sulfur compounds	S	11	Nitric acid	X
08	Dimethyl hydrazine	S-G	15	Hydrogen & water	G	012	Nitr cake (fused)	G
012	Dinitrochloro benzene & styrene	T-S	011	Hydroquinone	G	11	Nitric acid fuming	X
010	Dinitrochlorobenzene	T-S	02C	Hydroxy-acetic acid	T	01A	Nitro methane	T-S
08	Diethyl amine	S	012	Ink	G	08	Nitrobenzene	T-S
06	Diethyl phthalate	S	012	Insecticides	G	08	Nitroethane	T-S
01A	Dioxane	S-G	01E	Iodoform	S-G	14	Nitrogen	S
01B	Diphenyl	T	01E	Iodoform	S	14	Nitrogen gas	G
010	Diphenyl, chlorinated	T	01A	Iso-butane	S	08	Nitromethane	S
05	Diisobutyl ketone	T-S	05	Iso-butyl methyl ketone	T-S	08	Nitropropane	S
012	Dector solutions	C	01C	Iso-butylene	S	11	Nitrous acid	T
012	Dow Corning silicone fluid	G	01A	Iso-pentane	S	012	Oakite	G
012	Dowtherm "A" (Note #4)	T	09	Iso-propyl acetate	S	012	Oil, air corps hydraulic	T-S
012	Dowtherm "E" (Note #4)	T	07	Iso-propyl alcohol	S-G	012	Oil, asphalt	S-G
012	Dyedwood liquors	G	08	Iso-propyl amine	S-G	012	Oil, asphalt base	S-G
04	Embalming fluid	G	05	Iso-propyl ether	S	012	Oil, Bunker C fuel	S
09	Ester type plasticizer	T	01A	Kerosene	S	010	Oil, Chinawood (tung)	S-G
01A	Ethane	S	012	Ketchup	F	010	Oil, coconut	S-G
07	Ethanol	G	012	Lacquer in ketone solvents	T-S	010	Oil, cotton seed	S
08	Ethanolamine	S	012	Lacquer solvents	T-S	012	Oil, crude (asphalt base)	S
06	Ether	S	012	Lacquers, hot	S	012	Oil, crude (corrosive)	S
09	Ethyl acetate	S	02C	Lactic acid	F	012	Oil, crude (paraffin base)	S
09	Ethyl acrylate	S	010	Lard	F	012	Oil, crude (sweet)	S
07	Ethyl alcohol	G	012	Latex	G	012	Oil, cutting (soluble)	S
01E	Ethyl chloride	S	13	Lead nitrate	G	012	Oil, Diesel	S
06	Ethyl ether	S	12	Lime slurries	G	012	Oil, domestic fuel	S
09	Ethyl formate	S	15	Lime-sulfur	G	012	Oil, fuel & gas	S
012	Ethyl mercaptan	S	12	Lime water (milk of lime)	G	012	Oil, #6 fuel	S
09	Ethyl-n-butylate	S	09	Lindol (triacetol phosphate)	S	012	Oil, fuel	S-G
01E	Ethyl bichloride	S	010	Linsed oil	S	012	Oil, hydraulic	S
09	Ethyl propionate	S-G	012	Liquid cyanide	T-S	012	Oil, hydraulic (mineral base)	S
09	Ethyl sulphate	S-G	012	Liquid latex & gaseous butadiene	T-S	012	Oil, kerosene	S
01E	Ethylene chloride	T-S	012	Liquor, black	C	010	Oil, linseed	S
012	Ethylene chlorohydrin	S	012	Liquor, green	C	01A	Oil, lubricating	S
01E	Ethylene dichloride	T	012	Liquor, lime	C	01A	Oil, mineral	S
07	Ethylene glycol	G	012	Liquor steep	C	01A	Oil, mineral seal	S-G
08	Ethyl pyridine	S-G	012	Liquor sulphate	C	010	Oil, nut	S-G
03	Fatty acids	G	012	Liquor white	C	010	Oil, palm	S-G
13	Ferric chloride	G	13	Lithium bromide brine	G	01A	Oil, paraffin base	S
13	Ferric nitrate	G	13	Lithium chloride	G	010	Oil, peanut	S-G
13	Ferric sulfate	G	012	Lubricating oils, hot	S	012	Oil, quenching	S
13	Ferrous sulfate (Green Copperas)	G	12	Lye, caustic	T	010	Oil, rapeseed	S-G
13, 12	Ferrous sulphate & lime	G	011	Lysol	T-S	012	Oil with refrigerants	S-G
012	Film dope	S-G	13	Magnesium chloride	G	012	Oil, rich	S-G
012	Fish oils	S	13	Magnesium hydroxide	G	012	Oil, silicone	S
04	Formaldehyde or formalin	S-G	13	Magnesium oxychloride	G	010	Oil, soy bean	S-G
02A	Formic acid	S-G	13	Magnesium sulfate (epsom salts)	G-F	01A	Oil transformer	T-S
01E	Freon 11	S-G	02C	Maleic acid	T	010	Oil vegetable	S
01E	Freon 12	S-G	08	Maleic hydrazide	T-S	012	Oil and Freon (11 & 12)	T-S
0 E	Freon 121	S-G	012	Malt beverages (Note #1)	T-F	012	Oil and Freon (22)	T-S
0 2	Freon 12 and refrigeration oil	S-G	13	Manganese chloride	G	012	Oil and methylene chloride	S-G
0 2	Freon 22 and refrigeration oil	S-G	012	Mash (Note #1)	T	012	Oil and sulphur dioxide	T-S
012	Freon 113 and 114	S-G	010	Mayonnaise	F	02B	Oleic acid	S-G
012	Freons-liquids	S-G	012	Meat products	F	01C	Olefin (crude)	S
012	Fruit juices	F	012	Melamine resins	G	11	Oleum	X
012	Fuel oil	S	0 2	Mercaptan	G	02C	Oxalic acid	T-S
04	Furfural	S-G	15	Mercuric chloride	G	14	Oxygen (Note #6)	X
01A	Furn	S-G	15	Mercury	G	14	Ozone	G

CHEMICALS / PACKINGS • class • liquid • packing (continued)

03A	Palmic acid	G	012	Resins	G	13	Sulfur chloride	T
012	Paracymene	G	13	Salt ammoniac	G	14	Sulfur dioxide (wet)	T
012	Paraffin, hot	G	13	Salt cake	T-G	14	Sulfur dioxide, anhydrous liquid	T
012	Paraffin Wax 60%	G	012	Santizer 8	S-G	14	Sulfur trioxide	T
012	Paragard Compound	F	012	Santizer B-16	S-G	11	Sulfuric acid (Note #7)	X
012	Peatin liquor	F	012	Santizer E-15	S-G	11	Sulfurous acid	T-S
012	Penicillin	F	012	Santizer M-17	S-G	012	Sulphite pulp	P
01E	Pentachloroethane	S	012	Santolube 31	S-G	012	Sulphonated fatty alcohol	S-G
011	Pentachlorophenol	S	13	Sea water	G	012	Sulphonated vegetable oils	G
01A	Pentane	S	012	Sewage	G	13	Sulphur (molten)	G
07	Pentastal	F	012	Silicone fluid	S	13	Sulphur chloride	T
01E	Perchlorethylene	T	14	Silicon tetrachloride	T	14	Sulphur dioxide & water vapor	T-S
012	Perchlorethylene & filter aid	T-S	13	Silver bromide	S	012	Syrup (high sugar)	F
09	Perfume	T-S	13	Silver chloride	T	010	Tallow	P-G
11	Perchloric acid	T-S	13	Silver nitrate	G	02B	Tannic acid	G
08	Perfluorotriethylamine	S	012	Slop, brewery	G	012	Tanning liquors (veg)	G
15	Peroxide of hydrogen	G	012	Slop, distillers	G	012	Tar	S
01A	Petroleum ether	T-S	012	Sludge acid	T-S	02C	Tartaric acid	G
011	Phenol	T-S	012	Soap	C	02B	Terephthalic acid (water slurry 10% N. acid)	T-S
012	Phenol, formaldehyde mix	T-S	13	Soda ash (sodium carbonate)	G	01E	Tetrachloroethylene	T-S
012	Phenolic sulphonate	S	12	Soda, caustic	C	01E	Tetrachloroethane	T-S
02B, 02C	Phenylacetic acid	T	012	Soap liquor	C	01E	Sym-tetrachloroethane	T-S
012	Phenylstyrylmalonic ester	S	13	Sodium acetate	S	01A	Tetrahydrofuran	T-S
14	Phasene	T-S	13	Sodium aluminate	G	012	Tetraethyl lead	T-S
11	Phosphoric acid	T-S	13	Sodium aluminate lime	G	012	Thiamin solution	F-S
11	Phosphoric acid, crude	T-S	13	Sodium bicarbonate or baking soda	F	13	Titanium tetrachloride	T-S
11	Phosphoric anhydride	T-S	13	Sodium bichromate	G	01B	Toluene or taluel	T-S
15	Phosphorus (liquid) hot	T-S	13	Sodium bisulfate	T-S	012	Tomato juice	F
012	Photographic developers	T-S	13	Sodium bisulfite	T-S	01E	Trichloropropane	S
09	Phthalate esters	T-S	13	Sodium bromide	G	01E	Trichlorethylene (dry)	T-S
020	Phthalic anhydride	S	13	Sodium carbonate	G	01E	Trichlorethylene (wet)	T-S
011	Picric acid	S	13	Sodium chloride	G	01E	Trichloroethane	T-S
011	Picric acid, molten	S	09	Sodium glutamate	F	09	Tricresyl phosphate	S
012	Pine gum (hot)	G	13	Sodium cyanamide	T-S	08	Triethylamine	S
012	Pineapple juice	F	13	Sodium cyanide	T-S	13	Triethylamine phosphate	G
08	Piperidine	G	13	Sodium dichromate	G	012	Turpentine	S
012	Plasticizer (liquid dibutyl)	S	13	Sodium dichromate & water	G	012	Ucon Hydrolubes	G
012	Plating solution	S	13	Sodium ethylate	G	08	Urea	S
07	Polyglycol	G-S	13	Sodium fluoride	G	011	Urea & Phenolic resins	S-G
012	Polyvinyl acetate	S	13	Sodium hydrosulfite	C	012	Urine	S
13	Potash alum	G	13	Sodium hydroxide	C	012	Varnish	S
13	Potassium bicarbonate, to boiling	G	12	Sodium hydroxide (Dorco's Solution)	C	012	Vegetables, juices	F
13	Potassium bromide	G	12	Sodium hydroxide over 180F	S	010	Vegetables, oils	F
13	Potassium bicarbonate	F	15	Sodium hypochlorite	C	11	Vinegar	F
13	Potassium carbonate	G	09	Sodium lactate	C	012	Vinyl acetate (Note #5)	S
13	Potassium carbonate, to boiling	G	13	Sodium metaphosphate	G	012	Vinyl chloride	S
13	Potassium chlorate	G	13	Sodium nitrate	G	012	Vinyl chloride gas	S
13	Potassium cyanide	G	09	Sodium oleate	G	08	Vinyl pyridine	T-S
13	Potassium dichromate, to boiling	G	13	Sodium perborate	C	01E	Vinylidene chloride	T
13	Potassium ferriyanide, to boiling	G	13	Sodium peroxide	T-S	11	Vitral, oil of	X
13	Potassium hydroxide	C	13	Sodium peroxide solution	G	15	Water (acid, mine, nonoxidizing)	T-S
12	Potassium hypochlorite	G	13	Sodium phosphate (D1)	G	15	Water (acid, mine-oxidizing)	T-S
13	Potassium iodide	G	13	Sodium phosphate (mono)	G	15	Water (boiler feed)	G
13	Potassium nitrate	G	13	Sodium phosphate, to boiling	G	15	Water (brackish)	G
13	Potassium sulfate	G	13	Sodium phosphate (tri)	G	15	Water (chilled air, washing)	G
09	Potassium persulfate	T	13	Sodium polysulfide	G	15	Water (chilled condenser service)	G
13	Potassium permanganate	G	13	Sodium sulfide	G	15	Water (cooling tower)	G
13	Potassium phosphate	G	13	Sodium sulfite	G	15	Water (de-ionized)	G
13	Potassium phosphate, di- or tri-	G	012	Sodium sulfite	G	15	Water (detergent)	G
13	Potassium sulfate	G	09	Sodium sulfolite	G	15	Water (distilled)	G
13	Potassium sulfide	S	13	Sodium sulfonate	G	15	Water (grit, carrying, cool)	G
14	Producer gas	S	13	Sodium sulfite	G	15	Water (fresh, clean, cool)	G
012	Propane	S	13	Sodium sulfite	G	012	Water (soapy)	G
04	Propionaldehyde	T-S	13	Sodium sulfite	G	15	Water (to boiling)	G
02A	Propionic acid	S-G	13	Sodium tetraborate (Borax)	G	012	Water (with soluble oil)	G
01C	Propylene	S-G	13	Sodium thiosulfate	G	010	Wax, hot	G
01E	Propylene chloride	S	13	Sodium thiosulfate or "Hypo"	G	010	Wax, slurry	G
01E	Propylene dichloride	S	012	Solvasol	S	012	Whey	F
07	Propylene glycol	F	07	Sorbitol	S-G	07	Whiskey	F
09	N-propyl acetate	S	13	Stannic chloride	S-G	012	White liquor	P
06	N-propyl ether	S	13	Stannous chloride	G	07	Wine	F
09	N-propyl formate	S	012	Starch slurry	F	012	White water	P
09	N-propyl propanoate	S	15	Steam	G	012	Wort (Note #1)	T
07	Propylene glycol	F	03A, 03B	Stearic acid	G	01B	Xylene or xylol	T-S
012	Propylene oxide	S	01A	Stoddard Solvent	S	012	Zeln	G
012	Propylene polymer	S-G	01B	Styrene (Note #5)	S	15	Zeo-lite, treated water	G
08	Pulp stock	P	01B, 01D	Styrene & dinitrochlorobenzene	S	13	Zinc chloride	G
08	Pyridine	S	012	Sugar liquors & solutions	F	13	Zinc cyanide	G
012	Pyroligneous acid	T-S	012	Sulfate liquors, Kraft	C-P	13	Zinc nitrate	G
07	Pyrene	S	15	Sulfur molten	T	13	Zinc sulfate	G
012	Quinine bisulfate	S					Zinc sulphate (to boiling)	G
012	Quinine sulphate	S						
012	Resins, hot	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 #2023 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 last 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	INORGANIC	J-M Code
Hydrocarbons	01	Acids	11
Aliphatic	01A	Bases	12
Aromatic	01B	Salts	13
Unsaturated	01C	Gases	14
Aromatic Halogenated	01D	Commercial and misc.	15
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		

* 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 ("01A" 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	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"	Max. Size
2	1/4	3/4	1 1/2	2 1/2	3 1/2	5 1/2	7	8 1/2	11	13 1/2	22	25	33	3
4	1/4	1 1/4	2 1/4	5	9	12 1/2	15	18	22	29	40	54	74	
6	1/4	1 1/2	2 1/2	3 1/2	5 1/2	8 1/2	11	13 1/2	18	22	25	33	46	2 1/2
7	1/4	1	2 1/2	4 1/2	7	10	14	17	20	24	35	47	65	2
10	1/4	2 1/2	4	6 1/4	8	11	13	16	20	25	36	52	62	2 1/2
11	1/4	1 1/4	2 1/4	5	8 1/4	11 1/2	16	20	24	27	40	55	72	2
13	1/4	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	1/4	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	1/4	1	2 1/2	4 1/2	7	10	13	17	20	24	35	47	65	2
19	1/4	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	1/4	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	3/4	—	—	—	—	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	1/4	—	—	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 3/4	—	9 1/4	13 1/2	17 1/4	22	27	39	53	69	1 1/2
172	1/4	—	—	4 3/4	—	9 1/4	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 1/4	—	8 1/4	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	1/4	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	1/4	1	2	3 1/2	5 1/4	7	10	12 1/2	16	20	28	40	53	3
223	1/2	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"	5/8"	3/4"	7/8"	1"	1 1/4"	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 1/4"
254	1/4"	—	—	4 1/2"	7	10	14	18	21	24	32	46	65	1 1/4"
255	1/4"	—	—	4 1/2"	7	10	14	18	21	24	32	46	65	1 1/4"
257	1/4"	—	—	6	9	13	18	23	28	32	42	62	86	1 1/4"
263	1/4"	—	—	4 1/2"	7	10	14	18	21	24	32	46	65	1 1/4"
270	1/4"	—	—	4 1/2"	7	10	14	18	21	24	32	46	65	1 1/4"
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	3/8"	—	11	17	24	34	49	63	82	100	152	200	245	1 1/2"
285						Cord—See page 52								
293	3/8"	1	2 1/2	4	5 1/2	8	10 1/2	13	17	21	32	36	50	2
322	1/2"	1	2	3 1/2	5 1/4	7	10	12 1/2	16	20	28	38	50	3
323	1/2"	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	3/8"	—	4	5 1/2	10	17	20	23	32	40	52	68	97	1
350	3/8"	—	10	17	26	34	42	50	58	66	82	99	114	1 1/4"
351	3/8"	—	10	17	26	34	42	50	58	66	82	99	114	1 1/4"
360	3/8"	—	8 1/2	16	24	36	50	64	84	104	156	212	272	1
379	3/8"	—	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	1/4"	1 1/2	3 1/2	5	7 1/4	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	1/4"	3/2	1 1/4	2	3	5	6	7	10	14	16	25	34	3
580	3/8"	—	1 1/2	3	5	7 1/2	9	10 1/2	14	17	30	37	51	2 1/2
581	3/8"	—	1 1/4	4 1/2	6 1/2	9	10 1/4	12 1/2	16	19	33	42	56	2 1/2
587	1/2"	1 1/2	2 1/2	3 1/2	4 3/4	8	12 1/2	17	—	—	—	—	—	2
702	1/2"	3/2	1 1/4	2	3	5	7	9	11	14	20	25	34	3
733	1/2"	1	1 1/4	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	1/2"	1	2	3	5	7	10	14	15	16	25	34	40	2 1/2
788	1/2"	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	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/2"	Max. Size
857	1/4	1/4	1 1/2	2	3	6	7	8	11	15	19	27	36	3
866	1/4	1	2	3	6	Groove Packing—See page 52			17	19	27	36	50	2 1/2
869	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Groove Packing—See page 52			21	25	34	50	66	2 1/2
872	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
873	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
1000	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
1003G	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
1009A	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
1012M	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
1050R	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			21	24	32	46	65	1 3/4
2004	1/4	1 1/2	2 1/4	3 1/4	7 1/4	12	15 1/2	20	26	31	43 1/2	58	74	—
2005	1/4	1 1/2	2 1/4	3 1/4	7 1/4	11 3/4	12 1/4	23 1/2	—	—	—	—	—	—
2006	1/4	1 1/2	2 1/4	3 1/4	7 1/4	12 1/2	16 1/2	21 1/2	27	32 1/2	45	58 1/2	75	—
2007	1/4	1 1/2	2 1/4	3 1/4	7 1/4	15	22	27 1/2	—	—	—	—	—	—
2008	1/4	1 1/2	2 1/4	3 1/4	7 1/4	8	12	15	19	22	34	51	62	1 3/4
2009	1/4	1 1/2	2 1/4	3 1/4	7 1/4	10 1/4	14	17	21	25	35	56	68	1 3/4
2011	1/4	1 1/2	2 1/4	3 1/4	7 1/4	9 1/2	11	17	22	31	40	50	55	2 1/2
2012	1/4	1 1/2	2 1/4	3 1/4	7 1/4	9	13	16	21	26	35	45	55	2 1/2
2013	1/4	1 1/2	2 1/4	3 1/4	7 1/4	6 1/2	11	16	19	22	39	—	—	2 1/2
2014	1/4	1 1/2	2 1/4	3 1/4	7 1/4	11	15	18	21	24	30	—	—	2 1/2
2016	1/4	1 1/2	2 1/4	3 1/4	7 1/4	8	11	14	18	22	32	44	55	1 1/2
2017	1/4	1 1/2	2 1/4	3 1/4	7 1/4	8 3/4	12	16	21	25	37	49	59	2 1/2
2018	1/4	1 1/2	2 1/4	3 1/4	7 1/4	9 1/4	14	19	24	28	43	52	64	2
2020	1/4	1 1/2	2 1/4	3 1/4	7 1/4	8 3/4	11	14	19	24	32	48	58	2 1/2
2021	1/4	1 1/2	2 1/4	3 1/4	7 1/4	9 1/4	12	15	21	26	36	50	65	2
2022	1/4	1 1/2	2 1/4	3 1/4	7 1/4	35	40	46	60	75	102	135	165	1 1/4
2024	1/4	1 1/2	2 1/4	3 1/4	7 1/4	11	14 1/2	16	24	33	40	50	60	2 1/2
2031	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Tape—See page 53			24	33	40	50	60	2 1/2
2032	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Tape—See page 53			24	33	40	50	60	2 1/2
2035	1/4	1 1/2	2 1/4	3 1/4	7 1/4	8 3/4	11	14	19	24	32	48	58	2 1/2
2036	1/4	1 1/2	2 1/4	3 1/4	7 1/4	9 1/4	12	20	26	36	50	60	—	2
2300	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			26	36	50	60	—	2
2559	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Groove Packing—See page 52			26	36	50	60	—	2
2700	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			26	36	50	60	—	2
3123	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Groove Packing—See page 52			26	36	50	60	—	2
4180	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	12	15 1/2	23	26 1/2	2
4185	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	12	15 1/2	23	26 1/2	2
4186	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	12	15 1/2	23	26 1/2	2
4188*	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	12 1/2	16 1/2	—	31	2
4196	1/4	1 1/2	2 1/4	3 1/4	7 1/4	1/4 and up, see Thermo-Pac 500, page 53			—	—	—	—	—	2
4197	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	—	—	—	—	2
4198	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	—	—	—	—	2
4199	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Wick—See page 32			—	—	—	—	—	2
4200	1/4	1 1/2	2 1/4	3 1/4	7 1/4	1/4 and up, see Thermo-Pac 1000, page 53			—	—	—	—	—	2
4201	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Packing Set—See page 27			—	—	—	—	—	2
Blue	1/4	1 1/2	2 1/4	3 1/4	7 1/4	Thermo-Pac—See page 53			—	—	—	—	—	2

* Style 4188 is also available in 1 1/4" (40 lbs.) and 1 1/2" (56 lbs.)

continued

FBW-221

Johns-Manville MECHANICAL PACKINGS (continued)

RAMIE and FLAX

Approximate Weights—Pounds per 100 Feet

SIZES															
Style	Min. Size	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"	Max. Size
175	1/8"	3	4 1/2	6 1/2	12	18	26	47	60	73	89	106	124	142	186
175N	1/8"	3	4 1/2	6 1/2	12	18	26	47	60	73	89	106	124	142	186
180	1/8"	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160
181	1/8"	4	6	8	14	22	32	53	66	79	93	108	122	136	164
188	1/8"	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160
189	1/8"	3 1/2	6	7 1/2	12	20	28	48	61	73	88	102	117	132	160
190	1/8"	3 1/2	5 1/2	7 1/2	11 1/4	18	28	51	64	78	89	120	—	—	—
240	1/8"	4	6	8	14	22	32	53	66	79	93	108	122	136	164
245	1/8"	3 1/2	5 1/2	7 1/2	11 1/4	18	28	51	64	78	89	120	—	—	—

GROOVE PACKINGS—Square Cross-Section

Approximate Weights—Pounds per 100 Feet

SIZES										
Style	Min. Size	1/4"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	Max. Size
*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	1/4"	6	7 1/2	12	25	50	100	—	—	3/4
3123	1/4"	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

SIZES										
Style	3/8" x 1/2"	3/8" x 3/4"	1/2" x 3/8"	1/2" x 1"	3/4" x 3/8"	3/4" x 1 1/4"	3/4" x 1"	3/4" x 1 1/2"	1" x 1 1/2"	1" x 2"
128	—	—	—	35	—	—	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

SIZES										
Style	Min. Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/2"	Max. Size
274	1/2"	—	20	70	147	233	303	556	835	11.11
276	1/2"	—	14	54	86	200	250	357	503	6.25
285	1/2"	—	20	80	175	263	357	588	919	12.50
487	1/2"	—	20	80	175	263	357	588	919	12.50

FBW-222

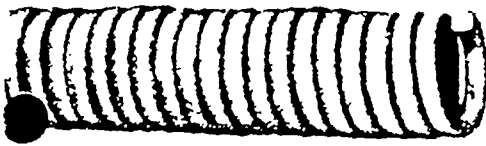
Johns-Manville MECHANICAL PACKINGS (continued)
GASKETING TAPES
Approximate Weights—Pounds per 100 Feet

SIZES							
Style	Width (in.)	Thickness					Maximum Width
		1/8"	1/4"	3/8"	1/2"	3/4"	
119 120	1/2	2 1/4	5 1/2	7 1/2	10	12	24"
	1	4 1/4	10 1/2	14 1/2	22	25	
	2	8 1/4	20 1/2	29	43	49	
	3	13	31	43	60	75	
121	1/2	1 1/2	4 1/2	6	8	9	24"
	1	3	8	12 1/2	17	18 1/2	
	2	5 1/2	15	25	33	37	
	3	9	24	38	50	56	
122	1/2	1/2	3	5	6 1/2	8	24"
	1	3	6	10 1/2	13	15 1/2	
	2	5	13	21	26	31	
	3	8	20	32	39	47	
131	1	2 1/4	6	—	—	—	3"
	2	5 1/2	12	—	—	—	
	3	8	18	—	—	—	
132	1	2	5	—	—	—	3"
	2	4 1/2	10	—	—	—	
	3	6 1/2	15	—	—	—	
141 2031	1/2	2	5 1/2	8	11	12	24"
	1	4	11	17	23	25	
	2	8	23	34	44	50	
	3	12	34	51	67	75	
142 2032	1/2	1 1/2	5 1/2	6 3/4	8 3/4	11	24"
	1	3 1/2	9 1/2	14	17	21	
	2	6 3/4	20	28	35	42	
	3	10	30	43	52	63	
Inconel		Sold on lineal foot basis only					

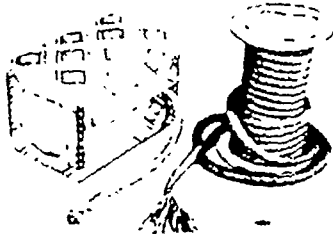
THERMO-PAC ROPE
Approximate Weights—Pounds per 100 Feet

SIZES															
Style	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"
500	3/4	1 1/4	1 3/4	4	7	10	14	20	25	33	40	50	67	93	114
750	—	—	1 3/4	4	7	10	12	15 1/2	23	26 1/2	30	38	53	59	77
1000	3/4	1 1/2	2 1/2	5	7 1/2	10	14	20	25	33	40	45	67	93	114
2300	—	—	3/4	2 1/4	—	3 1/4	5	7	9	15	—	19	26	36	45
2700	—	—	3/4	2 1/4	—	3 1/4	5	7	9	15	—	19	26	36	45
Blue	—	—	2	6	—	10	16	20	27	33	40	45	67	93	114

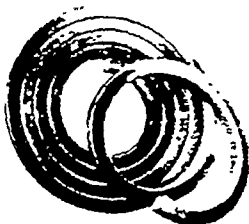
FBW-223



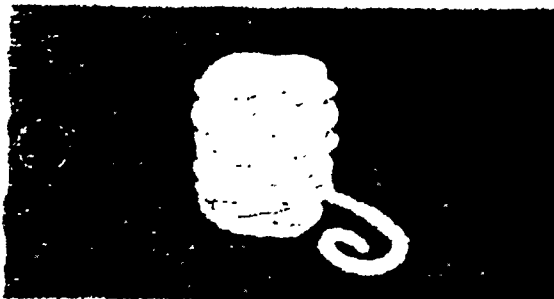
SPIRALS



SPOOLS



FLAT COILS



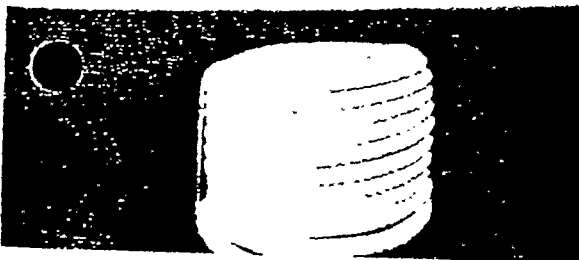
One pound BALLS



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 Hopkins

FBW-226