A.I.A. FILE NO. 37-D

Johns-Manville

+3000F

INSULATION

PRODUCTS INFORMATION

-400F

HIGH TEMPERATURE

PLUMBING, HEATING & AIR CONDITIONING

REFRIGERATION

INSULATING FIRE BRICK

REFRACTORY PRODUCTS

FINISHES & WEATHERPROOFING MATERIALS

ASBESTOS PAPER & MILLBOARD

A.I.A. FILE NO. 37-D

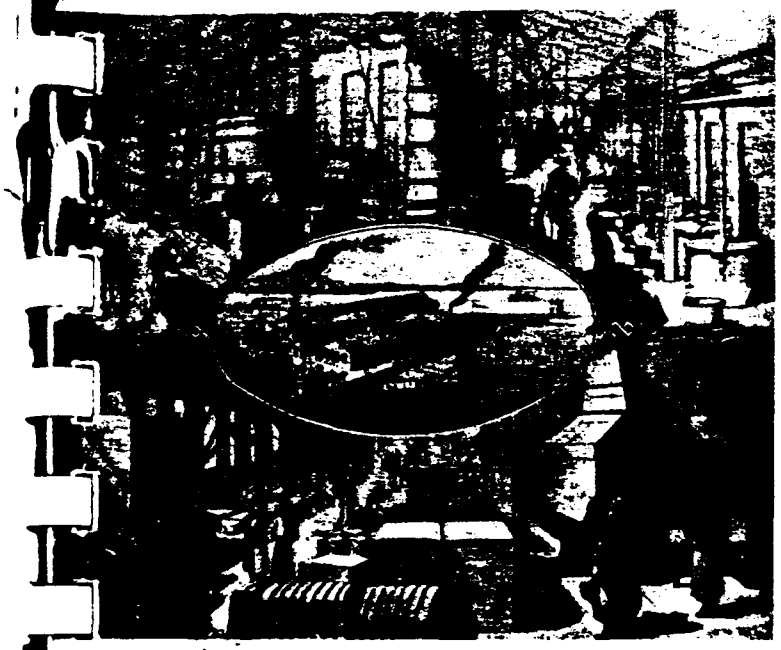
"There's a Johns Manville product for every commercial or industrial purpose
ask for it!

JM

Johns-Manville brings you the benefit of more than a century's experience in the development and manufacture of quality insulating materials...

CE/HI (P) 32410

Since 1858, Johns-Manville has been adding to its knowledge of how to manufacture better insulating materials to meet the increasingly exacting demands of industry. During this hundred year period it has developed and improved methods and machines for manufacturing insulations and accessory materials for every industrial and commercial requirement. Today, Johns-Manville operates thirty-three manufacturing plants and three mines.



The plants, of which the one at Waukegan, Illinois, illustrated at the left, is a typical example, are strategically located to provide the best possible service in all sections of the country. Modern methods of mass production and quality control assure product uniformity and top value for your insulation dollar. From these busy plants flow the Johns-Manville quality insulating materials that contribute so much to the efficient and economical operation of American Industry.

WILLIAM E. WAGNER

INDUSTRIAL INSULATIONS DIVISION
JOHNS-MANVILLE

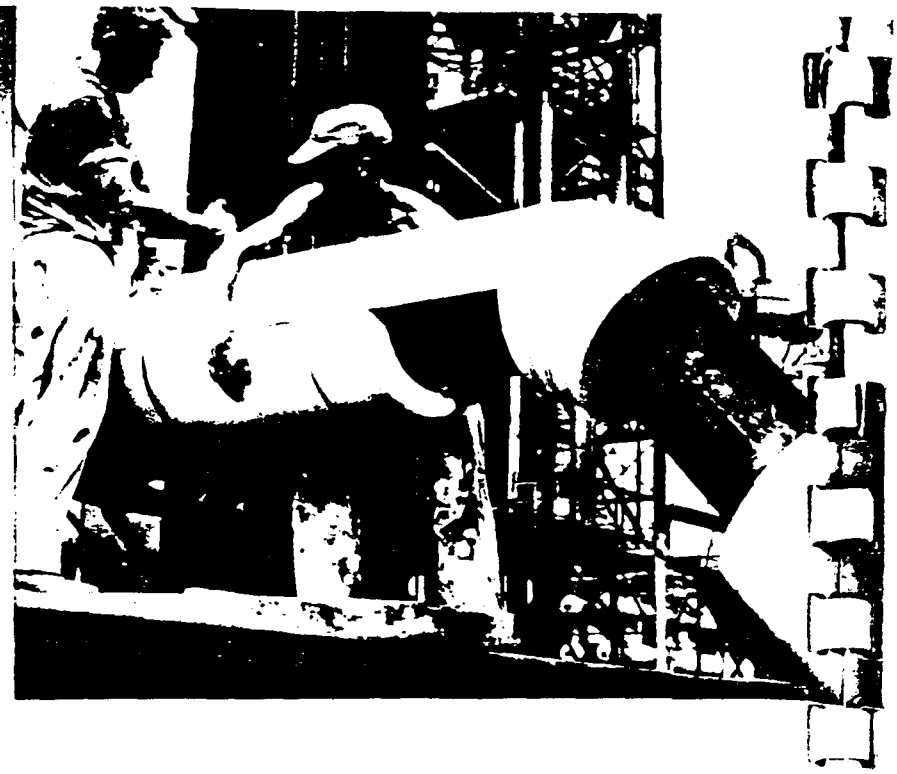
2010 McGEE TRAFFICWAY
KANSAS CITY 3, MO.
TEL: GRAND 1-0202

TABLE OF CONTENTS

CE/HI (P) 32411

Johns-Manville

PRODUCT INFORMATION



type: Pipe & Block
temp limit: 1200F

J-M THERMOBESTOS® pipe and block insulation

■ **DESCRIPTION:** A molded, high temperature pipe and block insulation. J-M Thermobestos is composed of hydrous calcium silicate bonded with asbestos fibers. It is a completely inorganic insulating material which, because of its light weight, low thermal conductivity, great structural strength and insolubility in water, is ideal for high temperature piping and equipment.

■ **AVAILABLE FORMS:** Thermobestos is furnished in both sectional pipe insulation and block form. The pipe insulation comes in a complete selection of sizes up to 24" x 3" half-sections. Larger sizes are available in quad segments from 25" to 33" P S in 1½, 2, 2½ and 3" thicknesses. Bevelled blocks are available for larger diameters. Regular blocks furnished in 6" x 36" and 12" x 36" sizes, in a full range of thicknesses.

■ **USES:** Especially recommended for use in the power generation and process industries on indoor and outdoor piping and equipment operating at temperatures to 1200F. Thermobestos is light enough for easy handling and fast application. Repeated wettings have no permanent effect on it which makes it ideal for installations subjected to weather, or for insulating underground steam lines. Because it will not burn or carry flame, it may also be advantageously specified for use in the presence of inflammable gases and liquids.

■ **ADVANTAGES**

Exceptional Strength

Similar in chemistry and composition to a very fine concrete, Thermobestos will withstand unusual operating abuse without appreciable damage.

Extreme Lightness

Thermobestos is as light as many insulating materials possessing a fraction of its strength and durability.

Chemically Stable

100% inorganic, will neither burn nor rot.

Not Damaged by Water

Can be soaked in water without damage. After drying, conductivity will be as good as new.

Easy Application

Thermobestos is purposely made in large blocks and half-sections to facilitate handling and reduce number of joints.

Low Conductivity

Thermobestos offers the lowest *k* factor of all insulations in general use throughout the power generation and process industries.

CE/HI (P) 32412

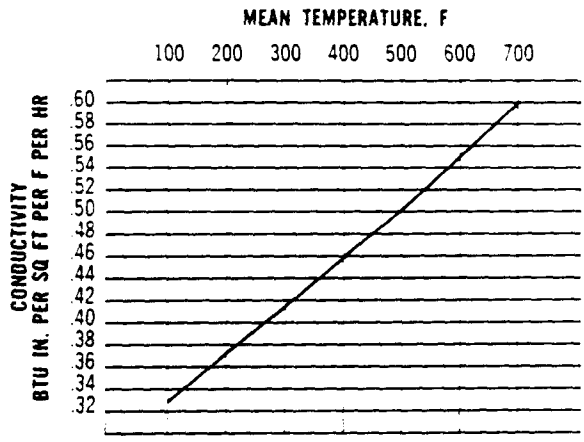
THERMOBESTOS

PHYSICAL PROPERTIES*

Density (dry)	11 lbs per cu ft
Transverse Strength (modulus of rupture)	95 psi
Compressive Strength (based on 2" thickness of block)	165 psi to produce 5% compression
Linear Shrinkage	1.5% after 24-hr soaking period at 1200F
Maximum Service Temperature	1200F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

Pipe Insulation:

MIL-I-2781
- Grade I, class b, to 500F
- Grade II, class d, to 750F
- Grade III, class e, type I and II, to 1050F

FEDERAL HH-I-523 Class 2, to 1200F

Block Insulation:

MIL-I-2819
- Class a, to 500F
- Class b, to 1000F

FEDERAL HH-I-523 Class 1, to 1200F

COMPLIANCE WITH ASTM STANDARDS

Pipe Insulation:

C345-54T, to 1200F

Block Insulation:

C344-54T, to 1200F

CE/HI (P) 32413

THERMOBESTOS
Specification Data

Pipe Insulation

RECOMMENDED THICKNESSES

*At temperatures above 600 F, pipe expansion is a significant factor. For best results pipe insulation should be applied in double-layer construction with staggered joints for all temperatures above 600 F. This construction prevents excessive heat losses and surface temperatures at the joints, opened by pipe expansion, thus eliminating scorched or burned jackets. The construction also eliminates the potential fire hazard of exposing jackets to higher temperatures at the joints. Double-layer, staggered joint construction also minimizes thermal stresses in the insulation by reducing the temperature differential across each layer. **Available in single or double-layer.

Nominal Pipe Size, inches	Temperature of Pipe, F: 100 to 199	200 to 299	300 to 399	400 to 499	500 to 599	600 to 699*	700 to 799*	800 to 899*	900 to 999*	1000 to 1099*	1100 to 1200*
	Nominal Thickness, inches										
Utility—Steam Generation											
1½ & less	1	1	1½	2**	2**	2½	2½	2½	3	3	3
2	1	1	1½	2**	2**	2½	2½	3	3	3	3½
2½	1	1	1½	2**	2**	2½	2½	3	3	3½	3½
3	1	1	1½	2**	2**	2½	3	3	3	3½	3½
3½	1	1	1½	2**	2½**	2½	3	3	3½	3½	3½
4	1	1	1½	2**	2½**	2½	3	3	3½	3½	3½
4½	1	1	1½	2	2½	2½	3	3	3½	3½	3½
5	1	1½	1½	2	2½	2½	3	3½	3½		
6	1	1½	2	2	2½	3	3	3½	3½		
7	1½	1½	2	2	2½	3	3	3½	3½		
8	1½	1½	2	2	2½	3	3½	3½			
9	1½	1½	2	2½	2½	3	3½	3½			
10	1½	1½	2	2½	2½	3	3½	3½			
11	1½	1½	2	2½	2½	3	3½	3½			
12	1½	1½	2	2½	3**	3	3½	4			
14 & up	1½	1½	2	2½	3**	3	3½	4			
Process											
1½ & less	1	1	1	1	1	1	1½	1½	1½	2	2
2	1	1	1	1	1	1½	1½	1½	2	2	2
2½	1	1	1	1	1	1½	1½	1½	2	2	2
3	1	1	1	1	1	1½	1½	2	2	2	2
3½	1	1	1	1	1	1½	1½	2	2	2	2
4	1	1	1	1	1	1½	1½	2	2	2	2
4½	1	1	1	1	1½	1½	1½	2	2	2	2
5	1	1	1	1	1½	1½	1½	2	2	2	2
6	1	1	1	1	1½	1½	2	2	2	2	2
7	1½	1½	1½	1½	1½	1½	2	2	2	2	2
8	1½	1½	1½	1½	1½	1½	2	2	2	2	2
9	1½	1½	1½	1½	1½	1½	2	2	2	2	2
10	1½	1½	1½	1½	1½	1½	2	2	2	2	2
11	1½	1½	1½	1½	1½	1½	2	2	2	2	2
12	1½	1½	1½	1½	1½	1½	2	2	2	2	2
14 & up	1½	1½	1½	1½	1½	2	2	2	2	2	2
Commercial—Full Year Operation											
1½ & less	1	1½	2	2½**	3**	—	—	—	—	—	—
2	1	1½	2	2½**	3**	—	—	—	—	—	—
2½	1	2	2½	3**	3**	—	—	—	—	—	—
3	1	2	2½	3**	3½**	—	—	—	—	—	—
3½	1	2	2½	3**	3½**	—	—	—	—	—	—
4	1	2	2½	3**	3½**	—	—	—	—	—	—
4½	1	2	2½	3**	3½**	—	—	—	—	—	—
5	1	2	2½	3**	3½**	—	—	—	—	—	—
6	1	2	3	3½**	4**	—	—	—	—	—	—
7	1½	2	3	3½**	4**	—	—	—	—	—	—
8	1½	2	3	3½**	4**	—	—	—	—	—	—
9	1½	2½	3	3½**	4**	—	—	—	—	—	—
10	1½	2½	3	3½**	4**	—	—	—	—	—	—
11	1½	2½	3	3½**	4**	—	—	—	—	—	—
12	1½	2½	3	3½**	4**	—	—	—	—	—	—
14 & up	1½	2½	3½	4**	4½	—	—	—	—	—	—
Commercial—Seasonal Operation											
1½ & less	1	1	1	1½	1½	—	—	—	—	—	—
2	1	1	1	1½	1½	—	—	—	—	—	—
2½	1	1	1	1½	2**	—	—	—	—	—	—
3	1	1	1½	1½	2**	—	—	—	—	—	—
3½	1	1	1½	1½	2**	—	—	—	—	—	—
4	1	1	1½	1½	2**	—	—	—	—	—	—
4½	1	1	1½	1½	2	—	—	—	—	—	—
5	1	1	1½	1½	2	—	—	—	—	—	—
6	1	1	1½	2	2	—	—	—	—	—	—
7	1½	1½	1½	2	2	—	—	—	—	—	—
8	1½	1½	1½	2	2	—	—	—	—	—	—
9	1½	1½	1½	2	2	—	—	—	—	—	—
10	1½	1½	1½	2	2½	—	—	—	—	—	—
11	1½	1½	1½	2	2½	—	—	—	—	—	—
12	1½	1½	1½	2	2½	—	—	—	—	—	—
14 & up	1½	1½	1½	2	2½	—	—	—	—	—	—

STANDARD SIZES

Length, inches	Simplified thicknesses, inches	For copper tubing
36	Nominal 1 (from ½" up to & including 6" pipe size only), 1½, 2, 2½, 3, 3½ & 4	To fit straight runs of copper tubing with nom. diameter ¾ to 3"

Block Insulation

RECOMMENDED THICKNESSES†

Nominal Thickness, inches: Temperature of Surface, F: 100 to 199	200 to 299	300 to 399	400 to 499	500 to 599	600 to 699	700 to 799	800 to 899	900 to 999	1000 to 1099	1100 to 1200
Utility—Steam Generation	1½	1½	2	2½	3	3	3½	4	4	4½	4½
Process	1½	1½	1½	1½	1½	2	2	2	2½	2½	3
Commercial—Full Year Operation	1½	2½	3½	4	4½	—	—	—	—	—	—
Commercial—Seasonal Operation	1	1	1½	2	2½	—	—	—	—	—	—

Note: For special sizes and curved blocks consult your nearest J-M office.

†Tabulated thicknesses are optimum thicknesses calculated on an economic basis for heat conservation under average operating conditions and assure adequate temperature control. Unusual conditions may warrant the use of other thicknesses.

STANDARD SIZES

Length, inches	Width, inches	Thickness, inches
36	6 and 12	1, 1½, 2, 2½, 3, 3½ and 4

Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Pipe

temp limit: 1200F

REFRIGERATION

WEATHERPROOFING MATERIALS

CE/HI (P) 32415

J-M METAL-ON® pipe insulation

■ **DESCRIPTION:** J-M Metal-On pipe insulation consists of high temperature Thermobestos pipe insulation pre-jacketed at the factory with top-quality aluminum. Furnished as an integral package (including a built-in isolation felt), a section of Metal-On snaps on the pipe and locks tightly in place to seal out weather and protect insulation indefinitely. Joints are sealed with aluminum "snap straps" fastened with conventional metal strapping bands. No sheet metal screws are used. Aluminum alloy jacket (containing magnesium) is especially selected to give superior corrosion resistance and strength.

■ **AVAILABLE FORMS:** Furnished in pipe insulation form only. Available in 36" sections in a complete range of sizes up to 24" pipe size by 3" thickness.

■ **USES:** Particularly recommended for use in the power generation, petroleum, chemical and allied industries, especially on outdoor installations, at operating temperatures to 1200F.

■ **ADVANTAGES**

Installation Savings

Both insulation and jacket are furnished in a single package, installed in a single operation.

Excellent Weather Protection

Keeps insulation dry during installation, thus avoiding electrolytic corrosion of aluminum through direct contact with wet insulation common where jacket is installed as a separate operation.

Proper Jacket Thickness

Jacket thickness designed to provide, at lowest cost, outstanding appearance, stiffness, workability, and resistance to abuse.

Integral Isolation Felt

A built-in, properly designed barrier between jacketing and insulation.

Easy to Remove

Rapid, easy removability for repairs and maintenance.

For Specification Data, including physical and thermal properties, recommended thicknesses, compliance with specifications, etc., see Thermobestos pipe insulation.

INDUSTRIAL & HIGH TEMPERATURE

Johns-Manville

PRODUCT INFORMATION

type: Block

temp limit: 1900F

J-M SUPEREX® block insulation

■ **DESCRIPTION:** J-M Superex block insulation is composed of calcined diatomaceous silica blended with other insulating materials and bonded with asbestos fiber. These light weight, large size blocks will withstand temperatures up to 1900F with negligible shrinkage. Their unique combination of low conductivity and high stability at elevated temperatures provide excellent efficiency and long, maintenance-free service.

Ever since its introduction, Superex has demonstrated its versatility as a high temperature insulation. Today, for example, it economically insulates 90% of this country's hot blast stoves.

■ **AVAILABLE FORMS:** Furnished in flat or curved blocks in the following sizes: Flat or curved, 3" or 6" wide by 18" or 36" long. Flat only, 9" or 12" wide by 18" or 36" long. Thicknesses range from 1" to 4".

■ **USES:** Superex blocks are widely used for equipment operating at temperatures to 1900F including boiler furnaces, hot blast stoves, mains and bustle pipes, hot gas flues, soaking pits, petroleum cracking furnaces, producer gas mains, and metallurgical furnaces of various types.

■ **ADVANTAGES**

High Compressive Strength

Compresses only 1/8" under a pressure of 85 lbs per square inch.

Low Conductivity at High Temperatures

Superex has a conductivity of .82 at 1000F mean temperature.

Low Heat Shrinkage

Has a linear shrinkage of only 2.7% at 1900F.

Dimensional Uniformity

Straight, true edges and close tolerances make possible snug joints.

Light Weight

Ideal for insulating movable high temperature equipment.

Large Size Blocks

Large 12" x 36" blocks speed application and reduce the number of joints.

CE/HI (P) 32416

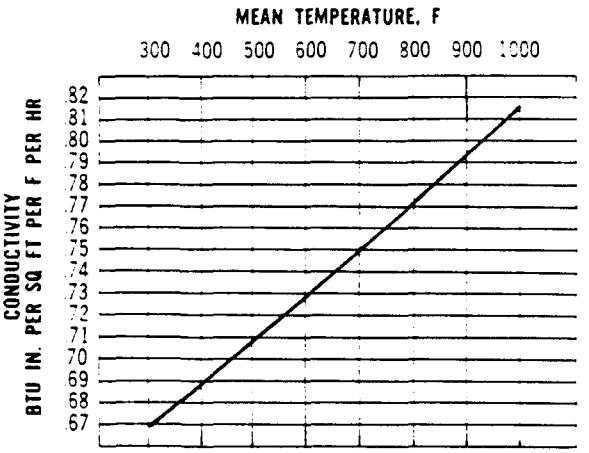
SUPEREX
Specification Data

PHYSICAL PROPERTIES*

Density (dry)	24 lbs per cu ft
Transverse Strength (modulus of rupture)	100 psi
Compressive Strength	85 psi to produce ⅛" compression
Linear Shrinkage (after 24 hr soaking heat at indicated temperature)	2.7% at 1900F
Maximum Service Temperature	1900F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

MIL-I-2819, Class C

STANDARD SIZES AND THICKNESSES

Length, inches	Width, inches	Thickness, inches
18 and 36	3 & 6 flat or curved 9 & 12 flat only	1 through 4 1½ through 4

NOTE: For special sizes and curved blocks consult your nearest Johns-Manville office.

CE/HI (P) 32417

INDUSTRIAL & HIGH TEMPERATURE

Johns-Manville

PRODUCT INFORMATION

type: Pipe & Block

temp limit: 1600F

J-M SUPEREX-M® pipe and block insulation

■ **DESCRIPTION:** Superex-M pipe and block insulation is, like Superex, a high temperature product composed of calcined diatomaceous silica blended with other insulating materials and bonded with asbestos fiber. Recommended for use at service temperatures to 1600F, it possesses lower density and conductivity than regular Superex.

■ **AVAILABLE FORMS:** Superex-M is furnished in both block and pipe insulation form. The pipe insulation comes in 3 ft half sections, in thicknesses ranging from 1" to 3½", in pipe sizes up to 14". Segments furnished for pipe sizes larger than 14". Blocks come in the following sizes: Flat or curved, 3" or 6" wide by 18" or 36" long. Flat only, 9" or 12" wide by 18" or 36" long. Thicknesses range from 1" to 4".

■ **USES:** In addition to being used (to 1600F) for the installations listed under Superex, Superex-M is also often specified in combination with J-M 85% Magnesia or Thermobestos to give greater insulating value for a given service temperature and insulation thickness. In such cases, the Superex-M is always placed next to the hot surface in sufficient thickness to reduce the temperature on the outer layer to its safe limit.

■ **ADVANTAGES**

High Compressive Strength

Compresses only 1/8" under a pressure of 70 lbs per square inch.

Low Conductivity at High Temperatures

Superex-M has a conductivity of .74 at 1000F.

Dimensional Uniformity

Straight, true edges and close tolerances make possible snug joints.

Low Heat Shrinkage

Has a linear shrinkage of only 2.0% at 1600F.

Large Sizes

In both block and sectional pipe insulation form, Superex-M comes in large sizes which means faster, more economical installation.

CE/HI (P) 32418

SUPEREX-M

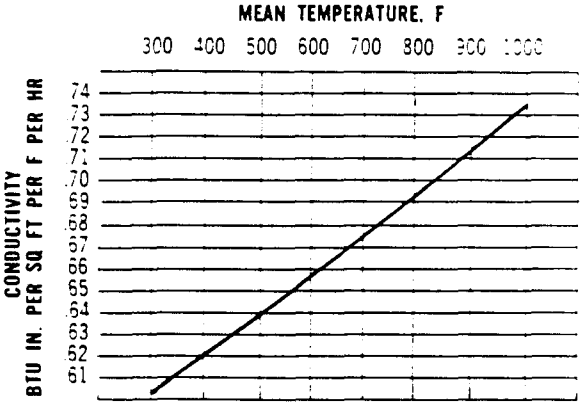
S[illegible] Data

PHYSICAL PROPERTIES*

Density (dry)	21 lbs per cu ft
Transverse Strength (modulus of rupture)	90 psi
Compressive Strength	70 psi to produce ⅛" compression
Linear Shrinkage (after 24 hr soaking heat at indicated temperature)	2.7% at 1900F
Maximum Service Temperature	1600F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

Pipe Insulation:

MIL-I-2781B
Grade III Class E, Type 2

Block Insulation:

MIL-I-2819
Class B and C

CE/HI (P) 32419

STANDARD SIZES AND THICKNESSES

Pipe Insulation:

Length	Thickness, inches (to fit standard pipe sizes)
3-ft sections and segments	Nominal 1 (through 6" pipe size only), 1½, 2, 2½ and 3

Block Insulation:

Length, inches	Width, inches	Thickness, inches
18 and 36	3 & 6 flat or curved 9 & 12 flat only	1 through 4 1½ through 4

Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Faced Blanket

temp limit: 1000F

J-M BANROC® BLANKETS mineral fiber insulation

■ **DESCRIPTION:** A felted, spun mineral fiber blanket secured between outer facings of metal fabric. Facing varies depending upon service requirements. The density and thickness of the blanket are carefully controlled to assure full insulating value. The density of the felt in the standard blanket is 8 lbs per cubic foot.

■ AVAILABLE FORMS

No. 101—One side covered with 1" galvanized wire mesh and 15 lbs asbestos saturated felt. Galvanized wire mesh is straight-line or hexagonal.

No. 102—1" galvanized wire mesh on both sides.

No. 112—Copper-bearing metal lath (also known as burial-vault mesh) one side, 1" galvanized wire mesh other side. Copper-bearing metal lath weighs approximately 2.5 lbs per sq yd with $^{3}/_{16}$" x $^{7}/_{8}$" between diamond centers. Diamond mesh lath (which can be substituted when copper-bearing metal lath is not available) weighs approximately 2.5 lbs per sq yd with $^{3}/_{8}$" x $^{3}/_{16}$" between diamond centers.

No. 122—Copper-bearing metal lath on both sides.

No. 132—$^{3}/_{8}$" rib lath one side, and 1" galvanized wire mesh other side. Rib lath weighs approximately 3.0 lbs per sq yd.

No. 132-A—Same as No. 132 except ribs are turned out to provide an air space, desired in some applications.

No. 142—$^{3}/_{8}$" rib lath one side, and copper-bearing metal lath other side.

No. 142-A—Same as No. 142 except ribs are turned out to provide an air space, desired in some applications.

NOTE: Under each style number, the first metal fabric listed is the side on which wire staples are twisted. When the twisted ends are required on the reverse side, it must be so specified.

■ **USES:** Where the convenience of a flexible insulation, plus excellent thermal efficiency, is desired, J-M Banroc Blankets offer the highest quality mineral fiber product available today. This insulation is used for industrial baking ovens, dryers, ducts and breechings, and similar equipment. Banroc Blankets are adaptable to flat or curved surfaces and do not break in handling. They are easily cut on the job to fit around obstructions and irregular equipment, and may be used under normal conditions for temperatures to 1000F.

CE/HI (P) 32420

ADVANTAGES

Easily Handled

Higher strength and body improves "handleability" . . . fibers will not dislodge around edges.

Uniform Thickness

More uniform fiber orientation results in uniform thickness and eliminates thin spots.

Light Weight

[illegible] lbs per sq ft per 1 inch thickness.

Square Edges

Makes possible firmer and squarer blanket edges, both as furnished and as cut on the job.

Factory Fabricated

Each blanket made to conform to rigid product specs.

BANROC BLANKETS
Specification Data

COMPLIANCE WITH GOVERNMENT SPECS

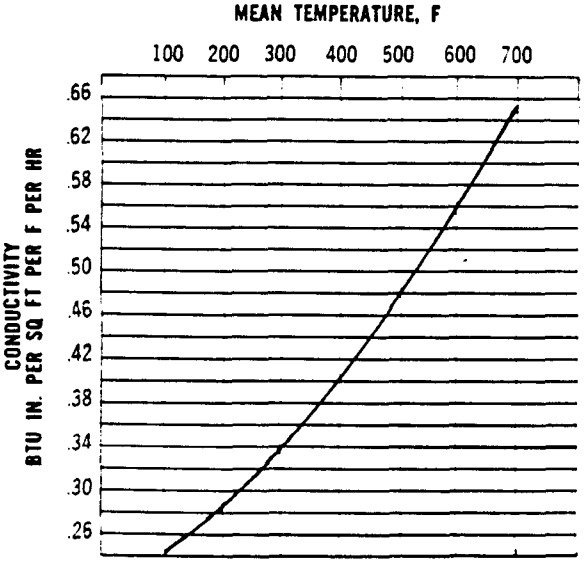
HH-I-563, Amendment 1—Type I, Class A & B

STANDARD SIZES* AND THICKNESSES

Blanket Size, inches	Thickness, inches
24 x 48 24 x 96	1, 1¼, 1½, 1¾, 2, 2½, 3, 3½, 4, 4½, 5, 5½, 6

*3" thicknesses up to and including 3" consist of single layer of felt. Greater thicknesses consist of two layers of felt.

THERMAL CONDUCTIVITY



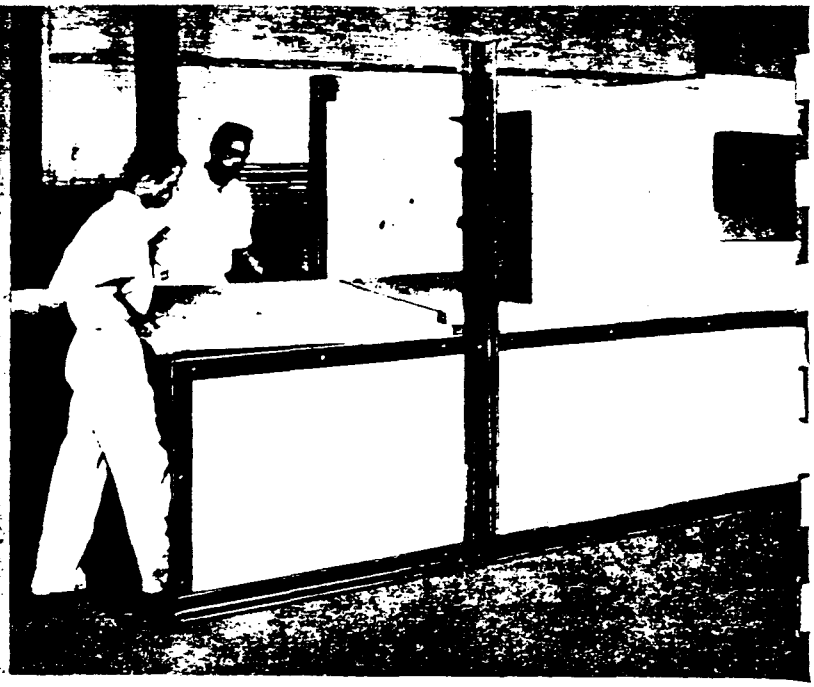
CE/HI (P) 32421

Johns-Manville

PRODUCT INFORMATION

type: Sheet

temp limit: 900F



J-M MARINITE® sheet insulation

■ **DESCRIPTION:** Johns-Manville Marinite is an insulating sheet material composed of asbestos fiber, diatomaceous silica, and an inorganic binder. Marinite combines great structural strength with light weight, excellent thermal properties and ease of erection. It is fireproof and has a low thermal expansion coefficient. Marinite is non-corroding and will not disintegrate after prolonged immersion in water.

■ **AVAILABLE FORMS:** Marinite is furnished in three densities: 23, 36 and 65 lbs per cu ft. All are supplied in two types: Type A sheets, with a plain sanded finish on both sides; Type B sheets, sanded both sides and impregnated with an inorganic primer, ready for painting. Marinite sheets range in size from 36" x 96" to 48" x 120", and in thickness from 3/8" to 2", depending on density.

■ **USES:** Because it is both a structural and an insulating material, Marinite offers major economic advantages in the construction of ovens, driers, breechings and other insulated housings. Marinite is the only insulation available that can be erected without the metal sheathing necessary where mineral-fiber type and similar insulating materials are employed.

■ **ADVANTAGES**

Structural and Insulating Material

Builds and insulates in one operation.

Fireproof

Will not burn. Every sheet of Marinite carries the Underwriters' Laboratories, Inc., label with the following Fire Hazard Classification (based on 100 for untreated Red Oak):

Flame Spread	0
Fuel Contributed	Negligible
Smoke Developed	0

Easy to Erect

Large, easy-to-handle sheets can be applied as quickly and easily as plywood.

Requires No Maintenance

Inorganic and not affected by moisture, will not rust, rot or corrode . . . lasts indefinitely.

CE/HI (P) 32422

MARINITE
Specification Data

PHYSICAL PROPERTIES*

		Marinite-23	Marinite-36	Marinite-65
Density (Dry), lbs cu ft		23	36	65
Transverse Strength (Dry), psi (Modulus of Rupture)		550	900	1500
After 24-hr soaking heat at indicated temperature		450 (900F)	900 (900F)	1500 (800F)
Modulus of Elasticity (Dry), psi (From Transverse Test)		0.20×10^6	0.36×10^6	0.65×10^6
Consolidation (Normal), in. in.	500	0.02	0.02	0.01
	4000	0.62	0.38	0.18
Load, psi	8000	0.68	—	0.31
	12000	0.74	—	0.39
Compressive Strength (Normal), psi		14000	7000**	16000
Screw Holding Strength (Normal), lb screw				
Withdrawal load for Type A, No. 6-12 Sheet-Metal Screws:				
½" penetration		35	80	180
⅜" penetration		130	240	460
Dimensional Change Due to Moisture, in. in.				
Shrinkage—Normal to dry		0.0008	0.0011	0.0007
Expansion—Normal to 90% RH		0.0001	0.0001	0.0001
Expansion—Dry to saturated		0.0010	0.0013	0.0009
Thermal Expansion, in. in. F		2.3×10^{-6}	1.3×10^{-6}	2.9×10^{-6}
Avg over temperature range indicated.		(up to 200F;	(up to 250F;	(up to 250F;
Detailed information for special cases furnished on request.)		shrinkage	shrinkage	shrinkage
		thereafter)	thereafter)	thereafter)
Maximum Service Temperature, F		900	900	800
For Continuous Service)				
Fire Hazard Classification				
Listed under Underwriters' Laboratories,		Flame Spread 0, Smoke Developed 0,		
Inc Label Service Guide, No. 40 U8.13)		and Fuel Contributed Negligible		

*The figures given in the above table are average values (unless otherwise specified) obtained in accordance with accepted test methods. Strength figures must be modified by applying adequate factors of safety to arrive at working values. "Dry" refers to oven-dried samples; "Normal," to normal conditions at 75F and 50% R.H. **For 3 layers of 1" thick material. One inch thickness alone shows no clearly defined failure up to 13,500 psi.

DIMENSIONAL TOLERANCES

Material	Length & Width, inches	Thickness, inches	Squareness, max. dev. per linear yd, inches
Marinite-23	± ⅛	± 1/32	±1/16
Marinite-36	± ⅛	± 1/32	±1/16
Marinite-65	± ⅛	± 1/32	±1/16

STANDARD SIZES AND THICKNESSES

Material	Thicknesses, inches	Sheet Sizes, feet			
		3 x 8	3½ x 8	4 x 8	4 x 10
Marinite-23	1, 1½, 2	✓	✓	✓	✓
Marinite-36	¼, ⅜, ½, ¾, 1, 1½, 2	✓	✓	✓	✓
Marinite-65	⅜, ½, ¾, 1, 1½, 2	✓	✓	✓	✓

*Subject to 8 to 10 weeks delivery.

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F					
	100	200	300	400	500	600
Marinite-23	0.55	0.57	0.58	0.60	0.61	0.63
Marinite-36	0.76	0.77	0.78	0.79	0.80	0.81
Marinite-65	1.50	1.56	1.62	1.68	1.74	1.80

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

CE/HI (P) 32423

Johns-Manville

PRODUCT INFORMATION

type: Pipe & Block

temp limit: 600F

J-M 85% MAGNESIA pipe and block insulation

DESCRIPTION: Johns-Manville 85% Magnesia is composed of hydrated basic carbonate of magnesia bonded with asbestos fiber and molded into both pipe and block form. The Johns-Manville manufacturing process provides the material with a maximum number of voids, or minute dead-air cells, which increases the natural resistance to heat transmission and reduces the weight of this durable insulation. Maximum mechanical strength consistent with high insulating value is an added advantage.

AVAILABLE FORMS: J-M 85% Magnesia is furnished in both sectional pipe insulation and block form. The pipe insulation comes in a complete selection of sizes up to 14" x 2" half-sections. Larger sizes are available in segments and curved blocks. Blocks are available in widths of 3, 6, 9 and 12", and lengths of 18 and 36", in a full range of thicknesses. 6" wide curved blocks are available for larger diameters.

USES: Recommended for use to 600F on heated piping and equipment in schools, hotels, hospitals, public buildings, ships and industrial installations of all types. For temperatures above 600F, J-M 85% Magnesia is often used as an outer layer over J-M Superex. This construction—known as Superex Combination—combines the high heat resistance of Superex with the greater insulating value of 85% Magnesia.

ADVANTAGES

Good Compressive Strength

J-M 85% Magnesia has the compressive strength necessary to withstand all normal abuse to which exposed piping and equipment may be subjected.

Chemically Stable

100% inorganic, will neither burn nor rot.

Low Maintenance

For practical purposes J-M 85% Magnesia is ageless and will last as long as the masonry in a building.

Withstands Wetting

Will withstand repeated wetting and drying without deterioration.

High Insulating Value

Has a thermal conductivity of .46 at 400F mean temperature.

Light Weight

Easy to handle and install.

85% MAGNESIA

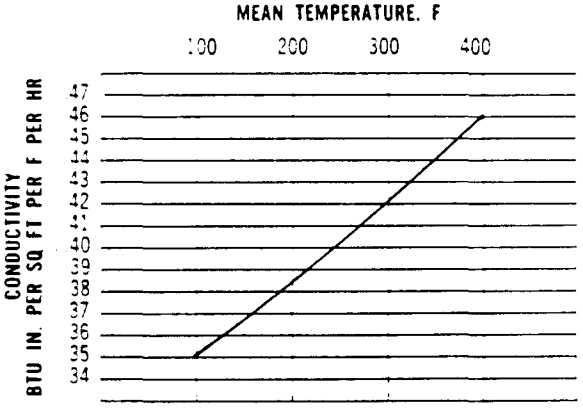
Specification Data

PHYSICAL PROPERTIES*

Density (dry)	11 lbs per cu ft
Transverse Strength (modulus of rupture)	50 psi
Compressive Strength	70 psi to produce 5% compression 85 psi to produce 10% compression
Linear Shrinkage	0.4% after 24-hr soaking period at 600F
Maximum Service Temperature	600F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

Pipe Insulation:

MIL-I-2781
Grade A, Class 1, to 600F

Block Insulation:

MIL-I-2819
Class 1, to 600F

COMPLIANCE WITH ASTM STANDARDS

Pipe Insulation:

C320-55, to 600F

Block Insulation:

C319-55, to 600F

CE/HI (P) 32425

85% MAGNESIA
Specification Data (cont.)

Pipe Insulation

STANDARD SIZES

Length, inches	Simplified thickness, inches	For copper tubing
36 (sections and segments)	Nominal 1 (from ½" up to and including 6" pipe size only), 1½, 2, 2½, and 3	To fit straight runs of copper tubing with nominal diameter of ⅜ to 6 inch

RECOMMENDED THICKNESSES*

Nominal Pipe Size, inches	Temperature of Pipe, F: 100 to 199	200 to 299	300 to 399	400 to 499	500 to 600
	Nominal Thickness, inches				
Utility—Steam Generation					
1½ & less	1	1	1½	2	2
2	1	1	1½	2	2
2½	1	1	1½	2	2
3	1	1	1½	2	2
3½	1	1	1½	2	2½
4	1	1	1½	2	2½
4½	1	1	1½	2	2½
5	1	1½	1½	2	2½
6	1	1½	2	2	2½
7	1½	1½	2	2	2½
8	1½	1½	2	2	2½
9	1½	1½	2	2½	2½
10	1½	1½	2	2½	2½
11	1½	1½	2	2½	2½
12	1½	1½	2	2½	3
14 & up	1½	1½	2	2½	3
Process					
1½ & less	1	1	1	1	1
2	1	1	1	1	1
2½	1	1	1	1	1
3	1	1	1	1	1
3½	1	1	1	1	1
4	1	1	1	1	1
4½	1	1	1	1	1
5	1	1	1	1	1
6	1	1	1	1	1
7	1½	1½	1½	1½	1½
8	1½	1½	1½	1½	1½
9	1½	1½	1½	1½	1½
10	1½	1½	1½	1½	1½
11	1½	1½	1½	1½	1½
12	1½	1½	1½	1½	1½
14 & up	1½	1½	1½	1½	1½
Commercial—Full Year Operation					
1½ & less	1	1½	2	2½	3
2	1	1½	2	2½	3
2½	1	2	2½	3	3
3	1	2	2½	3	3½
3½	1	2	2½	3	3½
4	1	2	2½	3	3½
4½	1	2	2½	3	3½
5	1	2	2½	3	3½
6	1	2	3	3½	4
7	1½	2	3	3½	4
8	1½	2	3	3½	4
9	1½	2½	3	3½	4
10	1½	2½	3	3½	4
11	1½	2½	3	3½	4
12	1½	2½	3	3½	4
14 & up	1½	2½	3½	4	4½
Commercial—Seasonal Operation					
1½ & less	1	1	1	1½	1½
2	1	1	1	1½	1½
2½	1	1	1	1½	2
3	1	1	1½	1½	2
3½	1	1	1½	1½	2
4	1	1	1½	1½	2
4½	1	1	1½	1½	2
5	1	1	1½	1½	2
6	1	1	1½	2	2
7	1½	1½	1½	2	2
8	1½	1½	1½	2	2
9	1½	1½	1½	2	2
10	1½	1½	1½	2	2½
11	1½	1½	1½	2	2½
12	1½	1½	1½	2	2½
14 & up	1½	1½	1½	2	2½

*Tabulated thicknesses are optimum thicknesses calculated on an economic basis for heat conservation under average operating conditions and assure adequate temperature control. Unusual conditions may warrant the use of other thicknesses.

Block Insulation

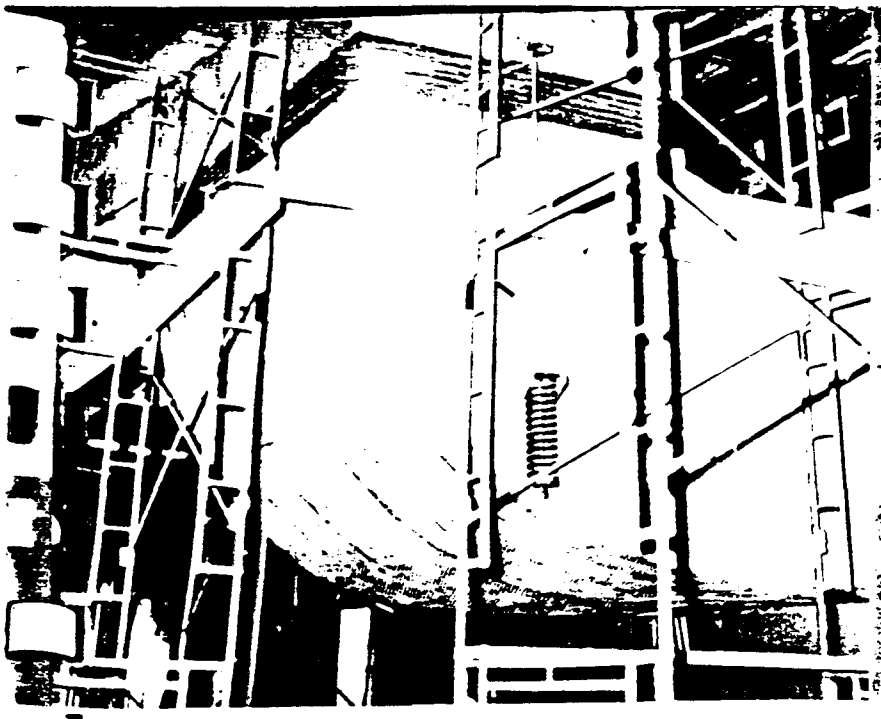
STANDARD SIZES

Length, inches	Thickness, inches	Width, inches
18 and 36	1 through 4	3 and 6, flat or curved
	1½ through 4	6 and 12, flat only

Note: On curved blocks the 4 inch thickness is furnished segmented to the specific radius required.

RECOMMENDED THICKNESSES

Temperature of System, F: 100 to 199	200 to 299	300 to 399	400 to 499	500 to 600
Nominal Thickness, inches				
Utility—Steam Generation				
1½	1½	2	2½	3
Process				
1½	1½	1½	1½	1½
Commercial—Full Year Operation				
1½	2½	3½	4	4½
Commercial—Seasonal Operation				
1	1	1½	2	2½



Johns-Manville

PRODUCT INFORMATION

type: Block

temp limit: 1700F

J-M H. T. BANROC® block insulation

■ **DESCRIPTION:** H.T. Banroc block insulation is a structurally strong and thermally effective insulating material made from felted inorganic fibers bonded with a special heat-resistant binder.

■ **AVAILABLE FORMS:** Furnished in block form only in thicknesses from 1" to 4"; lengths up to 36"; widths to 18".

■ **USES:** For insulating furnaces, boilers, heated vessels and tanks.

■ **ADVANTAGES**

Easy Application

Mineral wool composition makes possible impaling of insulation directly on studs or clips.

Large Sheet Size

Large size sheets, 18" x 36", cut installation costs.

Fireproof

Made from mineral fibers which will not burn.

Low Conductivity

H.T. Banroc has a *k* factor of .70 at 800F.

PHYSICAL PROPERTIES*

Density (dry)	18 lbs per cu ft	
Transverse Strength (modulus of rupture)	50 psi	
Linear Shrinkage (average of all 3 dimensions)	1200F 0.5%	1700F 3.0%

*The figures given in this table are average values obtained in accordance with accepted test methods.

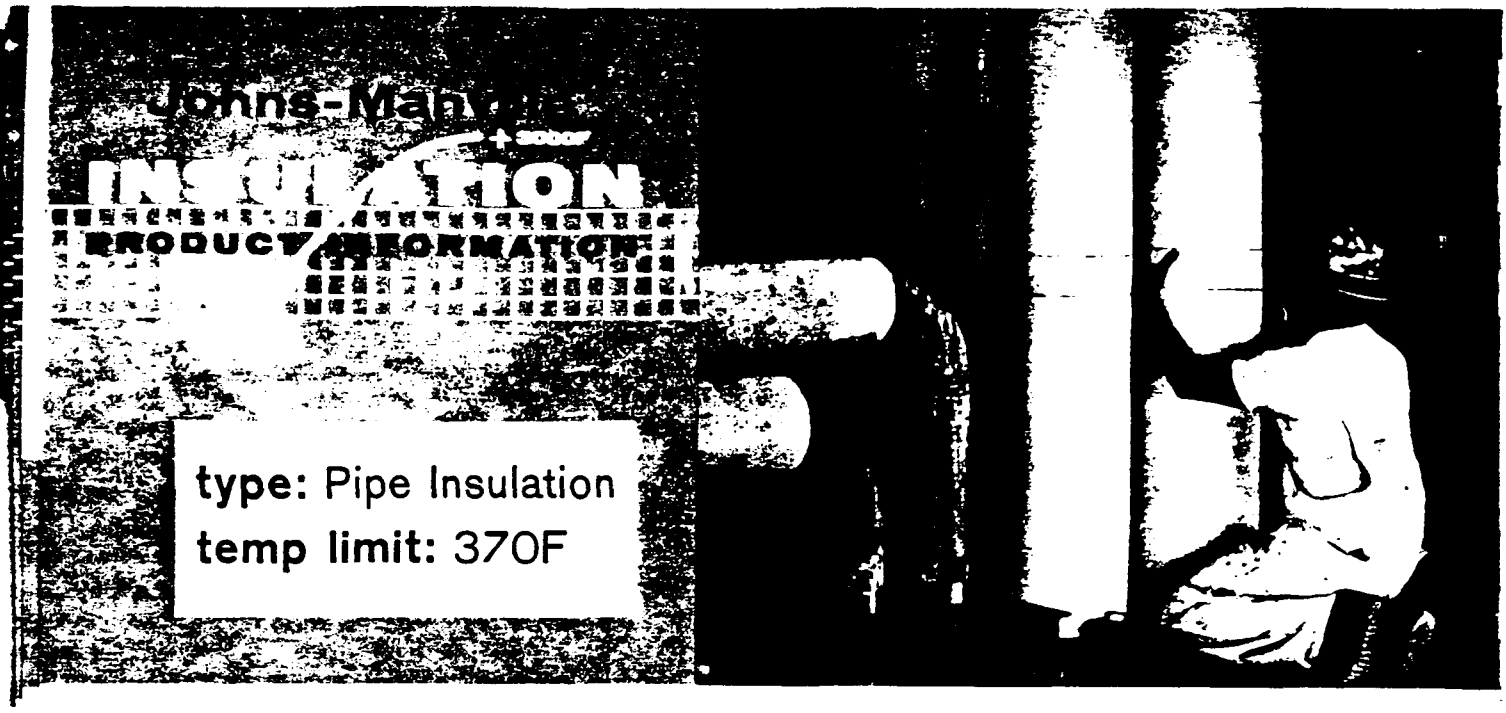
STANDARD SIZES AND THICKNESSES

Length, inches	Width, inches	Thickness, inches
18 and 36	6, 12 and 18	1 to 4 (½ inch increments)

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F			
	200	400	600	800
CONDUCTIVITY BTU IN. PER SQ FT PER F PER HR	.35	.45	.56	.70

CE/HI (P) 32427



J-M MICRO-LOK fiber glass pipe insulation

■ **DESCRIPTION:** J-M Micro-Lok is a lightweight pipe insulation made of long, fine flame blown glass fibers bonded together with a thermosetting resin. Countless air spaces created by these fine fibers are particularly effective in resisting the passage of heat. The three-foot sections of insulation are molded in one piece, then cut longitudinally through one wall and partially through the other. This produces a "hinged" section that opens uniformly, and with only slight effort, over the entire length. Because of the resiliency of the fibers, it closes automatically and firmly. The manufacturing process permits accurate control of dimensions. Thus, the inside diameters, wall thicknesses and outside diameters are always uniform. The outside surface is smooth and firm to give the sections a well-tailored appearance.

■ **AVAILABLE FORMS:** J-M Micro-Lok is made in three-foot sections, in standard wall thickness and sizes for iron pipe and copper tubing. It is available either bare or with factory-applied jackets. Micro-Lok is shipped in corrugated cartons.

■ **USES:** J-M Micro-Lok, with jackets as required, is designed for use on hot, cold and chilled water lines; brine, refrigerant and special process lines; dual temperature, steam and other hot lines to 370F.

■ **ADVANTAGES**

Saves Fuel & Power

Low k factor permits more efficient temperature control. Snug closure guards against heat loss or gain at joints.

Economical to Apply

Light weight and one-piece construction with "spring-hinge" full-length opening and automatic closing feature speeds on-the-job handling. Easy to cut and fit accurately.

Resilient & Durable

Resiliency of glass fibers absorbs mechanical abuse during shipment and application; prevents breaking and crumbling of edges; saves waste, makes tighter joints; saves patching costs. Glass fibers are incombustible, won't shrink, swell or rot, and will not attract rodents or vermin.

MICRO-LOK

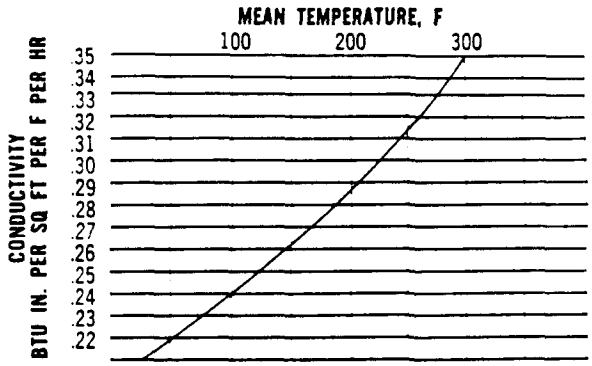
Engineering Data

PHYSICAL PROPERTIES*

Density, nominal	**3.50 lbs per cu ft**
Moisture Adsorption	**less than 0.2% by vol**
Alkalinity	**less than 2% expressed as Na_2O**
Corrosivity (with steel, copper, aluminum)	**does not cause or accelerate**
Thermal Diffusivity (at 150F mean temp)	**0.032 sq ft per hr**

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



JACKETING* INFORMATION

Canvas—4 oz., 6 oz., and 8 oz., in addition to standard canvas. All weights available on all insulation thicknesses and sizes.

General Purpose—60 lb. white bleached kraft laminated to 0.00035" thick aluminum foil. Vapor transmission rate less than .05 perms. Available for ½" and ¾" thicknesses in all pipe sizes.

Vapor Barriers

Dual Temperature:

WX: three ply with 60 lb. white bleached kraft; 0.001" aluminum foil and 55 lb. black asphalt-impregnated kraft. Vapor transmission rate less than .02 perms.

BX: three ply with 55 lb. black asphalt-impregnated kraft; 0.001" aluminum foil and 55 lb. black asphalt-impregnated kraft. Vapor transmission rate less than .02 perms.

Flame Resistant:

40 lb. flame retardant kraft paper laminated to 0.001" thick aluminum foil by a flame retardant adhesive. Vapor transmission rate less than .02 perms. Aluminum surface is exposed.

Weather Resistant—three weights of roofing felt available—35 lb., 45 lb., 55 lb. For 1" thick and over pipe insulation, for all pipe sizes.

All jackets have a minimum 1½" longitudinal lap. Canvas jackets have a 2½" circumferential lap. All other jackets are sealed at the circumferential joint by a 4" wide strip of the same material, included in the carton.

*Factory applied.

GUIDE TO SPECIFICATIONS FOR APPLICATION AND FINISHING

Service & Temperature	Location	Jacket Material
Hot Water 200F	Exposed or Concealed	Canvas or Gen. Purpose
	Outdoor	Roofing Felt or .016 Aluminum
Cold Water 50F	Exposed or Concealed	Gen. Purpose
	Outdoor	Roofing Felt
Chilled Water, Brine, Refrigerants and Special Processes	Exposed or Concealed	WX (White) or BX (Black) Dual Temp.
Dual Temp 212F to sub-zero (—120F)	Outdoor	Black Dual Temp. plus Roofing Felt or .016 Aluminum
Hot Water, Low Pressure Steam 350F	Exposed or Concealed	Canvas or Gen. Purpose
	Outdoor	Roofing Felt

COMPLIANCE WITH GOVERNMENT SPECS

HH-I-552 Type I, Class A and B
HH-I-562 Type II, Class 1 and 2

CE/HI (P) 32429

INDUSTRIAL & HIGH TEMPERATURE

Johns-Manville

PRODUCT INFORMATION

type: Flexible Blanket
temp limit: 350F

J-M MICROLITE® fiber glass duct insulation

DESCRIPTION: Microlite is a low-density, resilient, blanket-type thermal and acoustical insulation made of long, extremely fine, flame blown glass fibers, bonded with a thermosetting phenolic resin.

AVAILABLE FORMS: Made in blanket form and packaged in rolls. See table on opposite page for densities and thicknesses.

USES: Microlite is most useful:

Where greatest thermal and acoustical efficiency in the smallest space is required.

Where lightness in weight is important.

Where tensile strength, resiliency, ease of cutting and fitting help to reduce application and fabricating costs.

Where resistance to vibration shakedown is important.

ADVANTAGES

Reduces Heat Transfer

The enormous number of air pockets created by the very fine glass fibers make Microlite highly resistant to the passage of heat.

Absorbs Sound

The air pockets also become "sound traps" to absorb air-borne noises, particularly in the 125 to 4000 cps range.

Resilient and Flexible

Easily compressed into tight spots; springs back to assure snug fit around angles and curved surfaces; resists breakdown and sagging from vibration and bumps; yields under impact without damage.

Conserves Space

Because of its excellent insulating efficiency, space required for insulation can often be reduced. Compression packaging saves shipping, storage and work space. Insulation quickly returns to original thickness when unrolled.

Strong

Long fibers give blankets high tensile strength; won't pull apart with normal handling.

Easy to Handle and Apply

Can be handled without discomfort. Readily cut with knife or scissors. No special tools or skills needed. Can be used with adhesives and mechanical fasteners.

Durable

Glass fibers are incombustible. Being non-cellular and non-hygroscopic, they resist effect of moisture. Fibers will not decompose or provide food for rodents, insects or bacteria. Microlite resists effects of oil, grease, most acids.

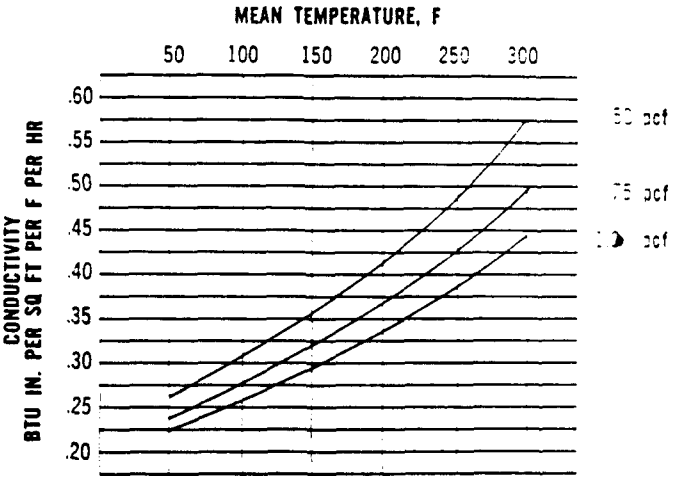
MICROLITE
Specification Data

STANDARD DENSITIES AND THICKNESSES

Density*, lbs per cu ft	Thickness*, inches 200-ft roll	100 ft roll	50 ft roll
.50	½	1,1½,2,2½	3,3½,4
.75	½	1,1½,2	2½,3,3½,4
1.0	½	1,1½	2,2½,3
1.5	½	1	1½,2
2.0	—	—	1,1½
2.5	—	½,1**	—
3.0	—	—	½,1**

*All densities and thickness are available in 24, 36, 48, and 72 inch widths. For information about factory-applied vapor barriers, reflective facings, coatings or other densities and thicknesses, call or write the nearest Johns-Manville sales office. **Cut pieces only.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

HH-I-542, Type I

MIL-I-16022B, Class 1, 2, 3, 4 & 5

MIL-I-15365B Microlite meets this spec in 1, 2 & 3 inch thicknesses and ½, 1, 2 & 3 densities only)

Maritime Specification 32-MA-3, class 1 & 2

CE/HI (P) 32431

SOUND ABSORPTION COEFFICIENTS

Density, lbs per cu ft	Thickness, inches	Sound Absorption Coefficient at Frequency (cycles per second) of 125	250	500	1000	2000	4000	NRC*	Mounting No.
½	½	.08	.14	.32	.60	.73	.73	.45	4
½	1	.14	.25	.51	.80	.78	.76	.60	4
½	1½	.18	.44	.77	.92	.81	.77	.75	4
1	½	.08	.16	.37	.68	.77	.78	.50	4
1	1	.12	.30	.68	.94	.82	.80	.70	4

*Noise Reduction Coefficient – The average of the sound absorption coefficients at frequencies of 250, 500, 1000 and 2000 cycles per second. The NRC is given to the nearest 5%.

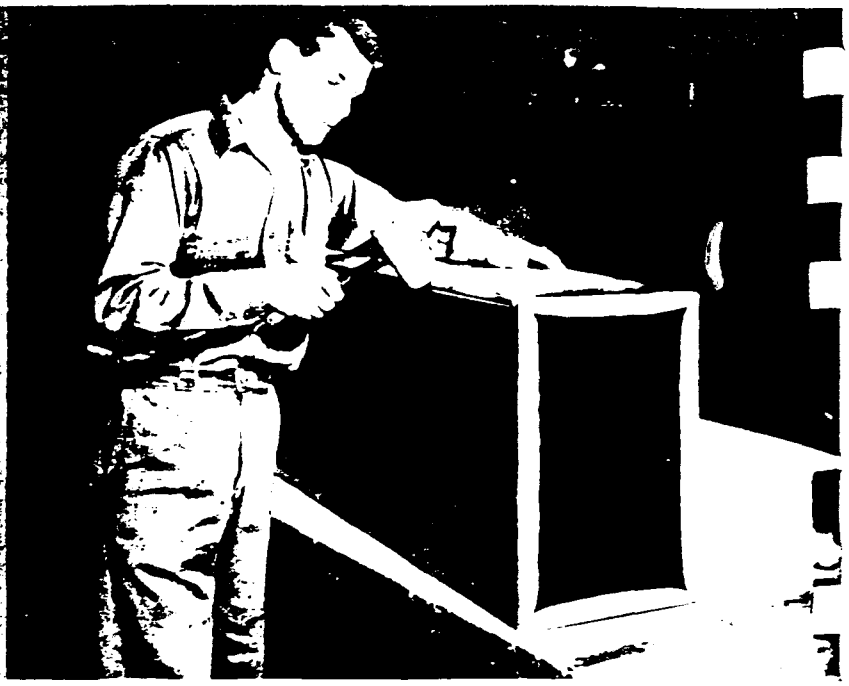
HIGH TEMPERATURE

Johns-Manville

PRODUCT INFORMATION

type: Semi-Rigid

temp limit: 350F



J-M MICROTEX® fiber glass duct insulation

■ **DESCRIPTION:** Microtex is a lightweight, resilient, semi-rigid blanket insulation composed of fine, flame blown glass fibers, reinforced with glass textile fibers and bonded with a thermosetting resin.

■ **AVAILABLE FORMS:** Made in blanket form and packaged in rolls. See table on opposite page for densities and thicknesses. Available plain; black coated one side; with vapor barrier or reflective facings applied.

■ **USES:** Coated Microtex is especially effective as a liner for air conditioning and heating ducts to absorb air-borne noises in the 250 to 4000 cps range and to dampen vibration. Also a highly efficient thermal insulation. Offers many advantages as a duct wrap for refrigerated trucks and trailers; air conditioning and heating equipment.

■ **ADVANTAGES**

Resists Heat Flow

Countless air spaces formed by its fine glass fibers makes Microtex highly effective in resisting the transfer of heat.

Absorbs Sound

Sound energy is effectively dissipated in the "traps" created by maze of fine fibers.

High Tensile Strength

The long, strong bonded fibers mesh and interlace to produce a tough, durable insulation.

Resilient and Flexible

Will not crumble; holds up during handling and fabrication; remains semi-rigid but is easily formed around corners and curves; resists settling from vibration.

Easy to Cut and Fit

No special tools, skills or techniques required. Pleasant to handle. Easily cut with an ordinary knife. Can be used with commercial adhesives and fastening devices.

Durable

Made of incombustible glass fibers. They do not absorb moisture; are not injured by contact with water. Glass fibers won't deteriorate; provide no food for rodents or bacteria. They also resist the effect of oil, grease and most acids.

CE/HI (P) 32432

MICROTEX

Specification Data

STANDARD DENSITIES & THICKNESSES*

Density,* lbs per cu ft	Thickness,* inches 200-ft roll	100-ft roll	75-ft roll	50-ft roll
.50	—	1,1½	2,2½,3	—
.75	—	1,1½	2,2½,3	—
1.0	—	1,1½	2,2½	3
1.5	½	1	—	1½,2
2.0	—	½	—	1,1½
2.5	—	½	—	1
3.0	—	½	—	1

*All densities and thicknesses available in 24, 36, and 48 inch widths. For information about factory-applied coatings, vapor barriers or reflective facings, call or write the nearest Johns-Manville sales office.

THERMAL CONDUCTIVITY

MEAN TEMPERATURE, 75F

Density, lbs per cu ft	CONDUCTIVITY BTU IN. PER SQ FT PER F PER HR
¾	.29
1	.265
1½	.245
2	.23
2½	.226
3	.225

SOUND ABSORPTION COEFFICIENTS

Density, lbs per cu ft	Thickness, inches	Sound Absorption Coefficient at Frequency (cycles per second) of 125	250	500	1000	2000	4000	NRC*	Mounting No.
1½	½	.15	.48	.34	.50	.68	.67	.50	6
1½	1	.22	.60	.54	.80	.84	.79	.70	6
2	½	.15	.48	.36	.56	.68	.67	.52	6
2	1	.24	.61	.57	.85	.86	.81	.72	6
3	½	.17	.49	.39	.66	.75	.74	.57	6
3	1	.27	.63	.62	.91	.89	.83	.76	6

*Noise Reduction Coefficient—The average of the sound absorption coefficients at frequencies of 250, 500, 1000 and 2000 cycles per second. The NRC is given to the nearest 5%.

CE/HI (P) 32433

Johns-Manville

PRODUCT INFORMATION

type: Wrap-Around & Rigid Board

temp limit: 450F

J-M SPINTEX® duct insulation

■ **DESCRIPTION:** J-M Spintex duct insulation is felted from long, tough, super-springy siliceous fibers. Produced by an exclusive spinning process which assures the utmost uniformity, these fibers prossess unusual fineness. This adds countless heat-stopping dead-air spaces to every cubic inch of Spintex, and gives the material the low thermal conductivity so essential for high insulating value. Spintex fibers are non-absorptive and treated to arrest capillary action, and will neither rot nor mildew.

■ **AVAILABLE FORMS:** Regularly furnished in flexible wrap-around and rigid board form. The following special facings are available to meet unusual conditions or decorative needs.

- VS Kraft paper and asphalt
- VF [illegible]4" vinyl film
- AF Laminate .001" aluminum foil-scrim-kraft
- AP Plain asbestos paper

■ **USES:** J-M Spintex duct insulation is ideal for insulating housings, plenum chambers, and air-conditioning ducts in offices, factories, institutions and commercial buildings of all kinds.

■ **ADVANTAGES**

Corrosion Resistant

Tested in accordance with the provision of U. S. Maritime Commission Specification 32-MC-1, Spintex when placed in physical contact with a polished steel plate exposed to alternate wetting and drying cycles causes no more corrosion than sterile cotton under similar test conditions.

Moisture Resistant

Spintex fibers are solid filaments, non-absorptive in themselves and treated to prevent hygroscopic or capillary action of the felt.

Incombustible

Spintex insulation (without facing) rates as *incombustible* when tested according to U. S. Bureau of Standards Commercial Standard CS-131-46, Section VI, and will pass the test prescribed in U. S. Coast Guard Specification 164009.

SPINTEX
Specification Data

STANDARD SIZES, THICKNESSES AND AVAILABLE FACINGS

Type	Wt per bd ft, lb	Length, inches	Width, inches	Thickness, inches	Facings
No. 411 (flexible)	0.21	60, 120	30	1, 1½, 2	VS, VF, AF
No. 413 (flexible)	0.35	48, 60	15, 30*	1, 1½, 2, 3	VS, VF, AF
No. 414 (rigid)	0.50	48, 60	15, 30*	1, 1½, 2	VS, VF, AF, AP
No. 415 (rigid)	0.67	48, 60	15, 30*	1, 1½, 2	VS, VF, AF, AP

*Spintex No. 413, 414, and 415, when faced, are available in 30" width only.

SPECIAL FACING CHARACTERISTICS

Type	Description	Combustible	Water-vapor barrier
VS	Kraft paper and asphalt*	yes	yes
VF	.004" vinyl film	**	yes
AF	Laminate .001" aluminum foil-scrim-kraft	**	yes
AP	Plain asbestos paper	no	no

*No. 413, 414 and 415 only. Sisalkraft paper and asphalt furnished on No. 411.

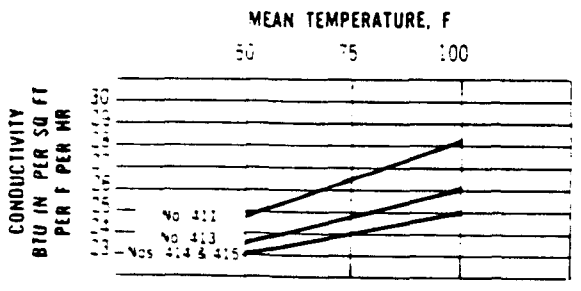
**Facing will burn but flame goes out when source of heat is removed. Flame is not transmitted along facing.

COMPLIANCE WITH GOVERNMENT SPECS

Spintex No. 415—HH-I-562, Type I, Class 2**. Spintex No. 414 & 415—HH-I-564, Type II, Class A**. Spintex No. 413, 414 & 415—HH-I-542, Type II**.

**Standard dimensions of Spintex Duct Insulation are not identical with those mentioned in these Federal Specifications.

THERMAL CONDUCTIVITY



FOR SEALING DUCT INSULATION JOINTS...

J-M DUTCH BRAND
PRESSURE SENSITIVE TAPE

Johns-Manville recommends J-M Dutch Brand No. 353 Duct Sealing Tape for forming, holding, and sealing air duct insulation. Specially treated waterproof, water-resistant silver cloth backing provides excellent vapor barrier. Adhesive grips non-porous surfaces to make air-tight seam at joints and overlaps.

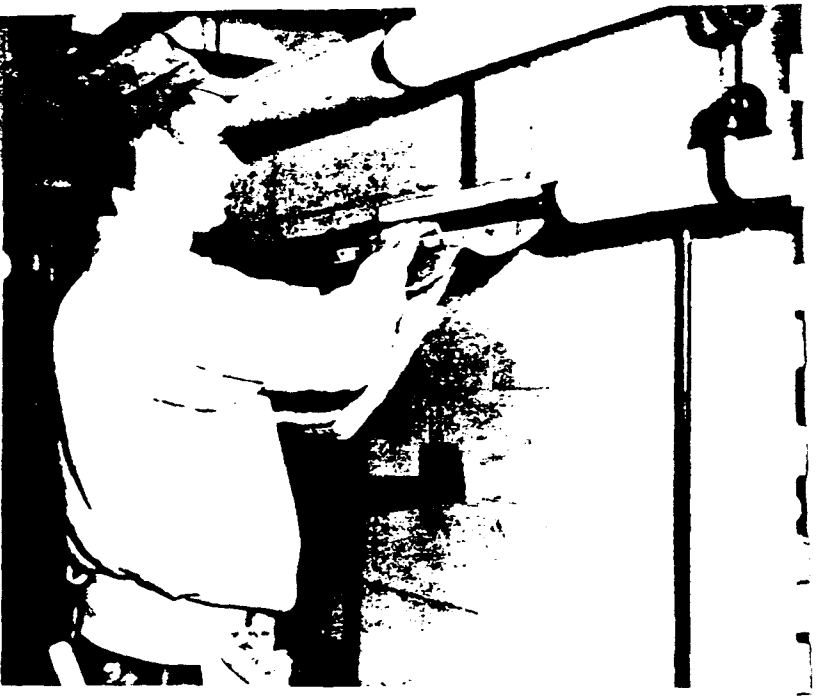
- **Backing:** Cloth-colored plastic coating.
- **Color:** Silver.
- **Adhesive Mass:** Water insoluble—rubber and resin base
- **Roll Length:** 60 yds. Special lengths on inquiry.
- **Widths:** All standard widths.
- **Core size:** 3"
- **Packing:** Bulk case with each roll separated, center supported.

CE/HI (P) 32435

HIGH TEMPERATURE

Johns-Manville

PRODUCT INFORMATION



type: Pipe

temp limit: 300F

J-M FIBROCEL® pipe insulation

■ **DESCRIPTION:** J-M Fibrocel is a precision-molded insulation made from chemically inert silica aggregate. In the manufacturing process light weight, inorganic structures are formed which when bonded together include minute voids. This combination gives Fibrocel its strength and insulating value.

■ **AVAILABLE FORMS:**

Fibrocel C –Standard or special weight canvas jacket and metal bands. For service to 300F.

Fibrocel VS–Jacketed in creped white kraft bonded to 1 mil aluminum foil. Service 50F-300F.

Fibrocel VB–Outer surface same as Type VS, inner vapor barrier full mil aluminum foil, inner facing creped black kraft. Three layers bonded with waterproof laminant. End strips furnished for sealing joints. For pipes subject to sweating. Recommended service 35F-300F.

■ **USES:** For hot, cold and chilled water lines; low pressure steam pipes; dual service systems.

■ **ADVANTAGES**

Precision Molded

A Fibrocel job presents a beautifully cylindrical appearance, straight and true as a gun barrel, completely free from bumps and irregularities.

Resists Deformation

Hard, rigid, strong, Fibrocel offers excellent back-up protection against jacket punctures. Stands up well under normal service abuse.

Won't Shrink

Completely eliminates objectionable shrinkage. Unaffected by changing atmospheric conditions.

Inorganic... Fireproof... Permanent

Will not rot, mold or burn.

Economical to Apply

Light, uniform, easy to cut and work.

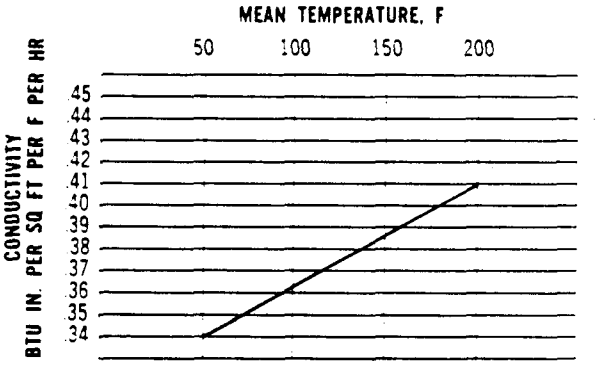
FIBROCEL
Specification Data

PHYSICAL PROPERTIES*

Density (dry)	9 lbs per cu ft
Transverse Strength (modulus of rupture)	50 psi
Linear Shrinkage	moist to dry— .05" per 36" length
Temperature Range	to 300F
Permeance	VB: 0.01 perm maximum VS: 0.3 perm maximum

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

Fibrocel C meets the requirements of Federal Specification HH-I-552 Type I, Class A.

STANDARD SIZES

Nominal Thickness, inches	Pipe Sizes, inches	
	Copper Tubing	Steel Pipe
¾	⅜ –3	⅜ –3
1	⅜ –6	⅜ –6
1½	⅜ –6	⅜ –6 .8 .10 .12
2	⅜ –6	⅜ –6 .8 .10 .12

RECOMMENDED THICKNESSES

HEATING PIPING INSULATION*

Pipe Temperature, F	Continuous Operation: Pipe Size, inches	Continuous Operation: Thickness, inches	Seasonal Operation: Pipe Size, inches	Seasonal Operation: Thickness, inches
200-299	⅜ thru 2	¾	⅜ thru 6	¾
	2½ thru 6	1	over 6	1½
	over 6	1½		
300-300	⅜ thru 2	1½	⅜ thru 3	¾
	over 2	2	3½ thru 6	1
			over 6	1½

*Thicknesses are optimum calculated on an economic basis for heat conservation under average operating conditions.

PLUMBING PIPING INSULATION**

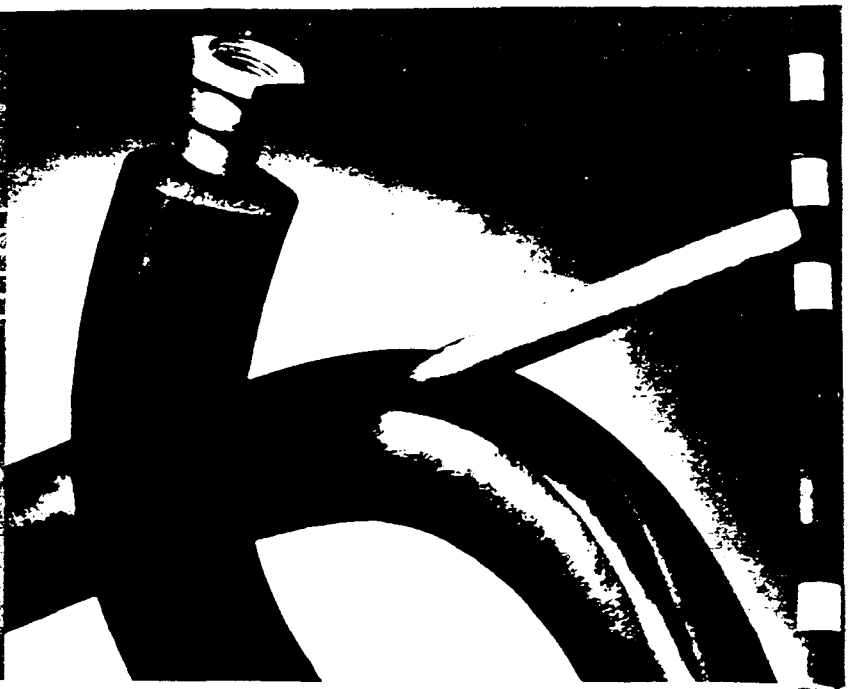
Pipe Temperature, F	Pipe Size, inches	Thickness, inches
35-39	to 3	1
	over 3	1½
40-49	to 1½	¾
	2-6	1
	over 6	1½
50-60	to 3	¾
	over 3	1

**Thicknesses are calculated to prevent condensation at ambient conditions of 85F and 80% R.H. dew point 78F.

CE/HI (P) 32437

Johns-Manville

PRODUCT INFORMATION



type: Pipe & Sheet

temp limit: 200F

J-M AEROTUBE® plastic pipe insulation

■ **DESCRIPTION:** Johns-Manville Aerotube is a closed cell, foamed plastic, tubular pipe insulation for use at temperatures from 32F to 200F. Its extreme flexibility permits quick, easy application, especially on bent tubing and fittings.

■ **AVAILABLE FORMS:** Furnished in 6′ lengths without longitudinal joints for both iron pipe and copper tubing. Also available in sheet form for flat surfaces.

■ **USES:** Recommended for heating, plumbing and air-conditioning service, particularly where sweating or condensation is a problem.

■ **ADVANTAGES**

Built-In Vapor Barrier

Aerotube has a closed cell structure that stops the passage of moisture.

Substantial Labor Savings

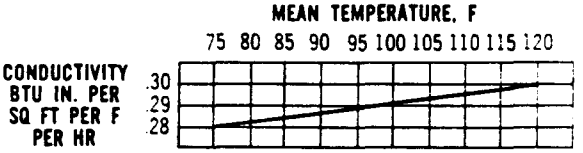
Tubular form without longitudinal joints speeds application.

PHYSICAL PROPERTIES*

Water Vapor Transmission, Perms (grains in. per sq ft per hr per in. Hg)	less than 0.1
Water Absorption, % by volume (60 days immersion)	3.9
Density, lbs per cu ft	7.5

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



RECOMMENDED THICKNESSES

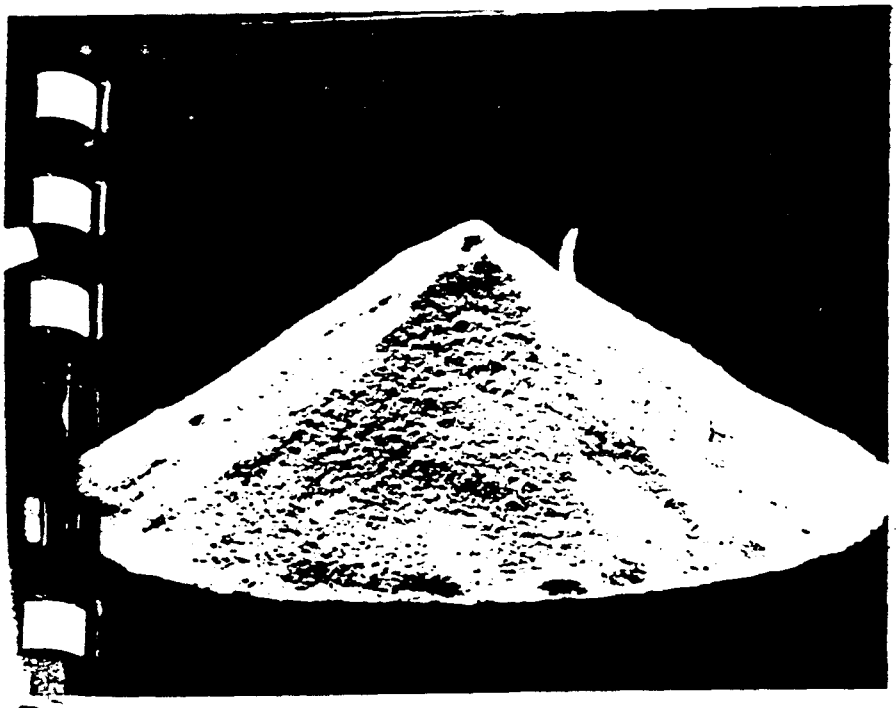
Normal design conditions: max. severity of 85F and 70% R.H.

Pipe Size, inches	TEMPERATURE OF PIPE, F: 50	32
	Nominal Thickness, inches	
⅜ id thru 2 ips	⅜	½
Over 2 ips thru 3 ips	½	½
Over 3 ips thru 6 ips	⅜ Sheet	⅝ Sheet
Over 6 ips thru FLAT Surfaces	⅜ Sheet	¾ Sheet

Mild design conditions: max. severity of 80F and 50% R.H.

Pipe Size, inches	TEMPERATURE OF PIPE, F: 50	32
	Nominal Thickness, inches	
⅜ id thru 2 ips	⅜	⅜
Over 2 ips thru 3 ips	½	½
Over 3 ips thru 6 ips	⅜ Sheet	⅜ Sheet
Over 6 ips thru FLAT Surfaces	⅜ Sheet	⅜ Sheet

CE/HI (P) 32438



Johns-Manville

PRODUCT INFORMATION

type: Fill

temp limit: −400 to +350F

J-M PERLOX expanded perlite insulating fill

■ **DESCRIPTION:** Johns-Manville Perlox is a white, light weight powder possessing unusual insulating properties. It is made from a chemically inert silica aggregate containing, in its natural state, myriads of tiny trapped particles of water. Under the action of high temperatures in the manufacturing process the water is vaporized, exploding the silica and causing it to expand—just like corn in a popcorn popper—to many times its original volume. As a result of this expansion a very low density, inorganic cellular structure is formed containing countless minute voids or partial vacuums sealed by microscopic but sturdy walls.

Completely inorganic, Perlox can be readily used at extremely low temperatures, and is safe in the presence of liquid oxygen.

■ **AVAILABLE FORMS:** Perlox is furnished in loose powder form only.

■ **USES:** Primarily developed as an insulating fill, Perlox is suitable for use over a relatively wide temperature range for any application requiring this type of material. It is particularly recommended for insulating liquid oxygen tanks and other cryogenic applications.

■ ADVANTAGES

100% Inorganic

Made from chemically inert silica aggregate. Can be used at temperatures as low as −400F. Absolutely safe in the presence of liquid oxygen. Physically and chemically stable.

Light Weight

A cubic foot of Perlox weighs only 3 pounds.

Low Conductivity

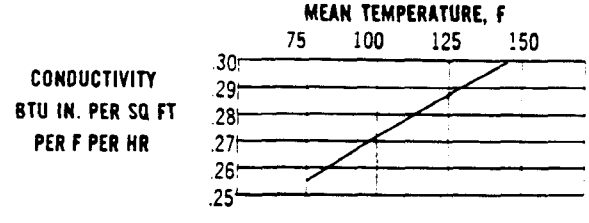
Has a *k* factor of 0.16 at −200F.

PHYSICAL PROPERTIES*

Organic Content	none
Moisture Content (average loss of weight when heated at 220F for 2 hours)	0.5%
Density	3 lbs per cu ft
Temperature Limit	−400 to +350F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



CE/HI(P)32439

J-M J-FOAM refrigeration insulation

■ **DESCRIPTION:** J-Foam is a low temperature expanded polystyrene insulating block featuring extreme lightness (1 lb pcf) and low thermal conductivity.

■ **AVAILABLE FORMS:** Furnished in sheets 12″ or 24″ wide by 4′ through 12′ in length, in a variety of thicknesses ranging from 1 to 8 inches.

NOTE: A form of J-Foam, self-extinguishing according to ASTM D-635-44, is available. Its density averages 1.5 lb pcf; other properties essentially the same as regular J-Foam.

■ **USES:** Recommended for use in cold storage rooms for ceilings, walls, floors. May be applied to either wood or concrete.

■ **ADVANTAGES**

Extra Low Conductivity

Thermal conductivity is only .23 at 10F; .25 at 40F; and .27 at 70F mean temperature.

Extreme Lightness

A cubic foot of J-Foam weighs only one pound; a single workman can easily carry a dozen sheets at a time.

Easy Installation

Light weight and larger sizes plus ease of securing speeds installation. One man can easily place a sheet of J-Foam in position and hold it momentarily until adhesive grips.

Large Size Sheets

Large sheets cover more surface and reduce the number of joints.

Strong and Resilient

J-Foam is not brittle, recovers quickly when pressed. It is amply strong for use in erecting self-supporting partitions.

Completely Inert

A safe and sanitary, completely inert insulating material, J-Foam will not rot, mold, or attract vermin or termites.

Moisture Resistant

No capillarity; non-hygroscopic; moisture permeability average: 1.5 perm inches.

J-FOAM

Data

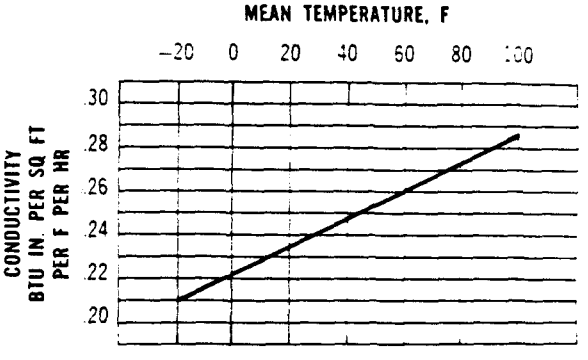
PHYSICAL PROPERTIES*

Density	**1.0 lbs per cu ft**
Compressive Strength	
Load to compress 5%	**10.0 psi**
Compression under load, 500 psf	**.028 in.**
Tensile Strength	**10.0 psi**
Water Absorption, 1" submersion	
24 hours	**1.7% by vol**
1 week	**2.4% by vol**
8 weeks	**4.0% by vol**
Capillarity	**none**
Water Vapor Permeability	**1.5 perm in.**
Maximum Recommended Temperature	**180F**
Coefficient of Expansion	**40 x 10^{-6}**

*The figures given in this table are average values obtained in accordance with accepted test methods.

NOTE: A form of J-Foam, self-extinguishing according to ASTM D-635-44, is available. Its density averages 1.5 pcf, other properties are essentially the same as those given above.

THERMAL CONDUCTIVITY



COMPLIANCE WITH GOVERNMENT SPECS

Interim Specification HH-I-00575 GSA-FSS)

STANDARD SIZES

Length, ft	Width, inches	Thickness, inches
4 through 12	12 and 24	1, 1½, 2, 3, 4, 6, and 8

PACKAGING INFORMATION

In Bundles — sheets 24" wide

Thickness, inches	No. Pcs/Ctn	Bd Ft if Sheet Length is: 4'	6'	8'	10'	12'
1	27	216	324	432	540	648
1½	18	216	324	432	540	648
2	13	208	312	416	520	624
3	9	216	324	432	540	648
4	6	192	288	384	480	576
6	4	192	288	384	480	576

In Cartons — sheets 24" x 48"

1	24	192
1½	16	"
2	12	"
3	8	"
4	6	"
6	4	"
8	3	"

CE/HI (P) 32441

Johns-Manville

PRODUCT INFORMATION

type: Pipe, Sheet & Lagging

temp limit: −300 to +350F

J-M ROCK CORK® refrigeration insulation

■ **DESCRIPTION:** Manufactured from mineral wool combined with a water-resistant asphaltic binder which furnishes an ideal base for an asphaltic adhesive or finish, assuring air-moisture-resistant seal.

■ **AVAILABLE FORMS:**

Pipe Insulation – furnished with asphalt-saturated and coated asbestos jacket.

Sheets – furnished 18″ x 18″ x 1″, as well as 18″ x 36″, in thicknesses from 1½″ through 4″.

Lagging – furnished 18″ long, 2″-6″ wide, 1½″-4″ thick. Discs available same thicknesses.

■ **USES:** Recommended for cold storage rooms and low temperature piping and equipment.

■ **ADVANTAGES**

High Moisture Resistance

Won't absorb moisture under conditions of humidity and condensation usually present in cold storage rooms.

Sanitary

Will not absorb or transmit the strongest odors. Won't rot or harbor bacteria.

Incombustible

Protects against costly losses due to fire. Passes Columbia Fire Test (see Specification Data).

Low Conductivity

Low thermal conductivity (.29 at 0F) provides precise temperature control.

Long Service Life

Installations made 30 and more years ago still providing satisfactory service.

Structurally Strong

Strong and rigid enough to build cold room dividing walls without supporting members.

Easy to Install

Light, readily handled, sheets are furnished in large sizes for easy application. Pipe insulation accurately formed for perfect fit.

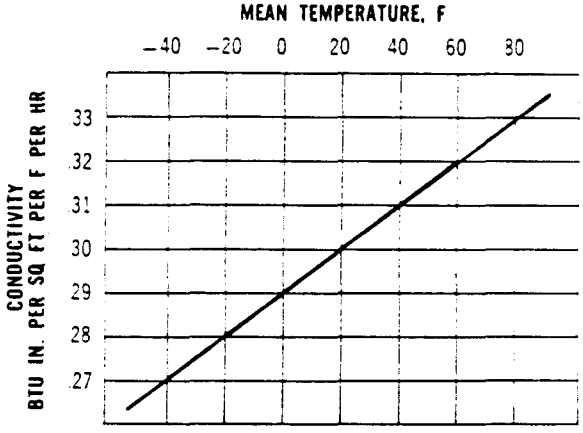
ROCK CORK
Specification Data

PHYSICAL PROPERTIES*

Cohesive Strength	300 lbs per sq ft
Compression (2" sample, load 500 psf)	.025 in.
Water Absorption submerged 24 hrs	3.0% by vol.
Moisture Absorption, from air, 85% relative humidity, 24 hrs	0.75%
Service Temperature Range	−300 to +350F
Transverse Strength (modulus of rupture)	35 psi
Average Weight	15 lbs per cu ft
Coefficient of Linear Change with Temperature	4.5 x 10^{-6} per F

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY



MEETS COLUMBIA FIRE TEST REQUIREMENTS

The new J-M Rock Cork Insulation has passed, with the highest—"incombustible"—rating, the exacting Columbia Fire Test requirements contained in the National Bureau of Standards' Commercial Standard CS131-46. Under this rigorous test a flame from a gas-air burner impinges directly on the material continuously for forty minutes. Temperature readings are taken every two minutes and flame is adjusted to reach 1300F in eleven minutes and 1700F after thirty minutes. During this test period material must not flame, and neither flame nor smoldering must occur after the gas is shut off.

STANDARD SIZES AND THICKNESSES

Nominal Thickness, inches	Iron Pipe Size, inches	Copper Tubing Size, inches
1	½-6	⅝-6⅛
1½	½-14	⅝-6⅛
2	½-14	⅝-6⅛
2½	½-14	⅝-6⅛
3	½-14	⅝-6⅛
3½	½-12	⅝-6⅛
4	½-12	⅝-6⅛

COMPLIANCE WITH GOVERNMENT SPECS

Sheets & Blocks	
HH-I-562	Type I, Class 1
Pipe Insulation:	
HH-I-562	Type II, Class 1, 2, & 3

CE/HI (P) 32443

Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Brick

temp limit: 3000F

J-M INSULATING FIRE BRICK

■ **DESCRIPTION:** Johns-Manville produces six types of Insulating Fire Brick to provide operators and builders of high temperature equipment six opportunities to get the one insulating fire brick that's right for a given service.

Each type of J-M Insulating Fire Brick has the correct balance of thermal and physical properties for its recommended service. All six types offer light weight, low conductivity and high structural strength.

Made from high quality refractory clays (plus alumina in the case of JM-3000), these insulating fire brick contain a carefully graded organic filler which is burned out during manufacture to give a uniform, controlled pore structure.

■ **AVAILABLE TYPES:**

JM-3000*—for temperatures to 3000F exposed.

JM-28—for temperatures to 2800F exposed.

JM-26—for temperatures to 2600F exposed.

JM-23—for temperatures to 2300F exposed.

JM-20—for temperatures to 2000F exposed.

JM-1620—for temperatures to 1600F exposed, to 2000F back-up.

*JM-3000 Insulating Fire Brick is the newest of the six types. It provides long-life insulation at a full 3000F, in back-up or direct exposure service, and is molded from specially selected kaolin clays plus alumina.

■ **USES:** Recommended for use as refractory lining or as back-up insulation behind other refractory protection in kilns, furnaces, flues, refining vessels, regenerators, gas producers and mains, soaking pits, stress-relieving furnaces, reactor chambers and similar high temperature industrial equipment.

■ **ADVANTAGES**

High Insulating Value

The light weight and high insulating value of J-M Insulating Fire Brick make possible thinner furnace walls, improved efficiency and lower operating costs.

Quick Heat Up

Furnaces can be brought up to operating temperatures with unusual speed, resulting in increased production.

INSULATING FIRE BRICK

PHYSICAL PROPERTIES*

Temperature Limit	JM-3000 3000F**	JM-28 2800F**	JM-26 2600F**	JM-23 2300F**	JM-20 2000F**	JM-1620 2000F*** 1600F**
Approximate Density	65 pcf	58 pcf	51 pcf	44 pcf	33 pcf	31 pcf
Transverse Strength	200 psi	175 psi	140 psi	130 psi	100 psi	80 psi
Cold Crushing Strength	400 psi	300 psi	210 psi	200 psi	150 psi	120 psi
Linear Shrinkage	†0.8% at 3000F	1.0% at 2800F	1.0% at 2600F	0.3% at 2300F	0.0% at 2000F	0.0% at 2000F
Reversible Thermal Expansion	0.5-0.6% at 2000F	0.5-0.6% at 2000F	0.5-0.6% at 2000F	0.5-0.6% at 2000F	0.5-0.6% at 2000F	0.5-0.6% at 2000F

*The figures given in this table are average values obtained in accordance with accepted test methods.
**Back-up or exposed. ***Back-up only.
†24-hr Simulative Service Panel Test; all others 24-hr soaking period.

PACKAGING

Type	No. of Brick per Carton
JM-3000	20
JM-28	20
JM-26	25
JM-23	25
JM-20	25
JM-1620	25

COMPLIANCE WITH GOVERNMENT SPECS

JM-20 complies with MIL-B-16305A, Class A

STANDARD SIZES

Type	Size
JM-3000 JM-28 JM-26 JM-23 JM-20 JM-1620	Accurately sized in all standard 9 in. shapes of the 2½ and 3 in. series, as well as special shapes.

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F			
	500	1000	1500	2000
JM-3000	3.22	3.30	3.37	3.46
JM-28	2.55	2.80	3.06	3.32
JM-26	2.22	2.44	2.68	2.93
JM-23	1.51	1.91	2.31	2.70
JM-20	0.91	1.10	1.29	–
JM-1620	0.77	1.02	1.27	–

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

CE/HI (P) 32445

Johns-Manville

PRODUCT INFORMATION

type: Brick
temp limit: 2500F

J-M SIL-O-CEL® INSULATING BRICK

■ **DESCRIPTION:** Made from diatomaceous silica, a material composed of millions of microscopic cells that offer maximum resistance to heat flow, Sil-O-Cel Insulating Brick are particularly useful where high load-bearing characteristics are required. Sil-O-Cel Insulating Brick are furnished in three types for use as back-up insulation behind refractory fire brick linings or behind insulating fire brick linings. The new Sil-O-Cel 16L brick may also be used for exposed as well as back-up service.

■ **AVAILABLE TYPES:**

Sil-O-Cel Insulating Brick are furnished in three different types as follows:

Sil-O-Cel Super—for temperatures to 2500F back-up only.

Sil-O-Cel C-22—for temperatures to 2000F back-up only.

Sil-O-Cel 16L—for temperatures to 1600F back-up or exposed.

■ **USES:** Sil-O-Cel Insulating Brick are recommended for use as back-up insulation in furnaces, kilns, hot blast stoves, soaking pits, boiler walls, oil heaters, regenerators, and similar high temperature equipment in the steel, chemical, ceramic, power, petroleum and glass industries.

■ **ADVANTAGES**

Good Insulating Value

Used as back-up insulation, Sil-O-Cel Insulating Brick make it possible to reduce the necessary thickness of the exposed refractory as much as one-third. This results in substantial savings in furnace wall construction for all the types of high temperature equipment for which these brick are recommended.

High Load Bearing Strength

Sil-O-Cel Insulating Brick are made from diatomaceous silica, a natural fossilized material which imparts to the finished brick great strength. The Sil-O-Cel C-22 brick, for example, has a cold crushing strength of [illegible] lbs per square inch.

CE/HI (P) 32446

SIL-O-CEL INSULATING BRICK
Specification Data

PROPERTIES*

	Super	C-22	16L
Temperature Limit	2500F**	2000F**	1600F***
Approximate Density	40 pcf	38 pcf	34 pcf
Transverse Strength	90 psi	115 psi	60 psi
Cold Crushing Strength	300 psi	700 psi	350 psi
Linear Shrinkage	2.0% at 2500F	0.8% at 2000F	0.7% at 1600F
Reversible Thermal Expansion	1.3% at 2000F	0.7% at 2000F	less than 0.1% at 1600F

*The figures given in this table are average values obtained in accordance with accepted test methods.
**Back-up only. ***Back-up or exposed.

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F			
	500	1000	1500	2000
Super	1.70	1.95	2.19	2.45
C-22	1.67	1.88	2.08	–
16L	0.92	1.07	1.22	–

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

COMPLIANCE WITH GOVERNMENT SPECS

Sil-O-Cel Super complies with MIL-B-16182B

STANDARD SIZES

Type	Size
Sil-O-Cel Super Sil-O-Cel C-22 Sil-O-Cel 16L	Furnished in all standard 9 in. shapes of the 2½ and 3 in. series, as well as special shapes.

PACKAGING INFORMATION

All Sil-O-Cel Insulating Brick are packaged 25 to a carton.

CE/HI (P) 32447

Johns-Manville

PRODUCT INFORMATION

type: Castable
temp limit: 3000F

J-M FIRECRETE® hydraulic setting refractory cement

■ **DESCRIPTION:** Johns-Manville produces seven types of hydraulic setting castable refractory cements to meet practically every castable requirement for temperatures through 3000F. Each of these refractories is economical and efficient in the service range for which it is recommended. All harden rapidly and are highly resistant to spalling.

■ **AVAILABLE TYPES:**

3X Firecrete – For service to 3000F. Composed principally of high aluminous materials calcined at high temperatures. Recommended for casting thicknesses of 2 inches or more.

H.T. Firecrete–For service to 2800F. Recommended for casting thicknesses 2 inches or more.

Standard Firecrete–For service to 2500F. Develops exceptional strength on air curing. Can be used to cast thicknesses as thin as 1 inch.

L.W. Firecrete–A light weight, insulating refractory concrete for service to 2400F. 75 lbs of dry material required for one cubic foot.

CA Insulating Firecrete–A light weight, low iron content refractory for use in controlled atmospheres. For service to 2600F.

No. 20 Firecrete–Similar to L.W. Firecrete but lighter. 58 lbs of dry material required for one cubic foot. Service to 2200F.

C-31 M Refractory Cement–A chrome base castable refractory for service to 3000F.

■ **USES:** Firecrete is used extensively for monolithic furnaces and linings and is recommended for such special shapes as those required for burner rings, baffle tile, header protection tile, pipe linings, furnace bottoms and similar installations.

■ **ADVANTAGES**

Hardens Rapidly

Firecrete permits casting and use of any desired shape within 24 hours.

Resists Spalling

All seven types are highly resistant to spalling.

Negligible Shrinkage

Firecrete has no drying shrinkage and only negligible fire shrinkage at recommended temperatures.

Easy and Economical to Use

The adaptability of Firecrete makes possible the easy construction of monolithic furnaces, linings and the like which would otherwise require the use of special shapes or involve costly cutting and fitting of brick.

FIRECRETE
Specification Data

PHYSICAL PROPERTIES*

	3X	H.T.	STD.	L.W.	CA Insulating	No. 20	C-31 M Refractory
Highest Recommended Service Temperature	3000F	2800F	2500F	2400F	2600F	2200F	3000
Pyrometric Cone Equivalent	33 (3173F)	30 (3002F)	16 (2669F)	15 (2615F)	32½ (3135F)	14 (2552F)	36 (3290)
Weight							
As Placed	148 pcf	131 pcf	130 pcf	109 pcf	109 pcf	96 pcf	193 pcf
Oven Dried at 220F	134 pcf	113 pcf	116 pcf	80 pcf	80 pcf	62 pcf	183 pcf
After 5-Hr Firing at 1750F	130 pcf	110 pcf	110 pcf	75 pcf	75 pcf	58 pcf	177 pcf
Crushing Strengths After 5-Hr Firing at:							
220F	3500 psi	700 psi	1310 psi	630 psi	580 psi	220 psi	2920 psi
1200F	2680 psi	560 psi	1190 psi	595 psi	475 psi	210 psi	1780 psi
1750F	2350 psi	300 psi	780 psi	490 psi	595 psi	220 psi	1300 psi
2000F	—	—	—	—	—	320 psi	—
2200F	2490 psi	580 psi	1190 psi	690 psi	650 psi	—	1690 psi
2400F	2950 psi	1500 psi	2130 psi	1690 psi	840 psi	—	3850 psi
Linear Change After 5-Hr Firing at:							
1200F	−0.2%	0.0%	0.0%	−0.2%	−0.1%	−0.2%	−0.2%
1750F	−0.1%	0.0%	−0.2%	−0.3%	−0.2%	−0.4%	−0.2%
2000F	−0.1%	—	—	—	—	−0.6%	—
2200F	−0.2%	0.0%	−0.6%	−0.5%	−0.3%	—	−0.3%
2400F	−0.7%	−0.6%	+1.6%	−2.4%	−0.8%	—	−0.5%
2600F	−0.9%	+0.9%	—	—	—	—	−1.9%
3000F	—	—	—	—	—	—	−3.1%

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F						
	800	1000	1200	1400	1600	1800	2000
3X	—	7.0	7.2	7.5	7.8	8.4	9.4
H.T.	—	4.45	4.76	5.08	5.41	5.74	—
Std	4.16	4.34	4.59	4.88	5.19	5.52	—
L.W.	1.99	2.09	2.21	2.36	2.56	2.82	—
CA Ins	—	2.57	2.70	2.90	3.12	3.33	3.65
No. 20	1.43	1.54	1.65	1.76	1.87	1.98	—
C-31 M	—	6.0	6.1	6.3	6.5	6.7	6.9

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

PACKAGING INFORMATION

	Pounds Required for 1 cubic foot	Packaging
3X Firecrete	130	100-lb bags
H.T. Firecrete	110	100-lb bags
Standard Firecrete	110	50 or 100-lb bags
L.W. Firecrete	75	100-lb bags
CA Insulating Firecrete	75	100-lb bags
No. 20 Firecrete	58	50-lb bags
C-31 M Refractory Cement	175	100-lb bags

Johns-Manville

PRODUCT INFORMATION

type: Gunning-Troweling

temp limit: 3000F

J-M BLAZECRETE® hydraulic setting refractory cement

■ **DESCRIPTION:** Four types of dry monolithic, hydraulic setting refractory cements have been developed and produced by Johns-Manville for gunning and slap-troweling applications.

These four refractories are especially adaptable for gun application in building new refractory linings and repairing old ones. They adhere readily with a minimum of loss when "shot" in place. Mixed with water at the gun nozzle, they are pneumatically projected with great force, resulting in a dense, homogeneous lining.

Blazecrete is equally effective for heavy patching by troweling, especially where brickwork has eroded deeply. It eliminates the laborious ramming or tamping required with "plastics," and patches need not be prefired.

■ **AVAILABLE TYPES:**

3X Blazecrete—For service to 3000F. High alumina content. Particularly adaptable for gun applicators and for heavy patching by slap-troweling.

Standard Blazecrete—For service to 2400F. Alumina silicate base.

L.W. Blazecrete—For service to 2000F. Light weight, alumina silicate base refractory. Used extensively for stack linings, heaters and other applications where gunning mix with low rebound loss is required.

C-2 Refractory Cement—For service to 2300F. Used to advantage in making a protective abrasion-resistant refractory surface over L.W. Blazecrete.

■ **USES:** Recommended for lining or patching forge furnaces, ashpits, cyclones, heaters, boilers, oil refining equipment, furnace bottoms, ladles and similar applications. L.W. Blazecrete is extensively used on tanks, structural steel and skirts for fire protection purposes.

■ **ADVANTAGES**

Hardens Rapidly

Applications ready for use within 24 hours of gunning or slap-troweling.

Resists Spalling

All four types are highly resistant to spalling.

Easy to Use

Can be applied by gunning or slap-troweling.

CE/HI (P) 32450

BLAZECRETE
Specification Data

PHYSICAL PROPERTIES*

	3X	STD.	L.W.	C-2 Cement
Highest Recommended Service Temperature	3000F	2400F	2000F	2300F
Pyrometric Cone Equivalent	33 (3173F)	16 (2669F)	14 (2552F)	15 (2608F)
Weight Slap Troweled:				
As Placed	148 pcf	132 pcf	104 pcf	140 pcf
Oven Dried at 220F	133 pcf	116 pcf	69 pcf	126 pcf
After 5-Hr Firing at 1750F	130 pcf	110 pcf	65 pcf	120 pcf
Weight Gunned:				
As Placed	153 pcf	134 pcf	117 pcf	–
Oven Dried at 220F	142 pcf	124 pcf	76 pcf	–
After 5-Hr Firing at 1750F	140 pcf	118 pcf	73 pcf	–
Crushing Strengths After 5 Hours Firing at:				
220F	570 psi	1350 psi	275 psi	5775 psi
1200F	700 psi	1070 psi	338 psi	4695 psi
1750F	790 psi	1130 psi	400 psi	–
2000F	–	–	461 psi	–
2200F	1040 psi	1480 psi	–	–
2400F	2390 psi	2870 psi	–	–
Linear Change After 5 Hours Firing at:				
1200F	0.0%	–0.1%	–0.3%	–0.2%
1750F	0.0%	–0.4%	–0.6%	–0.2%
2000F	–	–	–0.8%	–0.5%
2200F	–0.2%	–0.6%	–	–
2400F	–0.2%	–0.4%	–	–

*The figures given in this table are average values obtained in accordance with accepted test methods.

THERMAL CONDUCTIVITY

	MEAN TEMPERATURE, F							
	600	800	1000	1200	1400	1600	1800	2000
3X	–	–	4.10	4.30	4.68	5.40	6.35	7.68
Std	–	3.89	3.95	4.05	4.24	4.57	5.09	–
L.W.	1.42	1.52	1.64	1.76	1.89	2.01	–	–
C-2	–	–	3.40	3.50	3.80	4.30	5.10	5.90

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

PACKAGING INFORMATION

	Pounds required for 1 cu ft	Packaging
3X Blazecrete	130 (slap-troweling) 140 (gunning)	100 lb bags
Standard Blazecrete	110 (slap-troweling) 118 (gunning)	100 lb bags 100 lb bags
L.W. Blazecrete	65 (slap-troweling) 73 (gunning)	50 lb bags
C-2 Refractory Cement	120 (slap-troweling)	100 lb bags

Johns-Manville

PRODUCT INFORMATION

type: Fill
temp limit: 2400F

J-M AGGREGATES AND FILLS

■ **DESCRIPTION:** Johns-Manville lightweight aggregates and fills are available in a wide selection for temperatures through 2400F.

JM-2000 and JM-2400 L.W. Aggregates may be mixed with calcium aluminate cement to form an insulating refractory concrete for various operating conditions. Sil-O-Cel C-3 may be mixed with calcium aluminate or portland cement for lower temperature conditions. By selection of the aggregate, an insulating refractory concrete can be made with the characteristics desired for constructing cars, japanning and enameling ovens, foundations and bases of heated equipment, furnace doors, and many special shapes. In addition, all materials listed below may be used as fills for insulating irregular spaces in high temperature equipment, making it possible to conserve heat where other forms of insulation cannot be economically installed.

AVAILABLE TYPES

Name	Composition	Temperature limit, F	Approx density to which fills are normally packed, lbs per cu ft	Packaging
JM-2400 L.W. Aggregate	al. silicate	2400	50	65-lb bags
JM-2000 L.W. Aggregate	al. silicate	2000	41	50-lb bags
Sil-O-Cel C-3	calcined, coarse-graded diatomaceous silica	2000	31	50-lb bags
Sil-O-Cel Insulating Powder	finely ground diatomaceous silica	1600	17	50-lb bags
Sil-O-Cel Coarse Grade	similar to Sil-O-Cel Insulating Powder, but more coarsely ground	1600	22	50-lb bags

CE/HI (P) 32452

Johns-Manville

PRODUCT INFORMATION

type: Refractory Mortar
temp limit: 3200F

J-M BONDING MORTARS

■ **DESCRIPTION:** J-M Refractory Bonding Mortars are recommended for bonding together many relatively small units into a stable, strong, and gas-tight structure. The use of refractory mortars reduces slag or gas penetration and cuts down heat loss caused by open joints. There are two general classifications of bonding mortars: heat setting and air setting. Heat setting mortars will develop a bond only with the application of heat. Air setting mortars develop a strong bond without the application of heat.

J-M Bonding Mortars have been scientifically formulated to insure good workability, low shrinkage, and long shelf life.

AVAILABLE TYPES

CE/HI (P) 32453

Mortar	Type	Temperature Limit, F	Uses	Packaging
Blakite®	air setting	3200	laying insulating fire brick or refractory brick; shallow patching hot or cold surfaces	220, 100, 50, 25, 10 and 5-lb containers
No. 2[illegible]	air setting	3200	laying insulating fire brick or refractory brick; shallow patching hot or cold surfaces	220, 100, 50, 25, 10 and 5-lb containers
Hellite®	air setting	3000	laying fire brick; shallow patching	220, 100, 50, 25, 10 and 5-lb containers
No. 20	air setting	2700	laying fire brick	220, 100, 50, 25, 10 and 5-lb containers
No. 26	air setting	2600	laying fire brick; patching	100-lb bags
No. 31	(coarse) heat setting	3100	laying fire brick	100-lb bags
No. 32	(fine) heat setting	3100	laying fire brick	100-lb bags

Johns-Manville

PRODUCT INFORMATION

type: Refractory Felt

temp limit: 2000F

J-M CERAFELT refractory fiber felt

■ **DESCRIPTION:** J-M Cerafelt is a lightweight, refractory-fiber insulation notable for its excellent thermal and chemical stability. Made predominantly of alumina and silica, it combines lightness, heat resistance, low conductivity and high sound-absorption qualities.

■ **AVAILABLE FORMS:** Furnished in densities ranging from 3 to 24 lbs per cu ft. Also prefabricated fully encased in heat-resistant metal foils or meshes to fit any industrial shape.

■ **USES:** Recommended for a great variety of high temperature applications including gas turbines, refractory linings for domestic oil burner combustion chambers, high temperature packing, and similar industrial uses.

■ **ADVANTAGES**

High Heat Resistance

Will withstand continuous exposure to a full 2000F.

Low Thermal Conductivity

Unusually low conductivity at high temperatures due to opacity of basic fibers to infra-red radiation.

Light Weight

Weighs as little as 1 40th equal volume of hard fire brick.

Chemically Stable

Non-alkaline and chemically stable. Contains no corrosion-promoting agents.

THERMAL CONDUCTIVITY

Density, lbs per cu ft	MEAN TEMPERATURE, F							
	300	400	500	600	700	800	900	1000
3	.39	.46	.55	.65	.76	.89	1.02	1.16
4	.37	.44	.52	.61	.71	.82	.94	1.07
6	.35	.41	.47	.54	.62	.71	.81	.92
8	.34	.39	.45	.51	.57	.64	.71	.80
10	.34	.38	.43	.49	.55	.61	.68	.75
12	.34	.38	.43	.48	.53	.59	.65	.72
18	.32	.36	.40	.45	.50	.55	.60	.66
24	.31	.35	.40	.44	.48	.53	.58	.63

CONDUCTIVITY: BTU IN. PER SQ FT PER F PER HR

STANDARD DENSITIES AND THICKNESSES

Type	Density, lbs per cu ft	Available Thicknesses, Inches								
		1/16	1/8	1/4	3/8	1/2	3/4	1	1 1/2	2
CRF-300	3			X	X	X	X	X	X	X
CRF-400	4			X	X	X	X	X	X	X
CRF-600	6			X	X	X	X	X	X	
CRF-800	8		X	X	X	X	X	X		
CRF-1000	10		X	X	X	X	X	X		
CRF-1200	12	X	X	X	X	X	X	X		
CRF-1800	18	X	X	X	X					
CRF-2400	24	X	X	X						

STANDARD SIZES

Length, feet		Width, inches
CRF-300—CRF-600	4, 8 and 26	42
CRF-800—CRF-2400	4 and 8	

CE/HI (P) 32454

Johns-Manville

PRODUCT INFORMATION

type: Cements & Fills
temp limit: 1900F

J-M CEMENTS & FILLS insulating & finishing

■ **DESCRIPTION:** Johns-Manville Insulating and Finishing Cements have been produced for use with J-M insulating materials. The Insulating Cements are ideal for insulating irregular surfaces where it would be impracticable to apply pipe or block insulation. Finishing Cements are used to give insulation a hard, smooth finish which can be painted or weatherproofed. J-M Insulating Fills are recommended for use in filling irregular spaces.

■ **AVAILABLE TYPES:**

FINISHING CEMENTS

No. 301 Cement—A hydraulic-setting, insulating and finishing cement especially designed for one-coat application at temperatures to 1400F. (It should not be applied where surface temperatures are below 32F or above 150F). Because of extremely low drying shrinkage, it hardens in a few hours to a smooth, crack-free surface. It may be painted with a water-base paint as soon as firm, thus permitting completion of job in one operation. No. 301 is recommended for insulating small steel pipe fittings and as a finish over block insulation.

No. 352 Cement—A general purpose, all asbestos fiber cement with good troweling and finishing properties for service to 1000F. Generally used as a finish over block insulation and for general utility applications. For a hard finish, No. 352 Cement may be mixed two parts by weight with one part portland cement.

INSULATING CEMENTS

No. 450 Cement—A mineral wool cement for use at service temperatures to 1800F, No. 450 Cement has excellent adhesion qualities on both hot and cold surfaces. A good insulator, compared with other types of cements, it can be applied in heavy layers. No. 450 contains a rust inhibitor to minimize rusting of metal with which it may come in contact.

Superex Insulating Cement—For use with Superex or Thermobestos pipe and block insulation at service temperatures to 1900F. Recommended for patching, pointing up joints, and covering irregular shapes.

85% Magnesia Cement—For use with 85% Magnesia pipe and block insulation for patching, pointing up joints, and covering irregular shapes at service temperatures to 600F.

INSULATING FILLS

Fibrofil®—A mixture of diatomaceous silica and long fiber asbestos. Due to the asbestos fiber, this material has certain characteristics which differ from those of ordinary powdered fills. The fibers offset any tendency to settle or filter through cracks, making the material well adapted for use as a fill on gas generator sets, etc.

Fil-Insul®—An insulating fill for use in irregular spaces where block or brick insulations are not practicable and where a high-grade resilient fill is needed. Fil-Insul will permit considerable expansion and contraction because of its fibrous nature which also serves to prevent any settling or sifting through cracks.

CE/HI (P) 32455

Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Flat & Pre-Curved Sheets

temp limit: 600F

J-M ASBESTOCITE® asbestos-cement sheets

■ **DESCRIPTION:** J-M Asbestocite is a strong, flexible, monolithic industrial sheet material especially developed for use wherever severe operating conditions call for outstanding strength and permanence. Made of asbestos and cement and formed under tremendous pressure, it is an attractive natural gray in color, and has a hard, smooth finish on one side. Asbestocite is completely inorganic and will not burn, rot or corrode. Equally stable indoors or out, it withstands extreme temperature and atmospheric variations without damage.

■ **AVAILABLE FORMS:** Furnished in flat and pre-curved sheets in sizes ranging from 4' x 4' to 4' x 12', and in thicknesses (depending on sheet size) from 1/8" to 1/2".

■ **USES:** Recommended for a variety of industrial and commercial applications including the following: As a protective facing over cold storage room insulation; as a weatherproof facing over insulation on outdoor tanks and vessels; for cooling towers; for fume hoods and ducts.

Under normal conditions Asbestocite needs no paint or other protective coating to maintain its neat appearance and enduring protection. Its stone-like finish is unaffected by years of wear and tear, and it requires practically no maintenance. Where desired, for decorative purposes, it may be readily painted with any good quality alkaline-resistant type paint.

■ **ADVANTAGES**

Weather Resistant

Exposed to sun, wind, rain or snow, Asbestocite will not deteriorate. May be subjected to alternate freezing and thawing without danger of spalling or chipping.

Structurally Strong

Formed under tremendous pressure, then hydraulically re-pressed for extra strength.

Fireproof

Approved by the Underwriters' Laboratories as incombustible. Asbestocite serves as a highly effective barrier to the spread of fire.

Practically Maintenance Free

Under normal conditions will retain its neat appearance and enduring protection without painting or other preservative treatment.

Won't Corrode

Immune to most corrosive elements found in industrial atmospheres and will not cause corrosion when in contact with metals.

Permanent

Asbestocite is practically indestructible. Completely inorganic, it will not mold or decay from prolonged dampness, and excessive dryness will not cause it to powder or crack.

CE/HI(P)32456

ASBESTOCITE
Specification Data

PHYSICAL PROPERTIES*

Density, Dry	95 lbs per cu ft minimum
Normal (75 F, 50% RH) Moisture Content (of dry weight)	7%
Water Absorption (of dry weight after 24 hrs immersion)	22% max.
Transverse Strength, Dry (modulus of rupture)	
Long direction of sheet	5500 psi
Short direction of sheet	4000 psi
Modulus of Elasticity, Dry (transverse)	1.8 x 10⁶ psi
Compressive Strength, Normal**	14,000 psi
Tensile Strength, Normal	
Long direction of sheet	2350 psi
Short direction of sheet	1775 psi
Screw Holding Strength, Normal withdrawal load of type A, Nos. 6-12 sheet metal screws)	1/8" thickness—50 lbs per screw 3/16" thickness—75 lbs per screw 1/4" thickness—150 lbs per screw
Brinell Hardness No., Dry (500 kg load, 10 mm ball, 10 sec)	18
Flexibility, Normal (minimum bending radius)	
Long direction of sheet	1/8" thickness—30 inches 3/16" thickness—36 inches 1/4" thickness—66 inches
Short direction of sheet	1/8" thickness—36 inches 3/16" thickness—54 inches 1/4" thickness—72 inches
Moisture Change (in. in.)	
Shrinkage—normal to dry	0.0022
Expansion—normal to 90% RH	0.0006
Expansion—dry to saturated	0.0030
Maximum Service Temperature (soaking heat)	600F

*The figures given for the specified properties of standard Asbestocite are average values obtained in accordance with accepted test methods. Strength figures must be modified by applying adequate factors of safety to arrive at working values.

**"Normal" refers to normal moisture content.

COMPLIANCE WITH ASTM AND GOVERNMENT SPECS

Asbestocite meets the American Society for Testing Materials' [illegible] Type F Flexible as well as Federal Specification [illegible] Type F Flexible

FIRE UNDERWRITERS' APPROVAL

Underwriters Laboratories, Inc. approve J-M Asbestocite as being noncombustible. Their tests show that Asbestocite, when used as a protective covering or as a structural material, will not contribute fuel to a fire, will not permit the spread of flame over its surface, and will not generate objectionable smoke. This is the best possible guarantee of Asbestocite's fire safety for any industrial application.

CE/HI (P) 32457

STANDARD SIZES AND TOLERANCES

Thickness, inches	Standard Sheet Size*, feet			
1/8	4 x 4	4 x 8	4 x 10	4 x 12
3/16	4 x 4	4 x 8	4 x 10	4 x 12
1/4	4 x 4	4 x 8	4 x 10	4 x 12
3/8**	—	4 x 8	—	—
1/2**	—	4 x 8	—	—

*Pre-curved Asbestocite is furnished in 1/8" and 3/16" thicknesses in 4' x 4' and 4' x 8' sheet sizes to fit diameters from 3' to 10'. For information on ordering consult your nearest J-M representative.

**Available from West Coast plant only.

DIMENSIONAL TOLERANCES

	Length, inches	Width, inches	Thickness, inches
Flat	±1/32	±1/32	±1/32
Pre-curved	±1/4	±1/4	±1/32

Johns-Manville

PRODUCT INFORMATION

type: Protective Coating
temp limit: 250F

J-M INSULKOTE' weather protective coating

DESCRIPTION: Developed as high quality protective coatings, J-M Insulkotes are compounded of selected and processed bitumens, asbestos fiber and mineral fillers. These formulations were chosen after careful development and testing to give maximum protection at lowest applied cost to insulated tanks and process equipment. Insulkote effectively seals out water, preserves maximum insulation efficiency, helps prevent rusting and corrosion of expensive equipment.

AVAILABLE TYPES:

Non Water-Vapor Barrier – Insulkote ET* and EG** are non-burning, weatherproof coatings for use over insulation where "breathing" is required.

Water-Vapor Barrier—Insulkote ST* and SG** are weatherproofing and vapor barrier coatings for insulations on refrigerated equipment. Insulkote SG is an excellent anti-corrosion coating.

Combination Purpose – Insulkote SGC*** and EGC*** are coatings which afford protection against weather and corrosive atmospheric conditions, and will prevent condensation under moderate conditions.

*Trowel application **Spray gun application
***Trowel or spray gun application

USES: Recommended for weather-protecting insulated vessels, tanks, piping and equipment.

ADVANTAGES

Durable

Insulkote effectively seals out water, preserves maximum insulation efficiency, helps prevent rusting and corrosion of expensive equipment.

Keeps Out Water

Years of service in the field have shown that Insulkote resists acid or alkaline atmospheres and will stand up under the most adverse weather conditions. Its composition minimizes surface cracking and crazing under sudden temperature changes. A jet black material, it will not fade after it is applied—patches will not contrast with weathered coating.

Easily Applied

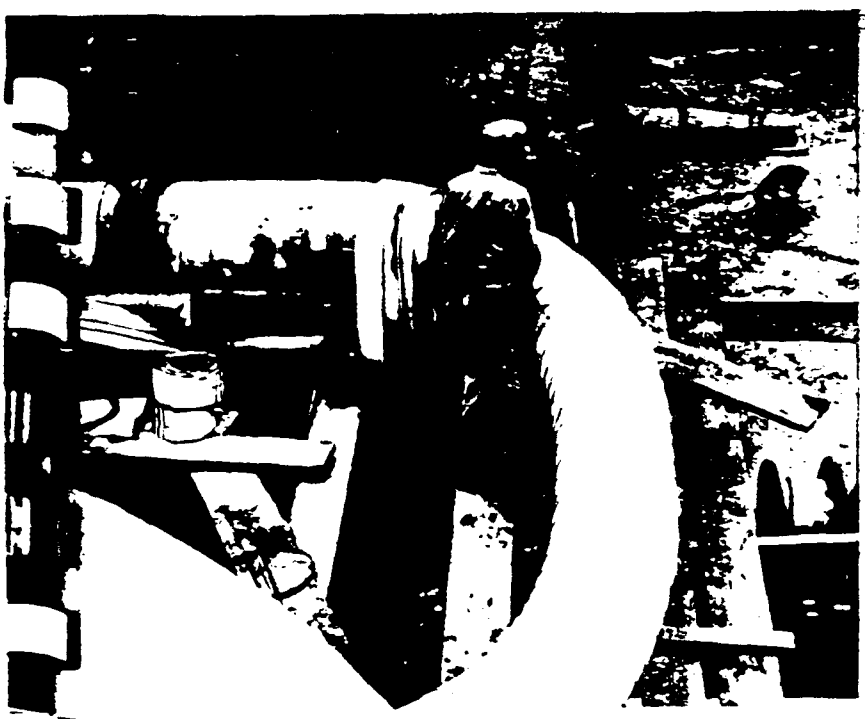
Furnished ready-mixed in two consistencies to facilitate quick, easy trowel or spray application.

PHYSICAL PROPERTIES*

	Insulkote ET	Insulkote EG	Insulkote ST	Insulkote SG	Insulkote EGC	Insulkote SGC
Type	emulsion	emulsion	solvent	solvent	emulsion	solvent
Application	trowel	gun**	trowel	gun**	trowel or gun**	trowel or gun***
Weight per gal	10 lbs	10 lbs	9.5 lbs	9.5 lbs	7.5 lbs	7 lbs
Coverage as applied	16 gal per 100 sq ft ¼" thick	16 gal per 100 sq ft ¼" thick	8 gal per 100 sq ft ¼" thick	8 gal per 100 sq ft ¼" thick	16 gal per 100 sq ft ¼" thick	16 gal per 100 sq ft ¼" thick
Percent shrinkage (volumetric)	50	50	25	25	40	20
Water vapor penetration in perms —for recommended thickness	2 to 5	4 to 7	0 to 1	1 to 2	— —	— —
Temperature use range	100 to 250F	100 to 250F	up to 250F	up to 250F	100 to 250F	up to 250F

Code: E—emulsion type; S—solvent type; T—trowel consistency; G—spray gun consistency; C—cork filler
*The figures given in this table are average values obtained in accordance with accepted test methods
**Spray gun application involves some loss through bounce and over spray. Amount of loss varies with air velocities and types of surface
All solvents have some degree of toxicity and proper ventilation should be provided where material is used in enclosed spaces.

CE/HI (P) 32458



Johns-Manville

PRODUCT INFORMATION

type: Felt

temp limit: 250F

J-M WEATHERPROOFING JACKETS

■ **DESCRIPTION:** Johns-Manville produces a complete line of weatherproofing jackets for every hot and cold insulation requirement. Most are made from asbestos felts which are saturated and coated with asphalt. These jackets, in various thicknesses and weights, may be used for fire protection as well as weatherproofing purposes.

■ **AVAILABLE TYPES:**

Double Coated Flexstone®—A rugged, heavy duty, weatherproofing jacket especially recommended for the protection of insulation on outdoor pipes and small diameter cylindrical vessels. It is composed of asphalt-saturated asbestos felt coated with a mineral-filled asphalt. Correctly designed for long life. Double Coated Flexstone jackets will not embrittle under prolonged exposure to sunlight. Supplied in rolls 32 in. wide, each roll containing 108 sq ft and weighing 55 lbs.

Asbestos Firetard®—A weatherproofing jacket designed for use where resistance to the spread of fire is of primary importance. Firetard is a lamination of heavy asphalt-saturated asbestos felt and plain asbestos felt, and affords excellent insulation protection. Because the unsaturated asbestos is incombustible, it prevents flame from traveling along the surface of an insulated pipe line. Recommended for weatherproofing outdoor pipes and small diameter vessels wherever fire hazards are present. Supplied in rolls 32 in. wide, each roll containing 108 sq ft and weighing 55 lbs.

Other available jackets include:

Type	No. Squares (100 sq ft) per Roll	Width, inches	Approx. wt per 108 sq ft, lbs
No. 50 Asbestos	2	32	32
No. 7700 Coated Asbestos Jacket	2	32	35
No. 15-A Felt Jacket	3	32	15
White Surface Asbestos Jacket	1	32	53
No. 45-A Asbestos Jacket	1	32	42
No. 55-R Insulation Jacket	1	36	55
No. 45-R Insulation Jacket	1	36	45
No. 30-R Insulation Jacket	2	36	30
No. 15-R Insulation Jacket (M,W,G)	4	36	15
No. 15-R Insulation Jacket (P)	3	36	15

■ **USES:** Especially recommended for weatherproofing insulated outdoor piping and small diameter equipment.

CE/HI (P) 32459

■ **ADVANTAGES**

Wide Jacket Selection

Twelve different jackets give user a choice to meet every requirement.

Factory Applied

All J-M weatherproofing jackets can be furnished factory-applied thus eliminating the necessity of separate application at the job site.

Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Asbestos Papers

temp limit: 400F

J-M ASBESTOS PAPERS

DESCRIPTION: You can save space, time and money by using Johns-Manville Asbestos Papers to protect against fire, heat or corrosion. They replace bulkier, less resistant materials in many applications. Various asbestos papers have been developed by J-M to fit the needs of industry. Their main differences are in the quality of fiber and type of binder used. The binder content is held to a minimum to provide the maximum advantages of asbestos.

AVAILABLE TYPES:

Commercial Asbestos Paper and Rollboard – A short fiber paper with high fiber content (minimum 95%). For use as a thermal insulation or safety covering for heating ducts.

Fibroid Asbestos Paper–Similar to above but specially processed for electrical applications. Primarily a base sheet or inorganic carrier for treatment with dielectric resins and varnishes.

Long Fiber Asbestos Paper–Made with high grade long asbestos fiber (minimum fiber content 88%). For use as a thermal insulation; gasketing; base sheet for saturating.

High Strength Fibroid Asbestos Paper–Similar to long fiber asbestos paper but specially processed for Class B electrical applications. A base sheet for saturating with electrical varnishes and resins to form a dielectric.

Armaturo Reinforced Asbestos Paper – Asbestos paper integrally combined on the paper machine with a reinforcement of strong, cotton scrim cloth. A base sheet for treatment with electrical resins and varnishes.

Special Long Fiber Asbestos Paper for Electrolytic Cells–A high quality paper, uniform throughout, for use as diaphragms in electrolytic cells.

Doublex Asbestos Paper–Contains inorganic binder, will not burn, char or smoke. High tensile strength, resists tearing. Developed for use as neon sign pattern paper. Also used as liner for foundry funnels and pouring gates.

Asbestos Welding Paper–A 32 lb paper, 1 16" thick, used to protect adjacent parts from heat, smoke, sparks during welding.

Type GT Asbestos Paper–Asbestos paper integrally combined on the paper machine with a reinforcement of strong glass threads. Almost 100% inorganic, it can be used "as is" wherever a strong heat-and-flame-resistant sheet is needed.

ADVANTAGES

Excellent Mechanical Properties

Fast, easy to apply and safe to handle; amply strong for most needs.

Heat Resistant

J-M Asbestos Papers will withstand heat (up to 400F) that would damage conventional papers and roll boards.

ASBESTOS PAPERS

Sp[illegible]ata

PHYSICAL PROPERTIES*

COMMERCIAL AND FIBROID ASBESTOS PAPER

Thickness, inches			Weight, lbs per 100 sq ft			Tensile Strength, lbs per in. width (avg)		Tear Strength, (Elmendorf) grams (avg)		Bursting Strength, (Mullen) lbs (min)	Asbestos Fiber Content, % (min)	Fe_2O_3 Content, % (max)
Nom	Min	Max	Nom	Min	Max	MD	CD	MD	CD			
012	010	014	4.0	3.5	4.5	13	5	40	60	4	95	5
015	013	018	6.0	5.5	6.5	14	6	70	100	8	95	5
018	016	020	8.0	7.5	8.5	14	7	85	125	8	95	5
022	020	024	10.0	9.5	10.5	14	8	125	150	8	95	5
026	023	028	12.0	11.5	12.5	15	9	130	170	8	95	5
029	027	032	14.0	13.5	14.5	15	9	140	180	10	95	5
032	030	035	16.0	15.5	16.5	15	9	150	190	10	95	5
050	045	055	23.0	22.5	23.5	15	10	200	225	10	95	5
062	058	067	32.0	30.0	35.0	15	11	265	275	20	95	5

COMMERCIAL ASBESTOS ROLLBOARD

094	085	103	48.0	43.0	53.0	14	11	380	450	25	98	5
125	112	138	64.0	57.0	71.0	13	10	460	500	25	98	5

LONG FIBER AND HIGH STRENGTH FIBROID ASBESTOS PAPERS**

006	005	008	2.1	1.8	2.4	10	3	25	40	5	88	5
007	005	008	2.2	1.9	2.5	11	4	35	45	5	88	5
008	006	009	2.5	2.2	2.8	12	4	40	50	7	88	5
010	008	011	4.1	3.6	4.6	13	5	50	70	8	90	5
015	013	017	6.0	5.5	6.5	14	6	80	100	8	98	5
018	017	020	8.0	7.5	8.5	14	6	120	145	9	98	5
020	018	022	9.0	8.3	9.7	15	7	150	190	10	98	5
025	023	027	11.5	10.7	12.3	17	9	190	225	12	98	5
030	028	034	13.6	12.6	14.6	20	11	250	295	12	98	5
050	048	061	23.5	20.5	24.5	21	13	300	340	20	98	5
062	058	067	30.0	27.0	33.0	23	15	375	425	18	98	5

DOUBLEX ASBESTOS PAPER

023	020	026	10.0	9.2	10.2	16	6	100	120	8	80	5

ASBESTOS WELDING PAPER

062	058	064	34	30	35	19	8	240	305	12	99	5

ARMATURO ASBESTOS PAPER

15 mils	14 mils	18 mils	6	5.5	6.5	24	8	235	—	22	84	5

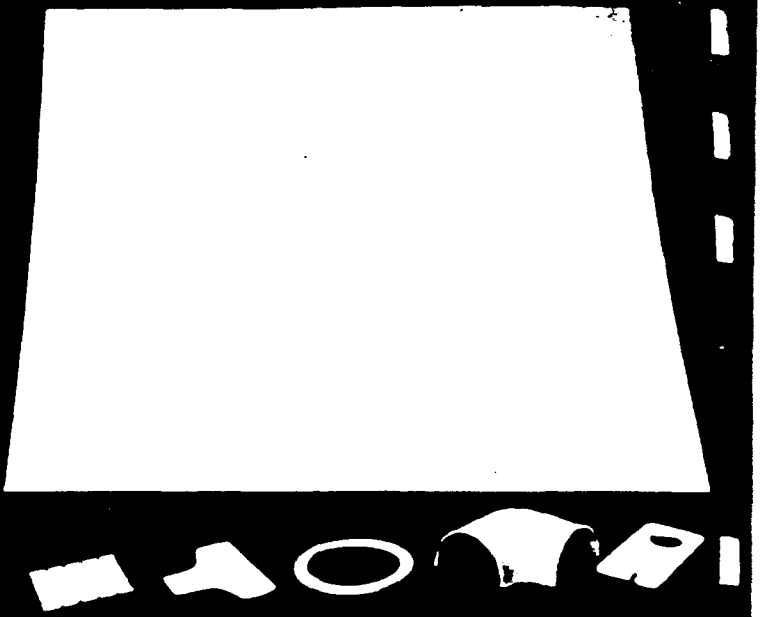
GT ASBESTOS PAPER

018	015	021	6.5	6.0	7.0	27	—	45	—	—	84 (exclusive of glass threads)	5

*The figures given in this table are average values obtained in accordance with accepted test methods.
**Same properties apply to Special Long Fiber Asbestos Paper for Electrolytic Cells.

CE/HI(P)32461

type: Sheet
temp limit: 1200F



J-M ASBESTOS MILLBOARD insulating sheet material

■ **DESCRIPTION:** Johns-Manville Asbestos Millboard is a dense, rigid sheet or board material formed of asbestos fibers and a small amount of binder. A natural light gray in color, Millboard sheets are furnished in standard sizes of 42" x 48", in thicknesses ranging from 1/32" to 1/2". Cut pieces can also be supplied.

■ AVAILABLE FORMS

No. 106 Millboard—A general purpose, high utility millboard suitable for most uses. It will withstand temperatures to 800F.

No. 102 Millboard—A higher quality millboard than No. 106. Will withstand temperatures to 1000F.

No. 219 Millboard—This is a premium grade millboard, specially treated for greater strength. Suitable for temperatures to 1100F, it can be used up to 1800F where some loss of strength is not detrimental.

C Grade Millboard—This millboard contains an especially long grade of asbestos fiber. It is suitable for temperatures to 1200F; embrittlement occurs above this limit. Where brittleness is not objectionable, may be used at temperatures up to 1800F.

Silicated Millboard—All grades of millboard can be specially treated to increase surface hardness. Where such sheets are required, the word "silicated" should appear on the order before the millboard type.

Special—Millboards for special purposes can be tailored to service requirements.

■ **USES:** J-M Asbestos Millboard is recommended for applications which require a sheet or board insulation for protection against fire, heat, acid fumes, etc. Frequently used as a fire-resistant lining for floors, partitions, ceilings, stoves and grates. It has been found particularly valuable in the steel industry where literally scores of uses have been discovered for this versatile material.

■ ADVANTAGES

Versatile

Adapted to literally scores of industrial applications.

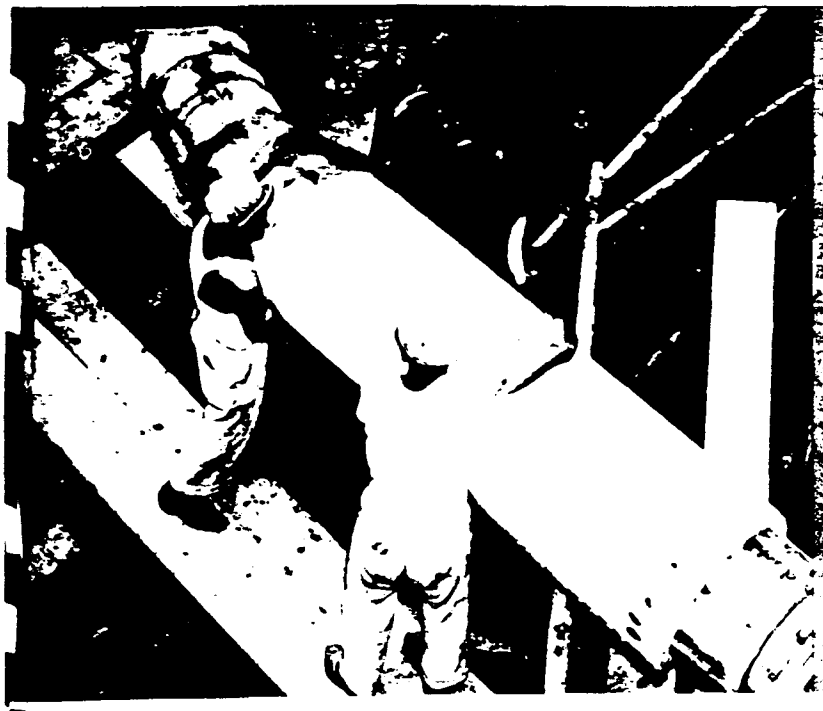
Fireproof

Made of asbestos, the world's most famous fireproof material.

THICKNESSES, TOLERANCES AND WEIGHTS*

Thickness, inches	Tolerance, inches ±	Lbs per 42" x 48" sheet No. 106, 102 and "C" Grade	No. 219
1/32	0.007	2.5	1.5
3/64	0.008	3.5	2.5
1/16	0.008	4.6	3.4
3/64	0.008	6.0	4.4
5/32	0.009	7.0	5.3
1/8	0.014	9.0	7.3
5/32	0.015	11.3	9.2
3/16	0.016	13.3	11.1
1/4	0.025	17.6	15.0
5/16	0.029	21.4	18.4
3/8	0.034	25.2	22.6
1/2	0.045	32.5	30.3

*Actual weights may vary plus or minus 10 percent.



Johns-Manville

INSULATION

PRODUCT INFORMATION

type: Miscellaneous

temp limit: Various

J-M MISCELLANEOUS INSULATIONS

Insulation	Description	Use	Temp. Limit	Standard Sizes
Asbestocel® Sheet, Block and Pipe Insulation	Alternate plain and corrugated asbestos felts built up to various thicknesses.	To insulate medium and low pressure boilers, warm air ducts, etc., and low pressure steam and hot water pipes.	300F	Sheets and blocks 36″ to 96″ long; 6″ to 36″ wide; ½″ to 4″ thick. Pipe insulation 3-ft lengths to fit all standard pipe sizes in full range of thicknesses.
Super Fire-Felt® Sheets and Blocks	Made of felted asbestos fibers and binder. Light in weight and resilient.	For use where large resilient sheets are desired.	700F unsupported 900F supported	Sheets 24″ x 36″; blocks 6″ x 36″; thicknesses from ½″ to 4″.
Asbestos Roll Fire-Felt®	A soft, flexible asbestos felt in roll form.	To insulate heated surfaces where space does not permit thicker or more rigid materials.	1000F	Standard rolls contain 100 sq ft; 36″ wide; 3/32″ to ¼″ thick.
Asbestos Blankets	Asbestos cloth envelope filled with asbestos fibers; wire tufted.	To insulate irregular surfaces where insulation must be readily removable.	850F	Made to order in 1½″, 2″ and 2½″ thicknesses; may be used in double-layer combinations through 4½″ thickness.
Wool Felt Pipe Insulation	Moisture resistant indented wool felt with dual service liner. Complies with Federal Specification HH-I-567.	For hot and cold water lines operating at temperatures between 60F and 225F, and, with integral jacket, between 45F and 60F.	225F plain 60F with integral jacket	3-ft lengths; ½″ to 2″ thicknesses single-layer; 1″, 1½″ and 2″ thicknesses double-layer; for pipe sizes ½″ and up.
Anti-Sweat Pipe Insulation	Insulating and waterproofing felt pipe insulation.	For insulating cold water lines. Prevents condensation and dripping.	—	3-ft lengths; ½″ and ¾″ thicknesses single-layer; 1″, 1½″ and 2″ thicknesses double layer; for standard pipe sizes.
Zero Pipe Insulation	A pipe insulation made up of layers of hair felt surrounded by several layers of wool felt.	For insulating water pipes. Prevents freezing under ordinary conditions.	—	3-ft lengths for all pipe sizes ½″ and up. About ¼″ thick.

CE/HI (P) 32463

call an AUTHORIZED J-M CONTRACTOR for expert, dependable application of Johns-Manville insulations...

JOHNS-MANVILLE · Industrial Insulations Contractor ·

When you pay for top-quality insulation, back up your investment with the best installation service money can buy. Today, with high fuel and maintenance costs, it is especially important to place your insulation job in skilled hands. The scientific application of J-M quality insulations by J-M Insulation Contractors will assure you of the maximum return on your insulation investment for years to come. Moreover, you get undivided responsibility for *all* your insulation requirements.

Johns-Manville has established J-M Insulation Technical Service Units and J-M Insulation Contract Units throughout the country to serve you—units staffed with men who understand insulation engineering and with skilled applicators who are thoroughly trained in proven Johns-Manville methods.

Working with J-M materials and J-M Insulation Engineers, these contractors *know* how to apply Johns-Manville insulations correctly to insure long, trouble-free performance. You can have the utmost confidence in their ability to handle your insulation application from start to finish.

And remember this important point: When your architect or engineer specifies Johns-Manville insulations, any J-M Insulation Contractor in the country will be able to give you a quick, accurate bid, regardless of the size or location of the job.

CE/HI (P) 32464

Johns-Manville

INSULATION RESEARCH . . .

the secret of J-M insulation progress

The Johns-Manville Research Center, located at Manville, New Jersey, contains the world's largest and most completely equipped laboratories devoted to the study of insulations and allied products for all temperature ranges encountered in modern industry. Here a staff of hundreds—including organic and inorganic chemists, physicists, geologists, metallurgists, and mechanical, mining, electrical, civil and chemical engineers—is engaged in research and development. Working with the most advanced laboratory equipment, these scientists devote their efforts to the development of new insulating products and the improvement of existing ones. In addition, they carry out insulation research assignments related to specific customer problems. This broad research program plays a major part in Johns-Manville's ability to offer exactly the right insulation . . . the most economical and efficient . . . for any equipment or operating temperature.