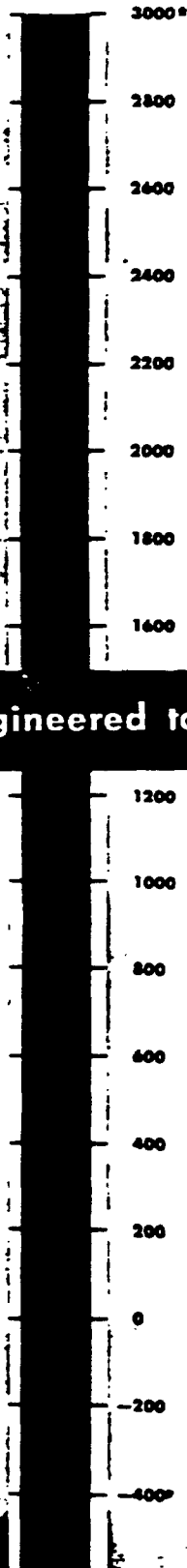


PLAINTIFF'S
EXHIBIT
K-1715

FOR THE EFFICIENT CONTROL OF TEMPERATURES FROM 400 F BELOW ZERO TO 3000 F ABOVE



Johns-Manville INSULATIONS

Engineered to conserve fuel and power, reduce maintenance co

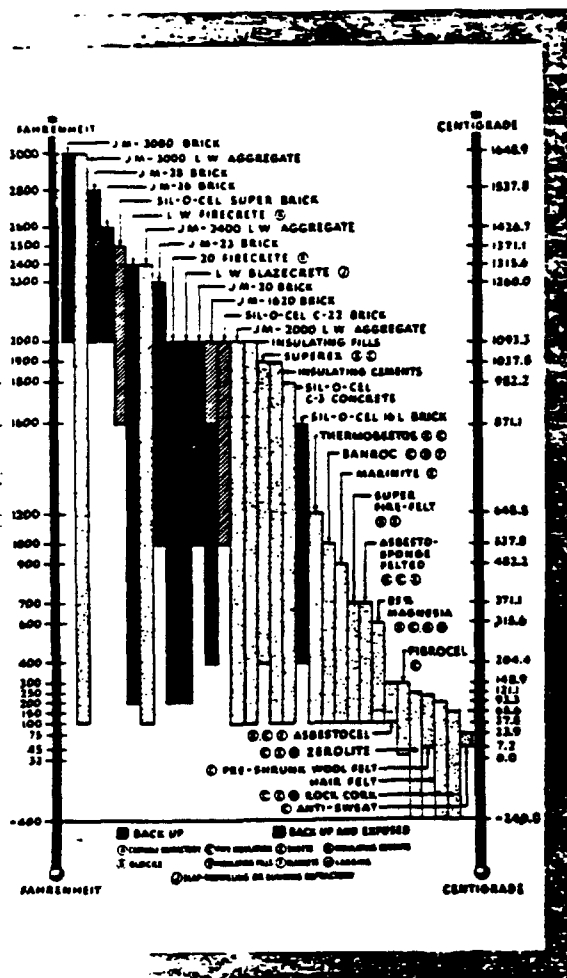


DEFENDANT'S
EXHIBIT
OF-287



INSULATIONS

The World's Most Complete Insulation Service



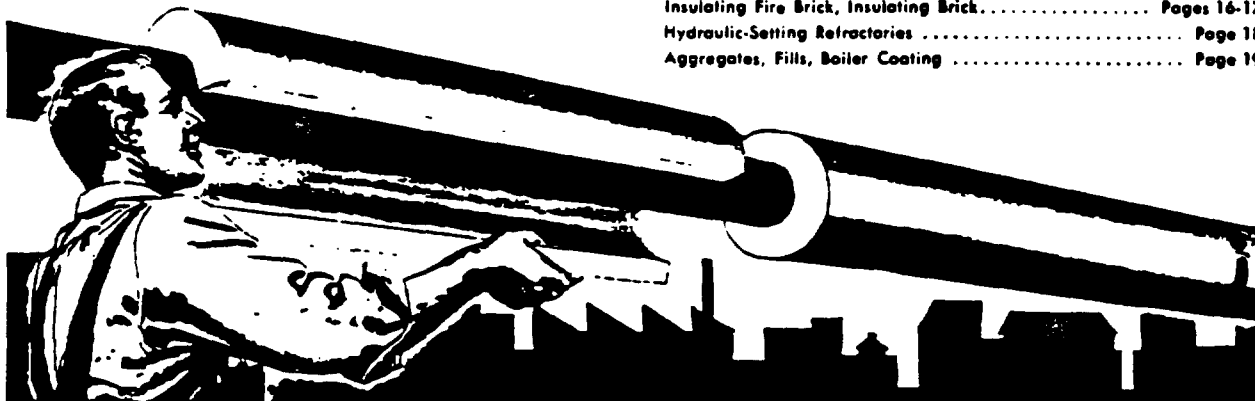
An attractive chart of Johns-Manville Thermal Insulations, similar to the one above, is available in size 11½" x 18". The chart is printed in four colors and is mounted on heavy card stock suitable for hanging on the wall. For your free copy of this ready reference chart, write your nearest Johns-Manville office for Form IN-6D.

With a background of nearly a century of experience and study of all types of insulation problems, Johns-Manville offers you undivided responsibility for all your insulation problems. This service includes:

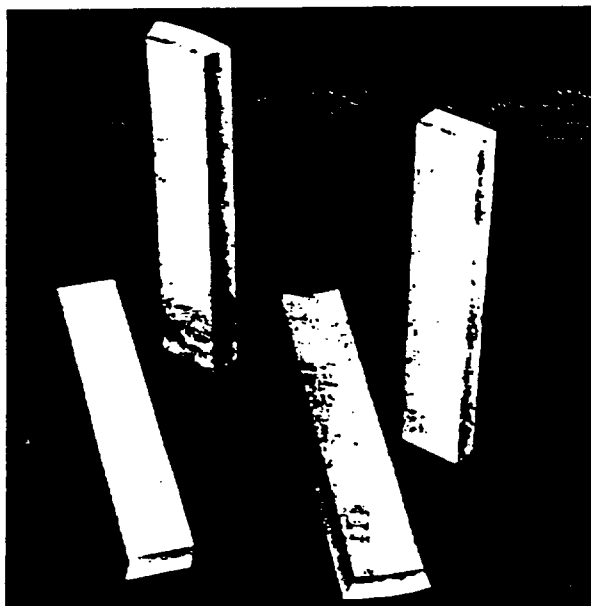
- **A FULL LINE OF INSULATIONS**—Johns-Manville insulations, made from asbestos, diatomaceous silica and other materials, are each made to serve a specific purpose. They are used on every kind of process equipment or piping for service temperatures from minus 400F to 3000F above.
- **ENGINEERING**—Johns-Manville provides the services of highly skilled insulation engineers. In solving modern industry's complex insulation problems, these engineers must consider many important factors—most economical thickness, strength and durability of the insulation, and protection against weather, moisture, chemicals and mechanical abuse. Johns-Manville engineers are thoroughly familiar with the correct usage of Johns-Manville materials, and they are available to see that the insulation for your job is scientifically correct.
- **SKILLED APPLICATORS**—Johns-Manville has established J-M Insulation Technical Service Units and J-M Insulation Contract Units throughout the country to serve you. These units are staffed with men who understand insulation engineering and with skilled applicators who are thoroughly trained in proved Johns-Manville methods. Working with J-M materials and with J-M Insulation Engineers, these men know how to apply J-M insulations to provide long trouble-free performance.

INDEX TO J-M INSULATIONS

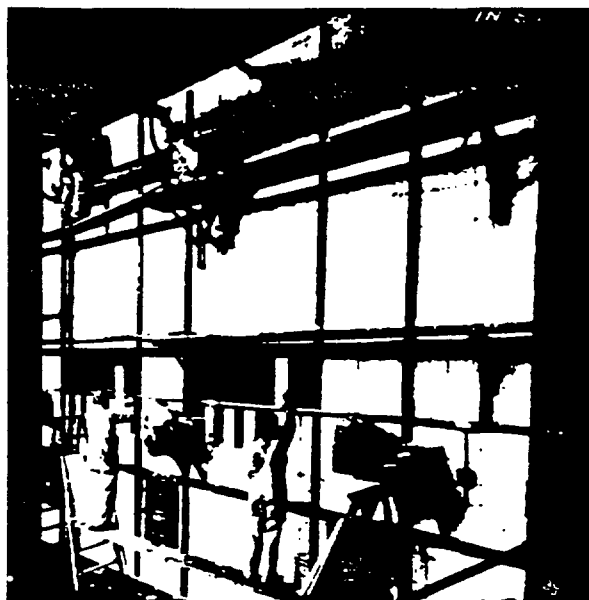
Blocks and Sheets	Pages 3-8
Pipe Insulation	Pages 9-13
Insulating Cements and Fills	Page 14
Insulation Weather-Protection—Coatings	Page 15
Insulating Fire Brick, Insulating Brick	Pages 16-17
Hydraulic-Setting Refractories	Page 18
Aggregates, Fills, Boiler Coating	Page 19



Blocks for High Temperature Service



J-M 85% Magnesia has proven its value over many decades of satisfactory, economical service.



J-M 85% Magnesia is particularly adapted to conditions where high insulating value and light weight are needed.

J-M 85% MAGNESIA BLOCKS

The Standard Insulation for Service to 600F

HIGH INSULATING VALUE • LIGHT WEIGHT • EASILY CUT • PROVED LONG LIFE

Johns-Manville 85% Magnesia is composed of hydrated basic carbonate of magnesia bonded with asbestos fiber, and molded into block form. Its high insulating value and permanence have been proved over many decades of satisfactory, trouble-free service. Time and again, it has earned its right to be called "Industry's greatest fuel saver for temperatures to 600F."

The process by which the materials are fabricated into J-M 85% Magnesia block insulation results in a durable product embodying good resistance to heat transmission, the lightest weight consistent with good mechanical strength, and excellent workability. It is economical to apply on flat, curved or irregular surfaces, and is particularly adapted to conditions where high insulating value and light weight are needed or where surfaces are so irregular that an easily-cut insulation is required.

PHYSICAL AND THERMAL PROPERTIES*

Density (dry)	12.5 to 13.5 lb. per cu. ft.				
Transverse Strength (modulus of rupture)	45 to 55 psi				
Compressive Strength	65 to 75 psi to produce 5% compression				
Linear Shrinkage	1 to 2% after 24-hr. soaking period at 600F				
Maximum Service Temperature	600F				
Conductivity	Mean temperature	100F	200F	300F	400F
	Btu in. per sq. ft.				
	per F per hr.	.42	.45	.48	.52

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

Where the insulation must withstand temperatures exceeding 600F, J-M 85% Magnesia is used as the outer layer over Superex. This construction, known as Superex Combination, is described on page 4. J-M 85% Magnesia in pipe insulation form is described on page 10.

Standard Sizes

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

Note: On curved blocks the 4-in. thickness is furnished subject to the specific radius required.



INSULATIONS

Blocks for High Temperature Service

SUPEREX® BLOCKS AND SUPEREX COMBINATION

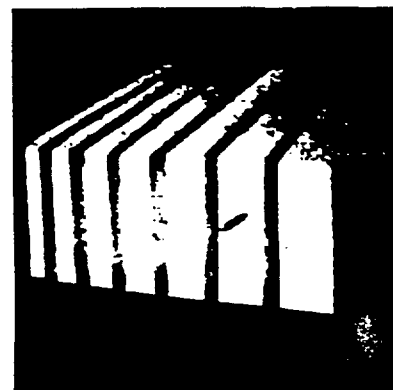
For service to 1900F

Johns-Manville Superex Blocks are made of calcined diatomaceous silica blended with other insulating materials and bonded with asbestos fiber. These light weight, large size blocks will safely withstand temperatures up to 1900F with negligible shrinkage. They are widely used for equipment operating at high temperatures, such as boiler furnaces, hot blast stoves, mains and bustle pipes, petroleum cracking furnaces, producer gas mains and metallurgical furnaces of various types. Superex is often used next to the hot surface because of its high heat resistance, with J-M 85% Magnesia as the outer

layer because of its greater insulating value (Superex Combination). Superex M is a diatomaceous earth block having all of the desirable properties of Superex, but with a temperature limit of 1500F. The lower temperature limit makes possible a reduction in density and conductivity.

STANDARD SIZES

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



Large size Superex Blocks mean fewer joints and faster application.

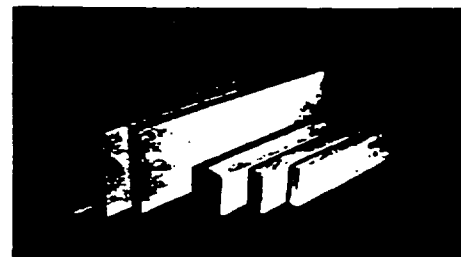
THERMOBESTOS® BLOCKS

For service to 1200F

J-M Thermobestos is made from hydrous calcium silicate combined with asbestos fibers by a special steam process. The result 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 process equipment which must withstand the rigors of severe outdoor operating conditions.

Especially recommended for use on outdoor process equipment operating at service temperatures up to 1200F, Thermobestos is light enough for easy handling and fast application. Repeated wettings have no permanent effect on it. Its hard composition resists crushing and will withstand unusual service abuse. Because it will not burn or carry flame, it is ideal for use in the presence of inflammable gases and liquids.

Johns-Manville Thermobestos is also available in pipe insulation form as described on page 11.



Thermobestos blocks have a unique combination of properties which assure excellent temperature control, long service life, minimum maintenance costs.

STANDARD SIZES

Width*, in.	Length, in.	Thickness, in.
6 and 12	36	1, 1½, 2, 2½, 3, 3½, 4

*For special sizes and curved blocks, consult your nearest J-M office.

PHYSICAL AND THERMAL PROPERTIES* OF SUPEREX AND THERMOBESTOS

Property	Superex			Thermobestos		
Density (dry)	23 to 25 lb per cu ft			10 to 12 lb per cu ft		
Transverse Strength (Modulus of Rupture)	60 to 80 psi			50 to 70 psi		
Compressive Strength	80 to 90 psi to produce ½ in. compression			120 to 140 psi to produce ½ in. compression		
Linear Shrinkage	2.7% after 24-hr soaking period at 1900F			1.5% after 24-hr soaking period at 1200F		
Maximum Service Temperature	1900F			1200F		
Conductivity (Btu in. per sq ft per F per hr at mean temperature)	400F	600F	800F	100F	200F	300F
	0.69	0.73	0.77	0.33	0.37	0.41
	1000F	1200F	1400F	400F	500F	600F 700F
	0.82	0.88	0.96	0.46	0.50	0.55 0.60

RECOMMENDED THICKNESS OF 85% MAGNESIA, SUPEREX COMBINATION AND THERMOBESTOS

Temperature of Surface, F	Inner Layer: Superex, in.	Outer Layer: 85% Magnesia, in.	Total Thickness,* in.
100 to 199	...	1½	1½
200 to 299	...	2	2
300 to 399	...	2½	2½
400 to 499	...	3	3
500 to 599	...	3½	3½
600 to 699	1	2½	3½
700 to 799	1½	2½	4
800 to 899	2½	2	4½
900 to 999	3	1½	4½
1000 to 1099	3½	1½	5
1100 to 1200	4	1½	5½

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

*Also recommended thicknesses of Thermobestos blocks.

High Temperature Sheets

MARINITE[®] SHEETS



Tenterframe housing built of Marinite provides better heat control, reduces heat losses, does not rot or corrode.

STANDARD SIZES AND THICKNESSES

Material	Sheet Sizes	Thicknesses
Marinite-23	36" x 96", 42" x 96", 48" x 96", 48" x 120"	1", 1½" and 2"
Marinite-36 and Marinite-65	36" x 96", 42" x 96", 48" x 96", 48" x 120"	¾", 1", 1½", 2", 2½" and 3"

*Can be furnished on request where volume warrants special run.

**2" material furnished on request where volume warrants special run.

†Furnished only in Marinite-65.

For Building and Insulating (Up to 900F) in One Operation

J-M Marinite serves industry in many ways, as a structurally strong, fireproof insulating sheet material. It offers major economic advantages in the construction of driers, ovens and other insulated housings. Marinite is the only insulation available that can be erected without the metal sheathing necessary when mineral-wool-fiber type and similar insulating materials are employed.

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, has a low thermal expansion coefficient, is completely non-corroding and will not disintegrate after prolonged immersion in water. Marinite's large, easy-to-handle sheets can be easily worked with woodworking tools . . . require no maintenance and will last indefinitely.

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, recommended where painting is not required; Type B sheets, sanded both sides and impregnated with an inorganic primer, ready for subsequent painting.

PHYSICAL AND THERMAL PROPERTIES

Property	Marinite-23	Marinite-36	Marinite-65
Density, Dry, lb per cu ft	21-25	34-38	60-70
Normal Moisture Content, % of dry weight	5 (approx.)	5 (approx.)	5 (approx.)
Transverse Strength, Dry, Ultimate, psi	550	900	1500
Modulus of Elasticity, psi (from transverse test)	0.15 x 10 ⁶	0.40 x 10 ⁶	0.70 x 10 ⁶
Consolidation, in. per in. under load of 500 psi	0.030 max.	0.025 max.	0.020 max.
Impact Resistance, Ultimate, inch-lb (15" span, 15" width, 1" radius head wt.)			
4 lb wt. on ½" thickness	...	28	60
6 lb wt. on 1" thickness	42	78	150
Screw Holding Power, Ultimate, lb (Sheet metal screws, Type A, Sizes 6-12)			
½" penetration	35	80	180
¾" penetration	130	240	460
Brinell Hardness, Dry			
10 kg load, 10 mm ball, 10 sec.	0.5	...	...
50 kg load, 10 mm ball, 10 sec.	...	1.8 (comp. to yellow pine)	4.6
Moisture Expansion, Shrinkage, normal to dry	0.0008	0.0011	0.0011
in. per in. Expansion, dry to 100% R. H.	0.0009	0.0011	0.0011
Expansion, dry to saturated	0.0010	0.0013	0.0013
Thermal Expansion, in. per in. per F avg. over temperature range indicated. (Detailed information for special cases furnished on request)	2.0 x 10 ⁻⁶ up to 200F; shrinkage thereafter	1.3 x 10 ⁻⁶ up to 250F; shrinkage thereafter	2.6 x 10 ⁻⁶ up to 250F; shrinkage thereafter
Maximum Service Temp., F (for continuous service)	*900	*900	*800
Conductivity, Btu in. per sq ft per F per hr at mean temperature			
100F	0.55	0.76	1.30
200F	0.57	0.77	1.56
300F	0.58	0.78	1.62
400F	0.60	0.79	1.68
500F	0.61	0.80	1.74
600F	0.63	0.81	1.80

*A table, based on operating temperatures and panel dimensions, giving the minimum total wall thicknesses of Marinite necessary to limit the effects of warpage resulting from expansion and shrinkage is given in brochure IN-153A. Write Johns-Manville for this information.

NOTE The figures given above for the specified properties are average values obtained in accordance with accepted test methods. However, due to factors beyond our control, responsibility for the results obtained from the use of this information is not assumed. Ultimate strength figures must be modified by applying adequate factors of safety in arriving at working values.



INSULATIONS

Refrigeration Sheets

ROCK CORK[®] SHEETS AND LAGGING

For service to minus 300F

For almost half a century the No. 1 choice of leading refrigeration engineers everywhere, J-M Rock Cork now offers still another characteristic: incombustibility. It successfully passes, with the highest—"incombustible"—rating, the Columbia Fire Test as defined by the National Bureau of Standards.

Rock Cork sheets and lagging are manufactured from mineral wool combined in production with an asphaltic binder, molded into sheet or lagging form and baked. Its asphaltic binder furnishes an ideal base for an asphaltic adhesive or finish, assuring an air- and moisture-resistant seal. This strong, long-lasting refrigeration insulating material safeguards even the most sensitive food products because it is free from offensive odors. Its low thermal conductivity provides precise temperature control. Light and readily handled, Rock Cork sheets are furnished in large sizes for quick, easy economical application.

Standard sizes and properties are given below. Rock Cork in pipe insulation form is described on page 13.



Moisture-resistant Rock Cork Sheets provide top-value insulation for all types of refrigeration service.

ZEROLITE[®] SHEETS AND LAGGING

For Service to minus 300F

FOR USE IN THE OIL AND CHEMICAL INDUSTRIES

IMMUNE TO MANY ORGANIC SOLVENTS • FIRE-RESISTANT

Zerolite is a resin-bonded, mineral wool insulating material particularly applicable in the oil and chemical industries because of its strength, fire-resistance, low heat conductivity, excellent resistance to moisture, and immunity to attack or damage by organic solvents such as benzol, methyl ethyl ketone and petroleum fractions and

derivatives. Its exceptional moisture-resistance is a result of a special Johns-Manville process which disperses the resin binder over the mineral wool fibers. Standard sizes and properties of both Zerolite and Rock Cork Sheets and Lagging are given in the following table. Write your nearest Johns-Manville office for further information.

STANDARD SIZES AND PROPERTIES OF ROCK CORK AND ZEROLITE SHEETS AND LAGGING

Sizes	Sheets: 18 x 18 in. (1 in. thickness), 18 x 36 in. (1½, 2, 3, 4 in. thicknesses)								
	Lagging: 18 in. long, 2 in. through 6 in. wide, 1½ in. through 4 in. thick.								
Discs: Thickness, 1½, 2, 3, 4 in.; maximum diameter, 36 in. Discs over 18 in. diameter furnished in 2 pieces.									
Properties*	Cohesive Strength, Lb per Sq Ft	Compression, in. (Load, 500 Lb per Sq Ft)	Water Absorption, Percent By Volume (Submerged 24 Hr)	Moisture Absorption in Air (75 Percent Relative Humidity, 96 Hr)	Service Temperature Range, F				
	300	0.020	3.0 max.	0.7 percent	—300 to +200				
	300	0.030	3.0 max.	0.0 percent	—300 to +250				
(Top figures for Rock Cork, bottom figures for Zerolite)	Transverse Strength (Modulus of Rupture)	Conductivity (Btu in. per Sq Ft per F per Hr at Mean Temperature)					Average Wt, Lb per Cu Ft	Specific Heat	Coef Linear Change with Temp
		80F	40F	0F	—40F	—80F			
	35 psi	0.33	0.31	0.29	0.27	0.25	16.0	0.27	4.5 x 10 ⁻⁶
	40 psi	0.28	0.27	0.25	0.23	0.22	15.5	0.30	2.2 x 10 ⁻⁶

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



INSULATIONS

4a
Jo

For Air Conditioning Ducts

SPINTEX® AND ROCK CORK®

High Efficiency—Long Service Life
Low Installed Cost

Johns-Manville Spintex and Rock Cork Insulations for air conditioning ducts are basically mineral wool products. Each has its particular characteristics that make it particularly suitable for a specific type of air conditioning system. Both possess the basic properties essential for efficient insulation of duct systems: resistance to moisture, fire, rot, decay and mold growth; low thermal conductivity; and proved long life.

The low installed cost of J-M Insulations for air conditioning ducts is a result of long experience in developing scientifically correct insulations and proper methods of application. You can select the most economical to apply on your ducts from the wide variety made by Johns-Manville. From the chart below, select the one best suited to your air conditioning requirements.



Large, arched exposed duct with Spintex No. 415 in place and wire mesh installed ready for asbestos-cement finish.

J-M SPINTEX INSULATIONS—Flexible, Semi-Rigid and Rigid

Type	Thermal Conductivity (Btu/Sq. Ft./In./Hr.)			Thickness, Inches	Standard Sizes, Inches	Fed. Spec. Compliance
	50F	75F	100F			
No. 411-Flexible	.26	.27	.29	1, 1½, 2	30 x 60 or 120	HH-I-542 Type II
No. 413-Heavy Flexible	.26	.27	.29	1, 1½, 2	30 x 48 or 60	HH-I-562, Type I, Class 2
No. 414-Semi-Flexible	.23	.24	.25	1, 1½, 2	30 x 48 or 60	HH-I-564, Form II, Class A
No. 415-Rigid	.23	.24	.25	1, 1½, 2	30 x 48 or 60	HH-I-542 Type II

Facings	Description	Fire-Resistance	Water Vapor Barrier	Permeability in Perms
VS	Sisalcraft paper adhered with asphalt or the equivalent	Combustible	Yes	0.25
VB	Kraft-aluminum foil-kraft laminate	See Note 1	Yes	0.05
VF	.004" gray vinyl film	See Note 1	Yes	0.1
AP	Plain asbestos paper	Incombustible	No	

NOTE 1: Facing will burn but flame goes out when source of heat removed. Flame is not transmitted along facing.

NOTE 2: Narrow rolls of Type VB facing, 9" in diameter (about 330-ft. long) and 2", 3", or 4" wide, are available to cover joints. Wider rolls, 36" wide, are also available for field application of the facing. VB adhesive, recommended for securement, has a coverage of 300 to 400 sq. ft. per gal. depending upon the surface.

FIRE RESISTANCE: Mineral felts used in all types will not support combustion. Spintex meets U.S. Maritime Commission Spec. 32-MC-1 for incombustible insulation for shipboard use and is rated incombustible according to Section VI, U.S. Dept. of Commerce, Commercial Standard CS 131-46. Type VB Facing is also flameproof and complies with TAPPI, T461m-48 and ASTM, D777-46 for flammability of treated paper and paperboard.

CORROSION: Not corrosive to any common metal or building material. Maximum alkalinity (expressed as Na₂O) is 0.25% per U.S. Maritime Commission Spec. 32-MC-1. Water held against surface of metal causes corrosion in most cases. Aluminum is among those susceptible. Surfaces below dew-point of surrounding air should be painted. Bituminous paints and aluminum pigmented vinyl base paints give good protection if in unbroken film.

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

J-M ROCK CORK INSULATION—Rigid

For use in exposed areas where insulation is to receive a hard plaster finish

Average Wt., Lb./Cu Ft	Facing		Thermal Conductivity (Btu/In./Sq Ft./Hr.)			Sizes, In.	Thickness, In.	Approx Wt., Lb./Sq Ft	Standard Packaging
			50F	85F	120F				
15.0	None; can be plastered	Rock Cork	0.31	0.33	0.34	18 x 18	1	1.250	54 sq ft per carton
							1½	1.875	36 sq ft per carton
						18 x 36	2	2.500	27 sq ft per carton
							3	3.750	18 sq ft per carton
							4	5.000	13½ sq ft per carton

Rock Cork, a mineral wool block, is also available as sectional pipe insulation. Rock Cork has an asphaltic binder, is thermo-plastic, fire-resistant, highly moisture resistant, and will not rot, decay, or support mold growth. Complies with Fed. Spec. HH-I-562 Type I Class 1.

QUALITY PRODUCTS

PAGE

7



INSULATIONS

Sheets, Blocks, Tapes, Blankets

Johns-Manville manufactures a form or type of insulation for practically any industrial requirement. Some of the more widely used insulations are described briefly on this page, covering such forms as sheets, blocks, tapes and blankets for various service conditions and temperatures ranging from 300F (Asbestocel Sheets and Blocks) to the extremely high temperatures encountered in jet powered

aircraft where Thermoflex Blankets are used. Regardless of your particular insulation problem, Johns-Manville is the logical place to turn for a satisfactory solution. Additional information about any of the insulations tabulated below may be obtained from your J-M Insulation Technical Service Unit, your Johns-Manville Distributor or your nearest Johns-Manville office.

J-M Insulation	Description	Use	Temp Limit, F	Standard Sizes
ASBESTOCEL® SHEETS AND BLOCKS	Alternate plain and corrugated asbestos felts built up to various thicknesses.	To insulate medium and low pressure boilers, warm air ducts, etc.	300	36 to 96 in. long; 6 to 36 in. wide; 1/2 to 4 in. thick. (Coarse and fine corrugated.)
SUPER FIRE-FELT SHEETS AND BLOCKS	Made of felted asbestos fibers and binder. Light in weight and resilient.	Where large, resilient sheets are desired.	700 unsupported 900 supported	Sheets 24 in. x 36 in.; blocks 6 in. x 36 in.; from 1/2 in. to 4 in. thick.
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 forms.	1000	Standard rolls contain 100 sq ft; 36 in. wide; 3/8 in. to 1/2 in. thick.
ASBESTOS BLANKETS	Asbestos-fiber-filled asbestos cloth envelope, wire tufted.	To insulate irregular surfaces where insulation must be readily removable.	850	1 1/2, 2 and 2 1/2 in. thick; can be used in double-layer combinations through 4 1/2 in. thick.
BANROC® BLANKETS	Made of a felted, spun mineral wool fiber secured between various types of metal fabric, asbestos paper or other finishes depending upon service requirements.	To insulate ovens, dryers, ducts, breechings and similar equipment.	Under normal conditions, up to 1000	Metal fabric: 24 in. x 96 in., 24 in. x 48 in.; 1 in. to .6 in. thick. Asbestos Paper: 24 x 48 in. in thicknesses through 3 1/2 in.; 24 x 24 in. in 4 in. thickness.
ASBESTOS PAPER AND ROLL BOARD	Thin, fireproof flexible felts made from various grades of asbestos fiber.	To insulate where a material of minimum thickness is required. Resists shock of sudden heat or flame.	Up to 400	Asbestos Paper: 25, 50 and 100 lb rolls; 18, 24, 36, 37 1/2, 72 in. wide; .0015 in. to 1/8 in. thick. Asbestos Roll Board: 25, 50 and 100 lb. rolls; 18, 36, 72 in. wide; 1/2 in. and 3/8 in. thick.
ASBESTOS SHEET MILLBOARD	A rigid sheet made from various grades of asbestos fiber.	For general use in protecting against fire, heat, acid fumes, etc. Comes in various grades. Commercial grade is No. 106.	Up to 1800	42 x 48 in.; 1/2 to 1/2 in. thick; cut pieces also furnished.
ASBESTO- SPONGE® FELTED SHEETS AND BLOCKS	Laminations of tough asbestos felts cemented together—averaging about 40 layers per in. of thickness.	Especially efficient under severe service conditions because of high insulating value and durability.	Up to 700	36 in. long; 6, 9, 12, 18, 24 and 36 in. wide; 1 through 4 in. thick.
THERMO-WRAP® AND THERMO- TAPE®	Composed of asbestos fibers enclosed in an asbestos cloth jacket. Outer surface is impregnated with fire- and abrasion-resisting coating.	To insulate steam and hot water pipes on railroad and similar equipment. Thermo-Wrap is wrapped and laced on; Thermo-Tape is spirally wound on.	450	Thermo-Wrap: 36 in. sections; 1, 1 1/2 and 2 in. thick for pipe from 3/4 to 3 in.; for tubing from 1/2 to 3 in. O.D. Also tees, 45° and 90° elbows and crosses. Thermo-Tape: 2 1/2 x 3/4, 2 x 1/2, 1 1/2 x 3/4 and 1 x 3/4 in.; 50-ft rolls.
THERMOFLEX® FELT	Uniform ceramic fibers felted with a small amount of binder to form a refractory-fiber insulation with unusual degree of lightness, resistance to heat, low conductivity and sound-control properties. Also available in loose fiber form.	For high temperature service. When enclosed in heat-resisting metal foil, an insulation for jet engines, exhaust assembly components, ice-elimination systems. — A sound-control material for high temperatures. — A filter medium for chemical filtration. — A refractory packing and fill.	To 2000	Semi-rigid or flexible felts in a variety of densities and thicknesses. Regularly furnished in 3, 4, 5, 6, 8 and 26" ft. lengths; 42 in. wide untrimmed. *Not in all densities
THERMOFLEX® TAPE	Asbestos fiber enclosed in knitted Inconel mesh.	To insulate diesel engine exhaust manifolds and as expansion joint filler in refractory settings.		Approx. 1 3/4 in. wide; 1 in. thick; 25 ft or more long.



INSULATIONS

Pipe Insulation Recommendations

THICKNESS RECOMMENDATIONS FOR PIPE INSULATION

Pipes, fittings and flanges at temperatures below 600F may be insulated with J-M 85% Magnesia to thickness given below.

All pipes 1½ in. and smaller, at temperatures above 600F, should be insulated with a single layer of Superex sectional pipe insulation. Small fittings are insulated with J-M No. 352 Insulating Cement or No. 301 Cement.

For sizes over 1½ in. at temperatures above 600F, Superex Combination Insulation should be used. This consists of a layer of Superex next to pipe with an outer layer of 85% Magnesia.

The thicknesses given 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.

NOMINAL THICKNESS, INCHES, FOR 85% MAGNESIA

Nominal pipe size, in.	100 to 199F	200 to 299F	300 to 399F	400 to 499F	500 to 599F
1½ & less	1	1	1	1½	1½
2	1	1	1½	1½	2"
2½	1	1	1½	2"	2"
3	1	1	1½	2"	2"
3½	1	1½	1½	2"	2"
4	1	1½	1½	2"	2½"
4½	1	1½	2	2	2½"
5	1	1½	2	2	2½"
6	1	1½	2	2½"	2½"
7	1½	1½	2	2½	2½
8	1½	1½	2	2½	3"
9	1½	1½	2	2½	3"
10	1½	2	2½	2½	3"
11	1½	2	2½	3"	3"
12	1½	2	2½	3"	3"
14 & up	1½	2	2½	3"	3½"

*Available in single or double-layer.

**Normally furnished double-layer. Can be furnished single-layer in limited quantities.

RECOMMENDED THICKNESS, INCHES, FOR SUPEREX COMBINATION

(Superex inner layer and J-M 85% Magnesia outer layer)

Nominal Pipe Size, Inches	Temperature of Pipe, F																	
	600 to 699			700 to 799			800 to 899			900 to 999			1000 to 1099			1100 to 1200		
	Nominal Thicknesses Inches																	
	Inner Layer	Outer Layer	Total	Inner Layer	Outer Layer	Total	Inner Layer	Outer Layer	Total	Inner Layer	Outer Layer	Total	Inner Layer	Outer Layer	Total	Inner Layer	Outer Layer	Total
1 1/2 & less	2	none	2	2	none	2	2 1/2	none	2 1/2	2 1/2	none	2 1/2	2 1/2	none	2 1/2	3	none	3
2	1	1 1/2	2 1/2	1	1 1/2	2 1/2	1	1 1/2	2 1/2	1 1/2	1	2 1/2	1 1/2	1 1/2	3	2	1	3
2 1/2	1	1 1/2	2 1/2	1	1 1/2	2 1/2	1 1/2	1 1/2	3	1 1/2	1 1/2	3	1 1/2	1 1/2	3	2	1 1/2	3 1/2
3	1	1 1/2	2 1/2	1	2	3	1 1/2	1 1/2	3	1 1/2	1 1/2	3	2	1 1/2	3 1/2	2	1 1/2	3 1/2
3 1/2	1	1 1/2	2 1/2	1	2	3	1 1/2	1 1/2	3	2	1 1/2	3 1/2	2	1 1/2	3 1/2	2	1 1/2	2 1/2
4	1	2	3	1	2	3	1 1/2	1 1/2	3	2	1 1/2	3 1/2	2	1 1/2	3 1/2	2 1/2	1 1/2	4
4 1/2	1	2	3	1	2	3	1 1/2	2	3 1/2	2	1 1/2	3 1/2	2	1 1/2	3 1/2	2 1/2	1 1/2	4
5	1	2	3	1	2	3	1 1/2	2	3 1/2	2	1 1/2	3 1/2	2 1/2	1 1/2	4	3	1 1/2	4 1/2
6	1	2	3	1 1/2	2	3 1/2	1 1/2	2	3 1/2	2	2	4	2 1/2	1 1/2	4	3	1 1/2	4 1/2
7	1 1/2	2	3 1/2	1 1/2	2	3 1/2	2	2	4	2	2	4	2 1/2	1 1/2	4	3	1 1/2	4 1/2
8	1 1/2	2	3 1/2	1 1/2	2	3 1/2	2	2	4	2	2	4	2 1/2	2	4 1/2	3	1 1/2	4 1/2
9	1 1/2	2	3 1/2	1 1/2	2	3 1/2	2	2	4	2 1/2	2	4 1/2	2 1/2	2	4 1/2	3	2	5
10	1 1/2	2	3 1/2	1 1/2	2 1/2	4	2	2	4	2 1/2	2	4 1/2	2 1/2	2	4 1/2	3	2	5
11	1 1/2	2	3 1/2	1 1/2	2 1/2	4	2	2	4	2 1/2	2	4 1/2	3	2	5	3	2	5
12	1 1/2	2	3 1/2	1 1/2	2 1/2	4	2 1/2	2	4 1/2	2 1/2	2	4 1/2	3	2	5	3	2	5
14 & up	1 1/2	2	3 1/2	1 1/2	2 1/2	4	2 1/2	2	4 1/2	2 1/2	2	4 1/2	3	2	5	3 1/2	2	5 1/2

NOTE: Thickness recommendations for Thermobestos same as for Superex—85% Magnesia Combination Pipe Insulation.

FINISHES FOR PIPE INSULATION

All insulation on indoor piping should be finished with 8-oz. canvas pasted or cemented over a layer of 40-lb. rosin-sized paper; or, where initial cost is a factor, 6-oz. canvas pasted or cemented directly over the standard canvas furnished with the insulation. On fittings, etc., the canvas shall be pasted or cemented directly over the smoothing coat of asbestos cement.

The best weather protection for insulated outdoor pipe lines is a weatherproof J-M Double Coated Flexstone® jacket of asphalt-saturated and coated asbestos felt. This jacket is secured by loops of No. 16 AWG Copperweld

wire applied on 4" maximum centers or ½" x 0.015" corrosion-resistant metal bands and clips on 6" maximum centers, with one loop on each end lap. Double-Coated Flexstone jackets are supplied in rolls 36 in. wide, each roll containing 108 sq. ft. and weighing 50 lbs.

Where a flame-retardant weatherproof jacket is required, a J-M Asbestos Firetard® jacket should be used. Firetard is a lamination of heavy asphalt-saturated asbestos felt and plain asbestos felt. It will not carry flame or support combustion. Supplied in rolls 32 in. wide, each roll containing 108 sq. ft. and weighing approximately 55 lbs.

QUALITY PRODUCTS



Asbesto-Sponge Felted Blocks

Asbesto-Sponge Felted Sheets and Blocks

(For Temperatures to 700° F.)

Unusual insulating efficiency, high salvage value and the ability to withstand vibration, shock and rough usage make Asbesto-Sponge Felted the ideal material where maximum insulating value and durability are desired.

Built up of felts composed of asbestos fibre and small particles of spongy cellular material, the remarkable efficiency of Asbesto-Sponge Felted is due to the great amount of entrapped dead air and the many surfaces interposed in the path of heat flow. The tightly laminated construction of tough asbestos felts is responsible for its immunity to the effects of vibration and rough handling, its sustained high insulating effectiveness in service, and its unusually high salvage value.

Like J-M 85% Magnesia, it is often used outside a layer of Superex for insulating high temperature equipment.

Asbesto-Sponge Felted is furnished in sheets 24 x 36 in. and blocks 6 x 36 in., from 1/2 to 4 in. thick. Weight approximately 2 1/2 lbs. per sq. ft. per inch thick. Also furnished in the form of sectional pipe insulation (see page 9).

Superex Blocks

(For Temperatures to 1900° F.)

The most generally adaptable material for application where the insulation must resist temperatures between 600° and 1900° F. is Superex block insulation, made of specially selected and calcined diatomaceous silica, blended and bonded with asbestos fibre, producing an insulation in which are combined the essential qualities of high heat resistance and exceptional insulating value.

It has a low thermal conductivity, will safely withstand temperatures up to 1900° F. with negligible shrinkage, and, although relatively light in weight, possesses ample strength for all purposes for which it is recommended.

Superex Blocks are widely used for the insulation of boiler furnaces, hot blast stoves, open-hearth regenerators, glass tank regenerators, rotary cement kilns, brick kilns, metalurgical furnaces of various types, producer gas mains, petroleum cracking furnaces and other industrial equipment operated at high temperatures.

Superex Blocks are furnished in standard sizes 3 x 18 in., 6 x 36 in. and 12 x 36 in., flat and curved, from 1 to 4 in. thick. Other sizes on special order. Weight approximately 1.9 lbs. per sq. ft. per inch thick. Also furnished in the form of sectional pipe insulation (see page 10).

Superex Combination Insulation

For service temperatures higher than 600° or 700° F., one or more layers of J-M 85% Magnesia or Asbesto-Sponge

Felted are often used outside of an inner layer of Superex, this construction being known as Superex Combination Insulation. This combination results in greater insulating efficiency and heat resistance for a given insulation thickness. The Superex is always used next to the hot surface as a protection for the 85% Magnesia or Asbesto-Sponge Felted, which, though high in insulating value, would not, if used alone, withstand the temperature involved.



Superex Block and Sil-O-Cel C-22 Brick in a Hot Blast Stove

In this case, C-22 Brick was used next to the refractory, followed by Superex Blocks. Where temperatures behind the refractory do not exceed 1900° F., Superex is ordinarily used alone next to the fire brick. In such cases, from 5 to 7 in. of Superex insulation is the usual recommendation for hot blast stoves.

RECOMMENDED THICKNESSES OF J-M BLOCK INSULATION ON METAL SURFACES

Maximum temperature on Superex, deg. F.	Thickness of Superex, inches	Thickness of Asbesto-Sponge Felted or 85% Magnesia, inches	Total thickness of block insulation, inches
300	—	2	2
400	—	2 1/2	2 1/2
500	—	3	3
600	—	3 1/2	3 1/2
750	1 1/2	2 1/2	4
900	2°	2°	4
1000	2 1/2°	2°	4 1/2
1200	3 1/2	1 1/2	5

* Where Asbesto-Sponge Felted is used as the second layer at operating temperatures of 750° to 1000° F., the Superex may be 1/2 in. thinner and the Asbesto-Sponge Felted 1/2 in. thicker than shown above.

JOHNS-MANVILLE SHEET AND BLOCK INSULATION FOR HEATED SURFACES

The table on the preceding page indicates the thicknesses of J-M Block Insulation recommended for use over metal surfaces at various temperatures under average conditions. However, the proper thicknesses of J-M Block Insulation recommended is dependent not alone on the temperatures involved, but also to a considerable extent on the kind of fuel and its cost and the degree of temperature control required. Application over furnace brickwork adds still another factor—the type and thickness of refractory—which must be considered.

Typical applications of Superex and Superex Combination Insulation on industrial equipment are shown on subsequent pages. Detailed recommendations applying to any specific insulation problem will be gladly furnished on application to any JOHNS-MANVILLE office.

Banroc Blankets

(For Temperatures to 1000° F.)

Banroc Blankets are made of Banroc (rock wool) felted between various fabrics, usually metal, such as galvanized wire netting, copper-bearing metal lath, and rib lath. Used for insulating ovens and for similar purposes. Standard sizes of most types, 24 x 96 in. and 24 x 48 in., in thicknesses of 1 to 6 in.

Asbestos Blankets

(For Temperatures to 900° F.)

Asbestos Blankets are made of quilted asbestos cloth filled with asbestos fibre and tufted with copper wire at close intervals. Used for insulating irregular surfaces where readily removable insulation is desired, such as paper digester shells and steam turbine casings. Furnished in single or double layer construction, 1½ to 2½ in. thick. Made to suit the individual condition. Recommendations on receipt of details.

Super Fire-Felt Sheets and Blocks

(For Temperatures to 700° or 1000° F.)

Super Fire-Felt is a light weight, efficient, resilient insulation made of felted asbestos fibre. Used for lining boiler tube doors and the air passages on ventilated furnace walls, and in other locations where the insulation may be subjected to vibration or to strains caused by expansion and contraction. Furnished in sheets 24 x 36 in., and blocks 6 x 36 in., ½ to 4 in. thick, also in special sizes and irregular shapes to order. Weight about 1.7 lbs. per sq. ft., per inch thick.

Temperature limit, if effectively supported between metal sheets or brick lining and steel shell, 1000° F. If less effectively supported or subjected to removal and replacement, 700° F. is the temperature limit of the material.

Improved Asbestocel Sheets and Blocks

(For Temperatures to 300° F.)

Improved Asbestocel sheets and blocks, made of alternate plain and corrugated asbestos felts built up to various thicknesses, are used for insulating such equipment as low pressure boilers, feed water heaters and warm air ducts. Furnished standard in 4 plies per inch of thickness in sizes 6, 9, 12, 18 and 36 in. wide by 36 or 72 in. long, from ½ to 4 in. thick. Weight about 1 lb. per sq. ft., per inch thick. Fine corrugated material with 6 plies per inch is also available.



Foster-Wheeler Wing Back Water Wall Insulated with one layer Superex and one layer J-M 85% Magnesite
Installation at the Mersey Paper Co., Liverpool, N. S.

Asbestos Roll Fire-Felt

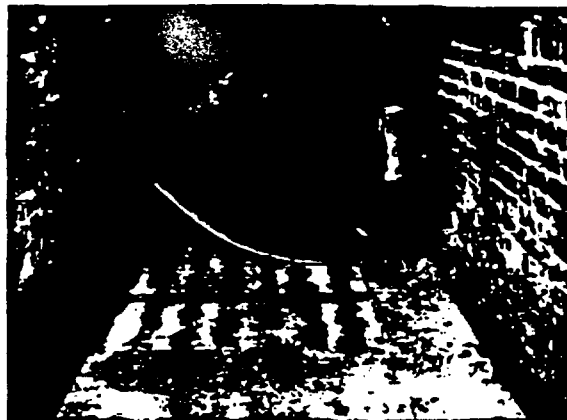
(For Temperatures to 1000° F.)

Asbestos Roll Fire-Felt is a soft, flexible asbestos felt for insulating heated surfaces where space does not permit the use of thicker forms of insulation.

This material is furnished 3/32, ¼, 3/16 and ½ in. thick, in rolls 3 ft. wide, containing about 100 sq. ft. Weight about 1.2 lb. per sq. ft., ¼ in. thick.

Asbestos Paper, Roll Board and Sheet Millboard

JOHNS-MANVILLE furnishes a complete line of asbestos paper (weights from 6 to 32 lbs. per 100 sq. ft.); asbestos roll board (3/32 and ¼ in. thick); and asbestos sheet millboard (1/32 to ¾ in. thick). These products are recommended where relatively thin protection against flame, heat or acid fumes is desired.



Laying J-M Millboard over Superex Blocks
This installation is being made between side walls and brick pier in base of asphalt still

SIL-O-CEL BRICK

INSULATING • INSULATING REFRACTORY

The high insulating value of the three types of Sil-O-Cel Insulating Brick is due to the fact that they are made of diatomaceous silica (Celite), the myriads of tiny dead-air cells of which offer maximum resistance to heat flow.

The basic material of which all Sil-O-Cel Brick are composed is almost pure silica (SiO_2) which accounts for their unusual resistance to high temperatures behind refractory linings and the fact that Sil-O-Cel C-22 Brick may be used so effectively as a combination insulation and refractory without fire brick protection.



Sil-O-Cel C-22 Brick Installation

Here Sil-O-Cel C-22 Brick is used in "core wall" construction behind the fire brick lining in a high temperature industrial furnace.



One of Six Malleable Annealing Furnaces Canton Malleable Iron Co., Canton, Ohio

In these furnaces Sil-O-Cel C-22 Brick is used as a combination insulation and refractory lining for walls, roofs and doors. For the past six years, C-22 Brick has saved enough fuel to pay over 100% annual return on its cost, and is still in perfect condition.

Sil-O-Cel Natural Brick

(For Temperatures to 1600° F.)

Sil-O-Cel Natural Brick are cut from the pure mineral Celite. They are used as an insulation behind refractory linings in high temperature industrial equipment; and will serve indefinitely at temperatures up to 1600° F. without loss of effectiveness.

Sil-O-Cel Natural Brick is the most efficient insulating brick obtainable and is used in preference to other types of Sil-O-Cel brick except where very severe temperatures are encountered.

Sil-O-Cel C-22 Brick

(For Temperatures to 2000° F.)

Sil-O-Cel C-22 Brick are highly efficient insulating-refractory brick, calcined for direct exposure to furnace temperatures. They are recommended up to 2000° F. as a refractory lining to replace fire brick in oil and gas-fired furnaces, electric furnaces of the resistance type, and coal-fired furnaces where they will not be subject to mechanical abrasion or slag action. When used as a refractory, they should be bonded with C-22 Cement.

This material makes possible thinner furnace walls, improved efficiency and lower operating costs. It combines all of the characteristics essential to a highly efficient insulating-refractory, including heat resistance, exceptional insulating qualities, low heat absorption, unusually high compressive strength and ample load-bearing capacity under heat.

This combining of the refractory and insulating course not only results in a saving in construction costs, but also cuts down the heat storage capacity of the masonry.

C-22 Brick have a heat capacity less than 1/3 that of fire brick, which effects a highly important economy in intermittent furnaces. Less heat is wasted when the furnace is shut down and the furnace can be brought up to temperature again in a very short time with minimum expense for heat. In preventing transmitted heat loss, C-22 Brick are three to four times as effective as fire brick.

Where furnace temperatures are above 2000° F., or surface erosion is severe, Sil-O-Cel C-22 Brick, protected by firebrick, are used as insulation where the temperature on the insulation will not exceed 2000° F.

Sil-O-Cel Super Brick

(For Temperatures to 2500° F.)

Sil-O-Cel Super Brick (U. S. Patent No. 1,544,433) is a calcined type of Sil-O-Cel brick designed for exceptionally severe insulating service where subjected to temperatures behind the refractory in excess of 2000° F., and can be used in this manner for temperatures up to 2500° F.

In high temperature furnaces, the use of Sil-O-Cel Super Brick often permits a reduction in the thickness of first-quality fire brick.

Sil-O-Cel Brick Sizes and Weights

Sil-O-Cel Brick are furnished in standard fire brick sizes and shapes, packed in fibre cartons of twenty-five 9-in. straight brick or an equivalent volume of other sizes. Weights per standard 9 x 4½ x 2½ in. straight brick: Sil-O-Cel Natural Brick, 1½ lbs.; C-22 Brick and Super Brick, 2½ lbs.

Johns-Manville

PIPE INSULATION FOR HEATED LINES

No matter what the pipe insulation problem may be, there is a J-M material that will do the job most effectively and economically. In this and succeeding pages, insulation for heated lines will be treated. Recommendations for insulating cold lines will be found on page 16.

J-M 85% Magnesia Pipe Insulation (For Temperatures to 600° F.)

Under actual service conditions, 85% Magnesia has proved to be the most durable and efficient insulation of the molded type. The J-M manufacturing process produces an 85% Magnesia with the maximum number of voids or minute dead-air cells which increase its natural resistance to heat transmission and reduce its weight. In addition, it provides maximum mechanical strength consistent with high insulating efficiency.

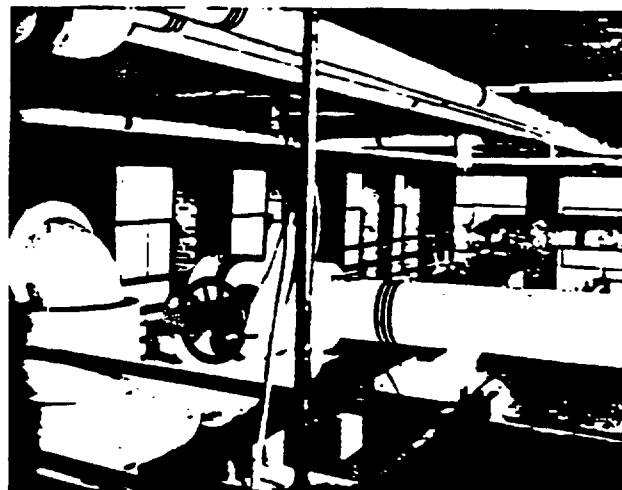
JOHNS-MANVILLE recommends 85% Magnesia as the most generally satisfactory and economical material for insulating steam lines at temperatures up to 600° F. For superheated steam at temperatures above 600° F., J-M-85% Magnesia is often used outside a layer of Superex, as described under the subject of Superex Combination Insulation, on the following page.

J-M 85% Magnesia is furnished in 3-ft. sections and segments in the following thicknesses: Standard (which varies from $\frac{7}{8}$ to $1\frac{1}{2}$ in., depending on pipe size), $1\frac{1}{2}$, 2, $2\frac{1}{2}$ in.;



Steam Headers and Heating Mains Insulated with J-M 85% Magnesia Pipe Insulation

In sub-station of New York Central Railroad, under Grand Central Terminal, New York, N. Y.



J-M 85% Magnesia on Steam Lines
Boiler room of the Franciscan Monastery
Washington, D. C.

Double Standard (two layers, each Standard thick); and 3 in. (double layer for broken joint construction). Also furnished in blocks (see page 5).

J-M Asbesto-Sponge Felted Pipe Insulation (For Temperatures to 700° F.)

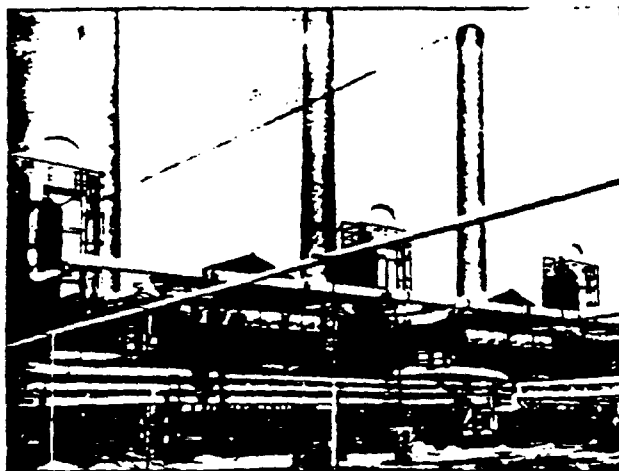
Asbesto-Sponge Felted is not only the most efficient commercial pipe insulation for temperatures up to 700° F., but it is also the most durable. It is practically abuse-proof, standing up indefinitely under vibration and wear and tear that quickly affect other materials. It retains its high insulating value unimpaired over long years of service. Though somewhat higher in first cost than other materials, it has proved in many cases to have the lowest cost per year of any insulation made. And it can be removed and replaced many times without loss of efficiency.

Asbesto-Sponge Felted is built up of felts composed of asbestos fibre and small particles of spongy, cellular material, there being about 40 laminations per inch of thickness. The large number of dead-air spaces and interposed surfaces effectively break up heat flow and are responsible for the unusual insulating properties of the material.

It is particularly well adapted to service on outdoor lines in oil refineries, steel mills, etc. For such uses it is furnished with a 3-ply integral waterproof asbestos jacket. The durability and weather-proof properties of the material are best demonstrated by the fact that the use of Asbesto-Sponge Felted with Waterproof Jacket is practically standard on railroads for covering the heating lines that run from the engine back underneath the cars. In such service it is subjected to constant vibration and to rain, ice and sub-zero weather.

Asbesto-Sponge Felted is often used outside a layer of Superex on superheated lines (see next page).

Asbesto-Sponge Felted is furnished in 3-ft. sections in thicknesses from 1 to 3 in. The 3-in. thickness is furnished in two-layer construction, unless solid construction is speci-



J-M Asbesto-Sponge Felted in Oil Refinery

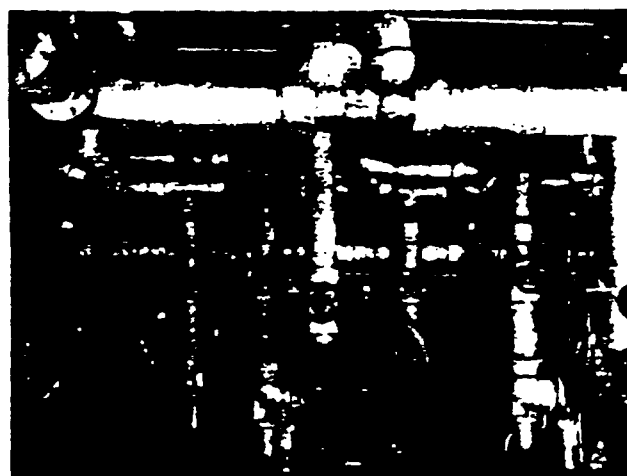
Whether on indoor or outdoor pipes, Asbesto-Sponge Felted is not only practically abuse-proof, but it is unsurpassed in insulating efficiency and durability.

fied. Thicknesses less than 3 in. are furnished solid, unless otherwise specified. It can also be supplied to fit straight runs of copper pipe or tubing of outside diameters from $\frac{1}{2}$ in. up. Also furnished in sheets and blocks (see page 5).

Superex Combination Pipe Insulation

(For Temperatures to 1900° F.)

Wherever steam temperatures exceed 600° or 700° F., JOHNS-MANVILLE recommends Superex Combination Pipe Insulation—a first or inner layer of Superex covered by a layer of J-M 85% Magnesia or Asbesto-Sponge Felted. In this construction, Superex is used as protection for the other insulation which, although high in insulating value, is comparatively low in heat resistance. This method is now practically standard where temperatures are above the range of 85% Magnesia or Asbesto-Sponge Felted when not so protected.



Superex Combination Insulation on High Pressure Super-Heated Steam Lines

Avon Station of Cleveland Electric Illuminating Co.

This method of pipe insulation utilizes the high temperature resistance of Superex and the superior insulating value of 85% Magnesia or Asbesto-Sponge Felted to result in greater total economy.

Superex is described in detail in connection with block insulation on page 5.

Superex Pipe Insulation is furnished in 3-ft. sections and segments in thicknesses from 1 to 3 in. Standard tables (next page) give the proper Superex Combination Insulation thicknesses for various temperature conditions and pipe sizes.

Banroc Pipe Insulation

(For Temperatures to 1000° F.)

Banroc Pipe Insulation, Style No. 65, is made of felted rock wool, secured between two layers of copper-bearing metal lath, with wire arch supports to resist compression and protected with a 24-gauge galvanized iron outer casing. It is used in some instances for outdoor lines in oil refineries where a fireproof waterproof jacket is desired or where the insulation must be frequently removed for repairs or changes. Furnished in 2-ft. sections, 1 to 4 in. thick. Special shapes can be supplied for flanges and bends.

Pre-Shrunk Asbestocel Pipe Insulation

(For Temperatures to 300° F.)

Pre-Shrunk Asbestocel Pipe Insulation is made of alternate layers of plain and corrugated asbestos felts with cross-corrugations at regular intervals. The felts are processed to make them moisture-resisting, thus removing the cause of the objectionable shrinkage encountered with other types of cellular insulation.

This material is recommended for the insulation of both low pressure steam and hot water piping. Made four plies to the inch in 3-ft. sections to fit standard pipe sizes, in standard thicknesses of two to eight plies. It can also be supplied to fit straight runs of copper pipe or tubing with diameters of $\frac{1}{2}$ to 6 $\frac{1}{2}$ in. The high-speed type is finished with aluminum or asbestos, fastened with staples and requiring no pasting, which saves one-third in application labor. Regular canvas-covered finish is also available.

J-M Pre-Shrunk Wool Felt Insulation

For Service Water Lines

J-M Pre-Shrunk Wool Felt Insulation is made of specially indented wool felt and provided with a dual-service liner for use on hot or cold water lines. Treated to prevent moisture absorption in storage, it eliminates objectionable shrinkage in service. Supplied in either canvas or flat aluminum finish, the latter being especially designed for use where pipes are exposed to view, as in basement recreation rooms, etc.

Pre-Shrunk Wool Felt Pipe Insulation is regularly furnished in 3-ft. sections, in thicknesses of $\frac{1}{2}$, $\frac{3}{4}$, and 1 in. double $\frac{1}{2}$ in. and double $\frac{3}{4}$ in. for all pipe sizes from $\frac{1}{2}$ to 5 $\frac{1}{2}$ in. Can be furnished to order for larger pipe sizes and also for straight runs of copper pipe or tubing of diameters from $\frac{1}{2}$ to 6 $\frac{1}{2}$ in. An integral waterproof jacket is supplied on Pre-Shrunk Wool Felt, when so ordered.

J-M INSULATION RECOMMENDATIONS

In general, all pipes, fittings and flanges at temperatures below 600° F., except small fittings which are insulated with J-M No. 302 Cement, should be insulated with Asbesto-Sponge Felted or J-M 85% Magnesia to the thickness given in table below. Asbesto-Sponge Felted Pipe Insulation may be used, where service conditions warrant, up to 700° F.

All pipes 1½ in. and smaller, at temperatures above 600° F. (or above 700° F., if Asbesto-Sponge Felted is used), should be insulated with a single layer of Superex sectional pipe insulation 2 in. thick. Small fittings are insulated with

J-M No. 302 Cement. For sizes larger than 1½ in. at temperatures above 600° or 700° F., Superex Combination Insulation is used. This consists of a layer of Superex next to the pipe, over which is applied Asbesto-Sponge Felted or J-M 85% Magnesia, as required.

The thicknesses below represent standard practice in general use on heated lines. Exceptional conditions may make necessary thicker insulation. On outside piping it is customary to use insulation ½ in. thicker than that on indoor lines.

FOR TEMPERATURES TO 600° F.

85% Magnesia or Asbesto-Sponge Felted

Thickness of insulation, J-M 85% Magnesia			Temperature, deg. F.	Thickness of insulation, Asbesto-Sponge Felted		
Pipes larger than 4 in.	Pipes 2 to 4 in.	Pipes smaller than 2 in.		Pipes larger than 4 in.	Pipes 2 to 4 in.	Pipes smaller than 2 in.
Std.	Std.	Std.	Below 212	1	1	1
Std.	Std.	Std.	212 to 266	1	1	1
1½	Std.	Std.	267 to 337	1½	1	1
2	1½	Std.	338 to 387	2	1½	1
Dbl. Std.	2	1½	388 to 499	2½	2	1½
3	Dbl. Std.	2	500 to 599	3	2½	2
			600 to 700	3½	3	2

FOR TEMPERATURES ABOVE 600° F.

Superex Combination Insulation

Temperatures	600-699 deg. F.		700-799 deg. F.		800-1000 deg. F.	
Pipe Size, in.	Thickness of insulation, in.		Thickness of insulation, in.		Thickness of insulation, in.	
	Superex	85% Magnesia	Superex	Asbesto- Sponge Felted, or 85% Magnesia	Superex	Asbesto- Sponge Felted, or 85% Magnesia
1½ and smaller	2	—	2	—	2	—
2	1½	1½	1½	2	1½	1½
2½	1½	1½	1½	2	1½	1½
3	1½	1½	1½	2	2½	1½
3½	1½	1½	1½	2	1½	1½
4	1½	1½	1½	2	2½	1½
4½	1½	2	1½	2½	1½	2
5 and larger, approx. —	1½	2	1½	2½	2	2

Finish of Insulation

All insulation on piping indoors should be finished with a jacket of 8-oz. canvas, sewed on over rosin-sized paper or asbestos paper, sized with glue and painted with two coats of lead and oil paint.

Where other insulation than Asbesto-Sponge Felted with integral waterproof jacket is used, the best weather protection for insulated pipe lines out-of-doors is a waterproof asbestos jacket of J-M Double Coated Flexstone fastened by rings of heavy non-corroding wire on 4 in. centers. Double-Coated Flexstone is furnished in rolls of 108 sq. ft., 32 in. wide, weighing approximately 55 lbs.

Where rough usage may be encountered, a metal jacket may be used instead of the weatherproof Flexstone jacket.

Where exposed to fire hazard, the application of asphalt-saturated roofing jackets is inadvisable since flame may be carried along exposed piping when a fire occurs adjacent to lines so protected. In such cases it is good practice to apply a J-M Asbestos Firetard Jacket. The Firetard jacket consists of one sheet of asphalt-saturated asbestos felt over which is cemented an unsaturated felt. It will not drip asphalt, carry flame nor support combustion. It is furnished in rolls of 108 sq. ft., 32 in. wide, weighing approximately 50 lbs.

Johns-Manville

INSULATING AND FINISHING CEMENTS

Johns-Manville manufactures a complete line of Insulating and Finishing Cements, each designed for a specific purpose.

The asbestos cements are used in industry principally as a finish over sheet or block insulation.

Cements made of mineral wool (No. 450), or of vermiculite (No. 500), are used for insulating irregular surfaces where it would be impracticable to apply sectional insulation, sheets or blocks.

All of these J-M Cements may be depended upon for insulating efficiency and covering capacity unsurpassed by other similar products.

J-M No. 450 Insulating Cement

No. 450 is a mineral wool base cement with good covering capacity and excellent adhesion to both hot and cold surfaces. It is a very good insulator compared with other cements. After being in service at temperatures to 1200° F., it can be removed, readily re-mixed and re-applied without appreciable loss of its original working properties. Where re-application is not essential, it may be used to 1500° F. Packed in 50-lb. bags. Covering capacity, applied and dried, 25 sq. ft., 1 in. thick, per bag; or 50 sq. ft., 1 in. thick, per 100 lbs.

J-M No. 500 Insulating Cement

No. 500 is an expanded vermiculite base cement with exceptionally high covering capacity, combined with good ad-

hesion, working qualities and insulating value. After use at 1500° F., it may be removed, re-mixed and re-applied, with no appreciable decrease in working properties. It may be used to 1800° F., if re-application is not required. Packed in 50-lb. containers. Covering capacity, applied and dried, 30 sq. ft., 1 in. thick per container; or 78 sq. ft., 1 in. thick per 100 lbs.

J-M No. 302 Insulating Cement

No. 302 Cement is made of asbestos fibre and binding materials. It is a high-grade finishing cement, easy to mix and apply. It sticks readily to hot surfaces. Temperature limit 1000° F. It produces a hard, durable and attractive surface which does not crack, break or peel off. Packed in 100-lb. bags. Covering capacity, applied and dried, 25 sq. ft., 1 in. thick, per bag.

J-M 85% Magnesia Cement

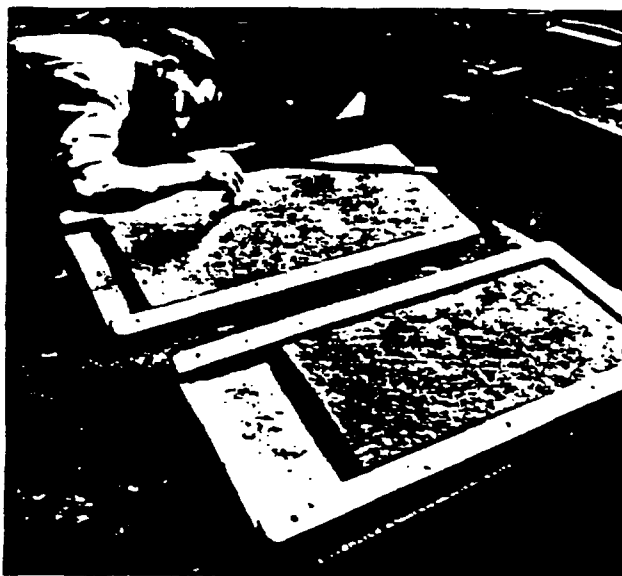
This material is similar in composition to J-M 85% Magnesia sectional and block insulation. Compared with other cements, its insulating efficiency is high but it is not ordinarily recommended as a finishing cement. Temperature limit 600° F. Packed in 60-lb. bags. Covering capacity, applied and dried, 35 sq. ft., 1 in. thick, per bag; or 58 sq. ft., 1 in. thick, per 100 lbs.

J-M No. 0352 and No. 352 Insulating Cements

These are general utility, short fibre cements used in large quantities by the steam-fitting and plumbing trade for insulating and finishing heating boilers and pipe fittings and for similar purposes. The temperature limit of either cement is 1000° F. Both No. 0352 and No. 352 packed in 100-lb. bags. Covering capacity, applied and dried, 19 sq. ft. 1 in. thick, per bag.

J-M No. 319 Semi-Refractory Cement

No. 319 is a semi-refractory insulating and finishing cement, ideal for use as a protective coating over insulation linings of breechings, flues, etc., exposed to the action of moving gases. Temperature limit 1600° F. Packed in 50-lb. bags. Covering capacity, applied and dried, 7½ in. sq. ft., 1 in. thick, per bag, or 15 sq. ft. 1 in. thick, per 100 lbs.



Testing Cement for Covering Capacity

Two insulating cements may look alike in the bag but on the job one may cover many more square feet of surface than the other. This photograph from the J-M laboratories shows dried test specimens being measured and evaluated. The same weight of material was employed for each specimen. Note lower coverage of the one in the foreground.

SIL-O-CEL C-3 CONCRETE INSULATING SEMI-REFRACTORY

Sil-O-Cel C-3 Concrete made it possible to utilize insulation where previously it had been impractical to do so for structural reasons. The material can be easily cast in monolithic form for the construction of doors, baffles, dampers, etc., and, when suitably reinforced, may be molded into large units for such purposes.

This semi-refractory insulating concrete is made by mixing four parts of Sil-O-Cel C-3 and one part of portland or luminate cement, by volume, with sufficient water to form a plastic, coherent mass.

Sil-O-Cel C-3 is a coarsely-ground, granular, semi-refractory, insulating product, milled from diatomaceous silica (Celite) and calcined to withstand high temperatures without shrinkage in service.

Approximately 28 lbs. of Sil-O-Cel C-3 are required per cubic foot of finished concrete. Made in accordance with directions, it sets up into a strong, durable concrete weighing approximately 60 lbs. per cubic foot and with a crushing strength of about 1,000 lbs. per square inch.

Sil-O-Cel C-3 Concrete is over three times as effective as fire clay brick in reducing heat transfer. It has a high degree of refractoriness and can be used without other refractory protection where it may be subjected to direct heat as high as 1800° F.

Sil-O-Cel C-3 Concrete Doors

Sil-O-Cel C-3 Concrete is used extensively for furnace door lining at temperatures up to 1800°. Such doors reduce heat losses, increase the output of the furnace, make temperatures



Sil-O-Cel C-3 Concrete Doors

The C-3 Concrete Doors on this battery of malleable annealing furnaces are 9 in. thick. They weigh only half as much as fire brick and conduct less than one-third as much heat, thus saving fuel as well as improving furnace performance and working conditions.

more uniform and improve working conditions. Sil-O-Cel C-3 Concrete weighs less than half as much as fire brick and conducts less than one-third as much heat.



Jannening Ovens of Sil-O-Cel C-3 Concrete

These large jannening ovens at Durand Steel Locker Co., Chicago Heights, Ill., built entirely of Sil-O-Cel C-3 Concrete.

Other Uses of Sil-O-Cel C-3 Concrete

Sil-O-Cel C-3 Concrete is also an ideal material for insulating the bases of various types of heat-treating furnaces, kilns, oil still furnaces, hot blast stoves, open hearth furnace regenerators and flues, and many other types of high temperature equipment. Insulating the bases of such equipment not only saves fuel but also insures more uniform heat distribution within the equipment and protects the foundation from excessive heat.

It is an excellent material for making up special shapes such as baffles, dampers, etc. It is also cast into covers for wheel annealing pits; for the construction of fire screens to protect men working in front of open furnace doors; and for a great variety of other uses.

Such equipment as jannening and enameling ovens, core ovens, etc., are often constructed entirely of Sil-O-Cel C-3 Concrete. Ovens of this type can be built and operated at great saving over the ordinary type of masonry construction. This monolithic method of construction can be satisfactorily employed for many types of equipment.

Sil-O-Cel C-3 Concrete is also adaptable for insulating the outside of walls of equipment which had been constructed without insulation. It can be applied very satisfactorily with a cement gun to steel surfaces or the brick walls of existing equipment.

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INSULATING FILLERS

It is ordinarily preferable to use insulation in the form of blocks, bricks or pipe sections. In some instances, however, conditions render impracticable the use of solid insulation and then insulation fillers are adapted to serve the purpose.

Sil-O-Cel C-3

A coarse, granular calcined diatomaceous silica (Celite), used as an insulating filling on high temperature equipment, particularly where lack of space prohibits the use of any but relatively thin fire brick linings and where the insulation is therefore subjected to very high temperatures. A typical application of this material in dry form is in the bases of oil-fired marine boilers. This material is also used in making Sil-O-Cel C-3 Concrete, as described on a preceding page. Temperature limit, 2000° F. Weight loose, 28 lbs. per cu. ft.; packed 31 lbs. per cu. ft. Furnished in 100-lb. bags.

Sil-O-Cel Coarse Grade

Coarsely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600° F. Usually packed to density of 22 lbs. per cu. ft. Furnished in 100-lb. bags.

Sil-O-Cel Insulating Powder

Finely ground diatomaceous silica (Celite), used as an insulating filler. Temperature limit, 1600° F. Weight loose, about 12 lbs. per cu. ft.; packed, 15 to 17 lbs. per cu. ft. Furnished in 100-lb. bags.

Fibro-Cel

A mixture of diatomaceous silica and long fibre asbestos. Because it does not settle under vibration or sift through cracks, it is well adapted for use as filling material on gas generator sets, etc. Temperature limit, 1800° F. Usually packed to density of 18 lbs. per cu. ft. Furnished in 80-lb. bags.

Johns-Manville

WATERPROOF FINISHES FOR INSULATION

Insulkote

Insulkote is a durable, easily applied weather-proof coating for insulation on outdoor smoke breechings, ducts and other exposed insulated equipment. It stands up under extreme weather conditions and remains sufficiently elastic to prevent its cracking. Furnished in ready-mixed, plastic form and of suitable consistency to apply with a trowel. Applied in one coat $\frac{1}{4}$ in. thick, it covers about 45 sq. ft. per 100 lbs. Furnished in 50-lb. pails and in 150, 300 and 500-lb. drums.



Sil-O-Cel Coarse Grade

Showing installation in wall of Harrop Tunnel Kiln at A. P. Green Fire Brick Co., Mexico, Mo. Sil-O-Cel Coarse Grade is a top used on the top.

Fil-Insul

An asbestos filling material used where a resilient, non-settling insulation is desired for medium temperature applications. Because of its fibrous nature, it will not sift through cracks. Temperature limit, 1000° F. Usually packed to density of 17 lbs. per cu. ft. Furnished in 80-lb. bags.

Banroc Loose

A loose rock wool fibre used as an insulating filling in ovens, fireless cookers, electric and gas ranges and similar equipment. Temperature limit, 1000° F. It is packed in place to the required density; usually 12 lbs. per cu. ft. is sufficient. Furnished in 50-lb. bags. Can also be furnished granulated (Banroc Granulated) in 50-lb. bags, the recommended density of which is 9 to 10 lbs. per cu. ft. poured, or 10 to 12 lbs., packed by hand.

Aertite Coating

Aertite Coating is a tough, rubbery, asphaltic-asbestos coating in plastic form, often used like Insulkote for weather-proofing insulation outdoors. Its primary use, however, is for coating boiler walls to prevent air infiltration. For a $\frac{1}{4}$ in. coat, 50 to 80 lbs. are required per 100 sq. ft., depending upon character of surface. Furnished in 25, 50, 150, 300 and 500-lb. containers. (For waterproof finishes over pipe insulation, see page 11).

Johns-Manville

ROCK CORK SHEET INSULATION FOR LOW TEMPERATURES

Because Rock Cork has a successful service record extending for more than a quarter of a century, **JOHNS-MANVILLE** recommends it as an efficient and economical insulation for cold rooms, ducts and refrigerating equipment. The earliest installation, made in 1907, is still in service and in excellent condition. The refrigeration load has not increased during 29 years of continuous service, indicating that the original high insulating value of Rock Cork is maintained indefinitely.

Made of rock wool combined with a waterproof binding ingredient, Rock Cork is mineral in composition; highly moisture-resistant; permanent; rot-proof; chemically inert; odorless and incapable of absorbing odors. Completely sanitary, it will not harbor vermin or rats and cannot support the growth of mold or bacteria. With its myriads of tiny air spaces completely sealed with the waterproof binder, Rock Cork stubbornly resists the infiltration of air and moisture, thus eliminating this direct cause of most insulation failures. No other low temperature insulation is as effective as Rock Cork in resistance to moisture absorption. More than any other one feature, this distinctive characteristic has been responsible for the outstanding service record of Rock Cork.

J-M Rock Cork is furnished in standard sheets: 18 x 36 in., in thicknesses of 1½, 2, 2½, 3 and 4 in., and 18 x 18 in., in 1 in. thickness. Other sizes, within the above limitations and of standard thickness, can be furnished on special order. The sheets weigh approximately 1.3 lbs. per sq. ft. per inch of thickness and are packed in cartons containing 54 board feet.

Rock Cork in lagging form for curved surfaces is supplied 18 in. long, 1½, 2, 3 and 4 in. thick, and 2 to 5 in. wide, depending on diameter.



Rock Cork at Swift and Company, Atlantic City, N. J.

Because their earliest installation in 1909 is still in perfect condition, Swift and Company continue to use J-M Rock Cork. In the latest job applied late in 1934 at a new branch house at Atlantic City, N. J., Rock Cork was used throughout.

Rock Cork is also manufactured in granular form for use as a loose, moisture-resisting fill type of insulation. Granulated Rock Cork should be packed to a density of 13 to 14 lbs. per cu. ft. Furnished in 35-lb. paper bags and burlap bags of random weight.

For data on Rock Cork in the form of pipe insulation see the following page.

RECOMMENDED THICKNESSES OF J-M ROCK CORK



**J-M Rock Cork Sheets are Efficient,
Permanent and Economical**

While many factors, such as the cost of refrigeration and local atmospheric and temperature conditions, may govern the amount of insulation which should be used, the thicknesses of Rock Cork sheets or lagging given in the following table are recommended for general requirements:

Temperature range, deg. F.	Thickness, inches
-80 to -40	12—Three layers
-40 to -25	10—Three layers
-25 to -15	8—Two layers
-15 to 0	7—Two layers
0 to 15	6—Two layers
15 to 25	5—Two layers
25 to 35	4—1 or 2 layers
35 to 45*	3 or 2—1 layer

*Suitable thickness of insulation at this higher temperature range generally depends on other factors than temperature difference. Among these are cost of refrigeration, surface temperature and dew point.



Miller Brewing Co., Milwaukee, Wis.
150,000 bd. ft. of Rock Cork Sheets were installed.

Johns-Manville

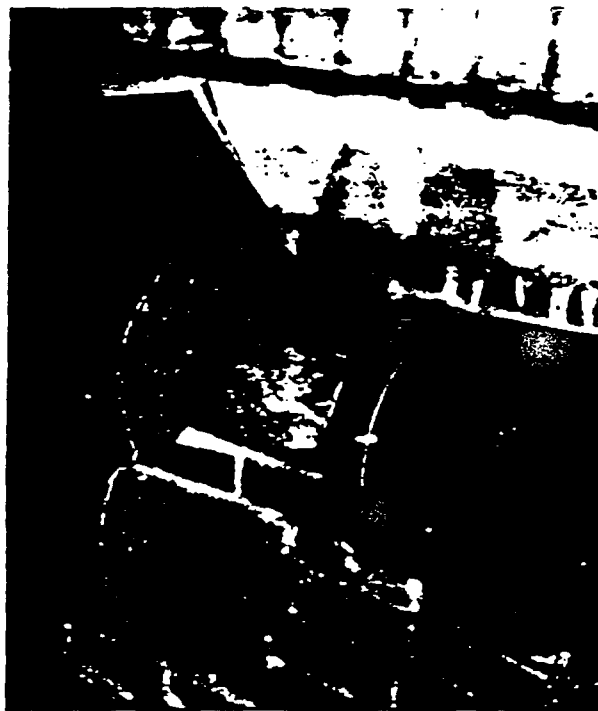
PIPE INSULATION FOR COLD LINES

The J-M line of cold pipe insulating materials covers the entire refrigerating range of temperatures from atmospheric to 400° below zero, and provides efficient insulation for every service.

Rock Cork Pipe Insulation

In Rock Cork Pipe Insulation, JOHNS-MANVILLE now makes available for the first time an insulation for low temperature pipes that combines with the proved permanent high efficiency and unequalled moisture resistance of Rock Cork Sheets the added protection of *hermetic sealing*—a further protection against any infiltration of moisture-laden air, the cause of most low temperature insulation failures.

At the factory, each section of Rock Cork Pipe Insulation is coated with waterproofing asphalt into which is firmly embedded a waterproof jacket that becomes an integral part of the pipe covering. This jacket is provided with a lap which is sealed down over the longitudinal joint at installation.



Rock Cork Pipe Insulation is Moisture-proof

With similar treatment of the circumferential joint between sections, and the most effective method of insulating fittings yet devised, Rock Cork Pipe Covering provides an unbroken, seamless sheath of insulation, permanently airtight and moisture-proof.

Fittings, the usual "weak spots" in low temperature pipe insulation, are insulated with Zerotex—a special water-



Rock Cork Pipe Insulation

Applied in 1931 as a test installation on an outdoor oil line at one of the great eastern oil refineries, and photographed here in 1935—years under exposure to the elements, Rock Cork Pipe Insulation has remained water proof and maintained its original insulating efficiency.

proofed rock wool—and then double-sealed to provide an impenetrable barrier to moisture at these vulnerable points.

Rock Cork Pipe Insulation is not a new or untried material. Thorough tests in both laboratory and field have proved its efficiency and durability.

In sheet form, Rock Cork has been successfully used as cold storage insulation for more than a quarter of a century. During this time it has demonstrated conclusively that it has no equal as a permanent and highly efficient low temperature insulation.

In spite of this record, the new form of Rock Cork—Rock Cork Pipe Insulation—was treated as an entirely new product in the Johns-Manville Research Laboratories. Extensive



Johns-Manville Method of Insulating Fittings

Successive layers of Zerotex (a blanket form of water-proof Rock Wool) finished with a double-wrapping of Zerotape (a sturdy, airtight water-proofed tape) over which is trowelled a layer of asphalt waterproofing Zeroseal (an asphalt plastic especially made for this purpose). Depending upon the thickness of insulation employed, one or two intermediate sealings with Zerotape and Zeroseal provide still further assurance against moisture penetration.

JOHNS-MANVILLE PIPE INSULATION FOR COLD LINES

tests proved Rock Cork Pipe Insulation as efficient and permanent for its purpose as Rock Cork Sheets.

Rock Cork Pipe Insulation was then installed in actual field service test jobs in a number of great eastern refineries and midwest ice and cold storage plants. Today, after more than four years of the hardest kind of use, indoors and out, it has proved its lasting efficiency in service.

Rock Cork Pipe Covering is furnished in 3-ft. sections in the following thicknesses:

Thickness	Temperature Range
Ice Water (1 1/4 to 2 in.)	30° to 45° F.
Brine (2 to 3 1/2 in.)	0° to 30° F.
Heavy Brine (2 1/2 to 4 in.)	-25° to 0° F.

For temperatures below -25° F., Rock Cork in the form of lags is applied over Heavy Brine thickness Rock Cork Pipe covering.



A Finished Rock Cork Pipe Insulation Job

Permanently efficient because it is permanent, moisture-proof.

J-M Built-up Brine and Ammonia Pipe Insulation

This J-M insulation is efficient in maintaining the extremely low temperatures required in pipe lines conveying brine, ammonia or other cold liquids or gases. It consists of two or more layers of insulating felts carefully applied and sealed. The effective method of sealing eliminates the possibility of moisture accumulating between pipe and insulation and then freezing and bursting the insulation. The material is not only highly efficient as an insulator, but will withstand contraction and expansion without cracking or breaking open.

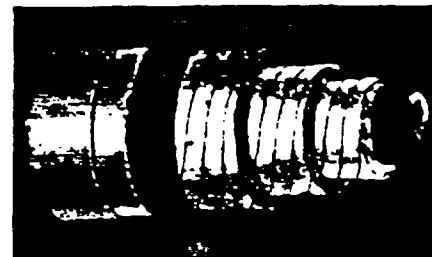
This type of built-up insulation to be satisfactory should be applied only by mechanics specially trained in low temperature work. JOHNS-MANVILLE Approved Contractors are experienced in such applications.

RECOMMENDED THICKNESSES

Plus 40° F. to plus 15° F.	2 in. insulation
Plus 15° F. to minus 5° F.	3 in. insulation
Minus 5° F. to minus 20° F.	4 in. insulation
Minus 20° F. to minus 40° F.	5 in. insulation
Minus 40° F. to minus 60° F.	6 in. insulation

*For pipes smaller than 3 1/2 in. at temperatures from minus 20° to minus 60° F., deduct 1 in. insulation.

Where temperatures are below minus 60° F., recommendations will be furnished by JOHNS-MANVILLE.



J-M Built-up Brine and Ammonia Pipe Insulation

Anti-Sweat Pipe Insulation

As its name implies, this material is designed to keep cold water cold and to prevent sweating and dripping. It is made of laminated insulating felt, protected inside and out with waterproofing felts. Furnished in 3-ft. sections, in thicknesses of 1/2 and 3/4 in. solid construction, and 1, 1 1/2 and 2 in. double layer, for broken joint construction. Can also be supplied to fit straight runs of copper pipe or tubing.

J-M Pre-Shrunk Wool Felt

For Service Water Lines

J-M Pre-Shrunk Wool Felt with dual service liner for hot or cold service water lines is described on page 10.

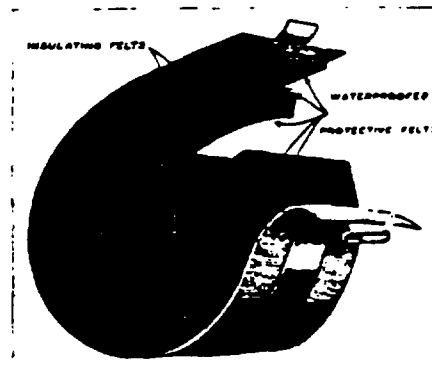
J-M Built-up Hair Felt

J-M Built-up Hair Felt Insulation is designed to protect water pipes from freezing where the pipes are subjected to severe conditions. This insulation consists of a suitable number of layers of 1 in. hair felt securely bound in place on the pipe by means of heavy jute twine and finished on the outside with a waterproof jacket.

It is not possible to give a definite recommendation as to thickness suitable to protect pipes under all conditions. A complete table of data on freezing time of water in pipes will be furnished on request.

Zero Pipe Insulation

Zero Pipe Insulation is used to prevent pipes from freezing under moderate conditions. It is composed of layers of hair felt and wool felt, with a layer of asphalt-saturated wool felt inside. It must be waterproofed if used outdoors. Furnished in 3-ft. sections, 1 1/4 in. thick.



J-M Anti-Sweat Pipe Insulation



J-M Zero Pipe Insulation

Johns-Manville Insulation Recommendations for STEEL MILL EQUIPMENT

Many J-M insulating products find wide application in steel mill equipment for improving performance, increasing production and lowering operating costs. The following recommendations are based on JOHNS-MANVILLE's many years of close co-operation with the Steel Industry in the control of heat losses.

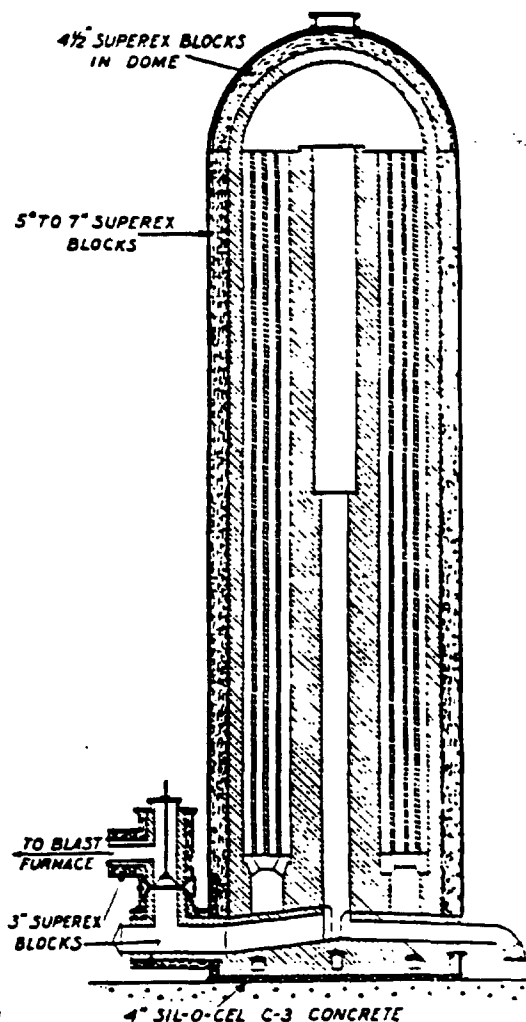
For complete insulation specifications and drawings covering all types of blast furnace and steel mill equipment, ask for the J-M handbook "Johns-Manville Service to the Iron and Steel Industry."

The Blast Furnace System

Blast Furnace Stack: For stack insulation JOHNS-MANVILLE recommends from 2½ to 4 in. of Sil-O-Cel Coarse Grade, (see page 14) installed between the brickwork and the shell from the mantle to the bottom of the wearing plates. Because of the more uniform temperature gradient, vapors of zinc or other impurities in the ore are prevented from chilling and condensing in the lining, but instead are carried through into the insulation, where condensation takes place in the highly porous Sil-O-Cel. The insulation also protects the shell against excessive temperatures.

Hot Blast Stoves: From 5 to 7 in. of Superex Blocks (see page 6) are recommended for hot blast stoves. The unusual heat resistance of Superex ordinarily permits the thickness of refractory to be reduced by one 4½-in. course. Domes are insulated with 4½ in. of Superex Blocks. Base insulation consists of a minimum of 4 in. of Sil-O-Cel C-3 Concrete (page 13). This method of insulation pays for itself in a few months' operation. Furthermore, stove capacity is increased and checkerwork lasts longer.

Hot Blast Mains, Bustle Pipes and Valves: The generally recommended insulation for hot blast mains and bustle pipes is a 3 in. layer of Superex Block or a 4½ in. course of Sil-O-Cel C-22 Brick behind a 4½ in. course of fire brick. Either of these constructions reduces radiation loss 60 to 70 per cent compared to that from an uninsulated 9-in. fire brick lining. Superex Block and C-22 Brick are also recommended for insulating valves.



Johns-Manville Insulation Recommendations
for Hot Blast Stoves and Mains



Bustle Pipe Insulated with Sil-O-Cel C-22 Brick

J-M Insulation used also in the stack, stoves, mains and valves assure economical operation of the entire system.

The Open Hearth Plant

Furnace Proper: The many steel mills now operating completely insulated open hearth report greatly reduced operating costs. Evidence also shows that, in a properly controlled insulated furnace, refractory life is appreciably lengthened.

For open hearth roofs the following J-M materials are being used with satisfactory results: Sil-O-Cel Coarse Powder with a binding ingredient to give a monolithic slab insulation; J-M No. 500 Vermiculite Cement (page 12); Vermiculite Granules, covered with a coating of No. 500 Cement; Superex Blocks; Sil-O-Cel C-22 Brick; and Sil-O-Cel Super Brick.

J-M No. 500 Cement is also used for insulating side walls above the charging floors. For hearths 5 in. of Sil-O-Cel C-3 Concrete is recommended under the usual brick hearth construction.

J-M INSULATION RECOMMENDATIONS FOR STEEL MILL EQUIPMENT

Regenerative System: For regenerator walls above ground 4 in. of Superex Blocks or 4½ in. of Sil-O-Cel Natural Brick are recommended; for roofs, 2 in. of Superex Blocks or 2½ in. of Sil-O-Cel Natural Brick. Sections below ground are insulated with 4 in. of Sil-O-Cel C-3 Concrete which is also the recommendation for the bases of regenerators, fan-tails and slag pockets.

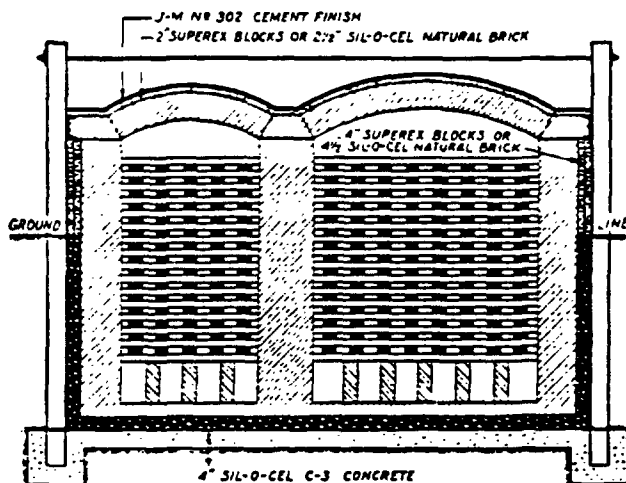
The walls of fan-tails and slag pockets are insulated with 4½ in. of Sil-O-Cel C-22 Brick or Sil-O-Cel C-3 as a granular fill. For fan-tail roofs the same materials are recommended, 2½ in. thick.

Open hearth flues are completely insulated in bases, sides and over the top with at least 4 in. of Sil-O-Cel C-3 Concrete.

On existing regenerators with irregular wall surfaces, J-M No. 500 Cement or Sil-O-Cel C-3 Concrete is used instead of brick or block insulation.

Producer Gas Mains

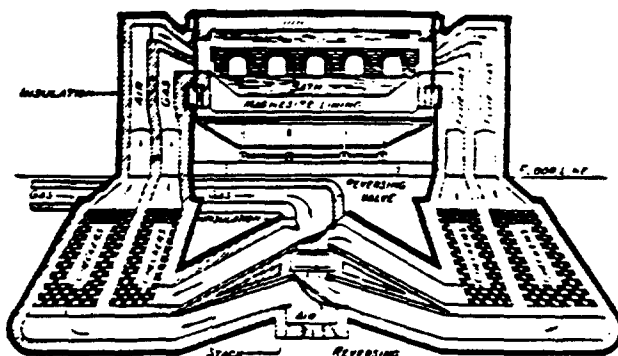
Producer gas mains should be insulated with 2½ in. to 4 in. of Superex Blocks or a 2½ or 4½ in. course of Sil-O-



Typical Insulated Open Hearth Regenerator



Four 100-Ton Open Hearth Furnaces
Regenerative systems insulated throughout with J-M Materials.

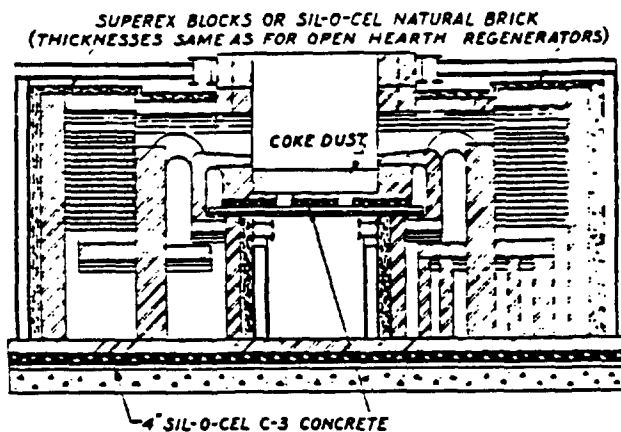


Perspective Cross-Section of the Open Hearth System
Showing Location of Insulation

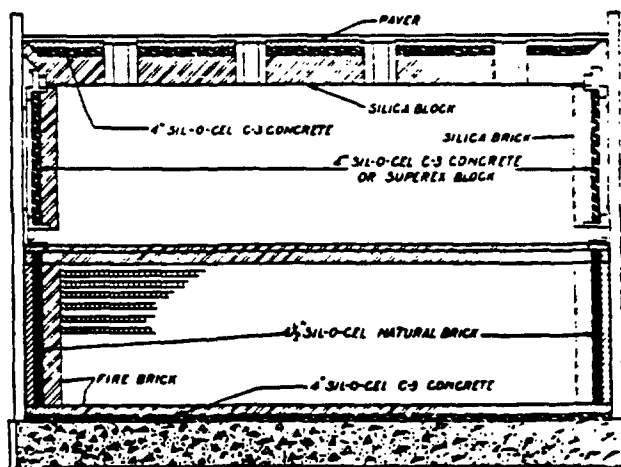
Cel Natural Brick. Such insulation not only returns its cost within a few months in fuel savings, but also reduces tar deposition, minimizes loss of sensible heat in gases and makes fewer burnouts necessary.

Soaking Pits and Coke Ovens

J-M Insulation recommendations for soaking pits and coke ovens are shown in the drawings below.



J-M Insulation Recommendations for Soaking Pits



J-M Insulation Recommendation for Coke Ovens

Johns-Manville Insulation Recommendations to INDUSTRIAL FURNACES AND OVENS

In the operation of steel mill re-heating equipment and other types of industrial furnaces and ovens, adequate insulation is now generally recognized as essential to economical performance. Not only does it pay for itself in fuel savings in an amazingly short time, but it also makes possible closer temperature control, reduces air infiltration, assures better working conditions and, in many cases, appreciably improves

the quality of the product turned out by the furnace

Despite the fact that less than 25 years have elapsed since J-M high temperature insulating materials first made furnace insulation possible, the advantages of thorough insulation are now universally recognized. Large quantities of the J-M Products are now used to minimize furnace operating costs in every major country in the world.

FURNACE INSULATION METHODS

In the higher temperature furnaces, operating above 2000° F., Superex Blocks, Superex-Magnesia Combination Blocks, or Sil-O-Cel Brick are usually applied behind the refractory in walls and over the fire brick roofs. These materials are described on pages 5 to 8. For bases, Sil-O-Cel C-3 Concrete (page 13) is practically standard construction.

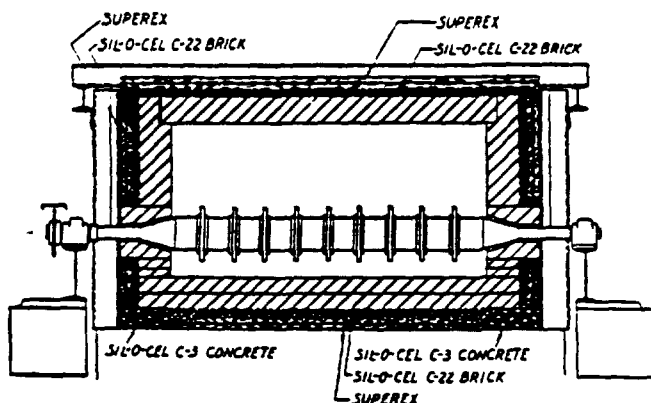
Where furnace temperatures are not over 2000° F., Sil-O-Cel C-22 Brick is recommended as the inner lining of walls, roof, base and door. This method reduces construction costs, improves furnace performance and minimizes radiation losses. On intermittent furnaces, it also effects enormous savings in heat capacity losses, permits of faster heating up

and, in many cases, faster cooling as well. This construction is described in greater detail on page 8.

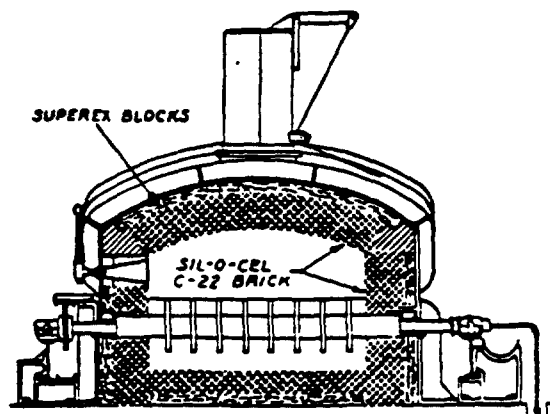
For door linings at temperatures up to 1800° F., Sil-O-Cel C-3 Concrete is more widely used than any other material (see page 13).

The most economical thickness of insulation will vary with the temperature, type of heating employed and the degree of temperature control required. It may vary from 2 or 3 in. on a coal-fired billet-heating furnace to 20 in. or more on electric furnaces.

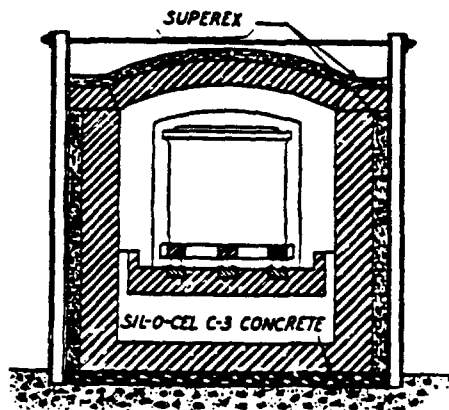
Detailed recommendations on any specific insulation problem will be furnished by any JOHNS-MANVILLE office.



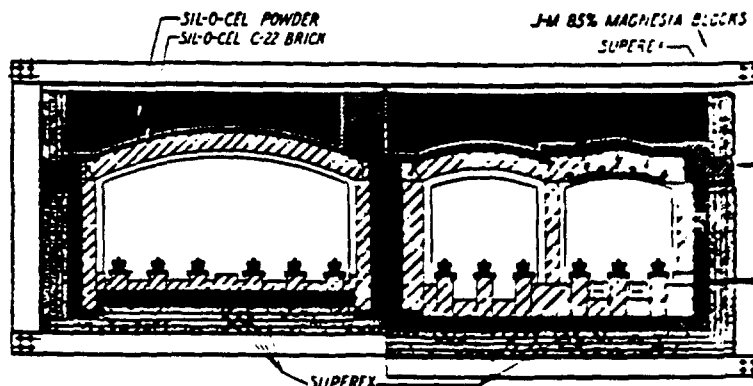
Method of Insulating Normalizing Furnace
Swindell-Dressler Corp., Pittsburgh, Pa.



Sheet Conveyor Furnace Lined with Sil-O-Cel C-22
Brick, backed up with Superex Blocks



Method of Insulating Car and Roll Furnace
W. S. Rockwell Co., New York, N. Y.



Method of Insulating Pusher Type Furnace
Hevi-Duty Electric Co., Milwaukee, Wis.

Johns-Manville Insulation Recommendations for NON-FERROUS METALS INDUSTRY

Heat is such an essential in metallurgy that its control or conservation is naturally one of the major factors in the design of any reduction or refining equipment. Typical examples of how J-M Insulating Materials serve the Non-Ferrous Metals Industry are briefly discussed here.

Roasting Equipment

Kilns: Where rotary kilns are used for calcining ores they are usually insulated in much the same manner as that outlined on page 23 for rotary cement and lime kilns. The insulation saves fuel, increases production, assures better temperature control and protects the steel shell.

Roasters: The Wedge multiple hearth roaster is insulated throughout with Sil-O-Cel Powder and Sil-O-Cel Natural Brick, as indicated in the accompanying drawing. The Nichols-Herreshoff type of roaster is insulated on the walls and bottom hearth as in the Wedge type. Roaster up-takes are insulated with 2½" of Superex Blocks or Sil-O-Cel Natural Brick.

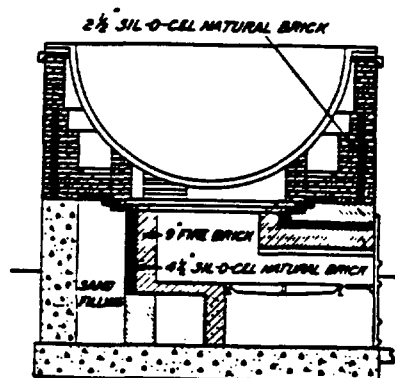
Hot calcine pipes between the roaster bottom hearth and the calcine hoppers are insulated with 2½" of Superex Blocks or Sil-O-Cel Natural Brick. The calcine hoppers are insulated with 2½" courses of Sil-O-Cel Natural Brick in the sides and bottom and with one 2½" course of Sil-O-Cel Brick over the crown.

Dust Collecting Equipment

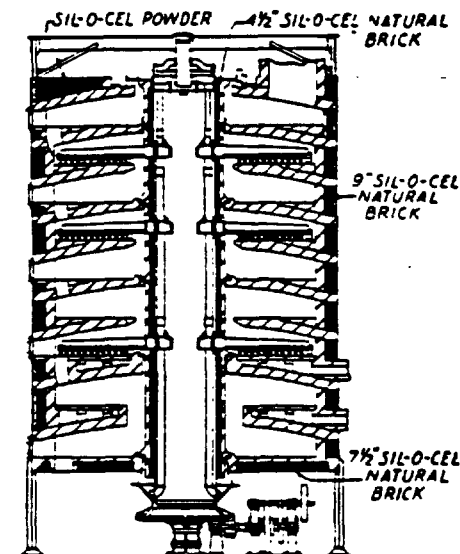
Flues are insulated to protect the flue itself as well as to maintain the temperature of the gases. Because of the varying temperatures due to the widely differing process demands, each installation should be considered as a separate problem.

Comparatively short internal flues are usually insulated either outside or inside with Sil-O-Cel Brick or Superex Block.

Long outdoor flues usually require thick insulation because of the additional exposure to temperature changes. Sometimes the insulation is applied internally, as on one large job where a steel flue was insulated with 5" thick Superex Com-



Method of Insulating 90-Ton Remelting Furnace for Lead Bullion



J-M Insulation Recommendations for Wedge Multiple Hearth Roaster

bination Block Insulation protected against erosion by 1" of J-M No. 319 Semi-Refractory Cement. On other jobs Superex Blocks and Sil-O-Cel Natural Brick have been used on the outside of the flue, waterproofed with a roofing jacket.

Cottrell Precipitators: The steel housings of Cottrell precipitators are usually jacketed and filled with 3" to 4" of Sil-O-Cel Coarse Grade. Over the tops 2½" or 5" of Sil-O-Cel Natural Brick or 2½" to 4" of Superex Blocks are used. Inspection doors are usually insulated with Sil-O-Cel C-3 Concrete not less than 4" thick.

Dust hoppers have been insulated on the inside with a 2½" course of Sil-O-Cel Natural Brick protected by a course of fire brick. Cottrell discharge pipes are usually insulated on the outside with a 2½" course of Sil-O-Cel Natural Brick or Superex Blocks.

Refining Equipment

A noteworthy example of the effectiveness of insulation is the 90-ton remelting furnace for lead bullion at the Midvale smelter of the U. S. Smelting, Refining and Mining Co. Daily use over a long period necessitated no repairs and, owing to the efficiency of the insulation, this furnace consumes no more coal in melting 90 tons of lead than do the uninsulated furnaces in melting 30 tons. The method of insulating is shown in the drawing opposite.

Sil-O-Cel materials and Superex Blocks are also widely used for such equipment as aluminum reducing furnaces, zinc distillation furnace regenerators, as well as the melting and heat treating furnaces used in the fabrication of non-ferrous metal products.

Boilers, Piping, Etc.

Insulation of boilers and other power plant equipment is treated on a later page. Pipe insulation materials and recommendations will be found on pages 9 to 11.

Johns-Manville Insulation Recommendations for OIL INDUSTRY EQUIPMENT

JOHNS-MANVILLE has been identified with petroleum production, transportation and refining from the very beginning of the oil industry. The present-day efficient utilization of heat in transforming crude oil into finished petroleum products is due in no small measure to the close association of JOHNS-MANVILLE with oil industry problems and to the development by J-M of insulating materials and methods designed to minimize operating costs.

J-M recommendations for the insulation of oil industry equipment can be only briefly touched on below. A 208-page book, "Johns-Manville Service to the Oil Industry," contains complete insulation specifications and detail drawings for every type of heated or refrigerated equipment involved in production, transportation, refining or processing.

In Oil Production

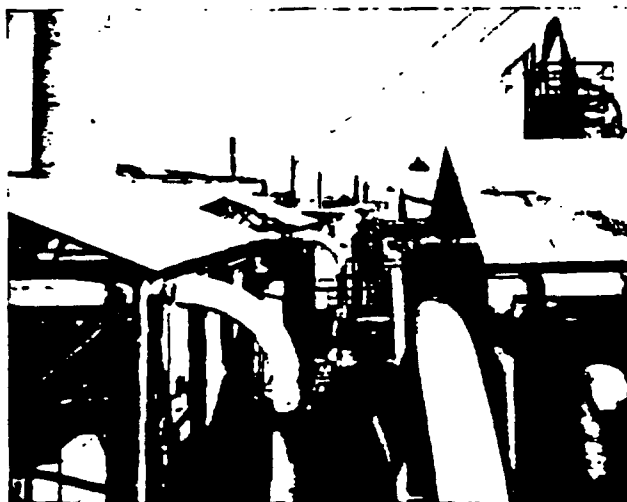
Field Boilers: 1½ in. thick J-M 85% Magnesia blocks, waterproofed with ¼ in. Insulkote, is the preferred specification for field boilers. J-M Asbestos Blankets, 1 in. thick, are used where a removable and replaceable insulation is desired.

Storage Tanks: Evaporation losses have been minimized on thousands of storage tanks by the special J-M Vapor-Tight Insulated Tank Top, complete details on which are included in the book, "J-M Service to the Oil Industry."

In Oil Transportation

Tank Cars: JOHNS-MANVILLE has developed a number of specifications for tank car insulation with J-M Standard Hair Felt and Asbestos-Sponge Felted Blocks. Complete details, including data on heat losses through various constructions are contained in "J-M Service to the Oil Industry," sent on request.

Pipe Lines: Where pipe lines must be insulated to prevent reduced capacity during cold weather, Asbestos-Sponge Felted Pipe Insulation with Integral Waterproof Jacket is recommended.



One of Many Refineries Where J-M Materials are Everywhere in Evidence

Thousands of miles of underground pipe lines have been protected against corrosion with J-M Asbestos Pipe Line Felts. Full details on request.

Pumping Stations: For insulation of pumping station boilers, see page on Power Plant Insulation. Steam pipe insulation is treated in detail on pages 9 to 11.

In the Refinery

Still and Fractionating Equipment: Asbestos-Sponge Felted, J-M 85% Magnesia and Superex Combination Block Insulation are the most widely used insulating materials for the exposed heated surfaces of stills, towers, and other fractionating equipment. The insulation is finished with J-M No. 302 Cement and waterproofed with Insulkote. Insulation thicknesses are generally those given in the table of recommendations on page 7. "J-M Service to the Oil Industry" carries a complete chapter on this subject.

Furnaces: Oil refinery furnaces are usually insulated outside the refractory with either Superex Blocks or Superex-Combination Block Insulation. On most installations the thickness has been approximately 4 in. Transite Asbestos Sheets, described on a later page, have been widely used by the oil industry as a furnace casing over the insulation, because they are fireproof, weather-proof, and maintenance-free.

Sil-O-Cel C-22 Brick, 4½ in. thick, are also often used as a "core wall" between the fire brick and red brick. Sil-O-Cel Natural Brick may be used opposite the cooler portions of the furnace.

For furnace bases, 4 in. of Sil-O-Cel C-3 Insulating Concrete has proved highly effective. This material is also used for the insulation of tube doors and to protect metal work on tube plates and tube supports.

Hot Tanks: J-M 85% Magnesia Blocks are the standard recommendation for hot tanks, applied in the following thickness on the sides (½ in. less on roof): 100 to 300° F., 2 in. thick; 300 to 400° F., 2½ in.; 400 to 500° F., 3 in.; 500 to 600° F., 3½ in. A Transite Casing or Insulkote finish is recommended on the sides. The roof insulation is covered with asbestos waterproofing felts with a layer of J-M Salamander White Top Roofing as a finish.

Cold Tanks: J-M Rock Cork sheets or lagging are used for sides and roofs of cold tanks in the thicknesses recommended in the table on page 16. The insulation is weather-proofed as outlined above for hot tanks.

Brine Coolers, Chillers, Cold Rooms, etc.: A complete chapter in "J-M Service to the Oil Industry" is devoted to the insulation of low temperature equipment and cold rooms with J-M Rock Cork Sheets and Lagging.

Cold Piping: See page 17.

Boilers and Other Power Plant Equipment: see page on Power Plant Insulation.

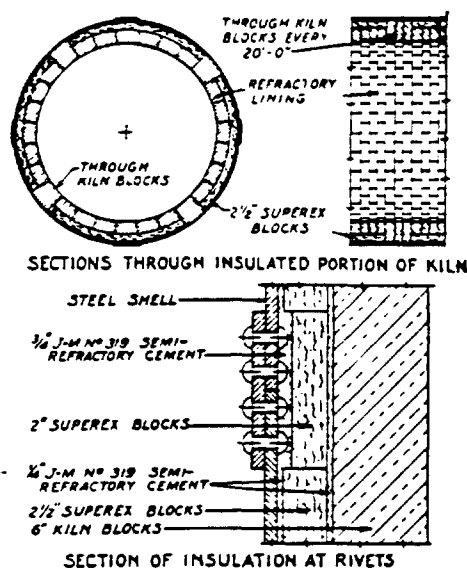
Steam and Hot Oil Lines: Asbestos-Sponge Felted is the ideal pipe insulation for the oil refinery, not only because of its high efficiency, but also because of its great durability and unusually high salvage value. For use on outdoor lines it is furnished with an integral waterproof jacket. For data on J-M Pipe Insulation, see pages 9 to 11.

Johns-Manville Insulation Recommendations for CEMENT AND LIME PLANT EQUIPMENT

In connection with the manufacture of portland cement and lime, Johns-Manville Insulations are used for the kilns and power plant equipment, as well as for the settling chambers on rotary kilns and the waste heat flue systems.

Rotary Kilns

Rotary kilns represent, perhaps, the most severe service that insulation is ever called upon to withstand. In addition to high temperature, there is rotation, vibration, abrasion,



J-M Insulation Recommendation for Rotary Kilns

expansion and contraction of the fire brick lining and the continued impact of the heavy mass of clinker.

Since 1924, however, when the first rotary kiln was insulated with J-M Superex, the cement industry has been able to take advantage of the savings which insulation makes possible. And the many kilns insulated since that time, in accordance with the same specifications, are returning year after year large dividends in fuel savings.

The JOHNS-MANVILLE insulation specification which has proved so successful for rotary kiln insulation is shown above. Insulation is omitted at the hot end for a distance equal to about 25% of the kiln length. In wet process kilns where filters are not used, the insulation is also omitted for a distance of 20 ft. at the wet end.

The results obtained in the Clinchfield, Ga., plant of the Pennsylvania-Dixie Cement Corporation are typical of those reported for other mills. At this plant careful fuel consumption records showed that Superex Blocks on two 10 ft. x 175 ft. kilns reduced coal consumption 5 lbs. per bbl. of cement, a saving of \$4,800.00 per year, representing an annual return of 120% on the investment in insulation. It should be noted that this figure does not include further

savings due to increase in temperature of exit gases to the waste heat boilers, but covers only the decrease in fuel consumption at the kilns.

Settling Chambers and Waste Heat Flues

For settling chambers and waste heat flues JOHNS-MANVILLE recommends insulation with 4½ in. of Sil-O-Cel Natural Brick or 4 in. of Superex Blocks in walls; 5 in. of Sil-O-Cel Natural Brick or 4 in. of Superex Blocks over the top; and 4 in. of Sil-O-Cel C-3 Concrete in the base. These materials have been used for insulating settling chambers and flues in practically every waste heat installation in the cement industry.

Vertical Lime Kilns

Insulation of vertical lime kilns not only quickly pays for itself in fuel savings but also assists in the production of clean, white lime with no "core" or unslakable lumps. For the fire box, 4½ in. of Sil-O-Cel C-22 Brick are recommended behind the fire brick. The balance of the kiln may be insulated with 5 in. of Sil-O-Cel Natural Brick or 4 in. of Superex Blocks. Sil-O-Cel Coarse Grade is also sometimes used.

Producer Gas Mains

Producer gas mains should be insulated with 2½ to 4 in. of Superex Blocks or a 2½ or 4½ in. course of Sil-O-Cel Natural Brick. Insulation soon pays for itself in fuel savings and also minimizes tar deposition in the mains.

Boilers, Piping, Etc.

Insulation of boilers and other power plant equipment is treated on a later page. Pipe insulation materials and recommendations will be found on pages 9 to 11.



Cement Mill Waste Heat Flue Being Insulated with Two 2-inch Layers of Superex Blocks

Johns-Manville Insulation Recommendations for GLASS MAKING EQUIPMENT

Insulation plays an important part in the manufacture of glass, not only in connection with the melting operation itself, but also in annealing and other processes where heating is involved. Johns-Manville recommendations are covered briefly below. Complete specifications are contained in the J-M handbook "Insulation in the Glass Industry," which will be sent free on request by any Johns-Manville office.

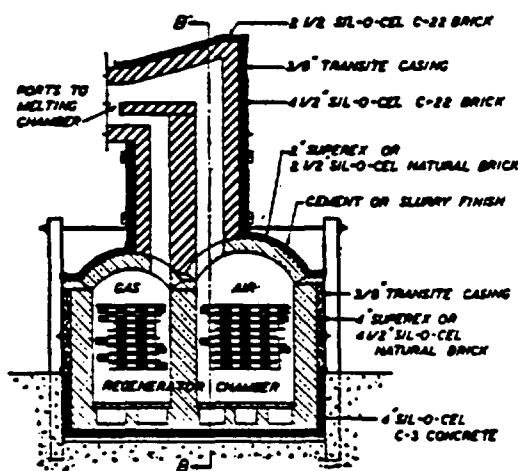
Melting Tanks

Whether or not insulation should be used on walls and crowns of glass tanks is a question to be considered specially for each individual job. This matter is now receiving a great deal of attention in the Glass Industry, due in part, perhaps, to the excellent results which have attended the use of insulation on open hearth roofs in the Steel Industry. There are a number of J-M insulations, including Superex Blocks, Sil-O-Cel Brick and Powder, and J-M No. 500 Cement, which will successfully resist the temperatures encountered outside the refractory.

Sil-O-Cel C-22 Brick on the refining end of continuous tanks offers an excellent opportunity for fuel savings which should be possible for every plant. In day tanks also, insulation has been used with uniformly beneficial results. A $4\frac{1}{2}$ -in. course of Sil-O-Cel C-22 Brick in the walls and a $2\frac{1}{2}$ -in. course in the base and over the crown will shorten the melting time, reduce fuel consumption and minimize troubles due to devitrified or cordy glass.

Regenerators, Flues and Uptakes

The JOHNS-MANVILLE recommendation for insulation of regenerators, flues, and uptakes is shown in the accompanying drawing. Through fuel savings alone, the cost of insulat-



J-M Insulation Recommendation for Regenerators and Uptakes

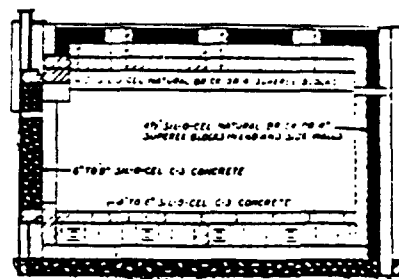
ing the regenerative system is returned in a remarkably short time. In one glass plant (name on request), Superex Insulation on existing regenerators of one 28-ton furnace saved \$8,800.00 per year and the entire cost of the insulation was returned during the first two months of operation.

Lehrs

For lehr insulation, Superex Blocks and the various types of Sil-O-Cel Bricks are the most frequently used. The method of insulation and the most economical thickness to use depend upon the type of lehr and the system of heating employed. Thickness may vary from 4 or 5 in. for cheap fuel up to 10 in. or even 20 in. where electricity is used.

Pot Arches

Insulation of pot arches not only saves fuel but it also assures more uniform heating of the pots, with elimination of trouble due to cracking or breaking. The J-M insulation recommendation is shown in the drawing. In one plant this method of insulation reduced gas consumption 42%. (For details ask for Performance Report No. 17.)



J-M Insulation Recommendation for Pot Arches

Fourcault Process Equipment

Fourcault Canals are heavily insulated to assure delivery of the glass in proper condition for drawing. J-M recommendations will be made separately after a study of the requirements for each installation.

Fourcault Squeeze Rolls: Developments over a number of years are responsible for the present Fourcault rolls made of J-M Asbestos Sheet Millboard. Full details on request. The casings which enclose the rolls are insulated with Asbestos-Sponge Felted or Super Fire-Felt Blocks, or with Asbestos Sheet Millboard.

Flattening Ovens

For flattening ovens, JOHNS-MANVILLE recommends $4\frac{1}{2}$ in. Sil-O-Cel Natural Brick or 4 in. Superex Blocks on the sides, and 5 in. Sil-O-Cel Natural Brick or 4 in. Superex Blocks on tops.

Producer Gas Mains

This equipment should be insulated with $2\frac{1}{2}$ in. to 4 in. of Superex Blocks or with a $2\frac{1}{2}$ or $4\frac{1}{2}$ in. course of Sil-O-Cel Natural Brick. The insulation returns its cost in a few months of operation, through fuel savings alone.

Boilers, Piping, Etc.

Insulation of boilers and other power plant equipment is treated on a later page. Pipe insulation recommendations will be found on pages 9 to 11.

Johns-Manville Insulation Recommendations for CERAMIC KILNS

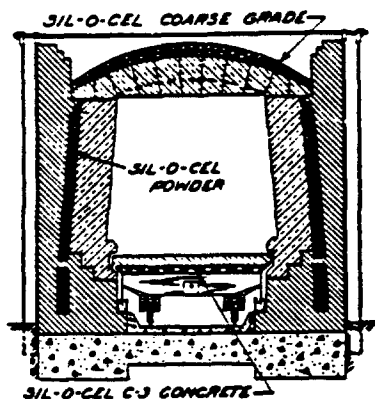
High temperatures are so intimately associated with the manufacture of brick, tile and pottery that adequate insulation is recognized as an essential in the design and construction of kilns of the permanent type. Insulation effects marked savings in production cost and also improves the quality of the ware by assuring more accurate temperature control and more even heat distribution. Furthermore, it permits kilns to be brought up to heat more rapidly and held at the desired temperature more easily.

Periodic Kilns

Wherever comparative fuel consumption records have been kept, insulation has been shown to be a decidedly worthwhile investment. In one instance, Superex Blocks over the tops of rectangular kilns returned their entire cost in fuel savings alone during the first year. Such savings (\$5,000.00 for six kilns in this particular case) are within the reach of any plant now operating uninsulated periodic kilns, for crown

insulation can usually be applied just as easily and economically on old kilns as on new construction. Insulation on crowns alone has in every case shown a reduction in fuel consumption of at least 10%.

The JOHNS-MANVILLE recommendation for insulation of the base, wall and crown of periodic kilns is shown in the drawing. Insulation of the base is one of the most effective means of assuring



Method of Insulating Harrop Tunnel Kiln

uniform temperatures throughout the entire kiln.

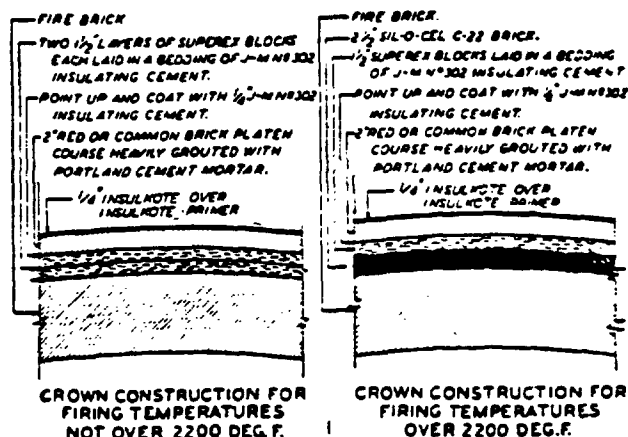
Continuous Tunnel Kilns

Continuous tunnel kilns, because of the great areas exposed to radiation, would be very wasteful of heat unless thoroughly insulated. Sil-O-Cel Powder, Sil-O-Cel Brick and Superex Blocks have been used in the great majority of tunnel kilns built during the past twenty years.

Boilers, Steam Lines, etc.

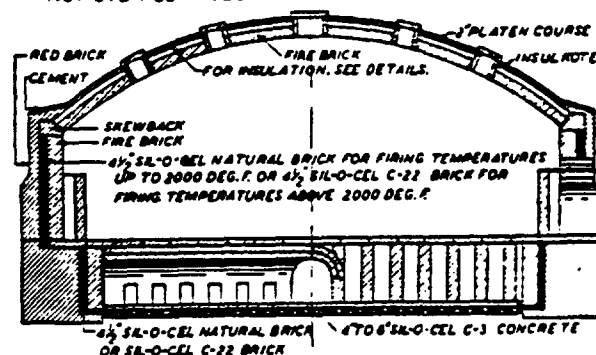
The insulation of boilers and other power plant equipment is covered on a later page.

For pipe insulation recommendations, see pages 9 to 11.

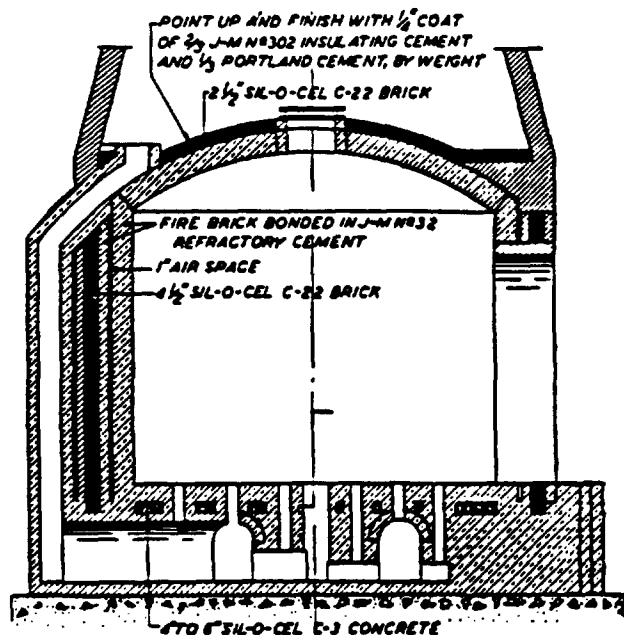


CROWN CONSTRUCTION FOR FIRING TEMPERATURES NOT OVER 2200 DEG. F.

CROWN CONSTRUCTION FOR FIRING TEMPERATURES OVER 2200 DEG. F.



J-M Insulation Recommendation for Round or Rectangular Down-draft Kilns



J-M Insulation Recommendation for Bottle-neck Up-draft Kiln

Johns-Manville Insulation Recommendations for GAS MAKING EQUIPMENT

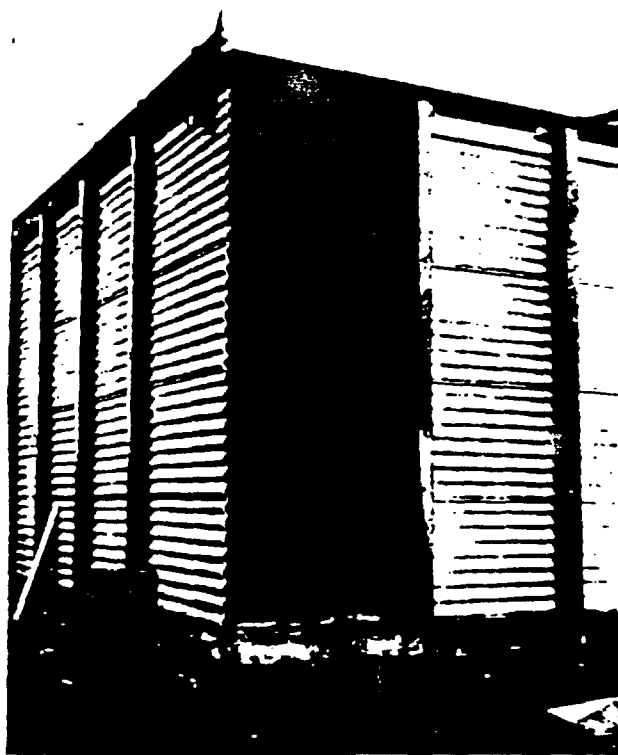
Wherever gas is manufactured, whether it is water gas, coal gas, oil gas or producer gas, some type of J-M Insulating Material will in all probability be on the job helping to cut production costs. Johns-Manville also has co-operated with the Industrial and House Heating Departments of many gas companies in assuring efficient utilization of gas heat through proper insulation.

Coal Gas Retort Benches

Maintaining a uniform effective temperature in the carbonization chamber of a coal gas bench as well as efficient operation of the producer are important factors in successful bench operation. Insulation of benches and of producer take-offs and mains assists greatly in assuring proper control of these factors and in reducing operating costs. The J-M method of insulating this equipment is shown in the drawing opposite.

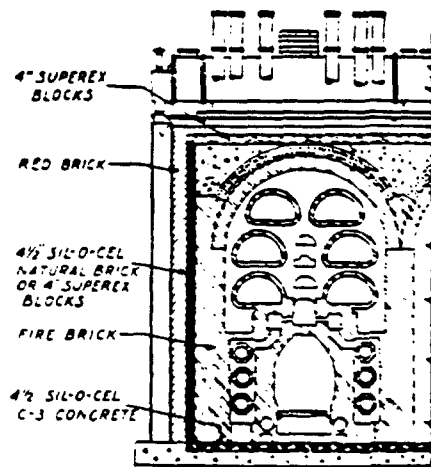
Producer Gas Mains

For producer take-offs, soot catchers and mains, 2½" to 4" of Superex Blocks or a 2½" or 4½" course of Sil-O-Cel Natural Brick are the standard recommendations. Such insulation quickly returns its cost in fuel saving, holds the gas at a high heat value and materially reduces tar deposits.



Purifier Box under construction at Utica (N. Y.)
Gas & Electric Co.

Insulated with 3" J-M Rock Cork Sheets on sides and top, protected on sides with J-M Corrugated Transite.

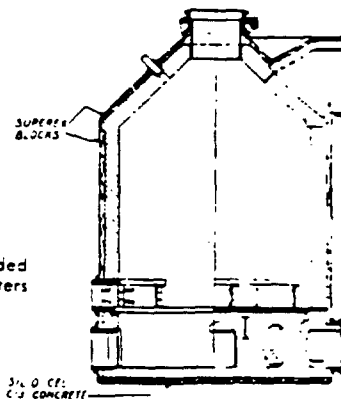


J-M Insulation Recommendation for
Horizontal Coal Gas Retort Bench

The same wall insulation is recommended for vertical retort benches.

Water Gas and Oil Gas Sets

J-M Insulating Materials (Superex Blocks, Sil-O-Cel Coarse Grade, Fibro-Cel and Sil-O-Cel C-3 Concrete) have been used in the great majority of water gas set installations during the past 20 years. The most satisfactory method of insulation for generators, carburetters and superheaters is shown in the drawing below. The same method is recommended for oil gas sets.



Water Gas Generator
Insulated according to
J-M Recommendation

The same method is recommended
for carburetters and superheaters
and for oil gas sets.

Purifier Box Insulation

For purifier box insulation, the method used in the recent modernization program of the Utica (N. Y.) Gas & Electric Company appears to be ideally suited to this type of equipment. This construction, consisting of 3" J-M Rock Cork sheets protected on the sides with J-M Corrugated Transite, is shown opposite. Rock Cork was also used over the top.

Boilers, Piping, Etc.

Recommendations for the insulation of boilers and other power plant equipment are given elsewhere. Waste heat boilers, often used in the gas industry, should also be insulated. H.R.T. boilers and vertical boilers of the LaMont type are insulated with 2" J-M 85% Magnesia Blocks. Pipe insulation recommendations are given in detail on pages 9 to 11.

Johns-Manville Insulation Recommendations for PULP AND PAPER MILLS

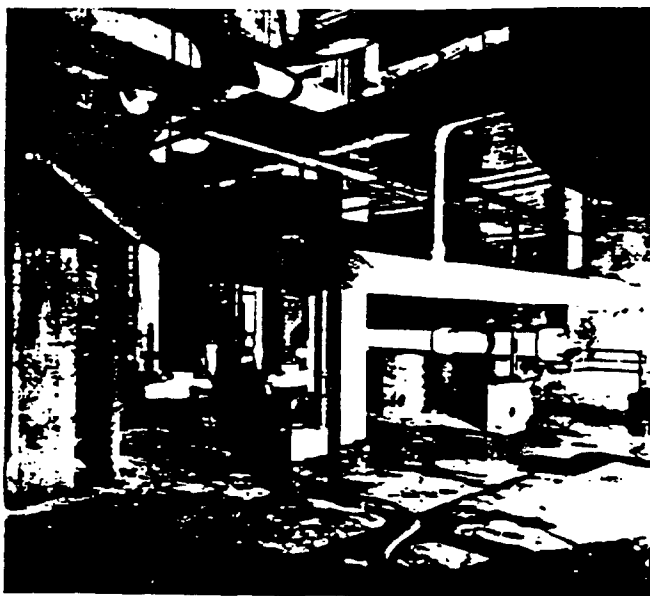
In pulp and paper mills, power plant equipment and steam lines obviously represent the best opportunities for economy through insulation. The trend toward higher steam pressure in connection with modernization programs places a special premium on thorough investigation of the adequacy of existing pipe insulation. Increased pressures almost invariably demand reinforcement of piping. The full benefit is to be derived from modernization.

Power plant insulation is covered on page 29. Pipe insulation recommendations will be found on pages 9 to 11. The services of Johns-Manville engineers are available without obligation in connection with any insulation problems.

Rotary Boiler Insulation

The Biggs Rotary Bleaching Boiler offers a good example of how savings may be made in the paper mill through insulation. For this equipment **JOHNS-MANVILLE** recommends 1½" J-M 85% Magnesia Blocks with a finish of J-M No. 302 Cement. This method of insulation, according to careful calculations of comparative heat losses, will pay an annual return on the investment of about 60% even when fixed charges against the insulation are based on amortization in only 5 years.

A complete analysis of these savings, together with detailed specifications and drawings covering insulation with J-M 85% Magnesia Blocks will be furnished on request. An alternate specification for insulation with J-M No. 450 Cement, sometimes used for the purpose, is also included.



Paper Mill Steam Lines Insulated with J-M Materials
When power plant equipment is modernized and pressures increased, steam lines usually require thicker insulation.

Digester Insulation

For the insulation of digesters J-M 85% Magnesia Blocks, 1½" thick, with J-M No. 302 Cement finish, is the preferred specification. J-M Asbestos Blankets are also sometimes used because of the ease with which they can be removed and replaced.

J-M Insulated Rot-Proof Roof

The J-M Insulated Rot-proof Roof was especially designed to withstand the severe humidity conditions encountered over paper machine rooms. The base for this roof is J-M Corrugated Transite, which is first laid directly over the purlins. The corrugations are leveled with cork mastic, after which a layer of sheet cork is applied and finished with a J-M Asbestos-Built-up Roof.

Many paper mills are now using this roof over machine rooms to minimize roof drip and periodic shut-downs for repairs and to insure permanent, waterproof protection.



Applying J-M Insulated Rot-proof Roof

Transite Paper Machine Hoods

These hoods are highly effective in increasing drying capacity, in decreasing the amount of air required for the drying operation, and in lowering the humidity of the paper machine room. Transite hoods are fireproof, highly acid-resistant, unaffected by heat and water, and require no maintenance. When insulated they provide still greater drying efficiency.

Eel-Slip—A New Bearing Material

Made of asbestos, graphite and rubber, this new bearing material for paper mills is as slippery as its name implies. Water is its best lubricant, and when running wet the coefficient of friction is unusually low, approximately .015. Many paper mills are already using Eel-Slip for increased efficiency and economy on the wet end of Fourdrinier and cylinder machines—for shaker or flat screen blocks, water tables or forming boards, suction box covers, steam joints, suction couch and press roll packing, deflector strips and doctor blades. Full information will be furnished by any **JOHNS-MANVILLE** office.

Johns-Manville Insulation Recommendations for BREWERY EQUIPMENT

To operate economically and on a competitive basis, the present-day brewery must be equipped to take advantage of proved modern methods of decreasing production costs. In every industry where heat or refrigeration is utilized, adequate insulation has, during the past fifteen years, come to be recognized as a vital economy measure and one of the major essentials to efficient operation.

Insulation of low temperature equipment and storage rooms is especially important because of the high cost of refrigeration. Furthermore, temperatures must be controlled within a relatively narrow range, a condition which cannot be maintained without adequate insulation.

In the case of heated equipment, fuel cost is one of the principal items of expense and the problem of heat conservation is a matter of major consequence. In the boiler room,

insulation of the boiler furnaces reduces radiation losses, minimizes air infiltration and assures better working conditions. Insulation on boiler drums and steam lines pays for itself many times over in fuel savings.

Brew kettles, cereal cookers, mash tuns, hot water tanks and similar equipment, all can be made to operate more economically by the careful selection and application of insulating material of the proper type and thickness.

Whether heating or refrigeration is involved, whether the surface requiring insulation is a pipe, kettle or the wall of a storage room, there is a J-M product which will serve the purpose effectively and economically.

In the table which follows, J-M recommendations for insulation in the brewery are briefly summarized.

J-M RECOMMENDATIONS FOR INSULATION IN THE BREWERY

Equipment or Location		Recommendations
Stock House	Fermenting and storage cellars	Two 2" layers Rock Cork Sheets
	Hops and yeast storage	Two 2" layers Rock Cork Sheets
	Brine piping, etc.	Rock Cork Pipe Insulation, Brine Thickness
Compressor Room	Brine coolers	4" Rock Cork Insulation
	Brine pipes	Rock Cork Pipe Insulation, Brine Thickness
	Low side ammonia lines	Rock Cork Pipe Insulation, Heavy Brine Thickness
	Steam piping 100-150 lb. ga.	Pipes larger than 4" 2" 85% Magnesia or Asbesto-Sponge-Fibrolite
		Pipes 2" to 4" 1 1/2" 85% Magnesia or Asbesto-Sponge-Fibrolite
		Pipes smaller than 2" Std. Thick 85% Magnesia or 1" Asbesto-Sponge-Fibrolite
Brew House	Brew kettle	1 1/2" 85% Magnesia Block
	Cereal cooker	
	Mash tun	
	Lauder tub	1" 85% Magnesia Block
Boiler Room	Hot water tank	
	Wort piping	
	Hot water piping	Std. Thick 85% Magnesia or 1" Asbesto-Sponge-Fibrolite
	Process steam piping	
	Steam piping 100-150 lb. ga.	Pipes larger than 4" 2" 85% Magnesia or Asbesto-Sponge-Fibrolite
		Pipes 2" to 4" 1 1/2" 85% Magnesia or Asbesto-Sponge-Fibrolite
		Pipes smaller than 2" Std. Thick 85% Magnesia or 1" Asbesto-Sponge-Fibrolite
	Feed water piping	Std. Thick 85% Magnesia or 1" Asbesto-Sponge-Fibrolite
	Boiler drums	2" 85% Magnesia Block
	Brick-set boiler walls	3" Superex-Magnesia or combination block insulation or 4 1/2" Sil-O-Gel Insulation



New Brewery of E. & J. Burke, Ltd., Built in 1933 at Long Island City, N. Y.

Over 250,000 board feet of J-M Rock Cork Sheets were used. Steam lines and heated equipment were insulated with J-M 85% Magnesia. Floors and roofs were also supplied by Johns-Manville.

For additional recommendations on the insulation of power plant equipment, see following page.

Pipe insulation is treated in greater detail on pages 9 to 11.

Johns-Manville APPROVED INSULATION CONTRACTORS

A nation-wide group of J-M Approved Insulation Contractors assures expert workmanship in the application of all Johns-Manville Insulating Materials. The name of the contractor nearest you will be furnished on request.

Johns-Manville Insulation Recommendations for POWER PLANT EQUIPMENT

Johns-Manville furnishes a complete line of insulating materials for improving performance, increasing capacity and reducing operating costs by effective control of heat losses on boiler settings and drums, economizers, breechings, turbines, pumps, feed-water heaters, and piping.

J-M recommendations for various types of power plant equipment are given briefly below. Complete specifications may be had on application through any Johns-Manville office.

Boiler Shells and Drums: H.R.T., fire-box type and cast-iron sectional boilers and the drums of water-tube boilers are insulated with J-M 85% Magnesia Blocks, 1 in. thick, for steam pressures up to 25 lbs.; 1½ in. thick, for pressures up to 100 lbs.; 2 in. thick for pressures up to 200 lbs.; and 2½ in. thick for pressures over 200 lbs.

Steam Turbines at temperatures below 300° F. are insulated with J-M 85% Magnesia Blocks 1½ in. thick; 300° to 400° F., 2 in. thick; 400° to 600° F., 3 in. thick; 600° to 800° F., 1½ in. Superex Blocks followed by 2½ in. J-M 85% Magnesia Blocks; 800° to 900° F., 2 in. Superex Blocks and 2½ in. J-M 85% Magnesia Blocks.

Feed-water Heaters are insulated with 1½ in. J-M 85% Magnesia Blocks.

Pump Cylinders and Chests: 2 in. J-M 85% Magnesia Blocks are recommended.

Brick-set Boilers: Superex or 85% Magnesia Blocks, Superex Combination, or Sil-O-Cel Brick may be used to insulate boiler settings. Recommendations for block insulation are given in the table below.

Insulation on the walls is finished with J-M No. 302 Insulating Cement, or, preferably, with a Transite Asbestos Sheet Casing (see page on Flat Transite, in this catalog).

On new settings a veneer of 4½ in. Sil-O-Cel C-22 Brick may be bonded into the outside of the fire brick every fifth course vertically. On new settings of H.R.T. boilers and small water-tube boilers, a "core wall" of 4½ in. Sil-O-Cel Natural Brick is often laid between the fire brick and red brick.

Water-Walls and Air-Cooled Walls: For complete insulation and casing specifications on various types of water-walls and ventilated walls, write the nearest J-M office.

**BLOCK INSULATION RECOMMENDATIONS
FOR TYPICAL WATER-TUBE BOILERS**

Type of boiler	Front wall	Side walls		Rear wall	Top
		From front wall to bridge wall	To rear of bridge wall		
B & W Type	3 in. Superex-Magnesia Combination	1½ in. Magnesia	None		2½ in. Magnesia
Stirling Type	3 in. Superex-Magnesia Combination	3 in. Magnesia (2 layers)	1½ in. Magnesia		3 in. Superex-Magnesia Combination
Springfield Type	None	3 in. Superex (2 layers)			

Transite Asbestos Casing over insulation on ventilated boiler wall

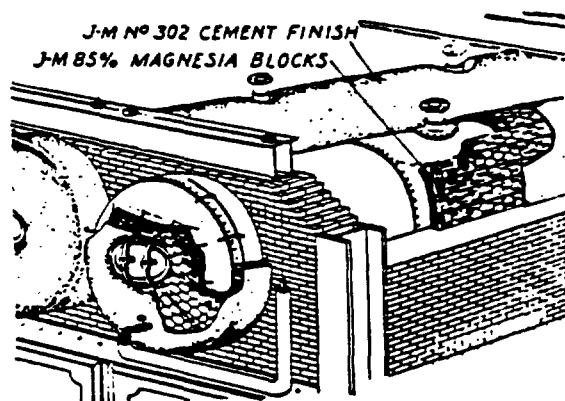


Boiler Bases: For boiler bases at least 4 in. of Sil-O-Cel C-3 Concrete is recommended under one or two layers of fire brick.

Boiler Tube Doors should be insulated with 2 in. Super Fire-Felt Sheets (page 7), protected with ¼-in. J-M No. 101-S Asbestos Sheet Millboard. If the doors are insulated before they are hung, they may be laid flat and filled with Sil-O-Cel C-3 Concrete. Complete specifications are available.

Breechings and Stacks: Breechings are often insulated on the inside with 2½ in. of Sil-O-Cel Natural Brick or 2 in. Superex Blocks, and finished with J-M No. 319 Semi-Refractory Cement. Sil-O-Cel Natural or C-22 Brick are also used for stack lining. Where breechings are to be insulated on the outside either Superex or Magnesia Blocks are used, depending upon the temperature. Proper support and reinforcement are particularly important, especially on internal lining. Complete specifications and drawings may be had on request.

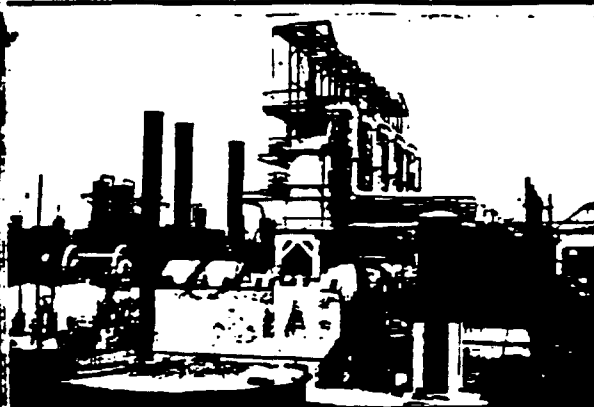
Pipe Insulation: Complete pipe insulation recommendations will be found on pages 9 to 11.



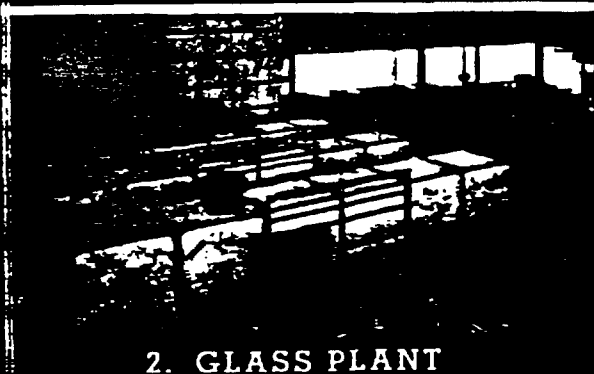
Method of Insulating Drums and Drum-Heads

J-M INSULATING MATERIALS

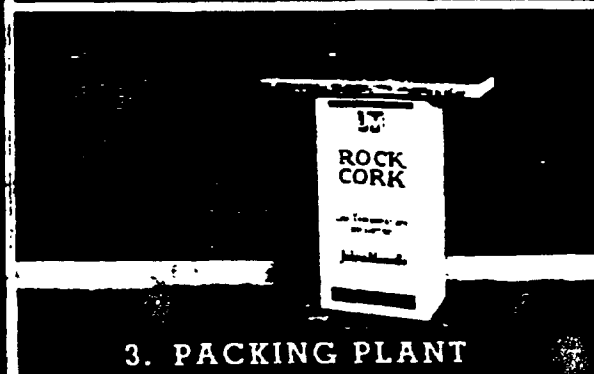
Heat or Refrigeration



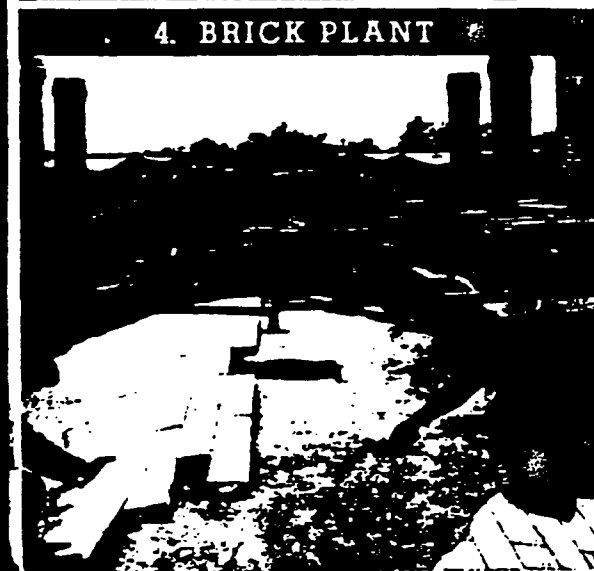
1. OIL REFINERY



2. GLASS PLANT



3. PACKING PLANT



4. BRICK PLANT

1. OIL REFINERY. J-M Insulations save fuel and improve performance wherever heat or refrigeration are used in transforming crude oil into finished petroleum products. Here is shown J-M Insulated shell stills, towers and piping at Tidewater Oil Co. Ask for "J-M Service to the Oil Industry."

2. GLASS PLANT. The walls of these lehrs at Illinois-Pacific Glass Co., Los Angeles, are built entirely of Sil-O-Cel Insulating Brick. J-M Insulating Materials are also used by the glass industry on tanks, regenerators, producer gas mains and pot arches. Ask for DS Series 600.

3. PACKING PLANT. J-M Rock Cork sheets were selected in 1904 for the new Pittsburgh, Pa., meat packing plant of Kingan & Co., because their Indianapolis job, then 26 years old, was still good as new. Ask for DS Series 604.

4. BRICK PLANT. Superex Blocks on six rectangular kilns at Hazelton (Pa.) Brick Company paid a 100% return each year in fuel savings alone. Ask for DS Series 603.

5. AUTO PLANT. J-M Insulations are used on many types of heat treating furnaces and ovens in automobile factories. The illustration shows Superex Combination Block Insulation being installed on a Surface Combustion drawing furnace. Ask for DS Series 600.

6. STEEL PLANT. This hot blast stove, being insulated next the steel shell with Superex Blocks, is only one of many types of high temperature steel mill equipment which depend on insulation for efficient, economical operation. Ask for "J-M Service to the Iron and Steel Industry."

7. FOUNDRY. The foundry core oven shown is constructed entirely of Sil-O-Cel C-3 Concrete. Brick-set ovens are usually insulated with J-M 85% Magnesia or Superex Blocks. Ask for DS Series 607.

8. CHEMICAL PLANT. J-M Asbestos Blankets on a large steam turbine. Other J-M Materials are available for the efficient insulation of boilers, piping and auxiliary power plant equipment. Ask for DS Series 602.



5. AUTO PLANT



6. STEEL MILL

reduce costs wherever IS USED IN INDUSTRY

JOHNS-MANVILLE
JM
PRODUCTS

9. CEMENT MILL. Superex Blocks are practically standard insulation for the severe service encountered in rotary cement and lime kilns. They are also used on waste heat flues and boilers. Ask for DS Series 611.

10. DISTILLERY. Cereal Cookers at Hiram Walker & Sons, Peoria, Ill., insulated with J-M 85% Magnesia Blocks. Spent grain dryers were insulated in the same way. In breweries J-M Rock Cork is used to insulate cold rooms. Ask for DS Series 605.

11. NON-FERROUS METALS. The illustration shows J-M Insulation being applied to a large flue at a zinc smelter. J-M Materials are also widely used by non-ferrous metal products plants to insulate both melting and heat-treating furnaces. Ask for DS Series 612.

12. DAIRY. The dairy, ice cream and other food products industries have learned to depend on J-M Rock Cork sheets for efficient, permanent insulation of cold rooms. The picture shows one of more than twenty-five Rock Cork installations in New York City plants of the Dairymen's League. Ask for DS Series 606.

J-M Insulation for Industrial Furnaces and Ovens, DS Series 610, and J-M Insulation in Marine Service, DS Series 615, not illustrated, are also available.

JOHNS-MANVILLE HANDBOOKS ON INDUSTRIAL INSULATION

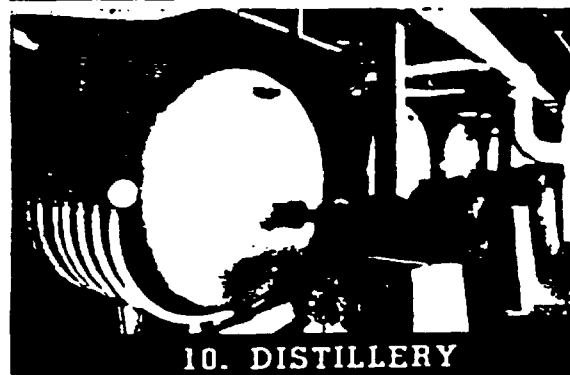
In a series of eighteen books, varying in size from 64 to 208 pages, Johns-Manville has made available to the operators of modern industrial plants a knowledge of insulating materials and insulation methods gained through 78 years of research and experience in the control of heat losses.

Each book contains detailed recommendations for insulating the equipment found in each individual industry. Not only do they specify the insulating materials best suited to the particular purposes, but recommended thicknesses are also given. Specifications and drawings provide details of application and the materials involved are also described together with information as to efficiencies, temperature limits, sizes and weights.

Any of these books will be mailed on request, free of charge, by specifying the title or DS Series Number.



9. CEMENT MILL



10. DISTILLERY



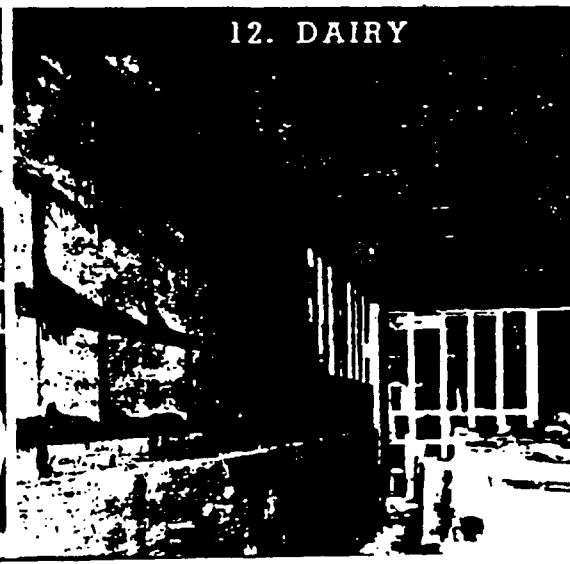
11. NON-FERROUS METALS



7. FOUNDRY



8. UTILITY



12. DAIRY



Wash Coating with J-M Refractory Cement
Used for bonding brick and for wash-coating. J-M Refractory Cements materially reduce refractory maintenance.

In addition to J-M No. 31, J-M No. 32, Hellite and Firecrete, there is included in the J-M line a number of other refractory cements for special conditions. Full information on all of these products may be had on application to any Johns-Manville office. Ask for Brochure RC-6A, which also contains a complete table of recommendations based on Johns-Manville's many years of research and experience on refractory problems.

Johns-Manville REFRACTORY CEMENTS

Over twenty years ago the first refractory cement was marketed by Johns-Manville. Since then service conditions have become more rigorous and more diversified and the demands placed upon refractory materials more complicated. One cement no longer serves. Today Johns-Manville is able to offer a wide range of cements for an equally wide range of conditions of service.

Used to bond fire brick and to wash-coat refractory walls, J-M Refractory Cements minimize refractory maintenance by protecting the edges of the brick from the action of flame and molten ash and by reducing clinkering, slagging and spalling. Refractory Cements also cut down heat losses because open joints between the brick, a common condition where ordinary fire clay is used, are eliminated; the insulation is protected from furnace gases; and air infiltration through joints is effectively prevented.

Out of the entire J-M Refractory line there are four materials which meet the requirements of the bulk of refractory work for bonding, wash-coating, patching and monolithic construction.

These four are No. 31, No. 32, Hellite and Firecrete, the applications of which are described on this and the following page. Details on these and other J-M Refractories for special conditions are given in the complete table below.

J-M No. 31

For brick setting with bond or cushion joints

For this purpose we recommend J-M No. 31 Cement. Aluminum silicate base; vitrifies at 1450° F. and can be used up to 3100° F. J-M No. 31 Cement makes an excellent joint of from $\frac{1}{8}$ to $\frac{3}{16}$ -in. thickness where a heat-setting dry cement is desired. The brick is well protected and the wall is permanently bonded.

Mixed with water J-M No. 31 Cement develops exceptional plasticity and remains well in suspension in the mixing box. Where a wash-coat is used over a wall set with this cement, use J-M No. 32.

DATA ON JOHNS-MANVILLE REFRACTORY CEMENTS

Cement	Character or Base	Highest working temperature, Deg. F.	Lowest working temperature, Deg. F.	Pounds needed to set 1000 brick	Pounds needed for 1 Cu. Ft. of construction	Form in which cement is shipped	Size of bags, cans or drums, pounds
Hellite	Al. Silicate	3000	Air Setting	400*		Ready Mixed	100, 250, 500, 800†
No. 32	Al. Silicate	3100	1250	400*		Dry	100
No. 31	Al. Silicate	3100	1450	600*-700*		Dry	100
Std. Firecrete	Al. Silicate	2400	Air Setting		110	Dry	100
H.T. Firecrete	High Alumina	2800	Air Setting		115	Dry	100
L.W. Firecrete	Al. Silicate	2400	Air Setting		75	Dry	100
No. 20	Silica	2700	Air Setting	400†		Ready Mixed	100, 250, 500, 800†
No. 26	Al. Silicate	2900	Air Setting	600*-700*		Dry	100
No. 30	Si. Carbide	3000	1450	800*		Dry	100
No. 33	Kaolin	3300	1250	750*	130	Dry	100
No. 34	Chrome	3400	Air Setting	600	200	Dry	100
No. 35	High Alumina	3500	1200	750*		Dry	100
P.F.B.M.**	Al. Silicate	3100	1500		133	Ready Mixed	100, 250, 500

*The figure given is for a bond joint, $\frac{1}{8}$ - $\frac{3}{16}$ in. thick. Without asterisk, the quantities are for brick-to-brick joints.

**Plastic Fire Brick Material.

†Approximate quantities required for washcoating 100 sq. ft.: 35 lb. Hellite with 7 lb. water; 50 lb. No. 32 with 30 lb. water; 40 lb. No. 20 with 7 lb. water.

‡Also furnished in 25 and 50-lb. containers, and, No. 20, also in 5 and 10-lb. cans.

J-M No. 32

For brick-to-brick joints and wash-coating with a dry heat-setting cement

This type of joint requires a finer grained cement—J-M No. 32, which also is heat-setting. Aluminum silicate base; vitrifies at 1250° F. and useful up to 3100° F. As a mortar J-M No. 32 has excellent plasticity, handles easily and stands well in suspension. Thinly mixed it is an excellent wash-coating for brickwork set with J-M No. 31 or No. 32 cement.

Hellite

For brick setting and wash-coating with a ready-mixed air-setting cement

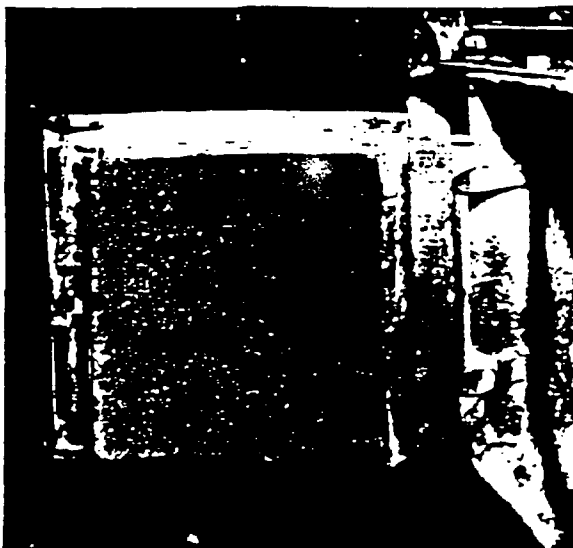
The best material for these purposes is J-M Hellite, an easily workable, finely ground, air-setting cement which makes strong, permanent joints. As a wash-coating, it increases the resistance of the firebrick to gases. It is also highly recommended for hot patching with paddle or gun. It has high adherence, minimum shrinkage and will not "bloat" on rapid heating. Temperature limit, 3000° F.

Firecrete

A new hydraulic cement for monolithic refractory construction

Firecrete is shipped in the form of a dry cement. Mixed with water on the job it can be used for either tamped or poured linings for doors, pipes or flues and for poured or cast baffles, dampers and special shapes. Handled like ordinary concrete, this new hydraulic-setting refractory cement has greatly simplified many types of refractory construction which were difficult and expensive to carry out with standard fire brick or special refractory shapes. Firecrete is exceptionally strong and highly resistant to spalling, with practically no-drying or firing shrinkage.

Firecrete is furnished in the following three types: Standard for temperatures up to 2400° F.; H. T. (High Temperature) for use up to 2800° F., and L. W. (Light Weight) for temperatures up to 2400° F.



Boiler Inspection Door Lined with Firecrete



Special Refractory Shapes Made of Firecrete

Casting special refractory shapes from Firecrete saves labor and expense.

Light Weight Firecrete, 40% lighter in weight than fire brick, is the latest development of the J-M Refractory Research Laboratory. With 40% lower heat storage capacity than fire brick, it is particularly suited for use in intermittently operated furnaces because of the speed with which the furnace can be brought up to temperature and the fact that 40% less heat is wasted as the furnace cools. Its low thermal conductivity, less than half that of fire brick, also recommends it for continuous furnaces. Light weight, combination insulating and refractory doors and roofs for furnaces represent two of many important applications for this unique material. Further details will be sent on request.

Johns-Manville

FLOORING MATERIALS

Johns-Manville Flooring Products include a light weight, tough asphaltic plank for industrial floors, and attractive, colorful asphalt tiles which provide a durable floor covering for offices and other locations where truck traffic or heavy loads on concentrated bearing areas are not encountered.

J-M Industrial Flooring Plank

The ideal factory floor should be strong, durable, practically wear-proof. It should be resilient yet capable of supporting heavy loads. It should be quiet, dustless, fire retardant, vermin-proof, odorless, and it should not check, chip, warp or decay.

J-M Industrial Flooring Plank possesses all of these qualities, and more. It is rapidly and easily applied and is ready for use as soon as it is laid. Should any part of the floor be seriously injured through accident, the damaged planks are quickly replaced and the repaired section is ready for traffic immediately. This type of industrial flooring requires little or no maintenance.

The plank is made of a mixture of tough fibre, high melting point, low penetration asphalt, and graded mineral filler, densely compressed and die-cut into rectangular planks or slabs, 12 x 12 in. and 12 x 24 in. in $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in. thicknesses. The material is available in three colors—red, brown and black.

J-M Industrial Flooring Plank is recommended for use on warehouse and manufacturing floors where a suitable sub-

floor exists and where unusually heavy loads do not rest on small bearing areas. This material has successfully withstood the highly abrasive foot traffic encountered in subway cars and the heavy trucking and static loads of railroad freight houses. It has been used in parking areas and on ramps, on the floors of passenger vehicles and lifts, throughout automobile and other industrial plants, in cold storage and other warehouses and on busy wharves and docks. In every case its ability to render trouble-free service under the most exacting conditions has been conclusively proved.

For detailed information on J-M Industrial Flooring, ask for DS Series 110, which includes recommendations for use as well as specifications and directions for application.

J-M Asphalt Tile Floorings

J-M Asphalt Tile, Type A—A resilient, quiet and attractive flooring material, ideally suited to the modern office or commercial building. It provides a permanently smooth and durable surface with many possible color combinations in either plain or marbled designs. It is odorless, waterproof and does not originate dust. Maintenance consists merely of cleaning with neutral soap and water. Furnished $\frac{1}{8}$ and 3/16 in. thick in a wide variety of tile sizes.

J-M Heavy Duty Asphalt Tile—A new type of flooring designed for severe service intermediate between that for which Industrial Flooring Plank and Asphalt Tile, Type A, were designed. Furnished in black, red, mahogany, and brown, $\frac{1}{4}$ in. thick in various size tile units.

Full particulars on both types of asphalt tile will be furnished on request.



J-M Industrial Flooring Plank is Easily and Rapidly Laid and is Ready for Use Immediately

This installation is at the Stern-Auer Shoe Co., Chillicothe, Ohio.

Johns-Manville

BUILT-UP AND INSULATED ROOFS

Realizing that no type of built-up roof can be acceptable or usable under all conditions, and recognizing the factor of individual preference, Johns-Manville has developed a number of different types of built-up roofs and is in a position to furnish a roof to meet practically any condition or personal preference.

The various standard J-M Built-up Roofs are listed on following pages. These roofs are classified on the basis of the kind of felt and number of layers used in their construction. The tables also indicate the ratings of the Underwriters' Laboratories, Inc.

J-M BONDED ASBESTOS BUILT-UP ROOFS

J-M Bonded Asbestos Built-up Roofs are the outcome of several decades of study and experience in producing durable, fireproof, weatherproof, light-weight roofs at a moderate cost. They are suitable for industrial buildings, warehouses, office buildings, hotels, hospitals and apartment houses.

J-M Smooth-Surfaced Asbestos Built-up Roofs

While JOHNS-MANVILLE furnishes built-up roofs of every type, the smooth-surfaced asbestos roof is recommended as the one best designed to stand up under all ordinary conditions and to give complete trouble-free protection for the life of the building. This roof is built up of alternating layers of asphalt-saturated asbestos felt and roofing asphalt.

J-M Asbestos Felts, with which J-M Bonded Asbestos Roofs are built up, will not support combustion even when impregnated and coated with asphalt. The Underwriters' Laboratories, Inc., give Class A



Applying J-M Rigid Roofinsul in Three 1/2-inch Layers

Roof insulation not only saves fuel and assures comfortable interior temperatures but also protects both the roof deck and the built-up roof.

ratings to both J-M Super Class A and Class A Asbestos Roofs. They are fire-resistant to the highest degree.

But the most important advantage of asbestos is its pronounced effect in assuring roof permanence and freedom from maintenance by the preservation of the waterproofing tar or asphalt.

The heat of the sun on other types of roofs draws up the underlying tar or asphalt through the capillary channels in the vegetable fibres themselves, bringing the life-giving lighter oils to the surface of the roof, from which they are lost by evaporation.

Asbestos felt, because of the peculiar non-capillary nature of asbestos fibre, forms a positive barrier against this evaporating action. The waterproofing asphalt, both in the felt and between the plies, is preserved practically in its original condition, despite the intense drying-out action of the sun. Since asbestos, itself, is imperishable, an asbestos roof is the best assurance of roof permanence.

J-M Bonded Roofing Asphalt

J-M Bonded Roofing Asphalt—a relatively recent development which has proved to be far superior to ordinary asphalt—is used on all J-M Bonded Asbestos Roofs. Tested at the JOHNS-MANVILLE Research Laboratories at Manville, N. J., in the most modern types of weathering machines, Bonded As-



There is a J-M Bonded Built-up Roof to Meet any Roofing Requirement

phalt remained in perfect condition after being subjected to alternate cycles of heat, rain and freezing cold equivalent to ten years of actual service. Ordinary asphalts, tested at the same time, were seriously impaired in waterproofing effectiveness.

The unusual ability of J-M Bonded Asphalt to stand up under all conditions of service will add years to the life of a roof.

Other Types of J-M Bonded Roofs

In addition to asbestos roofs, JOHNS-MANVILLE also supplies Combination Roofs, composed of a rag base felt and asbestos finishing felts, and a complete line of slag or gravel surfaced roofs, employing tar-saturated asbestos felts, tar-saturated rag felts, or asphalt-saturated rag felts. All of these roofs are included in the tables on later pages.

Application and Inspection

As the best results are obtained only when the proper roofing is correctly laid, JOHNS-MANVILLE has appointed Approved Roofing Contractors throughout the country, basing

these appointments on thoroughness of workmanship and financial responsibility.

JOHNS-MANVILLE also maintains an inspection service in connection with J-M Bonded Built-up Roofs. This service is required in connection with every roof which is to be bonded, and is rendered before, during, and after application.

Surety Roofing Bonds

All JOHNS-MANVILLE Built-up Roofs of whatever type will, when desired, be covered by a bond of the National Surety Corp., guaranteeing the performance of the particular roof for a period of from 10 to 20 years, depending on the type of roof applied. This bond is issued only on roofs laid by JOHNS-MANVILLE Approved Roofing Contractors and in connection with JOHNS-MANVILLE inspection service.

Where JOHNS-MANVILLE Flashing Materials are used in conjunction with JOHNS-MANVILLE Roofing, a flashing endorsement for a 10-year period will be attached to and become a part of the bond, under the same conditions imposed for the bonding of the roof.

JOHNS-MANVILLE INSULATED ROOFS

Insulation on industrial, commercial and institutional buildings is rapidly gaining acceptance as a decidedly economical investment. In connection with its Bonded Built-up Roofs, JOHNS-MANVILLE recommends insulation with J-M Rigid Roofinsul for the following reasons:

First, it effectively retards the passage of heat through the roof, thus saving on fuel and air conditioning bills.

Second, on new construction the use of Rigid Roofinsul makes it possible to reduce appreciably the investment in heating and air conditioning equipment.

Third, it permits closer control over interior temperatures both in summer and winter, assuring more comfortable, uni-

form working or living conditions throughout the year. Uniform interior temperatures are also a vital necessity in the operation of many modern industrial processes.

Fourth, Rigid Roofinsul prevents condensation on the underside of the deck and eliminates discoloration of ceilings and the annoyance and damage caused by roof drip.

Fifth, by preventing condensation, it protects the deck against rot and corrosion. When the deck is of concrete or other non-combustible material, J-M Rigid Roofinsul reduces the danger of cracking (commonly caused by sudden temperature changes) and thereby tends to prevent moisture from reaching the reinforcing steel members.

Sixth, it provides protection to the roofing felts themselves. All roof decks move to some extent under temperature changes. When this cycle of alternate expansion and contraction continues over a long period of time, any cracks in the deck may eventually be transmitted to the built-up roof unless there is an intervening layer of insulation. J-M Rigid Roofinsul not only minimizes movement of the deck by keeping its temperature more uniform, but also provides sufficient resiliency to take up strains due to any movement which does occur and prevents their transmission to the felts, thus prolonging the life of the roof.

J-M Rigid Roofinsul

J-M Rigid Roofinsul is furnished 24 x 48 in., 1/2 in. thick. It was designed especially for use as insulation over roof decks, principally under J-M Bonded Asbestos Built-up Roofs. It is light in weight and has a high insulating value, and is also rigid, structurally strong, and unusually resist-



J-M Rigid Roofinsul



J-M 4-Ply Asbestos Roof Applied on Old Roof Over Insulation

Specification Nos. 104, 105 or 108 (see tables).
Bonded for 20 years.

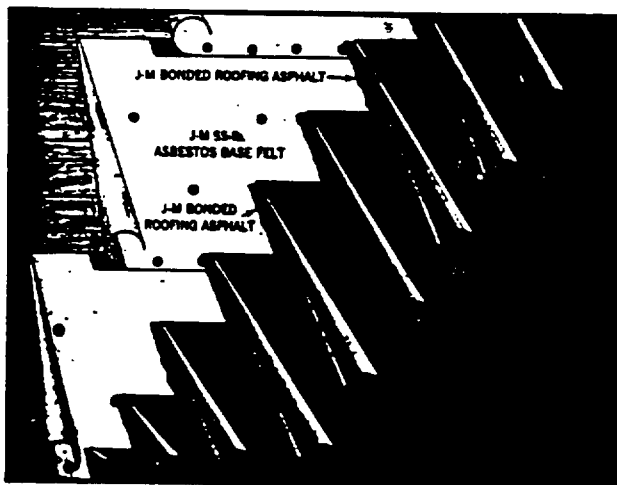
CONDENSED SPECIFICATIONS FOR J-M BONDED BUILT-UP ROOFS Over Wood Decks

[illegible]

Over Pre-Cast Gypsum Decks

1	Gravel or Slag	A	3-TWF	300	SEE SPEC NO ABOVE FOR MATERIALS	1	Gravel or Slag	A	4-TWF	304	SEE SPEC NO ABOVE FOR MATERIALS	2	Gravel or Slag	A	3-TWF	300	SEE SPEC NO ABOVE FOR MATERIALS	1	Gravel or Slag	A	3-TWF	300	SEE SPEC NO ABOVE FOR MATERIALS
			15-TWF	600	SEE SPEC NO ABOVE FOR MATERIALS				4-TWF	604	SEE SPEC NO ABOVE FOR MATERIALS				4-TWF	604	SEE SPEC NO ABOVE FOR MATERIALS						
2	Gravel or Slag		4-TWF	608	OVER 1/4 IN. RIGID ROOFING. SEE SPEC NO ABOVE FOR MATERIALS	2	Gravel or Slag	A	3-TWF	608	OVER 1/4 IN. RIGID ROOFING. SEE SPEC NO ABOVE FOR MATERIALS	2	Gravel or Slag					2	Gravel or Slag				
																		2	Gravel or Slag	3-TWF	60		
																		To	Gravel or Slag	4-TWF	610	OVER 1/4 IN. RIGID ROOFING. SEE SPEC NO ABOVE FOR MATERIALS	
																		6					

* CLASS A UNDERWRITERS RATING ON FIRE, WIND AND COLLIDING 3 INCH PER FOOT



J-M Super Class A Asbestos Roof Over Wood Deck
Specification No. 100. Bonded for 20 years.

SPECIFICATIONS FOR ALL J-M ROOFS

Detailed Specifications

Complete, detailed individual specifications are available for every JOHNS-MANVILLE Built-up Roof listed in the tables on this and the following page. Ask for individual specifications by number, or, where all specifications are desired, ask for "complete set of Architect's Specifications on J-M Bonded Built-up Roofs."

The following condensed specification, however, may be used in the absence of the standard specification, inserting the required items where indicated to complete.

Condensed Specifications

Roofing—Shall be **JOHNS-MANVILLE** (state Designation, see chart) Built-up Roofing laid in accordance with the manufacturer's Standard Specification (state Specification Number, see chart), and applied by a J-M Approved Roofing Contractor.

CONDENSED SPECIFICATIONS FOR J-M BONDED BUILT-UP ROOFS Over Non-combustible Decks (Poured Concrete or Poured Gypsum)

	• 20-YEAR ROOFS •				• 15-YEAR ROOFS •				• 10-YEAR ROOFS •			
1	SMOOTH	CLASS A	100	THREE 5/8" FAR W. ASPBESTOS FELT 100 LB BONDED ASPHALT (HOT) 50 LB REGAL ROOF COATING (COLD)	SMOOTH	CLASS A	100	THREE 5/8" FAR W. ASPBESTOS FELT 100 LB BONDED ASPHALT (HOT) 50 LB REGAL ROOF COATING (COLD)	SMOOTH	COMMON	200	THREE 5/8" FAR W. ASPBESTOS FELT 100 LB BONDED ASPHALT (HOT) 50 LB REGAL ROOF COATING (COLD)
2	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL				
3	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL				
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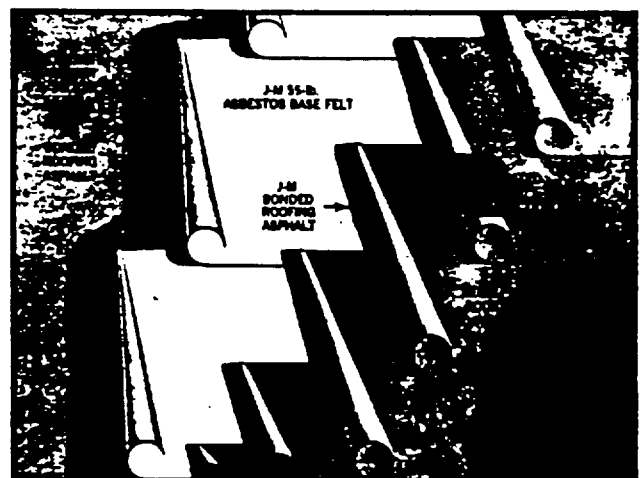
Over Steel Decks

1	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL THREE 5/8" FAR W. ASPBESTOS FELT 100 LB BONDED ASPHALT (HOT) 50 LB REGAL ROOF COATING (COLD)	SMOOTH	CLASS A	100	OVER J-M RIGID ROOFINSUL THREE 5/8" FAR W. ASPBESTOS FELT 100 LB BONDED ASPHALT (HOT) 50 LB REGAL ROOF COATING (COLD)
• CLASS A UNDERWRITERS RATING ON PITCHES UP TO AND INCLUDING 3 INCHES PER FOOT								

The roofing contractor shall furnish a J-M (state term) Surety Roofing Bond.

Flashing—Shall be JOHNS-MANVILLE Flashing applied in accordance with the manufacturer's Standard Flashing Specification. It shall be applied on parapet walls (state whether "not less than 8 in. high" or "to extend full height and under coping" or "not less than 8 in. high with cap flashing extended through the wall"). It shall be applied on high walls (state whether "same height as on adjoining parapet walls" or "not less than 8 in. high with cap flashing extended through the wall." If flashing is to be carried into raggle blocks, so state.)

Roof Insulation—Shall be JOHNS-MANVILLE Rigid Roofinsul (state thickness) thick applied in accordance with the manufacturer's Standard Specification. The insulation shall be underlaid with felt over the entire area.



J-M Class A Asbestos Roof Over Non-Combustible Deck
Specification No. 101, Bonded for 20 years.

Johns-Manville

STEELTEX FLOOR LATH

J-M Steeltex Floor Lath is a combined form and reinforcing which offers important structural advantages and economies in light-slab concrete floor and roof construction. It will give maximum reinforcing value and facilitate proper curing of the concrete through the maintenance of the original water-cement ratio, at the same time effecting important savings in application costs and in the reduction of waste material.

The reinforcing element of Steeltex Floor Lath is composed of 12-gauge cold-drawn electrically welded galvanized steel wire reinforcing mesh. This mesh is attached to a tough corded backing—the form element—by means of crimp wires which also space the reinforcing mesh at the proper distance from the backing to permit the concrete completely to surround and embed the reinforcement. The weight of the poured concrete insures complete and uniform embedment without the labor of blocking up or of pouring the slab in two operations.

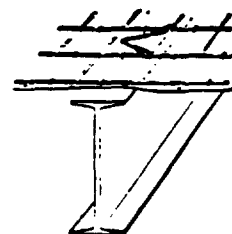
The Steeltex corded backing is of ample strength not only to support the concrete while it is being poured, but also to afford a safe walking surface once the fabric has been attached to the joists. Being water-resistant, the backing minimizes loss of water and fine aggregate through leakage, with a further advantage in the protection it affords to the floors below. Droppings are minimized, clean-up expense is eliminated, and work can proceed in safety even while the concrete is being placed.

Properly installed, there is no excessive sag when concrete is being poured, which effects considerable saving. Also, because Steeltex Floor Lath extends in one piece across the entire panel or bay, it gives lateral stiffness, continuity of reinforcing and distribution of loads over a number of joists or beams.



Steeltex Floor Lath is Applied by Unrolling it Across Joists
The roll form assures continuity of reinforcement across the entire panel, and provides, in one operation, both form and reinforcement.

Equally Adaptable to Floors and Roofs



**Steeltex Clips
Furnish a Secure
Hold**

The advantages of Steeltex Floor Lath as a reinforcement and form for light-slab floor construction apply equally in the construction of concrete and gypsum roofs. The material is easily laid on sloping or curved roof surfaces and the fibrous backing is particularly adapted to roof construction since it helps check condensation on the underside of the slab, thus protecting the steel joists, beams and plaster ceiling beneath.

TABLE OF SAFE LOADS FOR CONCRETE FLOOR SLABS USING STEELTEX FLOOR LATH

Values in table are Total Safe Loads in pounds per sq. ft. uniformly distributed, including Slab

Span of slab, inches	Size of Slab and Weight per square foot			
	2 in. (25 lbs.)	2½ in. (31 lbs.)	3 in. (38 lbs.)	3½ in. (44 lbs.)
18	436	586	736	886
20	353	475	597	715
22	292	392	494	594
24	245	330	415	499
26	209	281	353	426
28	180	242	305	366
30	157	211	266	319
32	139	186	234	281
34	123	165	207	249
36	109	146	184	222

Note: For partial continuity, i.e. $M = \frac{Wl^2}{10}$ take 5/8 of loads in table.

For simply supported, i.e. $M = \frac{Wl^2}{8}$ take 2/3 of loads in table.

For stress in steel other than 20,000, loads are directly proportional to stress, thus for 16,000, take 16/20 of load in table, for 18,000 take 18/20 of load in table, etc.

Specifications for Steeltex Floor Lath

(Specifications for Reinforcing Concrete and Gypsum Floors and Roofs Over Steel Joists)

Before installing Steeltex Floor Lath, joists shall be rigidly bridged to accord with Steel Joist Institute specifications.

Steeltex Floor Lath (a 3x4-in., 12-gauge, cold-drawn, electrically-welded, galvanized wire fabric, attached to a water-resistant backing, furnished in rolls 4 ft. x 125 ft.) shall be unrolled across the joists to the desired length from the outer or bearing walls of the building. Steeltex Floor Lath shall be fastened every 12 in. along the end joist with special clips.

Steeltex Floor Lath shall be stretched taut longitudinally across the joists by a special stretcher, and clipped securely every 12 in. along the bearing to which the stretcher is attached. Steeltex Floor Lath shall then be clipped to each joist every 24 in. on joists spaced 16 in. and over, and one clip or wedge per width of roll for joist spacing under 16 in. Each clip shall face in opposite direction from the adjacent clip.

Where end laps are necessary, Steeltex Floor Lath shall be lapped at least 1 ft. directly over a joist. Side laps shall be not less than 2 in.

Note: Installation instructions and test information are available upon request at the nearest Johns-Manville Office.

Johns-Manville

WELDED WIRE REINFORCEMENT

For general concrete building construction, but without the special features of Steeltex such as waterproof backing and self-furring, Johns-Manville supplies J-M Welded Wire Reinforcement.

This is more than ordinary "steel reinforcement." It is an electrically welded wire fabric of square or rectangular mesh, manufactured from a special high grade cold drawn steel wire of high tensile strength and proper ductile qualities.

This welding produces an absolutely rigid connection at every joint. Distortion of the fabric is thereby prevented, and since there are no wraps, ties or clips where the members are joined, the concrete is allowed to flow freely around all parts of the reinforcement and completely cover every wire. The result is a perfect bond between concrete and reinforcement.

The material is furnished in either plain or galvanized finish, in both rolls and sheets. The rolls are of such length as to provide an unbroken continuity of reinforcement ex-



A Rigid Connection at Every Joint

The superiority of J-M Welded Wire Reinforcement lies in the electric weld which fuses the wires into one homogeneous section, assuring unimpaired strength and maintained wire spacing.

tending across the entire width of most buildings. Full effectiveness of reinforcement is thus obtained at every section of the slab, while the almost complete absence of laps and splices reduces the required quantity of steel to a minimum.

A Type for Every Reinforcing Need

Practically any desired size of mesh and gauge of wire may be obtained in J-M Welded Wire Reinforcement. (See table of standard styles opposite.) This wide range of selection adapts the material to a multitude of uses, including reinforcement of all types of concrete floor slab construction, concrete driveways, sidewalks, retaining walls, etc.; beam and column wrapping; fireproofing of steel framework; temperature reinforcement in top or finish layer of cement or composition floors, etc.

Finish—Plain or Galvanized as specified. (Plain fabric will be shipped on all unspecified orders.)

Tensile Strength—Wire used in all fabric will develop 70,000 lbs. per sq. in.

Widths—(Rolls or Sheets.) For 4-in. spacing of longitudinal wires, maximum width is 112 in. and is measured from center-to-center of outside longitudinal wires. For 3-in. and 6-in. spacing of longitudinal wires, maximum width is 60 in., with 139 in. possible in some styles, and is measured from center-to-center of outside longitudinal wires. All transverse wires will have close overhang (1/2 in. or less) unless otherwise specified.

Lengths—Rolls: Stock lengths 100 ft. to 300 ft. depending on style. Customer may specify length of rolls on orders not shipped from stock. Sheets: No extra charge for sheets 6 ft. or over. Length of sheets to be specified by customer.

DIMENSIONS, SECTION AREAS AND WEIGHTS

SUITABLE USES	Style	Spacing, inches		Gauge of wire		Sec. Area, sq. in. per lin. ft.		Weight per 100 sq. ft.
		Long.	Trans.	Long.	Trans.	Long.	Trans.	
Gunite, Composition Flooring, Fireproofing, Etc.	AA 1414	2	2	14	14	.030	.030	21
	AA 1212	2	2	12	12	.052	.052	37
	TT 1414	3	3	14	14	.020	.020	14
	TT 1212	3	3	12	12	.035	.035	25
	TT 1010	3	3	10	10	.057	.057	41
	BB 1414	4	4	14	14	.015	.015	11
	BB 1313	4	4	13	13	.020	.020	14
	BB 1212	4	4	12	12	.028	.028	19
	BB 1010	4	4	10	10	.043	.043	31
	BB 88	4	4	8	8	.062	.062	44
Gunite, Waterproof Concrete Linings, Etc.	BB 66	4	4	6	6	.087	.087	62
	BB 44	4	4	4	4	.120	.120	85
	CC 1212	6	6	12	12	.017	.017	13
	CC 1010	6	6	10	10	.029	.029	21
Temperature, Reinforcing Ground Floors, Etc.	CC 99	6	6	9	9	.035	.035	25
	CC 88	6	6	8	8	.041	.041	30
	CC 77	6	6	7	7	.049	.049	36
	CC 66	6	6	6	6	.058	.058	42
	AH 711	3	16	7	11	.148	.008	53
	AH 610	3	16	6	10	.174	.011	63
Slab Reinforcing, Etc. (One direction only)	AH 510	3	16	5	10	.202	.011	73
	AH 49	3	16	4	9	.239	.013	89
	AH 38	3	16	3	8	.280	.015	104
	TH 711	3	16	7	11	.098	.009	38
	TH 610	3	16	6	10	.116	.011	45
	TH 510	3	16	5	10	.135	.011	52
	TH 49	3	16	4	9	.160	.013	61
	TH 38	3	16	3	8	.187	.015	72
	TH 28	3	16	2	8	.217	.015	83
	TH 17	3	16	1	7	.252	.018	96
	TH 06	3	16	0	6	.293	.022	113
	BH 711	4	16	7	11	.074	.008	30
	BH 610	4	16	6	10	.087	.011	35
	BH 510	4	16	5	10	.101	.011	40
	BH 49	4	16	4	9	.120	.013	48
	BH 38	4	16	3	8	.140	.015	56
	BH 28	4	16	2	8	.162	.015	64
Beam Wrapping, Fireproofing, Etc.	BD 1313	4	8	13	13	.026	.010	11
	BD 1214	4	8	12	14	.029	.008	12
	BD 1212	4	8	12	12	.028	.013	14
	BD 1112	4	8	11	12	.034	.013	17
Concrete Shapes, Etc.	BD 1012	4	8	10	12	.043	.013	20
	BD 912	4	8	9	12	.052	.013	23
	BD 812	4	8	8	12	.062	.013	27
	BD 711	4	8	7	11	.074	.017	33
Slab Reinforcing, Driveways, Ramps, Etc.	BF 1012	4	12	10	12	.043	.009	19
	BF 912	4	12	9	12	.052	.009	22
	BF 812	4	12	8	12	.062	.009	26
	BF 711	4	12	7	11	.074	.011	31
	BF 610	4	12	6	10	.087	.014	37
	BF 510	4	12	5	10	.101	.014	42
	BF 49	4	12	4	9	.120	.017	50

Note: The "Style" letter and numerals refer respectively to the spacing of wires and to the gauge of wires; for instance, "BD" means 4-in. spacing of longitudinal wires and 8-in. spacing of transverse wires, and "1112" means No. 11 gauge longitudinal wires and No. 12 gauge transverse wires.



J-M Floor and Column Reinforcing

Johns-Manville

CORRUGATED TRANSITE **for Industrial Roofing and Siding**

Strong, fireproof, weather-proof and permanent, Corrugated Transite Sheets have been widely used for many years as roofing and siding on industrial buildings over skeleton frame construction. Like all Transite products, they are made of asbestos fibre and portland cement, formed under tremendous pressure into a homogeneous, dense mass of great strength, toughness and durability.

In addition to its advantageous structural qualities, Corrugated Transite is highly resistant to acid fumes, alkaline vapors and adverse atmospheric conditions. It will not burn, rot, corrode, shrink or otherwise deteriorate.

Corrugated Transite is easily applied and requires no painting or maintenance of any kind. Accurate records indicate that Transite assures the longest building life and the lowest per annum cost.

Where Corrugated Transite is Used

The applications of Corrugated Transite for roofing and siding are practically unlimited. Throughout the country hundreds of industrial plants are built of this material. It is the leading fireproof product of corrugated type in use today for general industrial construction.

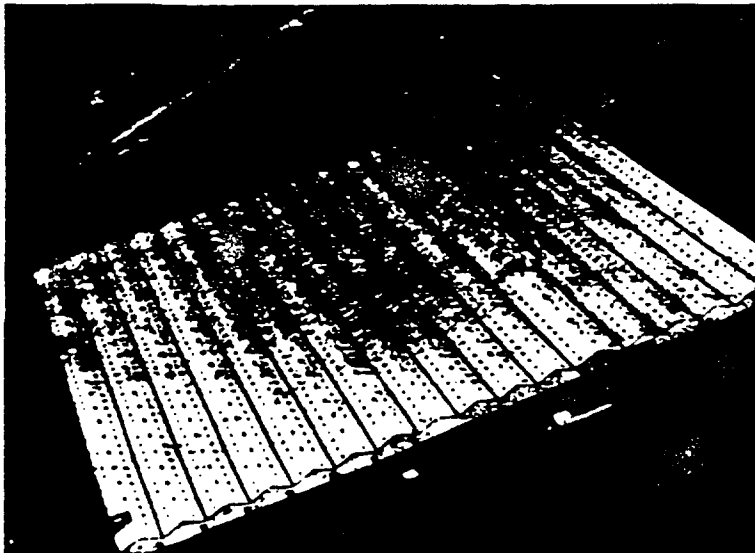
Oil refineries, for example, use it for fireproof aprons and roofs over stills, and for housings of various types. On the railroads it is used for round houses, car shops, switch towers, way stations and freight houses. In mining and quarry-



Strong, Fireproof, Weather-proof, Permanent
And Corrugated Transite is easily and rapidly applied.

ing, it is used as roofing and siding for hoist houses, loader and crusher sheds, storehouses, etc.

In the chemical and metallurgical industries, Transite solves difficult building problems because of its comparative permanence where ordinary materials are quickly destroyed. Its unique combination of qualities have also led to its widespread use for warehouses and docks, airplane hangars and exposition buildings. Because of its unusual strength, Corrugated Transite can be laid on purlins spaced 54 in., and on girts spaced 60 in.



A Million and a Half Square Feet of Transite

Used on the roof and sides of the International Harvester Company's plant at East Moline, Ill.

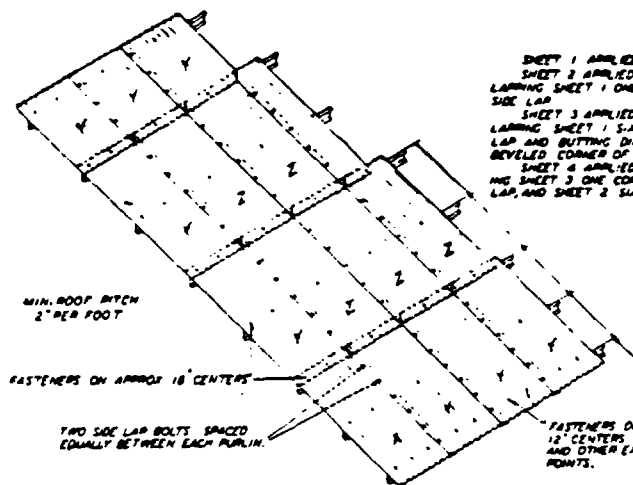
Sizes and Accessories

The standard type of Corrugated Transite Sheets has corrugations with a 4.2 in. pitch and a depth of 1½ in. The thickness is approximately 7/16 in. at ridge and valley of corrugations, and approximately 5/16 in. on tangent. Sheets are furnished 42 in. wide and in lengths up to 11 ft. Weight approximately 4.75 lbs. per sq. ft. crated. Curved or special cut sheets can be furnished on special order.

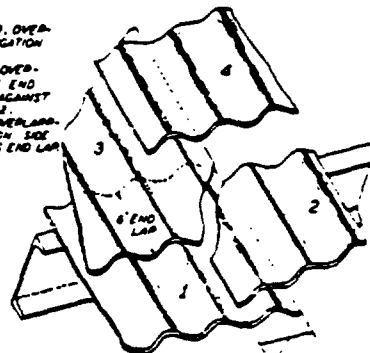
Corrugated Transite may also be obtained with corrugations of 2¾ in. pitch and 1½ in. depth, in 42 in. wide sheets up to 8 ft. 6 in. long.

For use with Corrugated Transite, the same material is also furnished in the form of ridge and corner rolls, and louvres. Further details of construction, beyond those shown on the following page, may be had on application to any JOHNS-MANVILLE office.

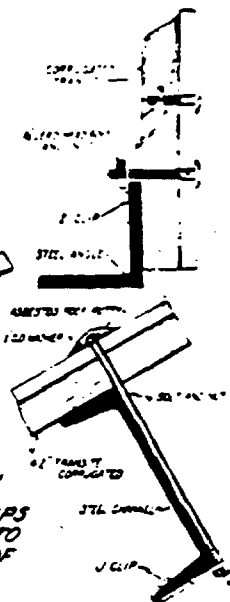
CORRUGATED TRANSITE CONSTRUCTION DETAILS



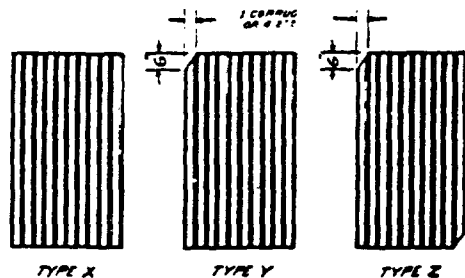
SHEET 1 APPLIED FIRST
SHEET 2 APPLIED SECOND, OVER-
LAPPING SHEET 1 ONE CORRUGATION
SIDE LAP
SHEET 3 APPLIED NEXT, OVER-
LAPPING SHEET 1 5-8 INCHES END
LAP AND BUTTING DIRECTLY AGAINST
BEVELLED CORNER OF SHEET 2.
SHEET 4 APPLIED LAST, OVERLAP-
PING SHEET 3 ONE CORRUGATION SIDE
LAP, AND SHEET 2 5-8 INCHES END LAP



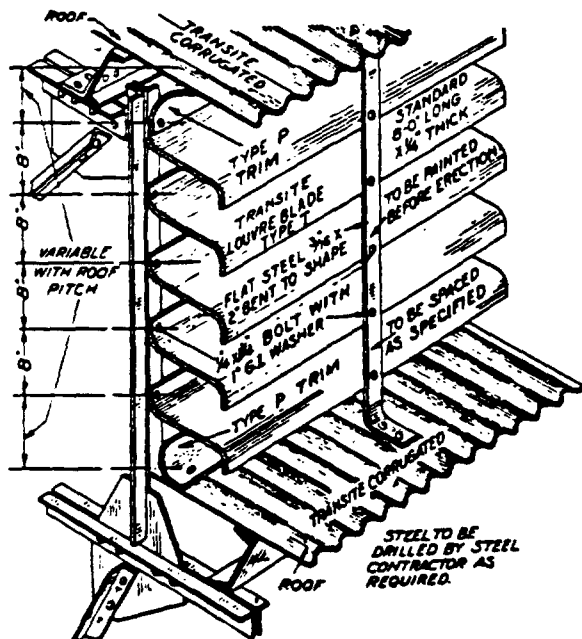
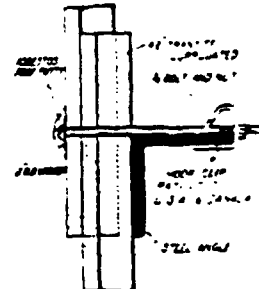
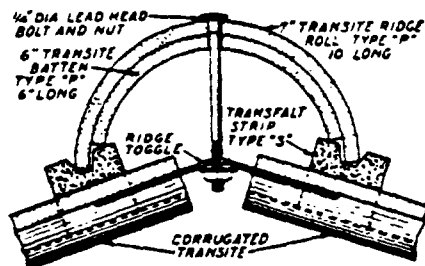
APPLICATIONS OF THE CLIPS
SHOWN CAN BE ALTERED TO
ACCOMMODATE ANY TYPE OF
CONSTRUCTION.



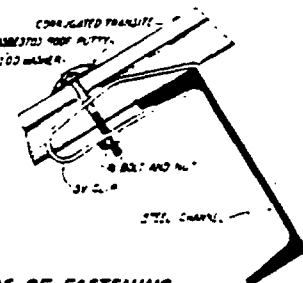
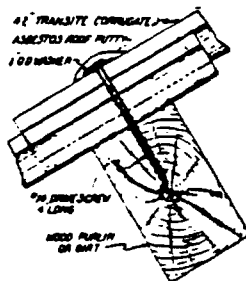
STRAIGHT LAP LINE CONSTRUCTION WITH CUT-CORNER SHEETS



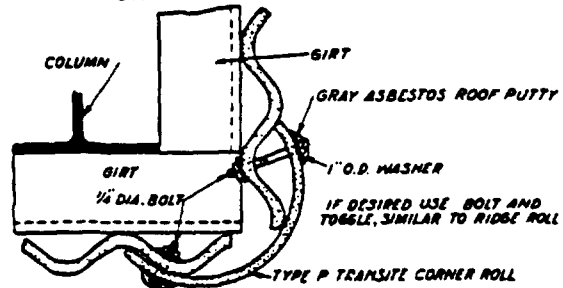
TYPES OF CUT-CORNER SHEETS



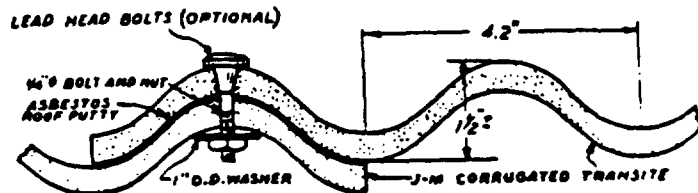
TRANSITE LOUVRE CONSTRUCTION
IS IDEALLY ADAPTED FOR MONITORS
AND OTHER LOCATIONS WHERE ABUNDANT
VENTILATION MUST BE COMBINED WITH
MODERATE WEATHER PROTECTION



STANDARD METHODS OF FASTENING



SECTION SHOWING CORNER ROLL



SIDE LAP CONSTRUCTION

Johns-Manville

FLAT TRANSITE ASBESTOS SHEETS



Flat Transite as a Furnace Casing

This oil refinery cracking furnace is insulated with J-M Materials and protected with a fireproof, weather-proof casing of Flat Transite on walls, and a Corrugated Transite apron and roof.

Transite in flat sheets is used as a casing over insulation on industrial furnaces and boilers; for ceilings, walls, panel work, partitions and fire doors in building construction; for arc barriers in electrical work where high dielectric strength is not required; and as dryer housings, hoods, dampers, baffles and ducts in various industrial processes. It is also furnished made up into core plates, ducts, forge jacks, smoke jacks, etc.

Transite does not become warped, distorted or weakened in service; in fact, it actually strengthens and toughens with age. It offers high resistance to acid fumes and severe weather conditions. It has withstood severe fire tests and is widely used where fireproof qualities are important. Painting, finishing or protection against deterioration is not required.

Flat sheets are furnished 36 x 48 in. and 42 x 48 in., in thicknesses of $\frac{1}{4}$ to 4 in., and 48 x 48 in., 48 x 96 in., and 42 x 96 in., in thicknesses of $\frac{1}{4}$ to 2 in. The special core plate material is furnished in thicknesses up to 2 in. in sheets 30 x 48 in., or in rectangular cut pieces.

W. R. Transite

Both Flat and Corrugated Transite sheets can be furnished with a bituminous impregnation to afford maximum impermeability where the material will be subjected to extreme or sustained moisture or acid conditions.

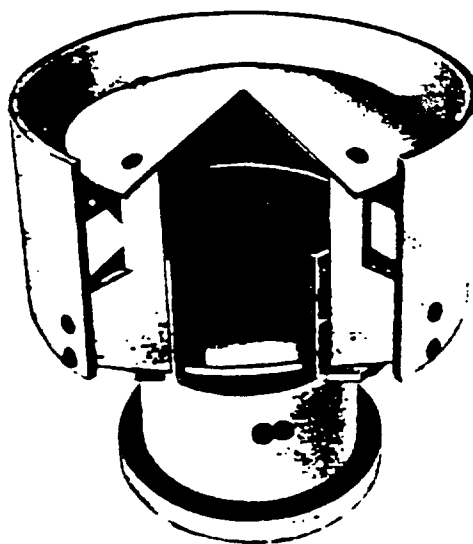
W. R. Flat Transite is furnished in standard size sheets, 42 x 96 in., $\frac{1}{4}$ in. thick, 42 x 48 in., $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ in. thick; and 36 x 48 in., $\frac{1}{4}$ and $\frac{1}{2}$ in. thick. Smaller sizes can be furnished on special order.

W. R. Corrugated Transite is furnished in the same sizes as standard Corrugated Transite, but in lengths only up to and including 8 $\frac{1}{2}$ ft.

TRANSITE VENTILATORS

At no place is the destructiveness of the elements more apparent than in ventilators. In a position exposed to the action of wind, rain, snow and ice from the outside, they are frequently subjected to corrosive gases and vapors from the inside. Transite is the ideal material for such service. It is highly corrosion-resistant — not only inside and outside, but clear through.

Transite Ventilators, made from Transite Pipe, described elsewhere, are designed for use on all buildings where fireproof, fume-proof and weather-proof construction is desired. They are especially satisfactory for engine houses, gas and power houses, laboratories, factories, etc., where a corrosion-resisting ventilator is essential. They never need painting and have proved



Transite Ventilator

most economical because of their permanence and freedom from maintenance.

The material of which they are made has a surface smoother than new and clean metal, and the design of the ventilators provide surface contours which permit the unimpeded flow of exhaust air.

Transite Ventilators have no exposed metal parts on either the interior or exterior surfaces. This is accomplished by the use of Transite throughout and the protection of bolt heads and nuts by a cement similar to Transite itself.

Transite Ventilators are available in sizes from 10 to 36 in. Sizes 10 to 24 in. are shipped assembled. Larger sizes are shipped knocked down, but may be readily erected.

Johns-Manville

SOUND CONTROL OF MECHANICAL EQUIPMENT

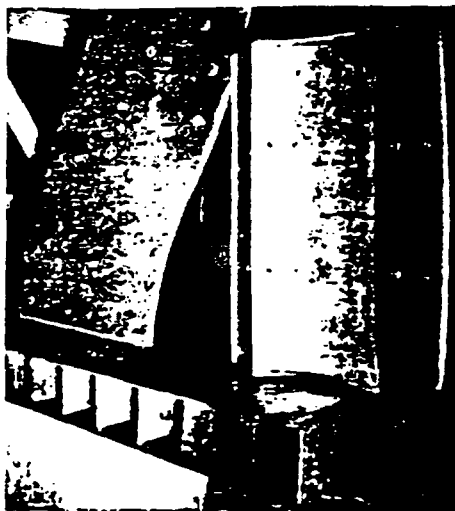
For the control of noise in air-conditioning, and other mechanical equipment, Johns-Manville supplies a number of different materials, the more important of which are described below. Detailed recommendations covering any sound control problem may be had on request.

Air-Conditioning Equipment

In all air-conditioning systems, quiet operation is an important consideration. Self-contained units should have the mechanism isolated from its housing, the usual metal panels of which should be lined with an efficient sound-absorbent, such as J-M Air-Acoustic Sheets or Sound Isolation Blankets.

Air-Acoustic Sheets are rigid, non-combustible, moisture-resistant, sound-absorbent sheets made of rock wool with a suitable binder. They are furnished 24 x 36 in., in thicknesses of $\frac{1}{2}$ and 1 in.

J-M Sound Isolation Blankets are composed of $\frac{1}{2}$, 1 or 2-in. thickness of rock wool stitched between sheets of flame-proofed muslin, or flame-proofed muslin one side and flame-proofed kraft paper the other. Both styles of Sound Isolation Blankets are available in roll form in widths of 22 and 36 in., and in special sizes on order.



Typical Acoustically-lined Duct

J-M Air-Acoustic Sheets installed in typical bend and sub-divided duct.

In large systems, air-conditioning equipment should be located in a separate room which has been sound-isolated and treated with sound-absorbent material, with the mechanical units individually mounted on J-M Vibration Isolation Platforms (described later). Ducts should be lined with a material which must be fire-proof, highly sound-absorbent, moisture-resistant and having a surface which will not materially increase friction losses in the duct system. J-M Air-Acoustic Sheets meet these specifications completely.

Mechanical Refrigerators

Mechanical refrigerators are usually provided with adequate vibration isolation for the power unit, but openings for motor and condenser ventilation necessitate noise-reduction in the machine compartment. This may be successfully accomplished by lining it with Air-Acoustic Sheets or with Rock Wool Panels, Style No. 2111, made of rock wool enclosed on back and edges with chipboard and surfaced on the exposed side with wire screening, supplied in sizes from 6 x 12 in. to 24 x 42 in., and $\frac{1}{2}$, $\frac{3}{4}$ and 1 in. thick. Silento Felt may also be used, or Wool Deadening Felt, an unsaturated rag felt, made in three weights, $\frac{3}{4}$ lb., 1 lb. and 1 $\frac{1}{2}$ lb. per sq. yd.

Oil-Burning Equipment

For a conversion oil burner connected with an existing heating plant, the most that can be accomplished in noise-reduction is to enclose it in a sheet metal housing lined with Air-Acoustic Sheets or with J-M No. 102 Banacoustic Blanket, made of rock wool felted between 1-in. mesh wire, supplied 2 x 4 ft. and 2 x 8 ft., in 1, 1 $\frac{1}{2}$ and 2-in. thicknesses, and in cut pieces on special order.

In a self-contained oil burner and boiler, the combustion roar can be lessened by isolating the boiler from the housing and covering the boiler assembly and lining the housing with J-M No. 102 Banacoustic Blankets.

Metal Furniture

The objectionable noise frequently occurring in panels of metal furniture can be quieted by increasing the stiffness of the panel and applying J-M Pre-Cemented Silento Felt to the interior surface.

This is a special, asphalt-saturated felt, approximately 1/16 in. thick, with a factory-applied coating one side, which is rendered adhesive, for application, by using a solvent. In place, the felt will withstand temperatures to 300° F. without bleeding or slipping and may be painted or oven-dried as required. Furnished in 100-ft. rolls in 24, 32 and 36-in. widths, and in cut pieces on order.

Machine Isolation

J-M Vibration Isolation Platforms, individually designed for the particular condition and location, make possible the allocation of machinery and motor units at points of economic advantage without creating a disturbance in the adjoining parts of the building. These platforms consist of a top, to which the machine is later fastened, secured on tiers of stringers, which are separated and supported by vibration-absorbing "chairs," with a fill of loose rock wool placed between the stringers and secured by an apron.

Detailed Recommendations

JOHNS-MANVILLE offers complete acoustical, noise absorption and sound isolation service and materials, including the technical assistance of its corps of acoustical engineers. You are invited to submit your sound control problems to us.

Johns-Manville

INDUSTRIAL FRICTION MATERIALS

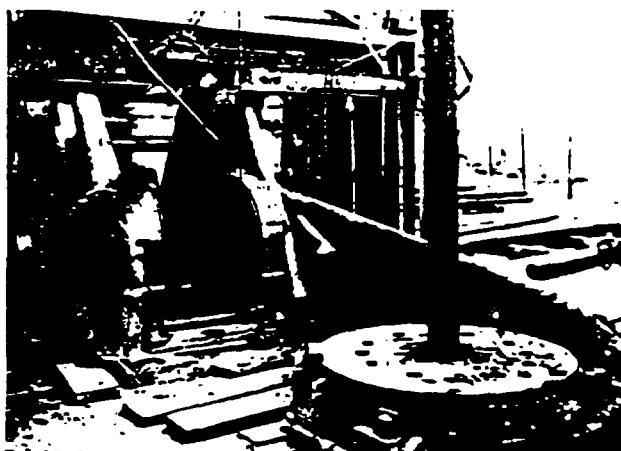
Johns-Manville has served industry for many years with a complete line of dependable industrial friction materials which have established new records for maintenance and power economies when applied to hoists, winches, shovels, draglines, aerial tramways, inclined planes, cranes and other equipment. It is very significant that for many years most of the manufacturers of industrial equipment have standardized on Johns-Manville Friction Materials.

JOHNS-MANVILLE Friction Materials are of both flexible and rigid type, to meet every service condition and all designs of equipment.

The flexible styles, which include the various woven linings and the woven and compressed and folded and compressed materials, are readily adaptable to all sizes of drums. These linings are suitable for average and high-speed operation, have high frictional value and maintain a relatively constant coefficient of friction through a wide range of temperature. Due to a certain amount of resiliency, the flexible linings readily conform to irregular surfaces and do not require any wearing-in period.

The rigid styles, which include J-M Asbesto-Metallic Friction Blocks and J-M Moulded Lining, are noted for mechanical strength, uniformity of friction, smooth, quiet operation and long life in severe, low or average speed service. The wearing-in period is relatively short. Because of their high mechanical strength, they are particularly adaptable to severe shock service where there is tendency to crush or shear the friction material due to the sudden application of heavy loads.

Both flexible and rigid styles possess to an unusual degree the three fundamentals required for a friction material in industry—heat resistance, mechanical strength and durability.



Rotary Well-Drilling is a Supreme Test of Both the Brake Lining and the Drum

Ideco Rotary Draw Works made by International Derrick & Equipment Co., are equipped with J-M Friction Materials.



Saving 79% of Paper Machine Brake Costs

Before J-M Brake Blocks were used, drag line braking cost \$359.00 a year in the Bogota P & B Corp. plant. Now it costs \$76.00 a year.

J-M Woven and Compressed Lining Style No. 900

This new, general utility woven lining for severe service, is the most recent advance in the development of asbestos friction materials. It is made of wire-inserted asbestos yarns, woven into a solid, single-ply structure and impregnated with a heat-resisting compound. It has the same low rate of wear and the general frictional characteristics of folded and compressed lining, yet, because of its solid woven structure, is free from ply separation at high temperatures. Its range of application is wide, as it is adaptable to various speeds and is strong enough mechanically to endure shock loads. It is particularly satisfactory in high temperature service as a replacement lining for worn drums.

J-M Folded and Compressed Lining Style No. 600

The most widely used general utility lining. It readily conforms to various size drums, is strong and adaptable to average speed and shock load conditions. It will resist temperatures up to 500° F. satisfactorily and its frictional value remains within reasonable limits through a wide variation of temperatures. Its rate of wear is unusually low, considerably below that of other woven or moulded materials. Style No. 600 has a wide range of application and has no superior for field replacement especially on worn drums.

J-M Giant Woven Lining Style No. 400

J-M Heavy Duty Woven Lining Style No. 500

These are exceptionally high quality linings of the flexible class, dense, solid-woven, with multi-metal wire insertion and

impregnated with a high heat resisting compound. The coefficient of friction is relatively high and constant through a wide range of temperature. The wear factor is very low. The varied metals in the wire insertion reduce scoring tendencies to the minimum even when used on steel friction surfaces.

J-M Standard Woven Lining Style No. 300

A dense, solid woven lining with brass wire insertion and impregnated with a heat-resisting compound. It is particularly adaptable to light high speed service where a relatively high and constant coefficient of friction is required through a wide range of temperature.

J-M Standard Oil-Resisting Woven Lining Style No. 304

Has same structure as Style No. 300, but is impregnated with an inorganic compound to resist oil. The inorganic impregnant is not thermally plastic and under heat shows an increase in frictional value rather than a fade. The lining is somewhat porous, thus giving the oil a chance to drain through the lining as the oil film is broken.

J-M Giant Oil-Resisting Woven Lining, Style No. 404

Has same structure as Style No. 400 and is impregnated with an inorganic compound. With the same characteristics as Style No. 304, it is furnished in heavier thicknesses.

(Note—Oil-Resisting Linings are not carried in stock, and are made on special order only.)

J-M Giant Rotary Woven Lining Style No. 410

Similar in structure to Style No. 400 lining but is impregnated with a high heat-resisting compound especially suitable for brakes on rotary draw works used in connection with oil well drilling. This lining is rugged, has great resistance to wear and heat, and maintains a high frictional value with minimum fade, through a wide range of temperature. Smoking and dusting of the lining has been minimized.

The incorporation of lead and zinc wire with the brass wire lessens scoring tendencies and considerably increases the life of the brake drums.

J-M Asbesto-Metallic Friction Blocks Styles No. 100 and No. 120

Asbesto-Metallic Friction Blocks belong to the rigid class of friction materials. They are made from asbestos, brass wire and rubber composition, hydraulically formed in a mould and cured by heat and pressure to the required shape.

Because of their mechanical strength, they are particularly adapted

for severe shock service, and, due to their high heat-resistance, should be used where temperature is a factor. Their coefficients of friction remain remarkably constant through a wide temperature range.

Style No. 100 Friction Blocks are designed primarily for use on cast iron friction surfaces. Style No. 120 Blocks are recommended for steel surfaces.

J-M Moulded Friction Lining Styles No. 200 and No. 220

These moulded linings are of the rigid class and have practically the same composition as the block material, but of less thickness. Although rigid, this material is readily adaptable to wrap bands, either internal or external. Style No. 200 Moulded Lining is recommended for cast iron friction surfaces; Style No. 220, for cast steel.

(Note—Sketches or accurate dimensions are necessary when ordering block materials.)

Clutch Facings

Facings for both cone and disc clutches can be made from any of the above mentioned materials. Insert blocks can also be furnished from J-M Asbesto-Metallic Block material.

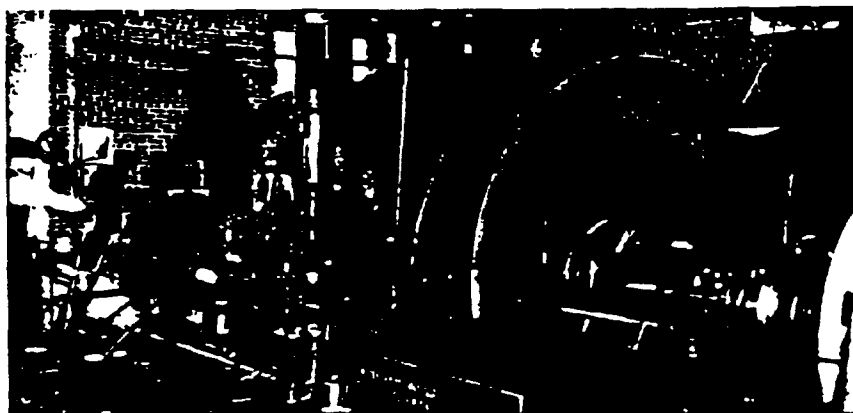
J-M Rivet Hole Plugs Style No. 1200

J-M Rivet Hole Plugs are used for filling the countersinks in the rivet holes.

Style No. 1200 contains graphite and in composition is similar to Style No. 120 Asbesto-Metallic Brake Block. Rivet Hole Plugs are recommended for use with all styles of block and fabric linings operating against both steel and cast iron surfaces.

The advantages in their use include: Reduction of scoring tendencies by preventing accumulation of dirt in rivet holes; and an increase of braking surface.

J-M Rivet Hole Plugs are shipped in a plastic condition and are packed in air-tight containers. Caution must be taken that the lid of the container is on tight at all times to prevent drying out of the plugs.



Mining and Quarrying Operations Generally Impose Heavy Loads on Hoisting Equipment

First cost, shutdown losses and labor costs for friction renewals are big factors. The correct friction material will save time and money on any hoist.

Johns-Manville

ELECTRICAL MATERIALS

Johns-Manville offers a group of electrical products designed to reduce the investment in distribution facilities. All of these materials are mineral in composition, permanent in nature and fireproof or highly fire-resistant.

TRANSITE CONDUIT and KORDUCT

Electrical conduit, made of the well-known J-M Transite, asbestos-fibre and cement formed into a dense, close-grained, homogeneous tube, combines all the desirable qualities essential to the ideal cable ductway.

It is non-combustible, immune to internal or external corrosion or electrolysis, unaffected by moisture, heat or frost and highly resistant to the action of soil acids or alkalis. The thermal conductivity of the material is relatively high, approximately 4 B.t.u. per sq. ft., per hour, per degree F. temperature difference, per inch of thickness, which facilitates the rapid dissipation of the heat generated within cables in service. Such conduit is non-inductive, offers extraordinary resistance to arcing and, since it is composed entirely of inorganic substances, a cable burn-out will not generate smoke, fumes or combustible gases.

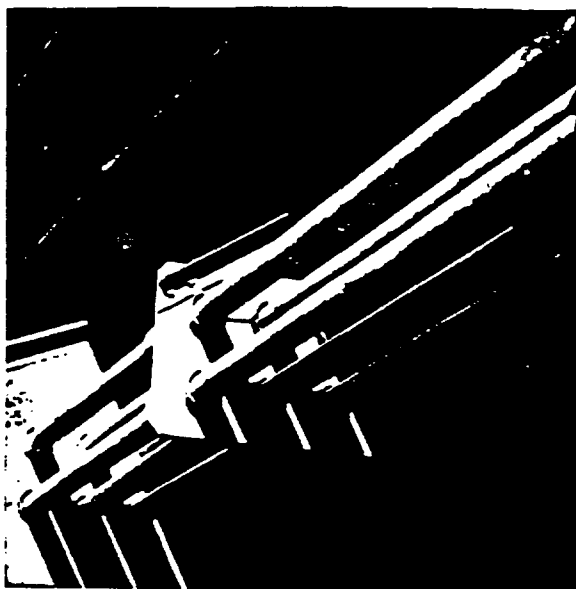
Formed on a highly polished steel mandrel, it has a smooth, uniform bore, which, with its low coefficient of friction, permits long cable pulls without undue strain and with no danger of injury to the cable sheath. Tapered ends of the conduit and tapered couplings, both accurately machined to fit, insure tight joints, with rapid assembly. Furnished in 10-ft. lengths, the longest length of section available in non-metallic conduit, it affords the greatest economy in transportation, handling and installation.

Electrical conduit of Transite is available in two forms: Transite Conduit, for use as underground or exposed conduit without a concrete envelope or other protection; and Transite Korduct, identical in material with Transite Conduit but of lighter wall thickness, for use in the construction of duct lines where the conventional concrete envelope is used.



Transite Conduit Underground

Bare Transite Conduit used underground by the Staten Island Edison Co. Exceptionally strong, it needs no concrete envelope.



Transite Conduit Overhead

Transite Conduit permits the use of bare busses on runs through process buildings in the Nitrogen Fixation Plant of Shell Chemical Co., Shell Point, Cal.

Transite Conduit

Transite Conduit is a remarkably strong, homogeneous and inert material of close grain-structure with a density of approximately 125 lbs. per cu. ft. Compared with first quality ordinary concrete, the conduit has about six times the tensile strength and three times the compressive strength. Its strength, combined with its comparatively light weight, makes possible its use in relatively long lengths. It will stand all ordinary stresses and abuse incident to shipping, handling, installation and operation, both as an underground and an exposed conduit. It may be stored in the open or under cover, to any convenient height. It is not affected by weather or frost and will not deform under the heat of the sun, regardless of length of exposure.

Transite Conduit affords the flexibility and all the other advantages of a single bore conduit, yet is easily assembled in multiples, on the job or in the shop. Its workability is such that it may readily be cut, tapered, drilled or otherwise machined economically, in shop or field. Fittings are available made of the same material as the conduit.

As an underground conduit without a concrete envelope, it has been very successfully used as the regular radial or network distribution system. It is extensively used for services from manholes to buildings and from manholes to pole-risers.

As an exposed conduit and bus protector, Transite Conduit has met with general favor. It is very highly fire resistant. Since

JOHNS-MANVILLE ELECTRICAL MATERIALS

it is non-metallic, there are no induction losses when it is placed around conductors, carrying only one phase of alternating current. Its light weight and ruggedness also recommend it for such service.

Transite Conduit is unexcelled as a conduit for rail jumpers. It resists the unusual corrosion and vibration conditions encountered in such service and decreases maintenance.

STANDARD DIMENSIONS AND WEIGHTS OF TRANSITE CONDUIT

Size (I.D.) in.	Size (O.D.) in.	Wall thickness, in.	Standard length, ft. and in.	Approx. weight, lb. per lin. ft.
2	2.50	.30	3-0	2.1
2½	3.19	.34	3-0	2.6
3	3.64	.38	3-0	3.3
3½	4.14	.42	10-0	3.7
4	4.64	.46	10-0	4.1
4½	5.20	.50	10-0	5.1
5	5.70	.54	10-0	5.7
6	6.70	.58	10-0	6.7

*Thicknesses and weights are subject to a tolerance of plus 5 percent.

**The weight shown includes one Harrington (Tapered Sleeve) Coupling per standard length of conduit.

2, 2½ and 3-in. conduit may be had in 10-ft. lengths on special order; 4, 4½, 5 and 6-in. conduit may be had in 5-ft. lengths on special order.

Transite Korduct

Transite Korduct was developed by JOHNS-MANVILLE to provide the desirable qualities of a Transite duct in the lightest usable wall strength. It is identical with Transite Conduit with the single exception of wall thickness, and the properties affected by such difference. It is not recommended for installation underground without a concrete envelope, nor in exposed locations where considerable mechanical strength is required. In both of these fields, Transite Conduit has proved itself pre-eminently suitable. However, in its own field, as a protected duct, Transite Korduct has no superior for satisfactory service and economy.



J-M Transite Korduct

On a 10-way duct line (2 tiers), for a large Eastern utility. In service with a concrete envelope.

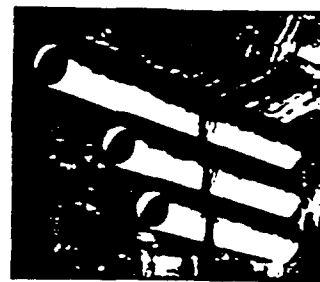
Sufficient strength is built into this material to insure satisfactory shipping, handling, storage and installation in a concrete envelope. It is the ideal material for constructing duct lines where the conventional concrete envelope is used. To a greater degree than any other conduit material on the market today, Transite Korduct combines permanence, incombustibility, smoothness of bore and rapid dissipation of copper heat with economy of installation resulting from light weight and long sections.

Transite Korduct is of distinct advantage where ducts must be provided in concrete structures, such as bridges, tunnels, dams, foundations, retaining walls, floors or any other masonry or concrete structure, as well as all underground conditions where a concrete envelope is essential. In such construction, it has all the exceptional features of a Transite duct with the added advantage of economy in transporta-

tion and installation costs.

Transite Korduct is available in the same sizes and lengths as Transite Conduit.

Heavy tin-plate couplings are standard with Korduct, being economical and avoiding the necessity for tapering the duct. Since Korduct is always concrete-encased, the durability of the coupling is immaterial. However, Harrington asbestos-cement couplings are available.



Transite Korduct on Midtown Hudson Tunnel, N. Y.

On these communication cables Korduct's light weight and long lengths cut material and labor costs. (Concrete casing used.)

J-M Duxseal

J-M Duxseal is a plastic, putty-like material developed by JOHNS-MANVILLE primarily for use by electric power companies and telephone companies to seal the openings of ducts running from manholes to building basements, street-lighting standards and similar locations. Its characteristics make it desirable, however, for many other electrical uses.

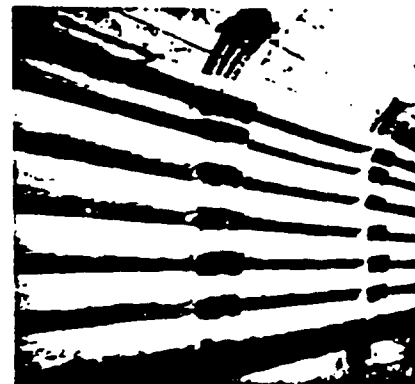
It will adhere readily to the wall of any type of duct, if it is reasonably dry and clean, and to the lead sheath of cables or to other metals; can be easily removed and completely salvaged. It is not thermo-plastic and will not slump away from the sides or tops of ducts or cables, yet will permit the ordinary movement of cables due to changes of temperature. It has very slight tendency to set or harden in service, a tough, dry film merely forming on the surface exposed to the air. It is insoluble in ordinary ground waters and is not affected by gases or condensates usually encountered underground.

Niagrite-Asbestoment Cable Fireproofing

J-M Niagrite-Asbestoment Cable Fireproofing is a combination of an asbestos insulating felt and an arc-proofing cement which will protect adjacent cables from communicated damage, not alone from the arc of a cable breakdown but also from oil or gas fires even of long duration. It is inexpensive and easy to apply. Both materials being selected for their practically negligible effect on load, it produces no corrosive action on the cable sheath, and will withstand intermittent or continual immersion with no effect on its fireproofing qualities. Complete details and instructions for application furnished on request.

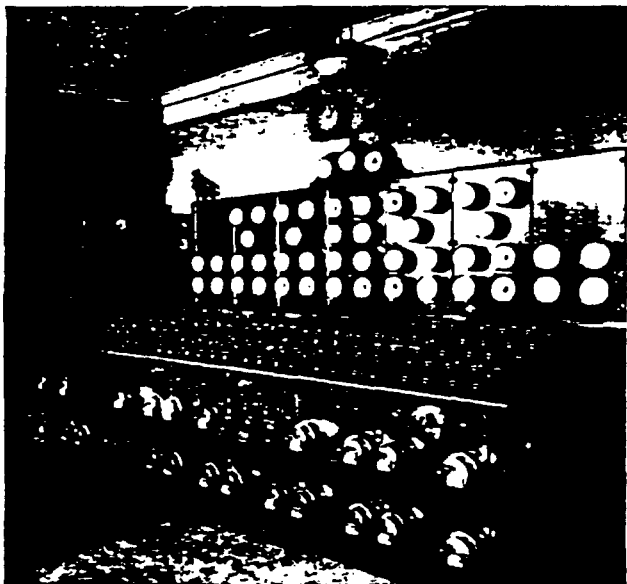
Niagrite in Cable Tunnel, City of Los Angeles

Single wrapping of ½ x 3-in. standard Niagrite, half lapped with heavy layer of Asbestoment on outside to protect the Niagrite and give a smooth appearance.



Asbestos Ebony

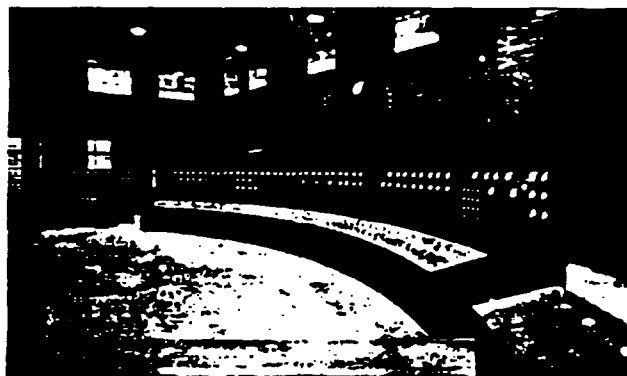
Asbestos Ebony is a densely pressed sheet of asbestos fibre and binding cement, impregnated with an insulating compound, ebony-like in appearance. It is employed for switch-board panels, controller plates, switch bases, bus bar supports and other electrical mountings. Because of its structure, it will withstand shock and vibration, is unaffected by sudden temperature changes, such as caused by arcs or flashovers, and will not shrink, crack or buckle under severe service conditions. It is impervious to water, oil, gas and ordinary chemicals.



Asbestos Ebony bench board at Bureau of Power and Light, Dept. of Public Service, City of Los Angeles, Cal.

High dielectric strength, insulation resistance, mechanical strength and durability, although relatively lighter in weight than other materials used for similar purposes, are its principal characteristics.

Asbestos Ebony is furnished in sheets 36 x 48 in. in thicknesses from $\frac{1}{4}$ to 4 in. and in sheets 42 x 48 in. and 42 x 96 in. in thicknesses from $\frac{1}{4}$ to 4 in., or finished panels of any size within these limits.



Asbestos Ebony control bench and instrument boards at the North Side Pumping Station, Chicago, Ill.

Johns-Manville Ohmstone

There is continually present in open hearth steel mills a fine, metallic dust which settles on every piece of apparatus. This dust deposit on panel faces causes an electrical leak between parts of opposite polarity which eventually results in a carbonized path, if the panel is of any moulded composition. These carbonized paths may, for a time, be removed by sanding the panel surface, but gradually reach a troublesome depth. Panel surfaces of Asbestos Ebony, as well as all hot or cold-moulded materials used for electrical insulation purposes, are affected by this condition.

J-M Ohmstone has been developed to provide a material immune to such carbonization. It is a non-impregnated, asbestos-cement sheet that will stand shock and vibration, designed for use as controller face plates or rheostat mounts in steel mills and other dust-laden process plants where electrically conducting dust is present, or for service under more severe heat conditions, continuous or intermittent, than those for which J-M Asbestos Ebony is suited.

J-M Ohmstone is furnished in stock sheets of the following sizes in $\frac{1}{4}$ to 2-in. thicknesses: 36 x 48 in., 42 x 48 in. and 42 x 96 in. While the natural color of the base material is a deep slate gray, Ohmstone is sprayed before shipment with a non-carbonizing lacquer which gives a non-glaring black surface, the identical lacquer and finish which is used on J-M Asbestos Ebony.

OHMSTONE CHARACTERISTICS

(1) **Durability**—J-M Ohmstone is a dense, homogeneous, monolithic sheet, not laminated. It will not warp or shrink under normal conditions. Sudden temperature changes, due to arcing between closely mounted apparatus, or flashovers, do not result in rupture. The material actually grows stronger and tougher with age.

(2) **Density and Hardness**—Ohmstone has a specific gravity of approximately 2 and weighs approximately 124 lbs. per cu. ft. It has a Brinnell hardness in excess of 20 and does not contain either hard spots or spongy areas.

(3) **Resistance to Surface Arc**—In its ability to withstand surface arcing without carbonization, Ohmstone surpasses all other synthetic insulating slab materials.

(4) **Dielectric Strength**—The dielectric strength of Ohmstone is in excess of 20 v.p.m. or 20,000 v. per inch of thickness. Where exposed to severe conditions of high humidity and temperature, its dielectric properties are somewhat reduced by surface absorption.

(5) **Temperature Limits**—Ohmstone has a safe working temperature limit of 400° F., but is capable of withstanding, without damage to its electrical properties, occasional heat exposure, flame or arc, far in excess of this limit.

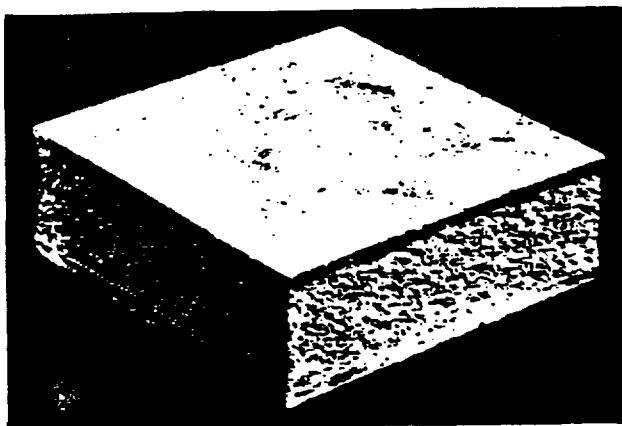
(6) **Moisture Absorption**—The water absorption of Ohmstone is less than 1% in 48 hours of total immersion.

(7) **Tensile and Compressive Strength**—Measured both lengthwise and across the sheet, Ohmstone has a modulus of rupture of not less than 4,000 lbs. per sq. in. in $\frac{1}{2}$ -in. thickness, and 2500 lbs. per sq. in. in greater thicknesses. The compressive strength of Ohmstone, in $\frac{1}{2}$ -in. thickness is not less than 15,000 lbs. per sq. in., and in greater thicknesses, not less than 10,000 lbs. per sq. in.

(8) **Workability**—Ohmstone can be worked with ordinary machine tools or, if necessary, with hacksaw and hand drill. Where possible, machining on Ohmstone should be done with abrasive wheels, rather than with steel cutting tools.

Expanded Transite For Cell Structures

Expanded Transite, one of the latest J-M research developments in construction material for the electrical field, is an exceedingly useful and economical material for erecting cell structures, barriers, partitions, compartments or housings for electrical apparatus. It is made of an expanded Transite core faced on both sides with sheets of standard Transite, all bonded under tremendous pressure into one strong slab, relatively light in weight but with remarkable strength. Low in erected cost, it overcomes the undesirable features incidental to monolithic concrete or masonry and practically eliminates the through metal connections necessary in the use of natural or precast slabs of other materials.



Expanded Transite

The dense faces and expanded core achieve great strength with light weight.

Expanded Transite, used in combination with Flat Transite, described elsewhere, offers extraordinary advantages in strength, light weight, facility of fabrication and decided economy as compared with other materials in the erection of complete structures.

Expanded Transite is available in standard sheets 48 x 96 in. with an overall thickness of 2 in. (two $\frac{1}{4}$ -in. faces with $1\frac{1}{2}$ -in. expanded core) but greater thickness of core can be supplied on special order.



Transite Cell Structure at the Westchester Lighting Company, Port Chester (N. Y.) Plant

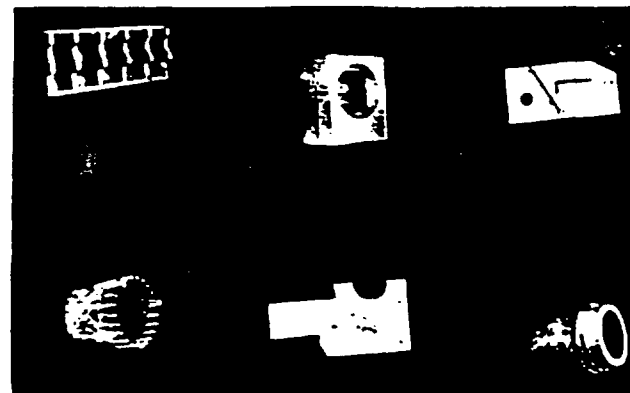
Asbestos Ebony Moulded

Asbestos Ebony Moulded is similar to and has the same characteristics as Asbestos Ebony sheets, except that it is moulded into special shapes with counterbores, slots or grooves, as desired. Used principally as small panels for switches, starters and meters. Available in thicknesses from $\frac{1}{4}$ to $1\frac{1}{2}$ in. in square shapes from 6x6 to 20x20 in., and in oblong shapes, to 20x25 in.

Electrobestos

Electrobestos is composed of asbestos fibre and high temperature clays, cold-moulded to shape, impregnated and heat treated. Widely used for arc or flame barriers and for parts of small ovens, muffles and other apparatus exposed to heat. Well adapted for arc chutes and deflectors, grid buttons, rheostat or shunt bases, moulded panel shapes and ribbed parts.

Electrobestos is not recommended for the mounting of current-carrying parts.



Hundreds of parts such as these can be cheaply moulded from Electrobestos

Electrobestos may be safely exposed to steady or intermittent heat up to 1200° F. Furnished in two types: plain Electrobestos, which has moderate structural strength but great adaptability to sudden temperature changes, and Electrobestos-X, slightly harder and stronger but not so resistant to temperature change. Usually supplied in moulded pieces, in thicknesses from $\frac{1}{4}$ to $1\frac{1}{2}$ in. within size limits of 6x6 in. to 20x25 in., but available in sheet form 30x30 in. in thicknesses of $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 in.

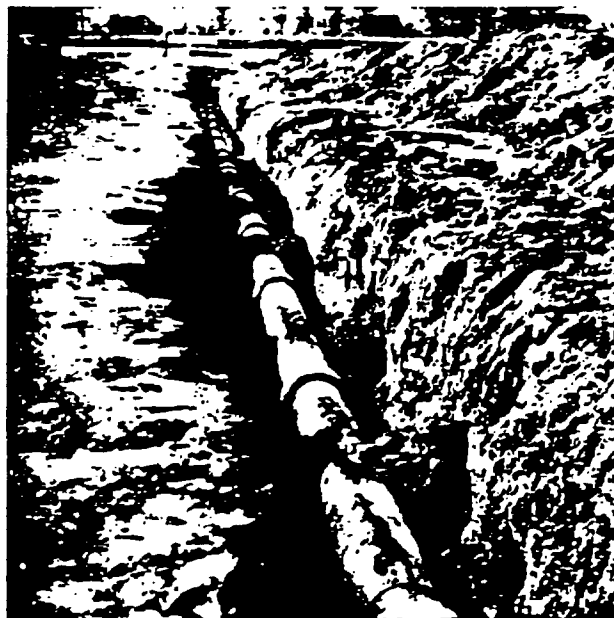
J-M Friction Tapes and Splicing Compounds

J-M Friction Tapes are woven from selected sheetings, impregnated with an insulating compound and coated with a high-grade adhesive rubber composition. They possess high dielectric strength, strong friction qualities, high tensile strength and exceptionally few pin holes. Furnished in $\frac{3}{4}$ -in. widths in three grades of black tape, a blue-gray "dry" type and white. "Hi-Value" grade, a non-raveling black tape, meets A.S.T.M. standard requirements.

J-M Splicing Compounds are uncured rubber tapes used for wire splices. Furnished in three grades, "Hi-Value," which meets A.S.T.M. standards, "Alpha," a gray rubber tape, and "Brooklyn," a general utility black rubber tape.

Johns-Manville

TRANSITE PRESSURE PIPE for Industrial and Municipal Water Lines



A 14-in. Transite Industrial Water Line
Installation at Forstmann Woolen Mills, Passaic, N. J.

Hundreds of municipalities and industrial plants throughout the country are finding in J-M Transite Pressure Pipe the answer to their water transportation problems. Made of asbestos fibre and cement formed under tremendous pressure into a dense, homogeneous mass, Transite Pipe is strong, durable and remarkably resistant to the destructive agencies that ordinarily shorten pipe line life and necessitate continual maintenance expense. Wherever used—for all types of water, in all kinds of soil—Transite Pressure Pipe has rendered trouble-proof, maintenance-free service.

Cannot Tuberculate

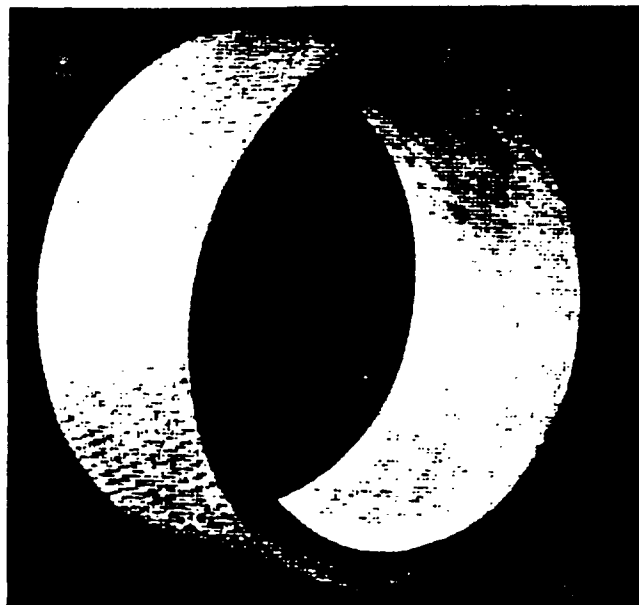
Because it is non-metallic, Transite Pipe cannot tuberculate, thus bringing complete freedom from this most troublesome form of internal corrosion and assuring an abundant supply of clean, rust-free water at all times. Immunity to tuberculation also means that pumping costs will remain permanently low.

Corrosion-Resistant

Transite Pipe's exceptional resistance to soil corrosion is due not only to its asbestos-cement composition but also to the dense structure that results from the high pressure under which it is manufactured. In cinder fills and acid and alkali soils that have proved highly corrosive to other types of pipe, Transite is now giving excellent service.

Immune to Electrolysis

Stray electric currents from high voltage lines or from street railway systems set up a highly destructive action at the point where they leave a pipe line, which condition is intensified where the soil has a comparatively low dielectric strength. Since Transite Pipe is non-metallic, it is immune to electrolysis under all conditions.



Transite Pressure Pipe Cannot Tuberculate

A typical example (right) shows how tuberculation cuts down the effective diameter of water pipe and reduces its carrying capacity, thus increasing pumping costs.

The asbestos-cement pipe (above), after 16 years service for water transportation, still maintains its initial high delivery capacity.



Constant High Delivery Capacity

The smooth interior wall imparted to Transite Pipe by the polished steel mandrel on which it is made provides a surface with minimum resistance to the flow of water. Tests show that Transite Pipe has 13% higher delivery capacity than most other forms of water pipe of same diameter and under same conditions of head and installation.

Moreover, this smooth interior surface is maintained indefinitely and is not affected by tuberculation or corrosion. Transite Pipe, therefore, provides positive assurance against excessive pumping costs, reduced pressures, cleaning expense, shutdowns and costly renewals. This constantly maintained high delivery capacity is Transite Pipe's outstanding characteristic.

Flexible, Bottle-Tight Joints

The special Simplex Coupling used in underground Transite lines is not only bottle-tight even under severe vibration, but is sufficiently flexible to permit making long sweeps without the use of special fittings. All but the sharpest curves can be made with straight sections of pipe. Consisting of a Transite sleeve and two rubber rings, Simplex Couplings are easily and quickly assembled, and are largely responsible for the low installation cost of Transite Pipe.

Elimination of all water loss by the permanently tight Simplex Couplings reduces operating expense, helps to maintain adequate pressures at all times and prevents the breaks in mains so often caused by joint leakage washing away the supporting soil.

If the pipe is to be installed above ground, plans should be submitted so that suitable hangers and anchorage may be designed.

Low Installation Costs

Despite its many advantages, Transite Pressure Pipe usually costs no more, installed, than any other type of pipe. Its relatively light weight results in appreciably lower handling costs—all but the largest sizes can be handled without mechanical equipment. No special working tools are required. The pipe can be cut with a hacksaw or with a well-set wood saw. Service connections can be installed with the same tools now in use, while the line is wet or dry. Valves, also, can be cut into lines with the same equipment now used for other kinds of pipe.

But the Simplex Coupling is primarily responsible for the low cost of laying Transite Pipe. The installation is simple and rapid and skilled labor is not necessary. Mechanically assembled, these couplings can be applied in one-third to one-half the time required for making an ordinary caulked joint. Moreover, the absence of caulking eliminates the need for wide trenches or large bell holes. Further economies are possible in trenching because of the flexibility of the coupling and the fact that extreme accuracy as to line or grade is not necessary.

Also Used for Process Lines

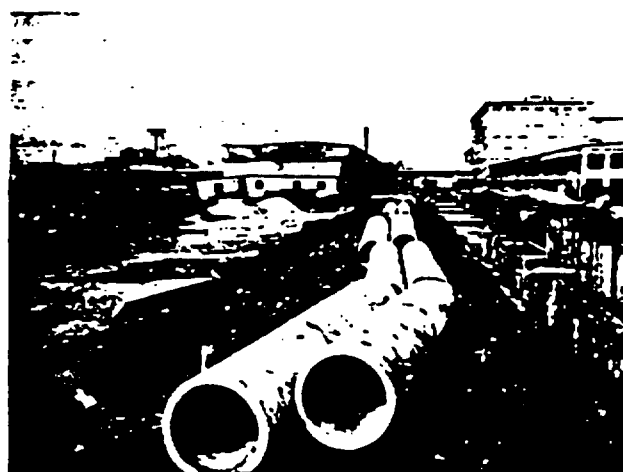
Transite Pressure Pipe, either plain or coated, has also been used successfully for handling a number of different types of process liquors. Recommendations in each individual case will be gladly furnished by JOHNS-MANVILLE. Inquiries should specify the exact service involved.



Immunity to Electrolysis Makes Transite Pipe Advisable in Proximity to Electric Railways



An Example of the Flexibility of the Simplex Coupling



The Combined Destructiveness of Tide Water and a Cinder Fill Necessitated this Replacement with Transite Pipe

JOHNS-MANVILLE TRANSITE PRESSURE PIPE FOR WATER TRANSPORTATION

Sizes and Pressures

Transite Pressure Pipe is manufactured in three pressure classes as follows:

Class (Working Pressure)	Equivalent head, feet of water
50	115
100	230
150	345

Transite pipe is furnished in standard sizes 2 to 36-in. diameter, inclusive. Standard lengths are as follows: pipe sizes up to and including 3½ in. diameter, 5 ft.; 4 in., 6½ ft.; 4½ and 5 in., 10 ft.; 6 in. and larger, 13 ft.

Details and Specifications

For complete details on Transite Pressure Pipe, including installation specifications, ask for Brochure TR-11A, sent free on request.



Two Men Can Easily Handle a 13-ft. Length of 8-in. Transite Pressure Pipe

All sizes up to 18 in. can be handled without mechanical equipment.

TRANSITE CLASS S PIPE for Industrial Vents and Stacks



A Transite Stack

Transite Stacks are absolutely weatherproof and highly resistant to corrosive fumes.

Transite Class S Pipe, because of its unusual resistance to internal and external corrosion, is rapidly gaining recognition as the outstanding material for venting acid fumes, corrosive vapors and the products of combustion from various industrial furnace operations.

Made of asbestos fibre and cement formed under pressure into a dense, unlaminated structure, Transite Class S Pipe is chemically inert to many of the common industrial gases and fumes, and remarkably resistant to the weak acids that often cause rapid deterioration of metal vents and stacks. Impregnated and coated pipe is also available for special conditions.

Like other J-M Transite asbestos-cement products, Transite Class S Pipe is strong, weatherproof, inherently permanent in character, and unaffected by temperatures up to 700° F. Its smooth, grayish-white surface, which will not discolor on exposure to weather, presents a neat appearance, although it may readily be painted, if desired, to match adjacent walls.

The relatively low heat conductivity of Transite Class S Pipe, compared with metal, is of decided advantage in maintaining the higher stack temperatures necessary for proper exhaust, and at the same time reduces the fire hazard in frame buildings. The higher stack temperatures which it permits also tend to prevent condensation on the inside of the stack or vent, a desirable feature in connection with certain process apparatus.

Economy

The corrosion resistance of Transite Class S Pipe makes its use as a vent or stack most economical by eliminating practically all maintenance or replacement. Its relatively light weight, as well as the convenient lengths in which it is

JOHNS-MANVILLE TRANSITE CLASS S PIPE FOR VENTS AND STACKS

available, not only reduce transportation and handling costs but are also highly desirable when vents are installed in existing buildings, as well as in new structures.

Suspended lines require only the minimum size of supports and impose the least weight, consistent with strength, on existing construction. Stacks may be set on lighter foundations and have ample strength when properly guyed.

Transite Pressure Pipe (see preceding pages) is sometimes used for the lower sections of stacks.

Pipe Sizes and Fittings

Transite Class S Pipe is furnished in sizes up to 5 in. in standard lengths of 10 ft., and in sizes 6 to 36 in. in standard lengths of 13 ft.

Standard fittings, made of the same material as the pipe, are available for all pipe sizes. These include sleeve couplings, which fit over the ends of the pipe or other fittings; 90° and 45° elbows; laterals; tees; reducers; and 90° bends of both 18 and 36-in. radius.

Joints are made by filling the joint space between the sleeve coupling and the pipe with a sulphur-base jointing compound or with J-M Flue Pipe Cement. Fittings are joined to the pipe with a sleeve coupling set in cement, similar to the method used in joining pipe sections.

Details and Specifications

For complete details on pipe and fittings, together with specifications for installation and recommendations for particular conditions, address the nearest J-M office.



Painted Transite Stack at Chase Brass Co.,
Waterbury, Conn.

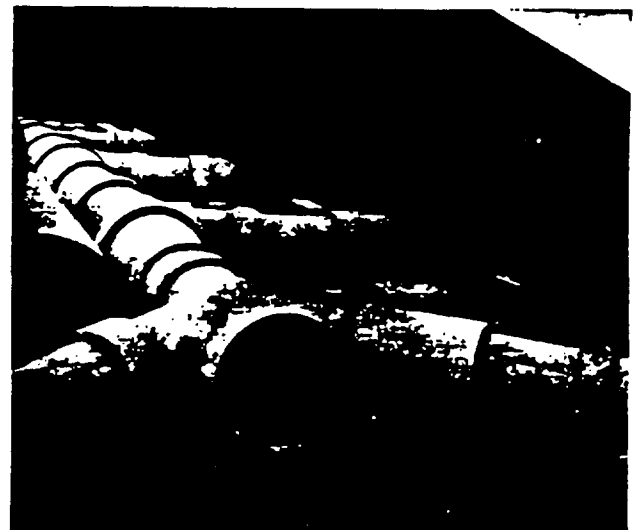
Transite needs no protection against deterioration, but may readily be painted when desired.



Transite Vents in the World's Largest Distillery
Hiram Walker & Sons, Peoria, Ill.



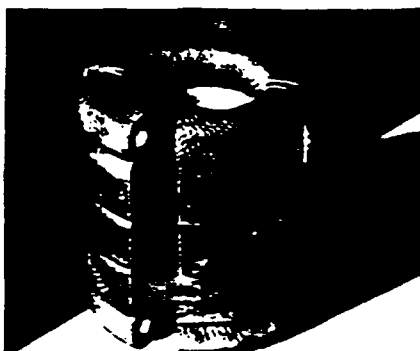
Transite Stack on Roundhouse Power Plant
Used for its resistance to corrosive fumes.



Transite Laboratory Vent System
Ursinus College, Collegeville, Pa.

Johns-Manville

PACKINGS AND GASKETS



Sea Rings are absolutely automatic, save power, reduce wear on equipment, last longer



Centripac is designed especially for centrifugal pump service



Style No. 255, the new patented interlocked braided asbestos packing



The diagonal construction of Style No. 271 allows for expansion

The Johns-Manville line of packings and gaskets has proved its dependability and economy for all types of industrial service. Rod, plunger, valve stem, piston, shaft packing and gaskets for any service — every requirement is met by some J-M product specially designed to serve the purpose.

The J-M Packing Catalog illustrates and describes the complete J-M line. It contains a table of recommendations and all information needed to choose the most efficient and economical material for every packing job. Sent free on request.

J-M Sea Rings

J-M Sea Rings are designed for service against steam, hot or cold water, air, brine, oil and other fluids and chemicals, on rods from $\frac{3}{4}$ in. to 16 in. in diameter, where packing space is $\frac{5}{16}$ in. to $1\frac{1}{4}$ in.

Depending upon the nature of the service, Sea Rings are made of asbestos fabric, or duck, or of a combination of the two, impregnated with heat and oil-resisting materials selected to meet the particular conditions.

The flexible lip is held tightly to the rod on the work stroke by the pressure of the fluid, but releases on the return. *Because unnecessary friction is eliminated, Sea Rings reduce wear on rods and minimize the power required.*

J-M Centripac Packing Styles No. 7, 11 and 18

J-M Centripac Packing is made of long-fibre asbestos yarn, with or without wire in each strand, plaited square and lubricated particularly for service against either fresh or salt, hot or cold water, steam, oil, ammonia, brine, and some weak acids, in use on centrifugal pumps and rotating rods. The materials and method of manufacture insure minimum friction, long packing life and—an important advantage in centrifugal service—no wear on the rod.

Furnished with or without wire, in coil and rings. Also without wire and with a special lubricant for service against gasoline and cold mineral oils.

J-M Interlocked Braided Asbestos Packing Styles No. 253, 254, 256, 257, 259 and 270

J-M Interlocked Braided Asbestos Packing is the most recent development in braided rod packing for service against saturated or superheated steam, hot or cold, fresh or salt water, oils and weak caustic or acids.

The individual strands of long fibre asbestos yarn are so interlocked in the braiding as to form an integral structure—no soft, heavy plaits to flatten; no jackets to wear through. The integral structure has greater resiliency and flexibility. Braided square, it has more contacting area on the rod.

Furnished in coil or ring form, in sizes for every service.

J-M Cross Diagonal Rod Packing Style No. 271

J-M Cross Diagonal Rod Packing is designed for service against hot and cold water, low-pressure steam, ammonia, light oils, and mineral seal oil, on reciprocating rods where the packing space is $\frac{1}{4}$ in. or more.

Made of diagonal plies of first-quality duck, frictioned with a high-grade rubber compound and graphited. The diagonal construction allows for the unusual expansion incident to hot-water and ammonia service. Will also give exceptional service on worn rods. Furnished in spiral, coil and rings.

JOHNS-MANVILLE PACKINGS AND GASKETS FOR EVERY REQUIREMENT

J-M Kearsarge Rod Packing Style No. 166

J-M Kearsarge Rod Packing is designed for service against steam, air, and gas up to 500° F., on reciprocating rods where packing space is at least $\frac{1}{4}$ in.

Made with a folded center block, which contains no rubber friction, and a non-hardening rubber cushion, over both of which is wrapped a double wearing surface of asbestos cloth woven from tightly twisted asbestos yarn.

The construction assures flexibility and resiliency throughout the life of the packing and, by allowing more thorough saturation with the lubricant, retains in service the original softness.

Furnished in coil, spiral and rings.

J-M Mogul Packing Styles No. 193, 222 and 223

J-M Mogul Packing is designed for service against steam, air, water, ammonia, oil and chemicals, where a packing without rubber is required, on valve stems, rods with small packing spaces and centrifugal pumps.

Made of long-fibre asbestos yarn, twisted or braided into coil form, lubricated, and graphited. Contains no wax.

J-M Twisted Mogul, Style No. 193, is the handiest packing for general conditions. By simply untwisting the strands, packing of any desired size may be obtained. Furnished in coils only.

J-M Braided Mogul, Styles No. 222 (round) and No. 223 (square) is especially adapted for reciprocating rods where the packing space is small. Has the body required for such service, as well as ample lubrication to keep it soft and pliable, and to prevent wearing and scoring the rod. Style No. 222 furnished in coil form; Style No. 223, in coil and rings.

J-M Universal Piston Packing Style No. 33

J-M Universal Piston Packing is designed for service against hot water, cold water, brine, air, and oil, on inside-packed pumps where the packing space is not less than $\frac{1}{4}$ in.

Made of layers of asbestos and duck, frictioned together, and folded back and forth on each other to form a wearing surface of rigid shoulders of asbestos and duck which gives greater flexibility and resiliency, longer life, and hence greater economy.

Furnished in spiral, coil and rings.

J-M Moulded Packing Cups

J-M Moulded Packing Cups are moulded to the exact size and shape required, and give long and efficient service against steam, air, water, oil, etc.

They are recommended for use on steam brake cylinders, air hoists, pneumatic chucks, hydraulic presses, valves, etc., and are particularly adapted to slow-moving pistons with relatively short travel, steam and air rams for setting clutches and brakes, steam-operated cylinders on vulcanizers, and air cylinders on foundry moulding equipment.

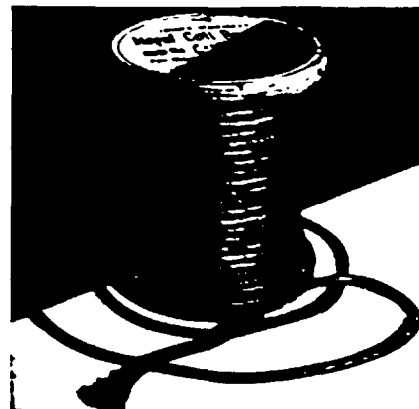
Furnished in a variety of shapes, including regular shaped cups, U-shape, with round or square bottom and "Hat" shape. Filler rings of J-M Mogul or J-M Flax Packing supplied for U-shaped cups.

Depending on the service, they are made of asbestos, duck, or other fabrics, impregnated with heat and oil-resisting compounds selected to meet the particular conditions and temperatures to which they will be subjected.

In moulding leather cups to the shape required, internal strains are produced which weaken the cup in its final form. In the manufacture of J-M Moulded Packing Cups, such heavy distortions are not necessary, and the J-M Cup retains its shape and durability in service.



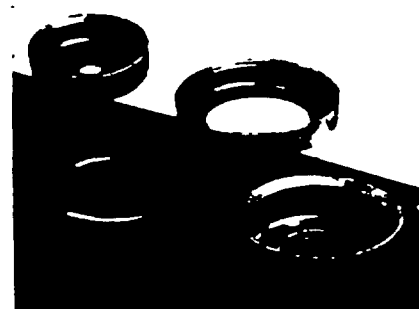
Kearsarge Rod Packing retains its efficiency in service. Note construction of center block



J-M Mogul. An excellent utility packing for general service

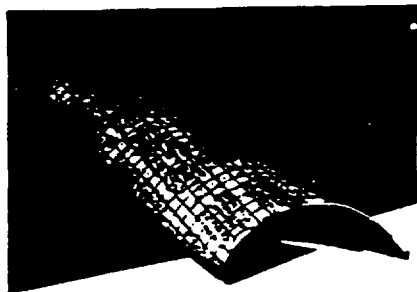


The folded wearing surface of Universal accounts for its durability



J-M Packing Cups are moulded from exceptionally durable materials

JOHNS-MANVILLE PACKINGS AND GASKETS FOR EVERY REQUIREMENT



Service Sheet Style No. 60, is the one sheet packing for all conditions. The absolute uniformity so essential in a sheet packing is carefully safeguarded by rigid factory control



J-M Kearsarge Boiler Handhole and Manhole Gaskets provide a perfect seal every time

J-M Service Sheet Packing Style No. 60

Designed for use on flanges and other parallel surfaces against superheated or saturated steam, gas, oil, air, water, ammonia and some acids, alkalies and other chemicals.

Made of selected long-fibre asbestos and special heat-resisting compound bonded under pressure into a pliable and resilient sheet adaptable to all sheet packing purposes. Can be used successfully in thicknesses one-half as great as rubber. It does not deteriorate with age and can be carried in stock almost indefinitely.

Graphited on one side only; the other surface ruled in 1-in. squares to facilitate cutting. Furnished in sheets 54 x 63 in., 36 x 126 in., 54 x 126 in. and 108 x 126 in., in thicknesses 1/32 in. to 1/4 in., and sheets 54 x 63 in., 36 x 126 in. and 54 x 126 in., in 1/64-in. thicknesses.

J-M Kearsarge Gaskets Style No. 116: Boiler Handhole and Manhole Style No. 118: Jointless Tube Plate

J-M Kearsarge Boiler Handhole and Manhole Gaskets, Style No. 116—Made by folding to proper size and shape plies of Asbesto-Metallic cloth, made from tightly twisted asbestos yarn with a fine wire insertion, treated with a special heat-resisting compound. Edges of folds are on inner side, while on outer side, where gasket is exposed to pressure, there is an unbroken, rounded shoulder. May be used repeatedly, if properly applied.

Furnished in oval form to fit plate for which they are intended. Shapes other than oval furnished on order.

Minimum flange width, 3/4 in. Thickness varies according to the number of plies, each ply being approximately 1/16 in. thick.

J-M Kearsarge Jointless Tube Plate Gaskets, Style No. 118—Are recommended for tube plate work. There are no taped joints to interfere with perfect seating. Made seamless and without a joint, from Asbesto-Metallic yarn woven into tubular ring form, properly folded and treated with the same heat-resisting compound used in J-M Kearsarge Boiler Gaskets.

J-M Flax Packings

Styles No. 188, 189 and 2000 (Regular Lubricated)
Styles No. 181, 240 and 3000 (W.P.H. Lubricated)

REGULAR LUBRICATED FLAX PACKINGS

J-M Flax, Style No. 188—Recommended for service against cold water, either fresh or salt, and brine. It is the finest regularly lubricated flax packing, braided solid, without center or corners, from pure long line flax roving, and lubricated with special lubricant. Marked with black diamond-shaped spots for identification. Furnished in coil and ring.

J-M Flax, Style No. 189—Braided solid and lubricated with special lubricant. Marked with red diamond-shaped spots for identification. Furnished in coil or ring.



J-M Flax, Style No. 2000—A special lubricated blended flax for general industrial packing. Furnished in coil only.

For general flax packing service, Style No. 189 is recommended

W.P.H. LUBRICATED FLAX PACKINGS

J-M Flax, Style No. 240 (W.P.H.)—Designed for severe high pressure or high friction service, where a W.P.H. flax is required. It is the highest quality W.P.H. flax packing that can be made, braided solid, without center or corners, from pure long line flax roving, lubricated with pure Japan wax, and graphited. Marked for identification by small grooves on opposite sides. Furnished in coil, spiral and ring.

J-M Flax, Style No. 181 (W.P.H.)—Designed for moderately severe hydraulic service where a W.P.H. flax is required. Braided solid, lubricated and graphited. Furnished in coil and ring.

J-M Flax, Style No. 3000 (W.P.H.)—A specially blended flax with W.P.H. lubrication. Furnished in coil form only.

All styles of W.P.H. lubricated flax packings are available in three densities: hard, medium or soft. Furnished in medium density unless otherwise ordered. For service where a graphite finish is objectionable, such as on paper stock pumps, white water pumps, etc., they can be furnished without graphite.

Johns-Manville

PACKING SERVICE

Standardization of all materials used in maintenance is the one most effective method of assuring maximum operating service and greatest return on equipment investment. Only by such means can the quality and uniformity of maintenance materials be preserved.

The Packing Service Plan, perfected by **JOHNS-MANVILLE**, is based on exhaustive study in this field, and will accomplish these objectives. The adoption of this plan has been the direct means of saving many thousands of dollars yearly. Indirectly, it has saved countless hours of uncharged time and avoided great quantities of unallocated trouble. The many advantages to be derived have been demonstrated repeatedly and under widely varying conditions.

In every case where it is employed, **JOHNS-MANVILLE** Packing Service reduces the capital tied up in packing stocks, minimizes mistakes in ordering, materially reduces handling and storage costs and provides assurance that the right packing will always be available.

The first step in the J-M Packing Service Plan is a detailed survey of the individual packing requirements, made by J-M engineers. Unnecessary duplications are eliminated and improper applications are corrected. When proper styles of packing have been specified, a chart of packing applications is compiled showing minimum types and sizes.

When the J-M Plan is installed it is recommended that costs be figured for the previous year for later comparison. The plant engineer is requested to keep a packing service record showing accurately the materials used and when repacking takes place. If the record sheet indicates some item is not giving proper service, an immediate investigation is made, so that corrective measures can be taken.

Only a minimum reserve stock of packing need be maintained because of the J-M Distributor Service which is operated in conjunction with the J-M Plan. The J-M Distributor receives a copy of the packing application chart and immediately stocks the exact styles and sizes of packing required. This makes replacements quickly available.

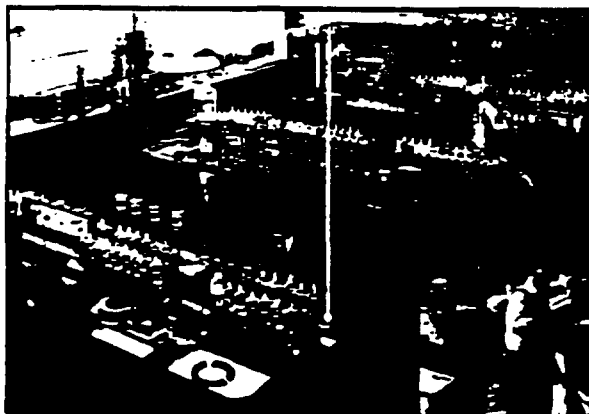
Of first importance are the right packings for all applications. The J-M line of packings has proved its dependability and economy for all types of industrial service. The other essentials are a minimum number of styles and sizes and immediate distributor service. These, combined with a simple record method and an efficient system of ordering and replacing, complete this J-M perfect packing service.



The minimum number of different styles and materials, yet the right packing for any equipment and every service



Security on old or new equipment, resulting from definite recommendations and closely controlled packing standards



Laboratory Control of Materials



Modern Manufacturing Methods



Exactness in Compounding

Over 60 years of manufacturing and field experience are behind every J-M Packing

OTHER JOHNS-MANVILLE PRODUCTS

In addition to the Industrial Construction and Maintenance Materials described in this catalog, Johns-Manville also manufactures a number of other products, some of which are used extensively in Industry while others find their principal application in homes and general building construction.

These products are described very briefly below. In each case complete information is available in special literature which will be gladly furnished on request.

J-M Acoustical Treatment and Sound Control

JOHNS-MANVILLE materials and methods for Sound Control of Mechanical Equipment, which were discussed on page 45, represent but one phase of J-M pioneering in the science of acoustical treatment and sound control.

In the JOHNS-MANVILLE Acoustical Laboratory have been developed a wide variety of sound-absorbing materials designed to prevent faulty hearing conditions in auditoriums, churches, etc., and to keep noise at an undisturbing level in restaurants, offices, hospitals, and similar locations. Still another J-M contribution to Sound Control—the J-M System of Sound Isolation—is an effective means of treating buildings or individual rooms to prevent disturbance from outside sound. All of these materials, as well as anti-vibration machinery platforms, are described in a complete engineering brochure, "JOHNS-MANVILLE Sound Control," DS Series 250.

J-M Underground Pipe Protection

The life of many thousands of miles of underground pipe lines has been materially lengthened by protecting them against corrosion with a wrapping of J-M Asbestos Pipe Line Felt over a bituminous coating. The asbestos felt is strong, providing high resistance to soil stress and protecting the bitumen coating from abrasion. It is inorganic and highly resistant to soil chemicals, water or soil bacteria. JOHNS-MANVILLE also supplies machines for wrapping pipe either in the pipe yard or in the field. For complete information, ask for "JOHNS-MANVILLE Service to the Oil Industry."

J-M Asbestos Textiles and Clothing

A full line of asbestos cloth and clothing is furnished by JOHNS-MANVILLE, as well as braided asbestos tubing and asbestos listing. Fibre, roving and yarn of many different grades are also available. Full details will be furnished on request.

Celite Filter Aids

Celite Filter Aids have been used for more than 20 years for the clarification of sugars, chemicals, oils, fruit juices, varnish and a wide variety of other products. These materials—Hyflo Super-Cel, Standard Super-Cel and Filter-Cel—are pure diatomaceous silica powders which, when mixed with the liquid being filtered and pumped through the filter press, increase flow rate and press capacity, lower operating costs and assure filtrates that are clear and brilliant. For complete information, ask for DS Series No. 450.

Celite Mineral Fillers

Celite Mineral Fillers, prepared from an especially pure form of diatomaceous silica, are made in many different grades to meet virtually every requirement of weight, porosity, abrasiveness, particle size and physical structure. They are used as inert extenders in many products and as the base for a wide variety of polishes and cleansers. For complete general data on Celite Mineral Fillers, ask for DS Series No. 470; for information on the use of Celite in Paint, ask for Brochure FA-10A.

Celite For Concrete

Celite for Concrete, a special grade of diatomaceous silica, is used in portland cement concrete to increase the workability of the mix and to improve uniformity, strength, water-tightness and appearance of the final concrete. It is added at the rate of from 2 to 6 lbs. per bag of cement, depending on the mix. Full details in Brochure CC-1A. Its use in mortar and plasters is described in Brochure CC-4A.

J-M Insulating Board

JOHNS-MANVILLE furnishes not only standard fibre Insulating Board and Insulating Lath for use as sheathing and plaster base, but also a wide choice of decorative insulating board and hard board products to cover practically any requirement. A special Non-Inflammable Insulating Board is also available for use where fire hazard is a factor. Standard and Decorative Insulating Boards are described in Brochure IB-20A. A separate brochure (IB-16A) gives complete information on J-M Hard Board.

J-M Asbestos Wainscoting

J-M Asbestos Wainscoting is made of asbestos fibre and portland cement moulded under great pressure into rigid, fireproof sheets. The face surface has a special "baked on" finish that stands up indefinitely under any normal conditions of use. Available in the following styles: Plain Color Panels or Scored Sheets (4" squares to simulate tile), either of which may be had in white, ivory, light green or light blue; also Marbleized Design in which have been reproduced the appearance of four of the finest marbles.

J-M Asbestos Flexboard

JOHNS-MANVILLE Asbestos Flexboard, a flexible asbestos-cement wall surfacing material, has been quickly recognized by the building industry as an adaptable product of amazing potentialities. This colorful, fireproof, permanent asbestos-cement sheet is so flexible that it can be made to conform to surfaces having a considerable curve, and so workable that it can be sawed and nailed like wood. Its attractive colors (green, buff, rose or slate) are not surface coatings; they go all the way through and are a basic part of the product. It is not only surprisingly low in cost but is also quickly and economically applied. In addition to the Decorative Type described above, Asbestos Flexboard is also furnished in plain buff-colored sheets, known as Standard Flexboard. Ask for folder TR-7A.

J-M Rock Wool Home Insulation

Developed primarily for home insulation, J-M Rock Wool is also widely used for the insulation of schools, hospitals, and various types of commercial and industrial buildings. Efficient, permanent and fireproof, it is the leading building insulation on the market today. For complete details, write the nearest JOHNS-MANVILLE office.



INSULATIONS

For Heated Piping



J-M 85% Magnesia has proven its high insulating value and mechanical strength in decades of economical and satisfactory service.

J-M 85% MAGNESIA PIPE INSULATION

The Universal Insulation for Heated Piping to 600F

LIGHT WEIGHT • HIGH INSULATING VALUE • ECONOMICAL • PROVEN LONG LIFE

Johns-Manville 85% Magnesia is molded into sectional and segmental pipe insulation from hydrated basic carbonate of magnesia bonded with asbestos fiber. The Johns-Manville process provides J-M 85% Magnesia Insulation 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 and the insulation is quickly and easily installed.

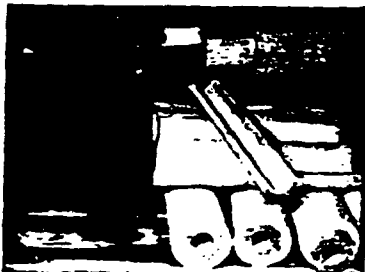
For temperatures above 600F, J-M 85% Magnesia is often used as an outer layer over Superex Pipe Insulation. This construction (Superex Combination) combines the high heat resistance of Superex with the greater insulating value of 85% Magnesia. Thickness recommendations for J-M 85% Magnesia and Superex Combination pipe insulation are tabulated on page 9. Physical and thermal properties of J-M 85% Magnesia are given on page 3.

STANDARD SIZES

Length	Nominal Thickness, in.	Form	Standard finish
3 ft	1 (through 6-in. pipe size only), 1½, 2, 2½—single layer. 2 (through 4-in. pipe size), 2½ (through 6-in. pipe size), also furnished double-layer. 3 and greater normally furnished double-layer but can be furnished single-layer in limited quantities.	Furnished in sectional or segmental form according to pipe size and thickness.	Sectional form furnished with canvas jackets. Segmental form for larger pipe sizes furnished without canvas.

NOTE Also available to fit straight runs of copper tubing with nominal diameters of ½ in. and up. When ordering, OD of tubing to be fitted must be stated.

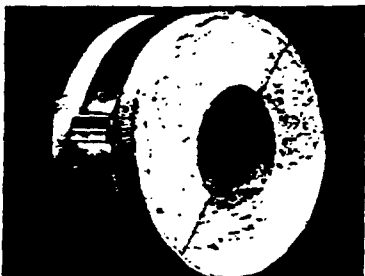
For Heated Piping



Superex Combination Pipe Insulation—an inner layer of Superex and outer layer of J-M 85% Magnesia.



Thermobestos is used for insulating steam and heated process lines with temperatures to 1200F.



Asbesto-Sponge Felted Pipe Insulation stands up under rough usage and mechanical abuse.

SUPEREX® PIPE INSULATION

For Service to 1900F

Made from calcined diatomaceous silica blended with other insulating materials and bonded with asbestos fiber, producing a material of high heat resistance and insulating value. Often used as inner layer in combination with J-M 85% Magnesia (Superex Combination) to combine the greater insulating value of 85% Magnesia with the high heat resistance of Superex. Thickness recommendations for Superex Combination are given on page 9. Physical and thermal properties of Superex are given on page 4.

THERMOBESTOS® PIPE INSULATION

For Service to 1200F

Composed of hydrous calcium silicate combined with asbestos fiber by a special J-M process and used for insulating steam and heated process lines. Above 600F, where pipe expansion is a significant factor, pipe insulation should be applied in double-layer construction with staggered joints. This construction prevents excessive heat losses and surface temperatures at the joints opened by pipe expansion, thus eliminating scorched or burned jackets...eliminates potential fire hazard of exposing jackets to higher temperatures at the joints...minimizes thermal stresses in the insulation by reducing temperature differential across each layer. Thickness recommendations given on page 9. Physical and thermal properties on page 4.

ASBESTO-SPONGE® FELTED PIPE INSULATION

For Service to 700F

Made of asbestos felts so combined to give a spongy laminated material. Felts are wound one over the other to the desired thickness, the cylinder then being slit lengthwise to permit application. Has excellent thermal characteristics and retains these characteristics in service. Can be furnished with an integral weatherproof asbestos jacket or permeable jacket of wire-inserted asbestos cloth for use where subjected to water submersion.

BANROC® PIPE INSULATION—a felted, spun mineral wool fiber insulation which may be used to 1000F under normal conditions. Style No. 25 consists of Banroc secured to expanded metal lath; Style No. 65, to a sheet metal jacket.

STANDARD SIZES

J-M Insulation	Length	Thickness, in. (to fit standard pipe sizes)	Standard Finish
SUPEREX	3-ft sections and segments.	Nominal 1 (through 6" pipe size only), 1½, 2, 2½ and 3.	Canvas jacket for pipe sizes 1½" and smaller.
*THERMOBESTOS	3-ft sections.	Nominal 1 (through 6" pipe size only), 1½, 2, 2½, 3, 3½ and 4—single layer. Nominal 2 (through 4" pipe size), 2½ (through 6" pipe size) and greater also furnished double-layer.	Canvas jacket.
*ASBESTO-SPONGE FELTED	3-ft sections.	1 to 2½, single-layer; 2½ and over, double-layer.	Canvas jacket (lacquered metal bonds furnished).
BANROC STYLE NO. 25	2-ft sections.	1, 1½, 2, 2½, 3 and 4 for all standard pipe sizes 2" in diameter and larger.	Finishing cement and canvas jacket for interior work (not furnished); weather-proof jacket for outdoor work (not furnished).
BANROC STYLE NO. 65	2-ft sections with 2" extra casing length for end laps.	1, 1½, 2, 2½ and 3 for all standard pipe sizes 2" in diameter and larger—4 in 4", 6", 8", 10" and 12" pipe sizes only.	24-gage galvanized sheet metal outer casing with flange seam containing ¼" galvanized stove bolts.

*Also available for straight runs of copper tubing with nominal diameters of ¾ in. and up.



INSULATIONS

For Low Temperature Piping

FIBROCEL® PIPE INSULATION

For service temperatures from 35F to 300F

Fibrocel is a new molded silica insulation expressly developed for use on hot, cold and chilled water lines, low pressure steam pipes and dual service heating and cooling systems.

Fibrocel can't shrink or expand—eliminates gaping joints. It resists compression—retains full-wall thickness . . . is flameproof—resists rot, odor and vermin . . . thermally effective . . . precision formed for exact fit. Fibrocel is economical to apply. It is light in weight, cuts cleanly and easily with a knife, and its firmness and dimensional uniformity assure tight, smooth joints.

Jacket Styles:

Fibrocel C for steam or hot or cold water. Furnished with standard or special weight canvas jacket and metal bands—for service temperatures from 60F to 300F.

Fibrocel VB for chilled water or dual service. Furnished with vapor barrier jacket consisting of metal foil faced both sides with creped natural kraft paper, bonded together with a special non-asphaltic waterproof laminant. Recommended for pipes subject to sweating and particularly adapted for dual service heating and cooling systems operating between 35F and 225F.

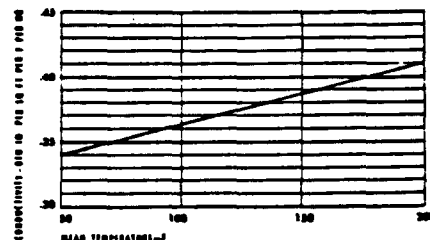


PHYSICAL AND THERMAL PROPERTIES*

Density	9 lb per cu ft
Transverse Strength (Modulus of Rupture)	50 psi
Shrinkage (Moist to dry)	0.05" per 36" length

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

FIBROCEL CONDUCTIVITY

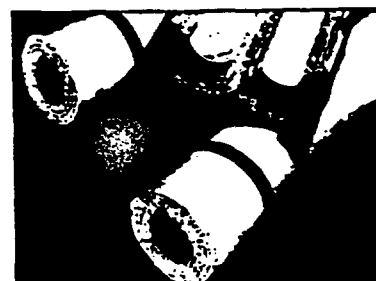


PRE-SHRUNK ASBESTOCEL® PIPE INSULATION

For Service to 300F

J-M Pre-Shrunk Asbestocel is a cellular type of insulation, made up of alternate layers of plain and corrugated asbestos felts, for use on pipes conveying low pressure steam and hot water. Specially-treated, moisture-resistant asbestos paper is used which prevents "breathing," removing the cause of objectionable shrinkage cracks. Furnished in 3-ft. sections to fit standard pipe sizes and in standard thicknesses of 2 to 8 plies, each ply approximately 1/8" thick.

Three finishes available: Glazed White, Asbestos Paper, and Canvas. Also available for straight runs of copper tubing with nominal diameters of 1/2" and up.



Glazed white finish of Pre-Shrunk Asbestocel will not carry flames.

OTHER J-M PIPE INSULATIONS FOR SPECIAL REQUIREMENTS

J-M Insulation	Description	Use	Standard Sizes
*Pre-Shrunk Wool felt	Moisture-resistant indented wool felt with dual-service liner.	Hot and cold water service lines for temperatures between 60 and 225F and with integral jacket, between 45 and 60F.	3-ft lengths; 1/2 to 2 in. thick single-layer; 1, 1 1/2, 2 in. thick, double-layer for pipe sizes 1/2" and up.
*Anti-Sweat	Pre-shrunk insulating and water-proofing felts.	For temperatures above 45F. Keeps water cold—prevents condensation and dripping.	3-ft sections; 1/2 and 3/4 in. thick, single-layer 1, 1 1/2 and 2 in. thick double layer for standard pipe sizes.
*Zero	Layers of hair felt surrounded by several layers of wool felt.	Prevents cold water pipes from freezing under ordinary conditions.	3-ft lengths for all pipe sizes 1/2 in. and up. About 1 1/4 in. thick.

*Also available for straight runs of copper tubing with nominal diameters of 1/2 in. and up.

For Refrigeration Piping



Properly applied, Rock Cork pipe insulation provides an unbroken, seamless sheath—a highly efficient barrier to the flow of heat.

ROCK CORK® PIPE INSULATION

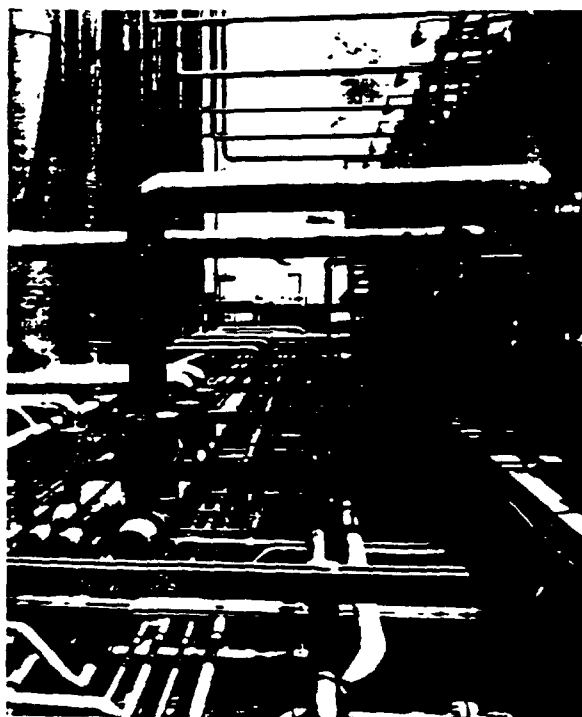
For service to minus 300F

MOISTURE-RESISTANT • PROVEN LONG LIFE

Made from mineral wool combined in production with an asphaltic binder, Rock Cork pipe insulation is further provided with an asphalt-saturated asbestos felt jacket which protects both longitudinal joints, reduces the need for seam-filling compounds and increases the speed of application. Many Rock Cork installations made more than 30 years ago are still paying dividends through efficient, trouble-free service.

Rock Cork is highly moisture-resistant . . . incombustible . . . can't decay . . . will not support mold growth . . . will not harbor bacteria . . . repels insects and vermin. For these reasons, Rock Cork is widely used in the food and beverage industries. It complies with Fed. Spec. HH-I-562 Type II.

Standard sizes of Rock Cork pipe insulation are shown in the table at the bottom of this page. All accessories required for proper application are furnished. Properties of Rock Cork will be found in the table on page 6.



The low conductivity and fire-resistance of Zerolite make it particularly applicable in the oil and chemical industries.

ZEROLITE® PIPE INSULATION

For service to minus 300F

**IMMUNE TO MANY ORGANIC SOLVENTS
FIRE-RESISTANT**

A resin-bonded, mineral wool insulating material, Zerolite pipe insulation is particularly applicable in the oil and chemical industries because of its immunity to attack or damage by many organic solvents, low conductivity and excellent resistance to moisture. It complies with Fed. Spec. HH-I-562 Type II. Furnished with all accessories required for proper application in the sizes shown in the following table. Properties of Zerolite are shown in the table on page 6.

**STANDARD SIZES OF ROCK CORK
AND ZEROLITE PIPE INSULATION**

Thickness	Length	Miscellaneous
ICE WATER (1.4 to 1.9 in.)	3-ft sections	Available to fit standard pipe sizes from ¼ through 12 in., single-layer sections. Furnished in sectional form, hinged, for pipe of nominal diameter up to 9" in ice water, 7" in brine, 5" in heavy brine thicknesses. Furnished in two separate half-sections for larger sizes. Also available for straight runs of brass or copper tubing with nominal diameters from ¼ through 8 in.
BRINE (1.9 to 3.2 in.)		
HEAVY BRINE (2.9 to 4.2 in.)		



INSULATIONS

Cements and Fills

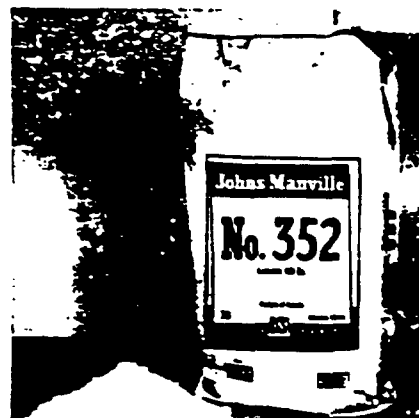
J-M INSULATING CEMENTS AND FILLS

EXCELLENT COVERAGE • DURABLE FINISH

Johns-Manville manufactures a quality insulating cement or insulating fill for practically any industrial requirement.

J-M Insulating Cements possess excellent coverage, finishing, insulating and protective finishing properties. They are especially suitable for insulating irregular surfaces such as valves, flanges, heating furnaces, kettles, etc. where it would be impracticable to apply pipe insulation, sheets or blocks.

J-M Finishing Cements are generally used over insulation to provide a smooth, attractive finish or a surface to which canvas may be applied. On heated equipment, the cements should be applied at equipment operating temperature. The J-M Insulating Fills are used for irregular spaces where insulation in regular forms is impracticable.



J-M INSULATING CEMENTS

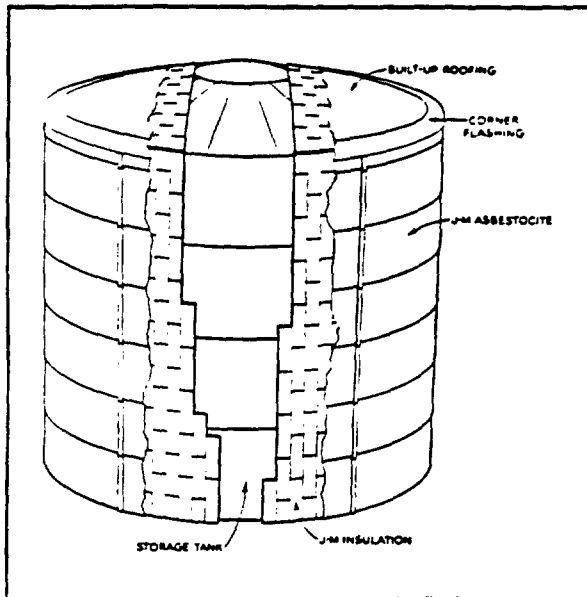
Name	General Use	Character or Base	Maximum Service Temperature, $^{\circ}$ F	Covering Capacity, Applied and Dried, 1" Thick		Approx. Gal of Water to Mix		Packaging, lb per bag
				Sq ft/100 lb	Sq ft/Bag	100 lb	per bag	
No.302	Finishing	Asbestos	1000	25	25	21	10.5 or 21	50 or 100
No.352	"	"	1000	19	9½ or 19	12	6 or 12	50 or 100
No.0352	"	"	1000	19	19	12	6 or 12	50 or 100
No.301	Insulating Finishing	(one-coat application)	1400	36	18	15	7.5	50
Suprex [®]	Insulating	Diatomaceous Silica	1900	45	34	30	22.5	75
No.500	"	Expanded Vermiculite	1800	78	39	36	18	50
No.450	"	Mineral Wool	1500	50	25	30	15	50
J-M 85% Magnesia	"	Magnesium Carbonate	600	70	35	54	27	50
No.678	Protective-Finishing	Semi-Refractory	1900	20	10	9	4.5	50
No.319	"	"	1600	15	7½	7.2	3.6	50

J-M INSULATING FILLS

Name	Composition	Maximum Service Temperature, $^{\circ}$ F	Density to which usually packed, lb per cu ft	Packaging, lb per bag
FIBROFIL [®]	Mixture of diatomaceous silica and asbestos fiber.	1800	18	80
FIL-INSUL	A mixture of mineral fibers.	1000	15	65
BANROC [®] LOOSE: GRANULATED	Mineral wool.	1000	12 9-12	40
GRANULATED ROCK CORK [®]	Mineral wool and bituminous binder.	150†	12-14	40
ZEROFIL [®]	Asphalt-impregnated loose mineral wool	150†	10	40

† Normally used at temperatures below 100°F.

Weather-Protection, Coatings



Johns-Manville Weather-Protected Insulation was developed by J-M Insulation Engineers especially for outdoor tanks and vessels.

J-M WEATHER-PROTECTED² INSULATION

**For Outdoor Tanks and Vessels
PERMANENT • MAINTENANCE-FREE**

Developed as a simplified insulation specification by J-M Insulation Engineers, J-M Weather-Protected Insulation consists of Asbestocite² (weather-resisting asbestos and cement) sheets applied over standard J-M Insulations. J-M Weather-Protected Insulation assures greater fuel savings and more efficient operation of equipment, either heated or cooled. A J-M Engineer will be glad to survey your outdoor equipment and estimate the savings possible with J-M Weather-Protected Insulation.



Skilled insulation applicators fastening Asbestocite sheets over the insulation.

INSULKOTE² PROTECTIVE COATINGS

For service to 250F

Guard Insulated Surfaces Against Weather or Water Vapor

Durable—J-M Insulkotes, compounded of selected and processed bitumens, asbestos fiber and mineral fillers, give maximum protection at lowest applied cost to insulated tanks, breechings, piping and other process equipment. They resist acid and alkaline atmospheres . . . will stand up under adverse weather conditions . . . minimize surface cracking and crazing under sudden temperature changes.

Seal Out Water—Insulkote helps prevent rusting and corrosion of expensive equipment. Depending on service involved, there is a type that will keep out water and permit passage of water vapor or one that will act as a water-vapor seal.

Easily Applied—Furnished ready-mixed in two consistencies for quick, easy trowel or spray application. A jet-black material, it will not fade after applied. If de-

sired, it may be readily painted by first applying a sealing coat of aluminum paint or equivalent, followed by a finish coat of lead and oil paint.

6 TYPES FOR CONVENIENT USE

Insulkote ET and EG—non-burning, weatherproof coatings for use over insulation on heated surfaces where "breathing" coatings are required. ET for trowel, EG for spray gun application.

Insulkote ST and SG—weatherproofing and vapor-barrier coatings for insulation on refrigerated surfaces. SG is an excellent anti-corrosion coating. ST for trowel, SG for spray gun application.

Insulkote SOC and EOC—afford protection against weather and corrosive atmospheric conditions and will prevent condensation under moderate conditions. Both may be applied by spray gun or trowel.

PHYSICAL PROPERTIES

Property	Insulkote ET	Insulkote EG	Insulkote ST	Insulkote SG	Insulkote SOC	Insulkote EOC
Type	emulsion	emulsion	solvent	solvent	emulsion	solvent
Application	trowel	gun*	trowel	gun*	trowel or gun*	trowel or gun*
Weight per gal	10 lb	10 lb	9.5 lb	9.5 lb	7.5 lb	7 lb
Coverage as applied, wet	1 1/2 gal per 100 sq ft 1/4" thick	1 1/2 gal per 100 sq ft 1/4" thick	8 gal per 100 sq ft 1/4" thick	8 gal per 100 sq ft 1/4" thick	1 1/2 gal per 100 sq ft 1/4" thick	1 1/2 gal per 100 sq ft 1/4" thick
% shrinkage (volumetric)	30	30	25	25	40	20
Water vapor penetration in perm-inches per recommended thickness	.2 to .5	.4 to .7	.0 to .1	.1 to .2	...	...
Temperature use range	100F to 250F	100F to 250F	up to 250F	up to 250F	100F to 250F	up to 250F

Code: E—emulsion type
S—solvent type
T—trowel consistency
G—spray gun consistency
C—cork filler

*Spray gun application involves some loss through bounce and "over spray." Amount of loss varies with air velocities and types of surfaces. All solvents have some degree of toxicity and proper ventilation should be provided where material is used in enclosed spaces.



INSULATIONS

Insulating Fire Brick for Refractory Lining or Back-Up

INSULATING FIRE BRICK

For service to 3000F

STRONG • LIGHT WEIGHT • ACCURATELY SIZED

J-M Insulating Fire Brick are used as refractory lining or as back-up insulation behind other refractory protection. Their light weight and high insulating value make possible thinner furnace walls, improved efficiency and lower operating costs. Furnaces can be brought up to operating temperatures with unusual speed, resulting in increased production.

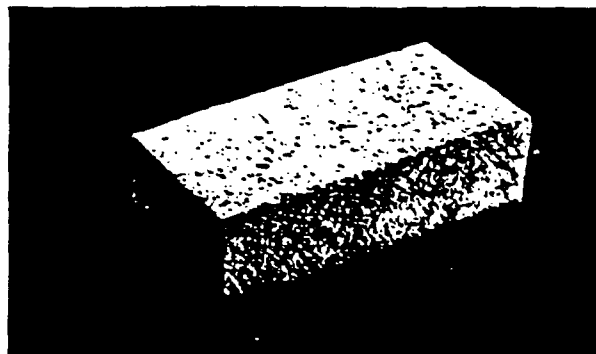
Each type of J-M Insulating Fire Brick has the correct balance of thermal and physical properties for its recommended service. All six types offer light weight, low conductivity and high structural strength.

JM-3000 Insulating Fire Brick, the newest of the six types, provides long-life insulation at a full 3000F, in back-up or direct exposure service. Molded from specially selected, high quality kaolin clays plus alumina, JM-3000 Insulating Fire Brick raises to a new high point the temperature for which such a product can safely be recommended.

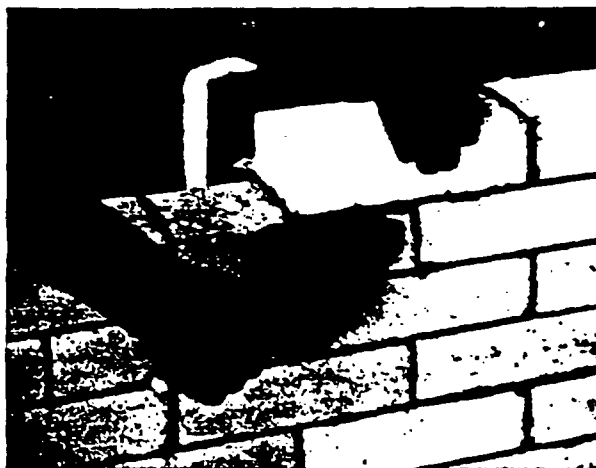
MORTAR FOR LAYING J-M INSULATING FIRE BRICK

Mortar	Used for Laying Following Types	Approx Pounds Needed Per 1000 brick equivalent
J-M Insulating Fire Brick Mortar (Meat-Set)	JM-28, JM-26, JM-23, JM-20 and JM-1620, when laid as backup insulation only.	200
J-M Special Bonding Mortar (Air-Set)	JM-3000, exposed or back-up	400
Blo-Krete JM-2986 Mortar (Air-Set)	JM-28, exposed or back-up	200-400*
Blo-Krete JM-1626 Cement (Air-Set)	JM-26, JM-23, JM-20 and JM-1620, exposed or back-up	200-400*

*Amount depends upon thickness of joint and porosity of brick.



J-M Insulating Fire Brick are available in six types for backup or exposed use at temperatures up to 3000F.



Setting Fire Brick with J-M Mortars assures a tight, strong, well-protected refractory wall.

STANDARD TYPES, SIZES AND PROPERTIES** OF INSULATING FIRE BRICK

Properties	Types of Insulating Fire Brick					
	JM-3000	JM-28	JM-26	JM-23	JM-20	JM-1620
Standard Sizes	Accurately sized in all standard 9 in. shapes of the 2 1/2 in. series, as well as special shapes.					
Maximum service temperature	†3000F	†2800F	†2600F	†2300F	†2000F	‡2000F †1600F
Approximate density, lb per cu ft	63-67	58	48	42	35	29
Transverse strength, psi	200	120	125	120	80	60
Cold crushing strength, psi	400	150	190	170	115	70
Linear shrinkage, percent	*0.8 at 3000F	4.0 at 2800F	1.0 at 2600F	0.3 at 2300F	0.0 at 2000F	0.0 at 2000F
Reversible thermal expansion, percent	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
Conductivity (Btu in. per sq ft per F per hr at following mean temperatures)						
500F	3.10	2.00	1.92	1.51	0.97	0.77
1000F	3.20	2.50	2.22	1.91	1.22	1.02
1500F	3.35	3.00	2.52	2.31	1.47	1.27
2000F	3.60	3.50	2.82	2.70		

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

Insulating Brick for Back-Up Insulation, Insulating Concrete



Sil-O-Cel Insulating Brick being installed with Superox Block (see page 4) in the combustion chamber of a Hot Blast Stove.

**STANDARD TYPES, SIZES AND PROPERTIES*
of Sil-O-Cel Insulating Brick**

Properties	TYPES OF INSULATING BRICK		
	Sil-O-Cel Super	Sil-O-Cel C-22	Sil-O-Cel 16L
Maximum service temp. (back up only)	2500F	2000F	1600F**
Standard sizes	All standard 9 in. shapes of the 2½ and 3 in. series, as well as special shapes.		
Approx. density, lb per cu ft	40	38	33-35
Transverse strength, psi	90	115	60
Cold crushing strength, psi	300	700	350
Linear shrinkage, percent	2.0 at 2500F	0.8 at 2000F	0.7 at 1600F
Reversible thermal ex- pansion, percent	1.3 at 2000F	0.7 at 2000F	less than 0.1 at 1600F
Conductivity (Btu in. per sq ft per F per hr at following mean tem- peratures)			
500F	1.70	1.67	0.92
1000F	1.95	1.88	1.07
1500F	2.19	2.08	1.22
2000F	2.45		

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

SIL-O-CEL® INSULATING BRICK

For service to 2500F

**UNUSUALLY HIGH LOAD-BEARING
CHARACTERISTICS**

Made of 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 loading 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, an improved replacement for the former Sil-O-Cel Natural Brick, may be used for exposed as well as back-up service.

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 considerable saving in furnace wall construction for all types of high temperature equipment.

MORTAR REQUIRED

Mortar	Approx Pounds Needed Per 1000 Brick Equivalent		
	Super	C-22	16L
Sil-O-Cel® Mortar	—	80	80
Super Brick® Mortar	80	—	—
Blekket	—	—	200-400

*Back-up only. †Exposed or back-up.

SIL-O-CEL® C-3 AGGREGATE FOR MAKING INSULATING CONCRETE

For service to 1800F

Insulating concrete made with Sil-O-Cel C-3 Aggregate can be cast into any shape desired. This makes it possible to utilize insulation where it had been impossible previously due to structural reasons. Insulating concrete made with Sil-O-Cel C-3 Aggregate may be used in the construction of core, jannanning and enameling ovens, foundations and bases of heated equipment, furnace doors and many special shapes such as baffles, dampers, etc. It is over three times as effective as fire brick in preventing heat penetration. Suitable reinforcing, such as would

be used in ordinary concrete, and provision for expansion joints must be provided as with any other monolithic material. About 28 lb of C-3 Aggregate needed per cu ft when rammed into place and dried. Mixture sets up into strong, durable insulating concrete weighing about 60 lb per cu ft and with a crushing strength of about 1,000 psi (72 tons per sq ft). May be used where subjected to direct heat as high as 1800F.

Sil-O-Cel C-3 Aggregate comes in 50-lb bags.

Patching and Castable Materials

HYDRAULIC-SETTING REFRACTORIES

CASTABLE, TROWELING AND GUNNING REFRACTORIES FOR TEMPERATURES THROUGH 3000F

The complete line of Johns-Manville hydraulic-setting refractories makes it easy to select the refractory for your job that will cut maintenance costs . . . reduce furnace and equipment downtime . . . step up production.

FIRECRETE® CASTABLE REFRACTORIES

Special shapes and linings of all kinds cast with Johns-Manville Firecrete are ready for use within 24 hours. All five types of Firecrete have negligible shrinkage and exceptionally high resistance to spalling.

BLAZECRETE® FOR TROWELING AND GUNNING

For heavy patching by troweling, Blazecrete eliminates laborious ramming or tamping. When gunned, it adheres readily with a minimum of rebound loss. All three types are economical for repairing old linings and building new ones.

DATA ON FIRECRETE AND BLAZECRETE

Type	Name	Character or base	Maximum service temperature, F	Approx pounds needed per cu ft	Packaging
Castables	3X Firecrete	High alumina	3000	130	100-lb bags
	H.T. Firecrete	High alumina	2800	110	100-lb bags
	Std. Firecrete	Al. silicate	2400	110	50 or 100-lb bags
	L.W. Firecrete	Al. silicate	2400	75	100-lb bags
	No. 20 Firecrete	Al. silicate	2000	58	50-lb bags
Gunning and patching cements	3X Blazecrete	High alumina	3000	gunning 140; patching 130	100-lb bags
	Std. Blazecrete	Al. silicate	2400	gunning, 118; patching 110	100-lb bags
	L.W. Blazecrete	Al. silicate	2000	gunning, 73; patching, 65	50-lb bags



Firecrete for casting special shapes.



Blazecrete for heavy patching.



Blazecrete for gunning application.



REFRACTORY PRODUCTS

Aggregates, Fills, Boiler Coating

J-M LIGHTWEIGHT AGGREGATES AND FILLS

**FOR MAKING INSULATING REFRACTORY
CONCRETE AND FOR INSULATING
IRREGULAR SPACES
AT TEMPERATURES THROUGH 3000F**

Johns-Manville lightweight aggregates and fills are available in a wide selection for temperatures through 3000F. The Firecrete and Blaze-crete refractories described on the preceding page are furnished prepared, ready for use. The three new refractories on this page—JM-3000, JM-2400 and JM-2000 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 core, japaning and enameling ovens, foundations and bases of heated equipment, furnace doors, and many special shapes such as baffles and damp-



ers. In addition, all materials shown here may be used as fills for packing irregular or otherwise inaccessible spaces to provide insulation on high temperature equipment, making it possible to conserve heat where other forms of insulation cannot be economically installed.

DATA ON J-M LIGHTWEIGHT AGGREGATES AND FILLS

Type of Product	Name	Composition	Maximum service temperature, F	Approx density, (Normal Packing), lb per cu ft	Packaging
Aggregates or Fills	JM-2400 L.W. Aggregate	Al. Silicate	2400	30	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
Fills only	Sil-O-Cel Insulating Powder	Finely ground diatomaceous silica	1600	15-17	50-lb bags
	Sil-O-Cel Coarse Grade	Similar to Sil-O-Cel Insulating Powder, but more coarsely ground	1600	22	50-lb bags

AERTITE® COATING FOR BOILER WALLS

For service to 250F

TOUGH • ELIMINATES AIR-INFILTRATION OR ESCAPE OF FURNACE GASES OR DUST

Aertite Coating is a tough, rubbery asphaltic-asbestos coating in plastic form used on the outside of boiler walls to eliminate air infiltration. It provides an air-tight "blanket" over the entire boiler setting. Its adhesive and ductile qualities keep the coating air-tight, and imperfect combustion due to air leakage through the setting is prevented. Aertite also checks the escape

of furnace gases or dust, and can be used in other locations for miscellaneous sealing against the effects of dampness, air and moisture. Aertite Coating is furnished in 25, 50, 150, 300 and 500 lb containers. For a 1/2 in. thick coating, from 50 to 80 lb per 100 sq ft of surface area will be required.

QUALITY PRODUCTS

Johns-Manville

INSULATIONS

MATERIALS · ENGINEERING · APPLICATION

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 with J-M Insulation Engineers, these contractors know how to apply J-M insulation 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.

Johns-Manville

22 East 40th Street

New York 16, New York

OFFICES IN ALL LARGE CITIES

CANADIAN JOHNS-MANVILLE
COMPANY, LTD.

JOHNS-MANVILLE
INTERNATIONAL CORPORATION

Montreal
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New York
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Mexico City

3000

2800

2600

2400

2200

2000

1800

1600

1400

1200

1000

800

600

400

200

0

300