FOR MORE ECONOMICAL CONTROL OF HEAT THROUGH 3000F



Johns-Manville

insulating fire brick

and

sil-o-cel® insulating brick

PLAINTIFF'S
EXHIBIT
K-1574

DEFENDANT'S
EXHIBIT
OF-145

LIGHTWEIGHT FUEL SAV... NT

BRICK ★ CASTABLES ★ AGGREGATES ★ FILLS ★ BONDING MORTARS

Johns-Manville

SIX TYPES FOR EXPOSED REFRACTORY LINING OR BACK-UP INSULATION AT TEMPERATURES THROUGH 3000F

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

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

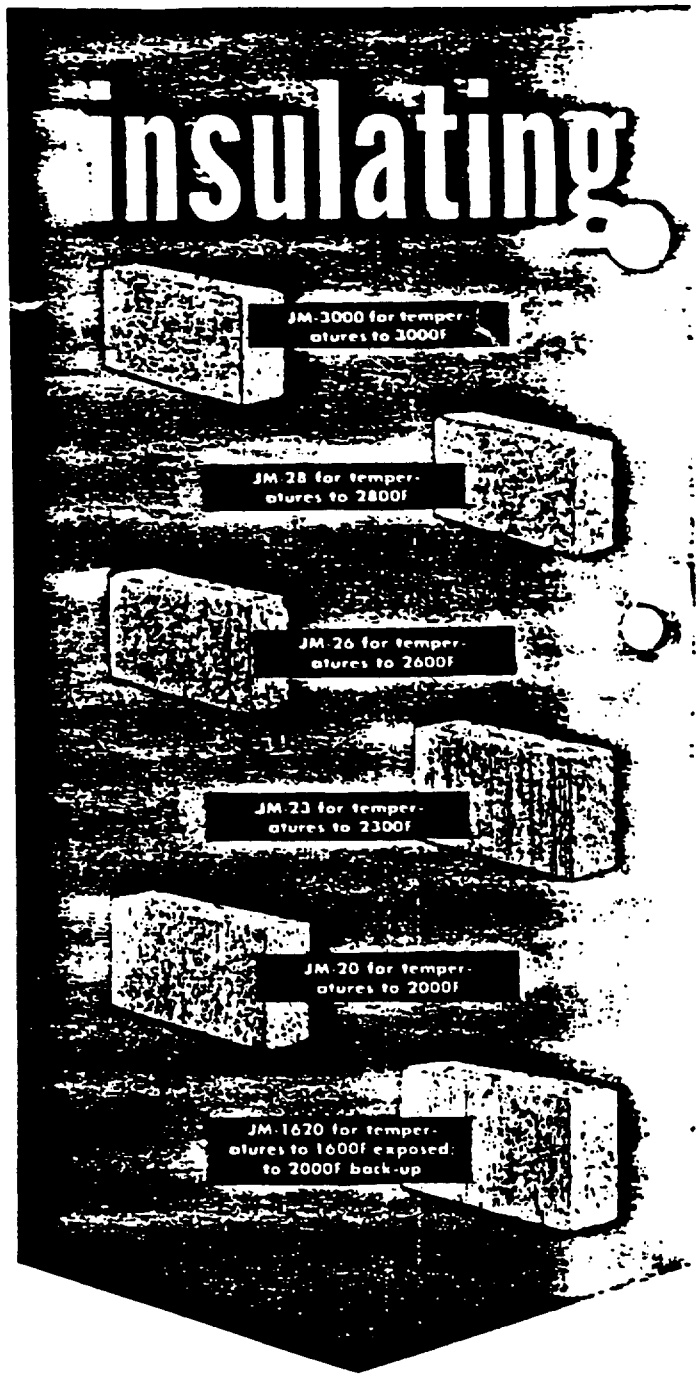
J-M Insulating Fire Brick are used as refractory lining or as back-up insulation behind other refractory protection. Their light weight and high insulating value make possible thinner furnace walls, improved efficiency and lower operating costs. Furnaces can be brought up to operating temperatures with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

JM-3000 Insulating Fire Brick, developed by the world's largest insulation research laboratory, is the newest of the six types. It 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.



The JM-3000 Insulating Fire Brick lining in this ceramic kiln helps turn out better products and saves fuel because it assures quick furnace response.

The other five types of J-M Insulating Fire Brick are made from high quality refractory clays. All six types contain a carefully graded organic filler which is burned out during manufacture, resulting in a uniform, controlled pore structure.



MORTARS FOR LAYING J-M INSULATING FIRE BRICK

Type brick	Mortar	Approx lb needed per 1000 brick
JM-3000	J-M Special Bonding Mortar (air-set)	400
JM-28	J-M No. 2986 Mortar (air-set)	200-400*
	J-M I.F.B. Mortar (heat-set)	200
JM-26 JM-23	JM-1626 Cement (air-set)	200-400
JM-20 JM-1620	J-M I.F.B. Mortar (heat-set)	200

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

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fire brick



STANDARD SIZES OF J-M INSULATING FIRE BRICK

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

Note: Standard shapes are illustrated on page 5.

USE THIS TABLE TO SELECT THE RIGHT INSULATING FIRE BRICK FOR YOUR EQUIPMENT

PROPERTIES		TYPES OF JOHNS-MANVILLE INSULATING FIRE BRICK					
		JM-3000	JM-28	JM-36	JM-23	JM-20	JM-1620
Temperature limit		†3000F	†2800F	†2600F	†2300F	†2000F	‡2000F †1600F
Approx. 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.

TYPICAL INDUSTRIAL USES FOR J-M INSULATING FIRE BRICK

Ceramic Industry

Experimental furnaces
Kilns

Chemical Industry

Calcining furnaces
Driers
High-temperature pressure vessels
Special process furnaces
Sulphur furnaces

Glass Industry

Bending furnaces
Flattening ovens
Gas mains
Glass tanks, regenerators, flues and uptakes
Lehrs

Iron, Steel and Allied Industries

Annealing furnaces
Billet-heating furnaces
Blast furnace mains
Blast furnace stoves
Brazing furnaces
Bustle pipes
Calorizing furnaces
Carburizing furnaces
Case-hardening furnaces
Core-drying ovens
Crucible furnaces

Iron, Steel and Allied Industries, continued

Die-casting machines
Drawing furnaces
Electric furnaces
Electrolytic cells (magnesium)
Enameling furnaces
Flues (high temperature)
Forge furnaces
Galvanizing and tinning furnaces
Hardening furnaces
Heat-treating furnaces
Hot gas mains
Japanning ovens
Laboratory furnaces
Normalizing furnaces
Open-hearth furnaces
Pack and pair furnaces
Plate-heating furnaces
Radiant tube annealing covers
Recuperators
Reduction pots (aluminum)
Regenerators
Retorts
Reverberatory furnaces
Salt bath furnaces
Slab-heating furnaces
Soaking pits
Soaking pit covers
Stress-relieving furnaces

Petroleum Industry

Air and gas heaters
Ducts
Flues
Oil heaters or furnaces (walls, arch, floor)
Reactor chambers
Regenerators
Stacks
Stills

Power Plants

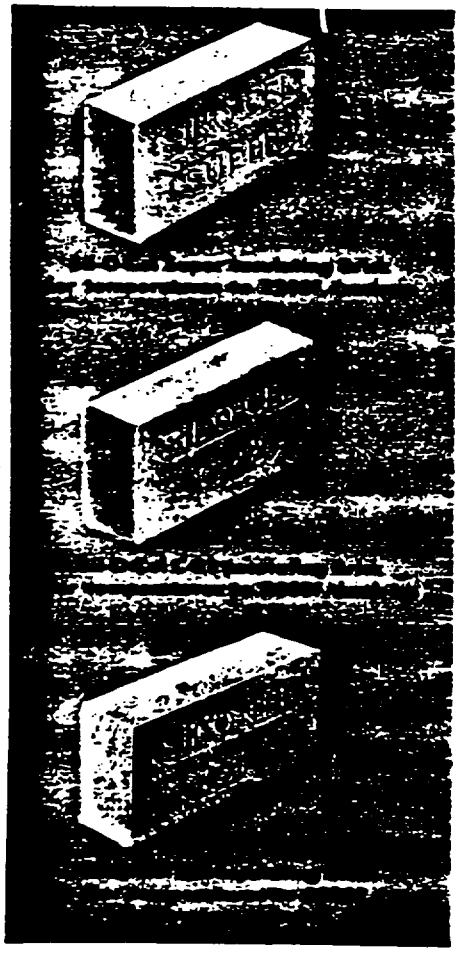
Boiler walls, floors, tops
Breechings
Ducts
Flues
Stacks

Miscellaneous

Bake ovens
Burners
Coke ovens
Cross-over flues
Domestic oil burners
Furnaces
Gas producers and mains
Heaters
Incinerators
Kilns
Ovens
Retort benches
Stacks
Stoves

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sil-o-cel® insulating brick





Installing Sil-O-Cel Insulating Brick in the combustion chamber of a hot blast stove.

THREE HIGH LOAD-BEARING TYPES FOR USE BEHIND OTHER REFRACTORY LINING AT TEMPERATURES THROUGH 2500F

Made from diatomaceous silica, a material composed of millions of microscopic cells that offer maximum resistance to heat flow, Sil-O-Cel Insulating Brick are particularly useful where high load-bearing characteristics are required.

Sil-O-Cel Insulating Brick are furnished in three types for use as back-up insulation behind refractory fire brick linings or behind insulating fire brick linings. The new Sil-O-Cel 16L brick, an improved replacement for the former Sil-O-Cel Natural brick, may also 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 a considerable saving in furnace wall construction for all types of high temperature equipment such as those listed on the preceding page.

STANDARD SIZES OF SIL-O-CEL INSULATING BRICK

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

Note: Standard shapes are illustrated on page 5.

MORTARS FOR LAYING SIL-O-CEL INSULATING BRICK

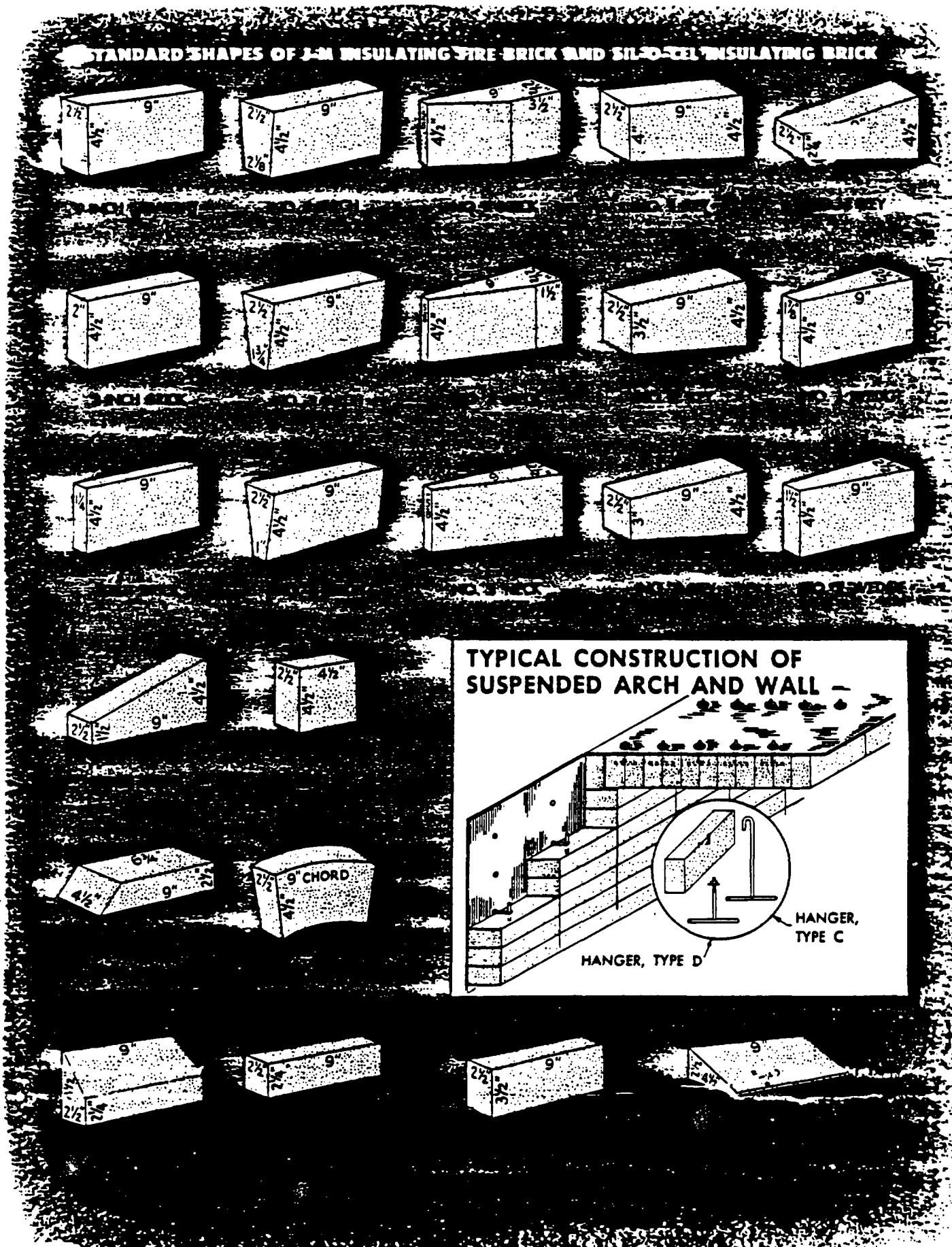
Type brick	*Mortar*	*Approx lb needed per 1000 brick*
Sil-O-Cel Super	Super Brick Mortar	80
Sil-O-Cel C-22 Sil-O-Cel 16L	Sil-O-Cel Mortar	80
Sil-O-Cel 16L, exposed	JM-1626 Cement	200-400

PROPERTIES OF SIL-O-CEL INSULATING BRICK

Properties	*Types of Sil-O-Cel Insulating Brick*		
	Super	C-22	16L*
Temperature limit	2500F (back-up only)	2000F (back-up only)	1600F (back-up or exposed)
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 expansion, 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 indicated mean temperatures)	1.70 at 500F 1.95 at 1000F 2.19 at 1500F 2.45 at 2000F	1.67 at 500F 1.88 at 1000F 2.08 at 1500F	0.95 at 600F 1.01 at 800F 1.07 at 1000F 1.13 at 1200F

Properties given for this brick are approximate.

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JM - 83


STANDARD SHAPES OF J-M INSULATING FIRE BRICK AND SIL-O-CEL INSULATING BRICK
TYPICAL CONSTRUCTION OF SUSPENDED ARCH AND WALL
HANGER, TYPE C
HANGER, TYPE D
9" CHORD

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Johns-Manville

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	Highest working temperature, F	Approx pounds needed per cu ft	Packaging
Castables	3X Firecrete	High alumina	3000	135	100-lb bags
	H.T. Firecrete	High alumina	2800	115	100-lb bags
	Std. Firecrete	Al. silicate	2400	110	100-lb bags
	L.W. Firecrete	Al. silicate	2400	75	100-lb bags
	No. 20 Firecrete	Al. silicate	2000	57	50-lb bags
Gunning and patching cements	3X Blazecrete	High alumina	3000	gunning, 155; patching, 130	100-lb bags
	Std. Blazecrete	Al. silicate	2400	gunning, 120; patching, 110-115	100-lb bags
	L.W. Blazecrete	Al. silicate	2000	gunning, 71-81; patching, 62-67	50-lb bags



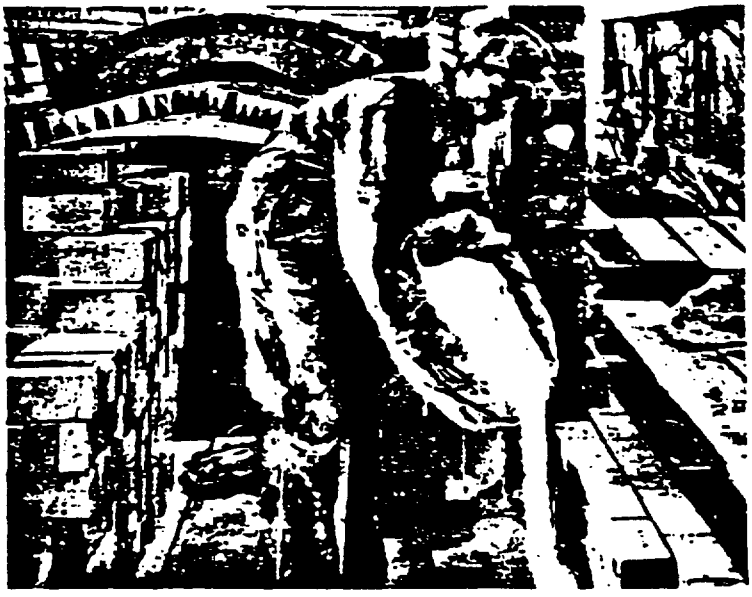
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Johns-Manville

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 Blazecrete 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, japanning and enameling ovens, foundations and bases of heated equipment, furnace doors, and many special shapes such as dampers. In addition,



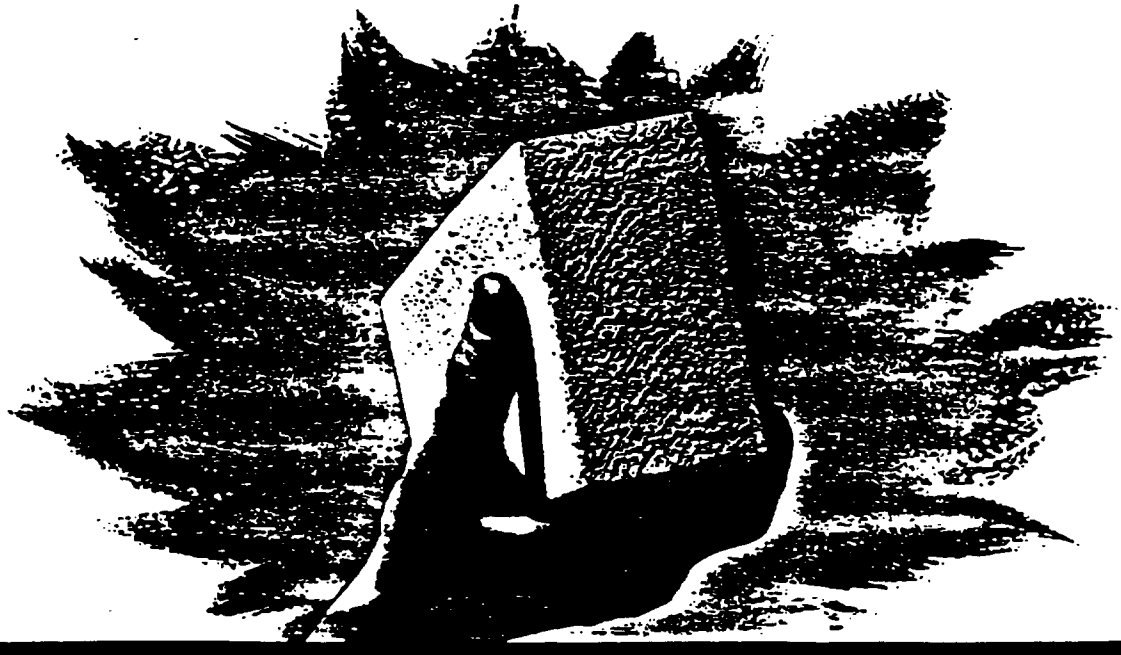
all materials shown here may be used as fills for insulating irregular spaces in high temperature equipment, making it possible to conserve heat where other forms of insulation cannot be economically installed.

DATA ON J-M LIGHTWEIGHT AGGREGATES AND FILLS

Name	*Composition*	*Temperature limit, F*	*Approx density to which fills are normally packed, lb per cu ft*	*Packaging*
JM-3000 L.W. Aggregate	High Alumina	3000	60	75-lb bags
JM-2400 L.W. Aggregate	Al. Silicate	2400	50	65-lb bags
JM-2000 L.W. Aggregate	Al. Silicate	2000	41	50-lb bags
Sil-O-Cel C-3	Calcined, coarse-graded diatomaceous silica	2000	31	100-lb bags
Sil-O-Cel Insulating Powder	Finely ground diatomaceous silica	1600	17	50-lb bags
Sil-O-Cel Coarse Grade	Similar to Sil-O-Cel Insulating Powder, but more coarsely ground	1600	22	100-lb bags

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put more heat to work with



JOHNS-MANVILLE INSULATIONS

Johns-Manville

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