

Johns-Manville



Refractory
Products

PLAINTIFF'S
EXHIBIT
K-1576

DEFENDANT'S
EXHIBIT

AI-147

Johns-Manville produces nine types of insulating fire brick for use in application from 2000°F to 3200°F. Each type is formulated to meet specific thermal and physical requirements, and is precision-machined to precise tolerances after firing.

Made from high purity refractory clays (plus alumina for the higher temperature products), these insulating fire brick contain a carefully graded organic filler which is burned out during manufacture to give a uniform, controlled pore structure. To fulfill the many different service requirements of J-M Insulating Fire Brick, complementary mortars are available.

Recommended for use as primary hot face refractory linings or as back-up insulation behind other refractories in furnace, kilns, flues, cement kilns, refining vessels and heaters, regenerators, gas producers and mains, soaking pits, stress-relieving furnaces, reactor chambers and similar high-temperature industrial equipment.

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

The thermal properties of JM-20 and JM-23 have recently been improved, providing the user with superior thermal performance.

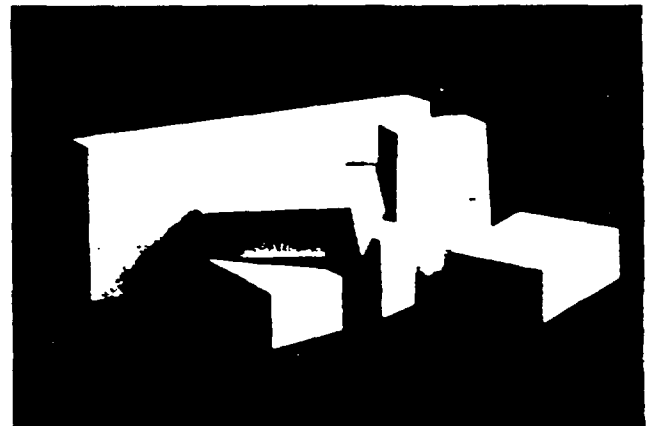
Low Heat Storage. Lower heat storage means reduced fuel costs in cyclically operated heating equipment.

More Efficient Construction. The Zelite Jumbo™ sizes offer larger pieces than conventional 9" x 4½" x 2½" or 9" x 4½" x 3" straights, fewer pieces are handled with fewer joints and less mortar required. Special machined shapes are also available.

Accurate Dimensions. Because Johns-Manville IFB are machined to precise dimensions, courses can be laid out quickly and easily, and the result is a stronger, more uniform refractory lining.

Available Forms

In addition to the great number of standard sizes available, J-M Insulating Fire Brick are also available in



special machined shapes. A large machining shop has been established in the Zelienople Plant to produce special shapes. The blanks for very large shapes are made by mortaring one or more slabs together. The unique large J-M slab means that a finished shape will have fewer joints than shapes made from any other IFB process. A J-M Representative will be pleased to review your requirement, and present a quotation on a part that will best meet your requirements.

J-M Insulating Fire Brick are available to most of the ASTM temperature groups specified in ASTM C155. Several special grades are also available to meet specific application needs as follows.

C-22³ Z fills the need of a stronger product to 2000°F temperature. It is normally specified as back-up insulation in load bearing applications such as soaking pits, furnace car bottoms, and in locations where it will be supporting large masses of other refractories.

JM-25 is a cost effective Insulating Fire Brick widely used in furnace construction where a JM-23 is not sufficiently refractory and the refractoriness of JM-26 is not needed. It has been long used in rotary cement kilns where the great strength of YUMA is not needed and the best possible insulating ability is desired.

YUMA³ has the highest strength of any J-M Insulating Fire Brick. It is used in abusive load-bearing conditions where no other IFB will hold up. It is particularly useful for the exposed lining of rotary cement kilns in those areas of the kiln that develop a mechanical coating of cement on the refractories.

Standard Sizes (inches)

Length	Width	Thickness
9	4½	2½ & 3
9	6	2½ & 3
9	6¾	2½ & 3
9	7½	3
9	9	2½ & 3
11¼	4½	3
11¼	9	3
12	4½	2½ & 3
12	6	2½ & 3
13½	4½	2½ & 3
13½	6	2½ & 3
13½	6¾	2½ & 3
13½	9	2½ & 3
18	9	2½ & 3
24	9	2½ & 3

Arches, wedges and keys are available in both standard sizes and specials.

Design

Traditionally, Insulating Fire Brick design practice has planned a 200°F differential between the maximum service temperature rating of the IFB and the normal furnace operating temperature. This criterion should be considered in addition to other properties of IFB such as hot load deformation. The mean temperature (i.e. the temperature at the mid-point) of the brick must be considered in the specific application, so hot load deformation is not a problem. Guidelines for the mean temperature of each type brick are:

Maximum Mean Temperature	Type Brick
1800°F	JM-20, C22Z
2000°F	JM-23, JM-25, JM-26, JM-28, YUMA
2200°F	JM-3000
2400°F	JM-32

Consult your J-M Representative for recommendations on the best combination of products for your temperature, processing and atmospheric conditions.

Available Forms

J-M Insulating Fire Brick are available in standard sizes of 9" x 4½" x 2½" and 9" x 4½" x 3". Many designs today utilize 3" standard IFB—a size which permits faster installation than possible with the 2½" ones. It's also possible to design with fewer joints, requiring less mortar.

Also, J-M IFB can be provided in metric sizes.

Specifications

JM-20 can meet MIL-B-16305B, Class A, HH-B-00675C

JM-23 can meet HH-B-00675C

JM-25 can meet MIL-B-16008C

JM-26 can meet HH-B-00675C

JM-28 can meet MIL-B-16305B, Class B, HH-B-00675C

Standard Samples

A 9" x 4½" x 3" straight of any standard product individually packaged in mailable carton.

R-00
A. MICHAEL

May, 1981

**NEW AD ANNOUNCES IMPROVED K VALUES FOR J-M 20 AND
23 INSULATING FIRE BRICK**

The thermal performance (K) of the new J-M 20 and 23 Insulating Fire Brick has been improved by over 25%. Improved K means energy savings for your customers. The new brick are very competitive to other products in the market.

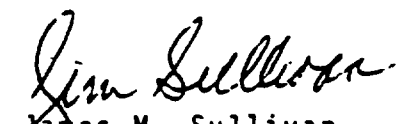
This message will be delivered to key specifying and buying influences during 1981 in the following magazines:

33 METAL PRODUCING - July, August, September, October,
November & December

HEATING/COMBUSTION EQUIPMENT NEWS - July/August, September/
October & November/December

INDUSTRIAL HEATING - July, August & October

A copy of the attached ad should be given to all your distributors and end-user customers. Order additional copies from the Service Center by requesting JMIP 123-P.


James M. Sullivan
Advertising Manager
Industrial Products Division

42-4-835

Attachment: JMIP 123-P

Distribution: 1021, 11T, 5211, 5312T, 5313T-S, 731

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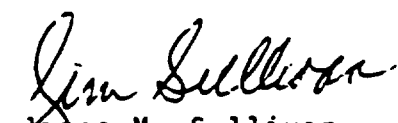
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Properties

Product	ASTM C155 Grades						Specialty Grades		
	JM-20	JM-23	JM-26	JM-28	JM-3000	JM-32	C-22* Z*	JM-25	YUMA*
Temperature use limit, °F (Normal oxidizing atmosphere)	2000	2300	2600	2800	3000	3200	2000	2500	2500
Density, Avg. (ASTM C-134-70) Lbs./ 9 x 4½ x 2½ straight Lbs./cu. ft.	2.0 34	2.0 35	2.9 48	3.3 56	3.8 65	4.4 75	2.8 47	2.5 43	3.6 61
Modulus of rupture, psi (ASTM C-93-67)	85	115	150	180	240	150	210	140	300
Cold crushing strength, psi (ASTM C-93-67)	100	135	220	300	400	280	330	180	500
Permanent linear change, % 1950°F soaking temp.	0.0	—	—	—	—	—	0.0	—	—
2250°F soaking temp.	—	0.0	—	—	—	—	—	—	—
2450°F soaking temp.	—	—	—	—	—	—	—	-0.4	-0.2
2550°F soaking temp.	—	—	-0.4	—	—	—	—	—	-1.5
2750°F soaking temp.	—	—	—	-1.2	—	—	—	—	—
2950°F soaking temp.	—	—	—	—	-1.0	—	—	—	—
3150°F soaking temp.	—	—	—	—	—	-0.4	—	—	—
Reversible linear thermal expansion, % at 2000°F	0.5 to 0.6		0.65 to 0.75			0.6 to 0.7		0.65	
Hot load strength % deformation 10 psi load for 1½ hours (ASTM C-16-70)									
2000°F	0.0	0.0	—	—	0.0	0.0	0.0	—	0.0
2200°F	—	—	0.2	0.2	0.0	—	—	0.3	0.1
2400°F	—	—	—	—	0.3	0.2	—	—	—
% deformation at 12.5 psi for 1½ hrs.									
2730°F	—	—	—	—	—	5.0	—	—	—
Thermal Conductivity (ASTM C-182-71) BTU in./sq. ft., °F. Hr. Mean Temperature									
500°F	0.92	0.92	1.99	2.47	2.80	3.90	1.62	1.82	2.81
1000°F	1.13	1.13	2.23	2.63	2.87	4.10	2.05	2.13	2.94
1500°F	1.36	1.36	2.46	2.79	3.05	4.20	2.49	2.45	3.14
2000°F	—	1.58	2.69	2.95	3.31	4.30	—	2.75	3.38
Chemical Analysis, %									
Alumina, Al ₂ O ₃	31.4	31.4	38.9	61.3	68.4	77.9	34.1	34.2	39.3
Silica, SiO ₂	53.9	53.9	57.7	36.4	29.8	20.7	59.4	61.5	56.3
Ferric Oxide, Fe ₂ O ₃	0.7	0.7	0.7	0.5	0.3	0.2	0.8	0.7	1.6
Titanium Oxide, TiO ₂	0.8	0.8	1.6	1.4	0.8	0.5	1.2	1.4	1.6
Calcium Oxide, CaO	12.6	12.6	0.4	—	0.2	0.1	3.4	1.6	0.27
Magnesium Oxide, MgO	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.1	0.31
Alkalies as, Na ₂ O & K ₂ O	0.3	0.3	0.5	0.3	0.3	0.1	1.0	0.1	0.53
Code Color	Green	Red	Brown	Orange	Purple	Green	Grey	Yellow	Black

*C-22Z is not recommended for exposure to combustion conditions.