Johns-Manville Refractory Products

Insulating Fire Brick

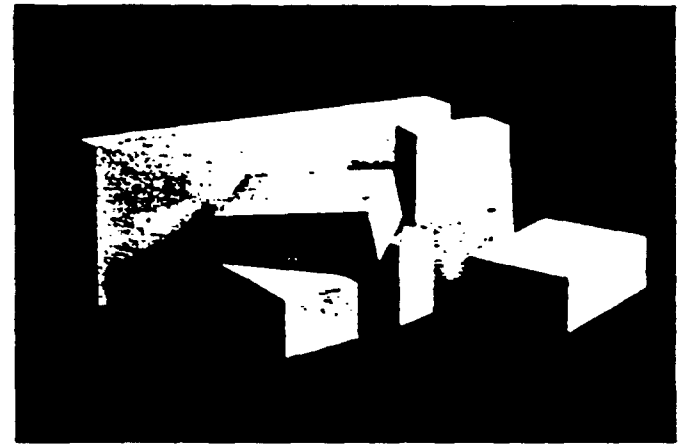
PLAINTIFF'S EXHIBIT K-1578

DEFENDANT'S EXHIBIT DF-149

Description

Johns-Manville produces eleven 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 molding and 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.



Typical Applications

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.

Advantages

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

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

More Efficient Construction. The Zelie* Jumbo* sizes offer larger pieces than conventional 9x4½x2½ 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. Most shapes that can be produced by machining can be made. 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 points 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.

Available Grades

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-22Z 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 refractories 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.

YUMA 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.

*Johns-Manville Trademark

Properties

	ASTM C155 Grades								Specialty Grades		
Product	JM-20	JM-20SL	JM-23	JM-23SL	JM-26	JM-28	JM-3000	JM-32	C-22Z	JM-25	YUMA
Temperature use limit, °F (Normal oxidizing atmosphere)	2000	2000	2300	2300	2600	2800	3000	3200	2000	2500	2500
Density, Avg. (ASTM C-134-70)											
Lbs./ 9 x 4½ x 2½ straight	1.8	2.0	1.8	2.1	2.8	3.3	3.8	4.4	2.8	2.5	3.6
Lbs./cu. ft.	31	35	31	36	48	57	65	75	47	43	61
Modulus of rupture, psi (ASTM C-93-67)	95	100	115	125	150	180	200	150	210	140	300
Cold crushing strength, psi	150	115	190	135	220	300	400	500	350	200	550
Permanent linear change, %											
1950°F soaking temp.	0.0	0.0	—	—	—	—	—	—	0.0	—	—
2250°F soaking temp.	—	—	0.0	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	0.1	—	0.1	—	—	—	—	0.0	—	0.0
2200°F	—	—	0.1	—	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	—	—	—	—	—	—	—	1.5	—	—	—
Thermal Conductivity (ASTM C-182-71) BTU in./sq. ft.,°F. Hr. Mean Temperature											
500°F	0.88	1.39	0.88	1.53	1.99	2.47	2.80	3.20	1.62	1.82	2.81
1000°F	1.06	1.70	1.06	1.77	2.23	2.63	2.87	3.10	2.05	2.13	2.94
1500°F	1.24	2.07	1.24	2.13	2.46	2.79	3.05	3.20	2.49	2.45	3.14
2000°F	—	2.48	1.42	2.58	2.69	2.95	3.31	3.50	2.92	2.75	3.38
2500°F	—	—	—	—	—	—	—	—	—	—	—
Chemical Analysis, %											
Alumina, AL_2O_3	38.0	30.4	38.0	30.4	38.9	61.3	68.4	77.9	34.1	34.2	39.3
Silica, SiO_2	45.0	60.3	45.0	60.3	57.7	36.4	29.8	20.7	59.4	61.5	56.3
Ferric Oxide, Fe_2O_3	0.6	0.7	0.6	0.7	0.7	0.5	0.3	0.2	0.8	0.7	1.6
Titanium Oxide, TiO_2	1.5	1.4	1.5	1.4	1.6	1.4	0.8	0.5	1.2	1.4	1.6
Calcium Oxide CaO	14.4	6.6	14.4	6.6	0.4	—	0.2	0.1	3.4	1.6	0.27
Magnesium Oxide, MgO	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.1	0.31
Alkalies as, Na_2O & K_2O	0.3	0.2	0.3	0.2	0.5	0.3	0.3	0.1	1.0	0.1	0.53
Code Color	Green	Green	Red	Red	Brown	Orange	Purple	Lime Green	Grey	Yellow	Grey

*C-227 is not recommended for exposure to combustion conditions.

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 & 9	3
12	4½	2½ & 3
12	6	2½ & 3
12½	4½	2½
13½	4½	3
13½	6	2½ & 3
13½	6¾	2½ & 3
13½	9	2½ & 3
18	9	2½ & 3
*24	9	2½ & 3

*23½ for JM-20 and JM-23

All sizes available in standard arches, wedges and keys. Arches, wedges and keys can also be made to special dimensions

Specifications

JM-20 meets MIL-B-16305B. Class A. HH-B-00675C
JM-23 meets HH-B-00675C
JM-25 meets MIL-B-16008C
JM-26 meets HH-B-00675C
JM-28 meets MIL-B-16305B. Class B. HH-B-00675C

Standard Samples

A 9 x 4½ x 2½ straight of any standard product individually packaged in mailable carton.

Johns-Manville
Ken-Caryl Ranch
Denver, Colorado 80217

For information on other J-M Thermal Insulations and Systems, Write the Johns-Manville Insulation Center, Drawer 17L, Denver, Colorado 80217 or Call (303) 979-1000.

The values given herein are typical values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Check with your Johns-Manville regional office to obtain current information.

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