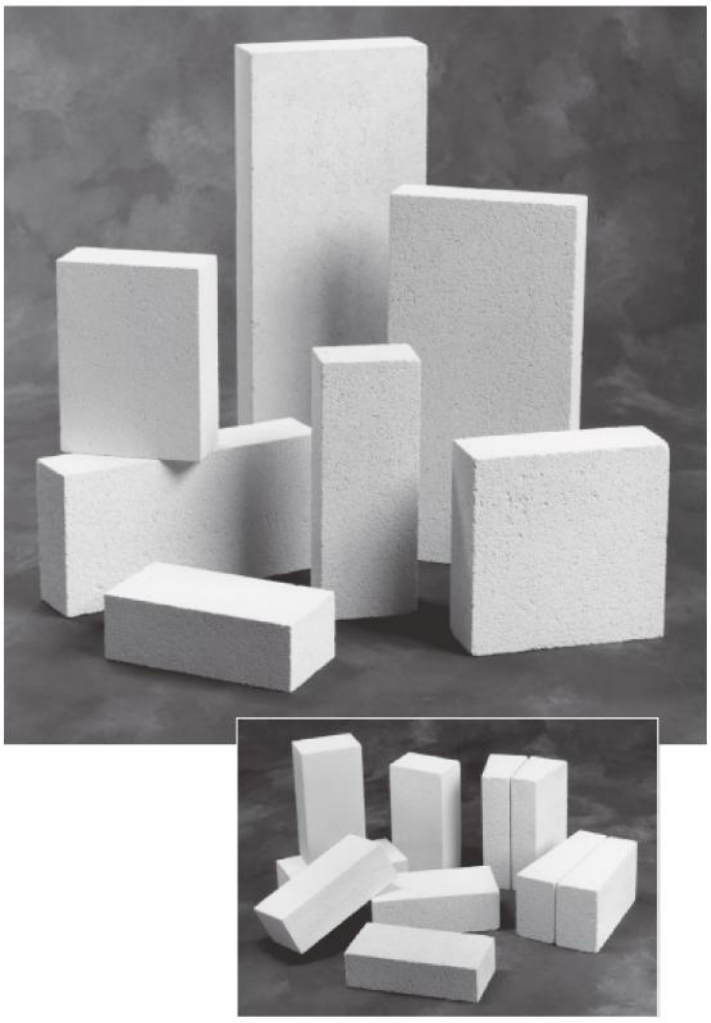
BNZ Materials, Inc.

Insulating Fire Brick



In selecting the proper Insulating Fire Brick for your application, there's more than meets the eye. Whether your special need is good thermal shock resistance, high strength or purity, or unique sizing, selection of the proper IFB for your application is not determined by temperature alone. BNZ's many grades of IFB are formulated for your specific needs.

CERTIFIED ISO9002 QUALITY SYSTEM

BNZ produces Insulating Fire Brick (IFB) for use in applications from 2000°F (1100°C) to 3200°F (1760°C). Each type is formulated to meet specific thermal and physical requirements, and after firing is machined to precise tolerances.

Made from high purity refractory clays and other ceramic raw materials, these IFB contain a carefully graded organic filler which is burned out during manufacture to give a uniform, controlled pore structure.

Advantages

High Insulating Value. The light weight and high insulating value of BNZ IFB make possible thinner furnace walls, improved efficiency and lower operating costs.

Strong. The high compressive strength of IFB allows for self-supporting structures at elevated temperatures. IFB are compatible with dense fire brick, and add strength to the whole construction.

Low Heat Storage. Lower heat storage versus dense brick means reduced fuel costs and faster heat-ups in cyclically operated heating equipment.

High Purity. BNZ IFB are low in impurities such as iron, which can adversely affect refractory performance in many applications. They are used in many furnaces with controlled atmospheres.

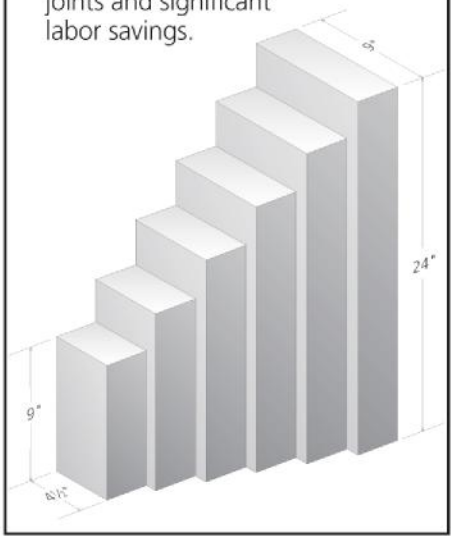
Accurate Dimensions. Because BNZ Insulating Fire Brick are machined to precise dimensions, courses can be laid quickly and easily, and the result is a stronger, tighter refractory lining resulting in less heat loss through the joints.

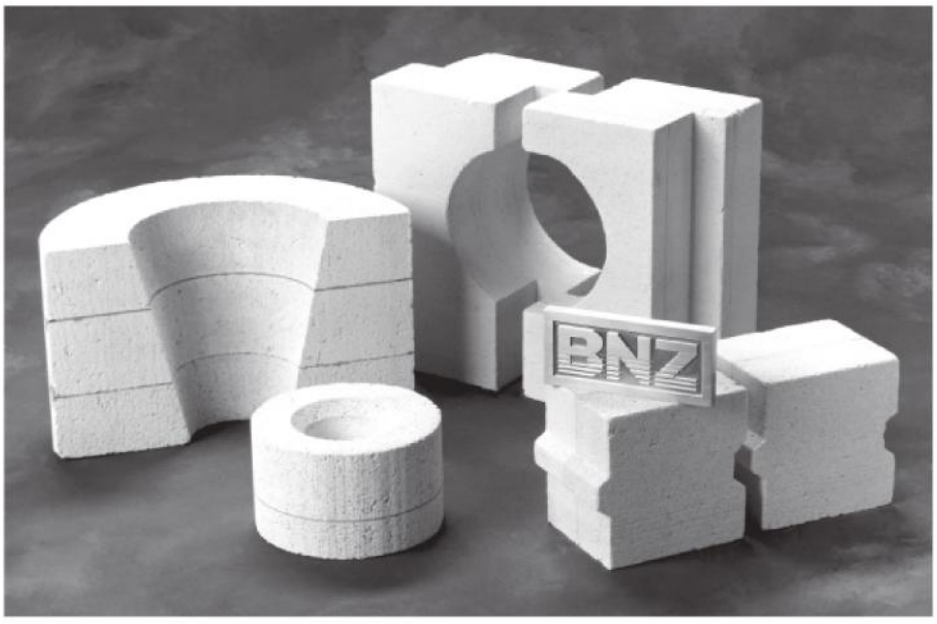
Typical Applications

Recommended for use as primary hot face refractory linings or as back-up insulation behind other refractories in furnaces, flues, kilns and similar high-temperature industrial equipment.

Size is no obstacle.

Most BNZ IFB are available in Zelie Jumbo™ series, which require no mortar joints to produce sizes up to 24" x 9" x 3". No longer are there design limitations caused by traditional standard brick shapes and sizes. The nominal cost of Zelie Jumbo sizes is more than offset by the elimination of many mortar joints and significant labor savings.





Available Forms

In addition to the great number of standard sizes available, Insulating Fire Brick are also available in special cemented or machined shapes. A large machine shop at the factory is capable of supplying accurate machined shapes of nearly any description. The unique large slab means that a finished shape will have fewer joints than shapes made from any other IFB manufacturer.

IFB shapes with drilled holes, grooves, flycuts, tapers, radii cuts, skew planes, tongue and groove, notches and chord cuts are easily fabricated in any quality IFB.

Thicknesses up to 4½", along with widths up to 12", allow a range of shapes and sizes for applications such as suspended roof modules.

Typical Data

STANDARD ASTM C 155 GRADES

Properties		BNZ-20	BNZ-23	BNZ-23A	BNZ-23 HS	BNZ-26	BNZ-26-60	BNZ-28	BNZ-3000	BNZ-32
ASTM Classification		20/23	23	23	23	26	26	28	30	32
Temperature Use Limit	°F	2300	2300	2300	2300	2600	2600	2800	3000	3200
(Normal oxidizing atmosphere)	℃	1260	1260	1260	1260	1427	1427	1538	1649	1760
Density, Avg.	lb/ft³	36	37	33	42	48	50	55	65	75
ASTM C 134	*kg/m³*	577	593	529	673	769	801	881	1041	1201
	lb/BEq	2.1	2.2	1.93	2.5	2.8	2.9	3.2	3.8	4.4
	kg/str.	0.9	1.0	0.86	1.1	1.3	1.3	1.5	1.7	2.0
Modulus of Rupture	lb/in²	95	105	115	140	200	190	220	250	300
ASTM C 133	*MPa*	0.7	0.7	0.79	1.0	1.4	1.3	1.5	1.7	2.1
	kg/cm²	6.7	7.4	8	9.9	14.1	13.4	15.5	17.6	21.1
Cold Crushing Strength	lb/in²	105	125	145	190	270	290	340	440	450
ASTM C 133	*MPa*	0.7	0.9	1	1.3	1.9	2.0	2.3	3.0	3.1
	kg/cm²	7.4	8.8	10.2	13.4	19.0	20.4	23.9	31.0	31.7
Permanent Linear Change	%									
ASTM C 210										
24 hrs at soaking temp: °F *(℃)*										
2250 *(1232)*		0.0	0.0	0.0	0.0	—	—	—	—	—
2350 *(1290)*		—	—		—	—	—	—	—	—
2450 *(1343)*		—	—		—	—	—	—	—	—
2550 *(1399)*		—	—		—	-0.1	-0.2	—	—	—
2750 *(1510)*		—	—		—	—	—	-0.7	—	—
2800 *(1538)*		—	—		—	—	—	—	—	—
2950 *(1621)*		—	—		—	—	—	—	-0.7	—
3150 *(1732)*		—	—		—	—	—	—	—	-0.4
Reversible Linear Thermal Expansion	%									
at 2000°F *(1093℃)*		0.6	0.6	0.6	0.6	0.6	0.6	0.65	0.65	0.65
Hot Load Strength	%									
ASTM C 16deformation										
10 psi load for 1½ hours: °F *(℃)*										
2000 *(1093)*		0	0	0	0	—	—	—	—	—
2200 *(1204)*		—	—		—	0.2	0.1	0.1	—	—
2400 *(1316)*		—	—		—	—	—	—	0.3	0.2
Thermal Conductivity	Btu-in/ft², hr, °F									
ASTM C 182	(W/mk)									
Mean temperature, °F *(℃)*										
500		0.9	1.0	0.92	1.2	1.6	1.8	2.3	2.8	3.9
(260)		0.13	0.14	0.13	0.17	0.23	0.26	0.33	0.40	0.56
1000		1.2	1.3	1.14	1.5	1.9	2.0	2.4	2.9	4.1
(538)		0.17	0.19	0.16	0.22	0.27	0.27	0.35	0.42	0.59
1500		1.5	1.6	1.39	1.7	2.2	2.1	2.6	3.1	4.2
(816)		0.22	0.23	0.2	0.25	0.32	0.30	0.37	0.45	0.61
2000		1.7	1.8	1.64	2.0	2.6	2.3	2.7	3.3	4.3
(1093)		0.24	0.26	0.24	0.29	0.37	0.33	0.39	0.48	0.62
To convert Btu-in/ft², hr, °F to Kcal-m², hr, °C, multiply by 0.124.										
Chemical Analysis	%									
Alumina – Al_2O_3		38.8	38.8	38	38.8	47.0	60.4	67.0	69.9	78.3
Silica – SiO_2		47.7	47.8	45	47.8	48.6	36.1	30.5	28.1	20.7
Ferric Oxide – Fe_2O_3		0.4	0.4	0.3	0.4	0.7	0.4	0.3	0.3	0.2
Titanium Oxide – TiO_2		1.6	1.6	1.6	1.6	1.3	1.0	0.9	1.2	0.5
Calcium Oxide – CaO		10.9	10.9	15	10.9	0.3	0.1	0.3	0.2	0.1
Magnesium Oxide – MgO		0.2	0.2	0.1	0.2	0.1	0.2	0.0	0.1	0.1
Alkalies, as Na_2O & K_2O		0.3	0.3	0.5	0.3	2.0	1.8	1.0	0.2	0.1

Typical Data

SPECIAL GRADES

Properties		C-22 Z	BNZ-24	BNZ-25	BNZ-26 HS
Temperature Use Limit	°F	2300	2400	2500	2600
(Normal oxidizing atmosphere)	°C	*1260*	*1316*	*1371*	*1427*
Density, Avg.	lb/ft³	46	37	45	57
ASTM C 134	*kg/m³*	*737*	*593*	*721*	*913*
	lb/BEq	2.7	2.2	2.6	3.3
	kg/str.	*1.2*	*1.0*	*1.2*	*1.5*
Modulus of Rupture	lb/in²	210	120	150	360
ASTM C 133	*MPa*	*1.4*	*0.8*	*1.0*	*2.5*
	kg/cm²	*14.8*	*8.5*	*10.6*	*25.4*
Cold Crushing Strength	lb/in²	320	130	260	580
ASTM C 133	*MPa*	*2.2*	*0.9*	*1.8*	*4.0*
	kg/cm²	*22.5*	*9.2*	*18.3*	*40.8*
Permanent Linear Change	%				
ASTM C 210					
24 hrs at soaking temp: °F *(°C)*					
2250 *(1232)*		0.0	—	—	—
2350 *(1290)*		—	-0.4	—	—
2450 *(1343)*		—	—	-0.4	—
2550 *(1399)*		—	—	—	-0.7
2750 *(1510)*		—	—	—	—
2800 *(1538)*		—	—	—	—
2950 *(1621)*		—	—	—	—
3150 *(1732)*		—	—	—	—
Reversible Linear Thermal Expansion	%				
at 2000°F *(1093°C)*		0.5	0.6	0.6	0.6
Hot Load Strength	%				
ASTM C 16	deformation				
10 psi load for 1½ hours: °F *(°C)*					
2000 *(1093)*		0.1	0	—	—
2200 *(1204)*		—	—	0.3	0.1
2400 *(1316)*		—	—	—	—
Thermal Conductivity	Btu-in/ft², hr, °F				
ASTM C 182	(W/mk)				
Mean temperature, °F *(°C)*					
500		1.5	0.9	1.8	1.9
(260)		*0.22*	*0.13*	*0.26*	*0.27*
1000		1.8	1.1	2.1	2.2
(538)		*0.26*	*0.16*	*0.30*	*0.32*
1500		2.2	1.4	2.5	2.5
(816)		*0.32*	*0.20*	*0.36*	*0.36*
2000		2.5	1.6	2.8	2.8
(1093)		*0.36*	*0.23*	*0.40*	*0.40*
To convert Btu-in/ft², hr, °F to Kcal-m², hr, °C, multiply by 0.124.					
Chemical Analysis	%				
Alumina – Al_2O_3		38.8	40.0	34.0	44.7
Silica – SiO_2		47.8	47.2	63.0	49.9
Ferric Oxide – Fe_2O_3		0.4	0.5	0.7	0.6
Titanium Oxide – TiO_2		1.6	1.5	1.4	1.6
Calcium Oxide – CaO		10.9	10.3	0.3	0.6
Magnesium Oxide – MgO		0.2	0.2	0.1	0.1
Alkalies, as Na_2O & K_2O		0.3	0.3	0.5	2.5

* ASTM C 113

CERTIFIED ISO9002 QUALITY SYSTEM

Design

Temperature use limits should be considered along with other properties of the IFB in determining the proper grade to use for your application.

The hot load deformation along with the mean temperature (i.e. the temperature at the midpoint of the brick) should be considered as well, to assure a successful application.

Guidelines for the mean temperature of each type brick are:

Maximum Mean Temperature	Type Brick
1800°F (982°C)	BNZ-20
2100°F (1149°C)	BNZ-23, BNZ-23HS, C-22Z
2200°F (1204°C)	BNZ-25, BNZ-26, BNZ-26-60, BNZ 26-HS BNZ-28
2400°F (1316°C)	BNZ-3000
2600°F (1427°C)	BNZ-32

Consult your BNZ representative for recommendations on the best combination of products for your temperature, processing and atmospheric conditions.

Complementary Mortars

BNZ manufactures a range of specially-formulated mortars with the proper water retention characteristics that makes them uniquely suited for laying porous IFB. Consult your local BNZ representative for the proper mortar for your application.

BNZ Standard ASTM Grades

BNZ-20 has the low density to meet the criterion for ASTM Grade 20. Its low reheat shrinkage meets the ASTM Grade 23 criterion.

BNZ-23 is the traditional 2300° IFB manufactured by BNZ. It has a history for excellent service in suspended arch designs under cycling conditions.

BNZ-23 HS is a high strength ASTM 23 Grade for applications where a stronger brick than the traditional 23 is required.

BNZ-26 is the standard ASTM Grade 26.

BNZ-26-60 meets all requirements of an ASTM C 155 class 26 IFB, with a higher alumina content than the standard BNZ-26 IFB. This makes the BNZ-26-60 specially designed for areas where furnace atmospheres require the chemical inertness of a higher alumina product. These include the exposed lining of ceramic kilns and special atmosphere furnaces.

BNZ-28 is the traditional ASTM Grade 28.

BNZ-3000 has long been the standard for true ASTM Grade 30 brick. Its low reheat shrinkage at testing temperature of 2950°F is an indication of its ability to tolerate excursions above normal operating temperatures in applications such as strip annealing furnaces.

BNZ-32 is a reasonably priced alternative to bubble alumina brick in many high temperature applications or where high alumina content is required. The Zelie Jumbo sizes are especially useful as spanner brick over burner tile.

BNZ Specialty Grades

C-22Z is a higher strength IFB for applications to 2300°F. It is normally specified in load bearing applications.

BNZ-24 is a low density, low conductivity IFB. It is designed for applications such as pottery and other ceramic kilns where capability of cone 10 firing is required.

BNZ-25 has been improved with higher strength. Its 2500°F rating fills the gap above 2300°F without the cost of high temperature brick.

BNZ-26 HS is a new designation of the former BNZ-1400. It has a combination of very high strength and superior thermal shock resistance. Typical applications include steel ladle and tundish back-up insulation, wear areas of ceramic kilns, carbon baking anode furnaces and high traffic areas in a variety of furnaces and kilns. This grade also replaces the YUMA brick. YUMA brick can still be made to order on special request.

The physical and chemical properties of BNZ's Insulating Fire Brick represent 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. Results should not be used for specification purposes.

BNZ Materials manufactures, and is a worldwide supplier of a range of specialty industrial insulations. BNZ Insulating Fire Brick has been manufactured continuously at Zelienople, Pennsylvania for more than 60 years.

In addition to the Insulating Fire Brick product line, BNZ also manufactures many grades of Structural Insulations under the tradenames Marinite, Transite and CS85. These products are designed for use from ambient temperatures to 1800°F, in densities from 36 to 100 pcf, and will meet the demanding requirements of a variety of industries and their specific needs.

Contact BNZ for more information on these products and their applications.

BNZ Materials, Inc.

Insulating Fire Brick Plant Location

Zelienople
191 Front Street
Zelienople, PA 16063
Phone: **724-452-8650**
800-955-8650
Fax: 724-452-1346

CS85,™ Marinite® & Transite® Plant Location

Billerica
400 Iron Horse Industrial Park
North Billerica, MA 01862
Phone: 978-663-3401
800-888-0061
Fax: 978-663-2735

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Warranty

BNZ Materials warrants that its products are manufactured in accordance with its applicable material specifications and are free from defects in workmanship and materials using BNZ's specifications as a standard. Every claim under this warranty shall be deemed waived unless in writing and received by BNZ within thirty (30) days of the date the defect was discovered and within one (1) year of the date of the shipment of the product.

BNZ MAKES NO OTHER REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION, THE WARRANTY OF MERCHANTABILITY OR THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, OTHER THAN THE LIMITED WARRANTY SET FORTH ABOVE.

Limitation of Liability

It is expressly understood and agreed that the limit of BNZ's liability shall be the resupply of a like quantity of non-defective product and that BNZ shall have no such liability except where the damage or claim results solely from breach of BNZ's warranty.

IT IS ALSO AGREED THAT BNZ SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES FOR ANY ALLEGED NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY, OR ANY OTHER THEORY, OTHER THAN THE LIMITED LIABILITY SET FORTH ABOVE.