



Standard Specification for Brick, Insulating, High Temperature, Fire Clay¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers two types of thermal insulating brick for industrial or marine boiler furnaces. Type I is a special, 2500 °F (1371 °C) maximum service temperature, insulating firebrick that is used as backup insulation for refractory furnace linings.² Type II is a standard insulating brick that, in general, is used where there may be direct contact with combustion gases, such as forge and stress relieving furnaces.³

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:⁴

C133 Test Methods for Cold Crushing Strength and Modulus of Rupture of Refractories

¹ This specification is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.07 on General Requirements.

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² Type I is a replacement for MIL-B-16008C, Brick, Insulating, High Temperature, Fire Clay

³ Type II is a replacement for MIL-B-16305B Class B, Brick, Refractory, Insulating.

⁴ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

C134 Test Methods for Size, Dimensional Measurements, and Bulk Density of Refractory Brick and Insulating Firebrick

C155 Classification of Insulating Firebrick

C210 Test Method for Reheat Change of Insulating Firebrick

D1974/D1974M Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes

D3953 Specification for Strapping, Flat Steel and Seals

D4727/D4727M Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes

D5118/D5118M Practice for Fabrication of Fiberboard Shipping Boxes

D6251/D6251M Specification for Wood-Cleated Panelboard Shipping Boxes

D6880/D6880M Specification for Wood Boxes

2.2 *Military Specification:*⁵

MIL-L-10547 Liners, Case, and Sheet, Overwrap; Vapor-proof or Waterproof, Flexible

2.3 *Military Standards:*⁵

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-147 Palletized Unit Load 40 Inch by 48 Inch 4-Way (Partial) Pallet Skids, Runners, or Pallet Type Base

MIL-STD-2073-1 Standard Practice for Military Packaging

2.4 *ASQ Document:*⁶

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

3. Classification

3.1 Refractory insulating brick shall be of the following types, as specified (see Section 6): Type I — 2500 °F (1371 °C), Type II — 2800 °F (1538 °C). Type II brick is part of Group No. 28 of Classification **C155**.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information as necessary to describe the material adequately:

4.1.1 ASTM designation and year of issue,

⁵ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁶ Available from American Society for Quality (ASQ), 600 N. Plankinton Ave., Milwaukee, WI 53203, <http://www.asq.org>.

- 4.1.2 Type insulating firebrick required,
- 4.1.3 Dimensions required (see 7.1), and
- 4.1.4 Optional requirements, if any (see Supplementary Requirements S1, S2, and S3).

5. Materials and Manufacture

5.1 Bricks shall be composed of heat-resistant materials which have been burned or fired to produce the desired density, strength, low heat conductivity, and structure.

6. Physical and Mechanical Properties

6.1 The average bulk density shall not exceed 45.0 lb/ft³ (720 kg/m³) for Type I brick. The bulk density shall be a maximum of 60 lb/ft³ (993.1 kg/m³) for Type II brick (see 10.2).

6.2 The modulus of rupture shall average not less than 100 psi (700 kPa) for Type I brick. The modulus of rupture shall average not less than 175 psi (1206.6 kPa) and not more than two of the ten bricks tested shall show less than 150 psi (1034.6 kPa) for Type II brick (see 10.3).

6.3 Bricks shall show an average linear reheat change of not more than 1 % when heated at 2450 °F (1343 °C) for Type I bricks. Bricks shall show an average linear reheat change of not more than 2 % when heated at 2750 °F (1510 °C) for Type II brick (see 10.4).

7. Dimensions and Permissible Variations

7.1 Insulating brick shall be furnished in the dimensions specified (see 4.1.3). Standard size brick shall be 9 in. by 4½ in. by 2½ in. (229 mm by 114 mm by 64 mm), 9 in. by 4½ in. by 2 in. (229 mm by 114 mm by 51 mm), or 9 in. by 4½ in. by 1½ in. (229 mm by 114 mm by 32 mm), as specified.

7.2 *Dimension Tolerances*—Length, width, and thickness dimensions of brick shall have the tolerances as specified in Table 1 (see 10.2).

8. Workmanship, Finish, and Appearance

8.1 Bricks shall be of homogeneous structure, and shall be free from cracks, laminations, segregations, void defects, or soft centers. All corners and edges shall be sufficiently strong to prevent excessive crumbling or chipping when handled or shipped.

TABLE 1 Dimension Tolerances

Dimension-inches (millimetres)	Tolerances-inch (millimetres)
9 (229 mm)	±3/32 in. (3 mm)
2 (51 mm) to 4½ (114 mm) inclusive	±1/16 in. (2 mm)
1½ (32 mm)	±1/32 in. (1 mm)

9. Sampling

9.1 For purposes of sampling, an inspection lot for examination and tests shall consist of all material of the same size and shape offered for delivery at one time.

9.2 The sample unit for the tests of Section 10 shall be one brick.

9.3 The sample size (the number of sample units) for the tests of Section 10 shall be as specified in Table 2.

10. Test Methods

10.1 *Testing of the End Item*—The end item shall be tested for the applicable characteristics as shown in Table 2 from each lot presented for examination for each size and shape of brick.

10.2 *Dimensions and Bulk Density*—Dimensions and bulk density shall be determined in accordance with the test method specified in Test Methods C134.

10.3 *Modulus of Rupture*—The modulus of rupture shall be determined in accordance with the test method specified in Test Methods C133.

10.4 *Reheat Change*—The reheat change shall be determined in accordance with Test Method C210, except that the Type I test specimens shall be maintained at a temperature of 2450 °F (1343 °C) for 24 hours. Type II test specimens shall be maintained at a temperature of 2750 °F (1510 °C) for 24 hours.

11. Inspection

11.1 Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the purchaser. The purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

12. Product Marking

12.1 Bricks shall be marked with the manufacturer's brand name and Type I or II in accordance with this specification by indelible stamping or stenciling.

13. Packaging

13.1 Bricks shall be packed in containers which will ensure acceptance by common carrier and safe delivery to destination at the lowest applicable rate. Containers shall comply with commercial carrier regulations.

14. Keywords

14.1 brick; insulating brick; fire clay

TABLE 2 Instructions for Testing

Characteristic	Specification Reference		Requirements Applicable to		Number Determinations per Unit	Results Reported as		Sample Size
	Requirement	Test Method	Individual Unit	Lot Average		Pass or Fail	Numerically to Nearest ⁴	
Density	6.1	10.2	...	X	1	...	0.1 lb/ft ³	10
Modulus of rupture	6.2	10.3	...	X	1	...	psi	10
Reheat change	6.3	10.4	...	X	1	...	0.1 %	3

⁴ Test reports shall include all values on which average results are based.

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements (see Supplementary Requirements S1, S2, and S3) shall apply only when specified in the contract or purchase order (see 4.1.4).

S1. Referenced Documents

S1.1 The following documents shall apply only when one or more of the requirements of Supplementary Requirements S2 or S3 are specified in the contract or purchase order (see 4.1.4):

S1.1.1 *ASTM Standards*:⁴

Practice **D1974/D1974M**

Specification **D3953**

Specification **D4727/D4727M**

Practice **D5118/D5118M**

Specification **D6251/D6251M**

Specification **D6880/D6880M**

S1.1.2 *Military Specification*:⁵

MIL-L-10547

S1.1.3 *Military Standards*:⁵

MIL-STD-129

MIL-STD-147

MIL-STD-2073-1

S1.1.4 *ASQ Document*:⁶

ANSI/ASQ Z1.4

S2. Special Government Requirements

S2.1 *Examinations and Test Requirements*:

S2.1.1 *Examination of End Item for Defects in Appearance, Workmanship, and Dimensions*—An examination shall be made in accordance with **Tables S2.1-S2.4** to determine that the appearance, workmanship, and dimensions of the end item comply with the requirements of this specification.

S2.1.1.1 The sample unit shall be one brick.

S2.1.2 *Examination of Preparation for Delivery*—An examination shall be made in accordance with **Table S2.2** and **Table S2.4** to determine that the packing and markings comply with the requirements of **Table S2.3** of this specification.

S2.1.2.1 The sample unit shall be one shipping container, fully packed, selected just before the closing operation.

S2.1.3 Examination of palletized unit loads, as applicable. Unless palletization is not required (see S3.5), an examination in accordance with **Table S2.3** and **Table S2.4** shall be made to determine that palletized unit loads comply with the requirements of MIL-STD-147.

S2.1.3.1 The sample unit shall be one palletized load.

S2.1.4 For the test specified in **10.2**, the sample size for examination of dimensions shall be governed by S2.1.2.1.

S2.2 *Inspection Levels*:

S2.2.1 The inspection levels for determining the sample size shall be in accordance with ANSI/ASQ Z1.4 and **Table S2.4**.

S2.2.2 Requirements of **4.1.4** should state when the Acceptance Quality Limits (AQL) of 2.5 can be used for workmanship and dimensions, Inspection Level S-3 and S-4 (see **Table S2.4**), and AQL of 4.0 can be used for examination of preparation for delivery and of examination of palletized unit loads (see S2.1.2 and S2.1.3), Inspection Level S-2 (see **Table S2.4**).

S2.3 *First Article Testing (FAT)*:

S2.3.1 Unless otherwise specified in the contract or purchase order, FAT shall be done in accordance with conformance requirements of Sections **6** through **10** to determine if

TABLE S2.1 Examination of End Item

Examine	Defect
Appearance and Workmanship	Material not as specified. Not free from cracks, laminations, segregations, and void surface defects. Corners or edges chipped or crumbled affecting serviceability. Shape of brick not as required.
Standard Brick	Specified dimensions 2 in. (51 mm) or greater vary by more than $\pm 1/16$ in. (2 mm) from dimension specified. Specified dimensions less than 2 in. (51 mm) vary by more than $\pm 1/32$ in. (1 mm) from dimension specified.
Special Shape Brick	Length, width, or thickness varies by more than $\pm 1/16$ in. (2 mm) from size specified.