



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

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

1. Scope

1.1 This specification covers one type of thermal insulating brick for use as backup insulation for refractory furnace linings of boiler furnaces.

1.2 The values stated in inch-pound units are to be regarded as standard. The SI units in parentheses are for information purposes only and may be approximate.

2. Referenced Documents

2.1 ASTM Standards:²

C93 Test Method for Cold Crushing Strength and Modulus of Rupture of Insulating Firebrick (Withdrawn 1992)³

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

C210 Test Method for Reheat Change of Insulating Firebrick

2.2 Federal Specifications:

PPP-B-601 Boxes, Wood, Cleated-Plywood⁴

PPP-B-621 Boxes, Wood, Nailed and Lock Corner⁴

PPP-B-636 Box, Fireboard⁴

2.3 Military Specification:

MIL-L-10547 Liners, Case, and Sheet, Overwrap; Vapor-proof or Waterproof, Flexible⁴

2.4 Military Standards:

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes⁴

MIL-STD-129 Marking for Shipment and Storage⁴

MIL-STD-147 Palletized Unit Load 40 Inch by 48 Inch

4-Way (Partial) Pallet Skids, Runners, or Pallet Type Base⁴

3. Ordering Information

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

3.1.1 ASTM designation and year of issue,

3.1.2 Dimensions required (see 6.1), and

3.1.3 Optional requirements, if any (see S1 through S3).

4. Material and Manufacture

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

5. Physical and Mechanical Properties

5.1 The average bulk density shall not exceed 45.0 lb/ft³ (720 kg/m³) (see 9.2).

5.2 The modulus of rupture shall average not less than 100 psi (700 kPa) (see 9.3).

5.3 Bricks shall show an average reheat change of not more than 1 % when heated at 2450°F (1343°C) (see 9.4).

6. Dimensions and Permissible Variations

6.1 Insulating brick shall be furnished in the dimensions specified (see 3.1.2). Standard size brick shall be 9 by 4½ by 2½ in. (229 by 114 by 64 mm), 9 by 4½ by 2 in. (229 by 114 by 51 mm), or 9 by 4½ by 1¼ in. (229 by 114 by 32 mm), as specified.

6.2 Standard size brick shall not vary more than $\pm 1/16$ in. (2 mm) from specified dimensions of 2 in. (51 mm) or greater, nor more than $\pm 1/32$ in. (1 mm) from specified dimensions less than 2 in. (see 9.2).

6.3 For special shapes, no dimension shall vary more than 1/16 in. (2 mm) from the dimensions specified (see 9.2).

7. Workmanship, Finish, and Appearance

7.1 Bricks shall be of homogeneous structure, free from cracks, laminations, segregations, void defects, or soft centers.

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² 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Standardization Documents, Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 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	5.1	9.2	...	X	1	...	0.1 lb/ft ³	10
Modulus of rupture	5.2	9.3	...	X	1	...	psi	10
Reheat change	5.3	9.4	...	X	1	...	0.1%	3

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

All corners and edges shall be sufficiently strong to prevent excessive crumbling or chipping when handled or shipped.

8. Sampling

8.1 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.

8.2 The sample unit for the tests of Section 9 shall be one brick.

8.3 The sample size (the number of sample units) for the tests of Section 9 shall be as specified in Table 1.

9. Test Methods

9.1 *Testing of the End Item*—The end item shall be tested for the applicable characteristics as shown on Table 1 from each lot presented for examination for each size and shape of brick.

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

9.3 *Modulus of Rupture*—The modulus of rupture shall be determined in accordance with the test method specified in Test Methods C93.

9.4 *Reheat Change*—The reheat change shall be determined in accordance with Test Method C210, except that the test specimens shall be maintained at a temperature of 2550°F (1343°C) for 24 h.

10. Inspection

10.1 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.

11. Product Marking

11.1 Bricks shall be marked with the manufacturer's name or trademark by suitable indentation or stamping.

12. Packaging

12.1 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.

13. Keywords

13.1 brick; insulating brick; fire clay

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified in the contract or purchase order (see 3.1.3).

S1. Referenced Documents

S1.1 The following documents shall apply only when one or more of the requirements of S2 or S3 are specified in the contract or purchase order (see 3.1.3): Federal Specifications PPP-B-601, PPP-B-621, and PPP-B-636; Military Specification MIL-L-10547; and Military Standards MIL-STD-105, MIL-STD-129, and MIL-STD-147.

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 S1-S4 to determine that the appearance, workmanship, and dimensions of the end item comply with the requirements of this specification.

TABLE S1 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.
Standard brick	Shape of brick not as required. 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.

TABLE S2 Examination for Preparation for Delivery

Examine	Defect
Packing	Not as specified. Container not as specified, closures not accomplished by specified or required methods or materials. Any nonconforming component, component missing, damaged or otherwise defective, affecting serviceability. Inadequate application of components; such as incomplete closures of case liners, container flaps, loose or inadequate strappings, bulged or distorted containers.
Count	Number of bricks per container less than specified or indicated quantity.
Weight	Gross or net weight exceeds specified requirements.
Markings	Omitted, illegible, incorrect, incomplete, or not as specified.

TABLE S3 Examination of Palletized Unit Loads

Examine	Defect
Packing	Not palletized as specified. Arrangement or number of containers per pallet not in accordance with MIL-STD-147. Inadequate application of components such as incomplete closures, loose or inadequate strapping, bulged, or distorted containers.
Count	Less than specified in indicated quantity of containers.
Markings	Exterior markings omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements

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 and Table S4 to determine that the packing and markings comply with the requirements of Table S3 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 S3.3), an examination in accordance with Table S3 and Table S4 shall be made to determine that palletized unit loads comply with requirements of MIL-STD-147.

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TABLE S4 Inspection Levels and Acceptable Quality Levels (AQL) for Examination

Examination Paragraph	Inspection Level	AQL
S2.1.1 (Appearance, workmanship)	S-4	2.5
S2.1.1 (Dimensions)	S-3	2.5
S2.1.2	S-2	4.0
S2.1.3	S-2	4.0

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

S2.1.4 For the test specified in 9.2, the sample size for examination of dimensions shall be governed by S2.1.2.1.

S2.2 The inspection levels for determining the sample size and the acceptable quality levels (AQLs), expressed in defects per 100 units, shall be as specified in Table S4, in accordance with MIL-STD-105.

S3. Preparation for Delivery

S3.1 *Level A*—When level A is specified (see 3.1.3), bricks shall be packed in snug-fitting, wood-cleated plywood, nailed wood, or fiberboard boxes conforming to PPP-B-601 (overseas type), or PPP-B-621 (Class 2), or PPP-B-636 (V3c or V3s), respectively. Plywood and nailed wood boxes shall be lined with sealed case liners conforming to MIL-L-10547. Boxes shall be closed and reinforced in accordance with the appendix to the applicable box specification, but wire strapping shall not be used with fiberboard boxes. Crimp-type connectors shall be used with metallic or nonmetallic strapping.

S3.1.1 Each box shall contain not more than the following:
 25 Bricks—9 by 4½ by 2½ in. (229 by 114 by 64 mm),
 40 Bricks—9 by 4½ by 2 in. (229 by 114 by 51 mm), or
 50 Bricks—9 by 4½ by 1¼ in. (229 by 114 by 32 mm).

S3.2 *Level B*—When Level B is specified (see 3.1.3), bricks, in unit quantities specified in S3.1.1, shall be packed in snug-fitting fiberboard boxes conforming to PPP-B-636 (domestic class, grade 200). Boxes shall be closed by Method II and reinforced by use of filament tape, flat steel, or nonmetallic straps in accordance with the appendix to PPP-B-636. Crimp-type connectors shall be used with metallic or nonmetallic strapping.

S3.3 *Palletizing*—Unless otherwise specified (see 3.1.3), packed brick shall be palletized in accordance with MIL-STD-147. Palletized loads shall be provided with fiberboard caps.

S3.4 *Marking*—In addition to any special marking required by the contract or purchase order, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129. Shipping containers shall be marked as follows: STORE IN DRY PLACE.