

MIL-B-15606H(NAVY)  
30 June 1983  

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SUPERSEDING  
MIL-B-15606G  
29 November 1968  
(See 6.5)

## MILITARY SPECIFICATION

### BRICKS, REFRACTORY, AND BURNER TILE, NAVAL BOILER FURNACE LINING QUALITY

This specification is approved for use by all interested Commands of the Department of the Navy and the Marine Corps and is available for use by all other Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers refractory brick and burner tile for lining Naval boiler furnaces.

1.2 Classification. Refractory brick shall be of the following grades, as specified (see 6.2.1).

Grade AA - Super quality.  
Grade A - Alumina.  
Grade B - Super duty.

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### FEDERAL

NN-P-71 - Pallets, Material Handling Wood, Stringer  
Construction 2-Way and 4-Way (Partial).  
QQ-S-781 - Strapping, Steel, and Seals.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FEDERAL (Continued)

- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized Unit Loads.

2.1.2 Government drawings. The following Government drawings form a part of this specification to the extent specified herein.

DRAWINGS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

- NAVSHIPS 810-1385708 - Burner Tile, Refractory, for Marine Boilers.
- NAVSHIPS S5102-1385784 - Brick, Refractory, for Marine Boilers.

(Copies of specifications, standards and drawings required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- C 24 - Pyrometric Cone Equivalent (PCE) of Refractory Materials, Test for.
- C 38 - Panel Spalling Testing Refractory Brick.
- C 113 - Reheat Change of Refractory Brick, Test for.
- C 122 - Panel Spalling Testing Super-Duty Fireclay Brick.
- C 133 - Cold Crushing Strength and Modulus of Rupture of Refractory Brick and Shapes, Tests for.
- C 573 - Chemical Analysis of Fireclay and High-Alumina Refractories.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

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2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

## 3. REQUIREMENTS

3.1 Qualification. The brick or tile furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.4 and 6.3).

3.2 Composition. The brick or tile shall be composed of heat-resistant clays, or processed aluminum silicate minerals which have been burned or fired to produce the desired properties.

3.3 Dimensions. Brick shall be furnished in the dimensions specified (see 6.2.1), and shall conform to Drawing S5102-1385784 for shapes shown thereon. Burner tile shall be furnished in dimensions specified (see 6.2.1), and shall conform to Drawing 810-1385708 for shapes shown thereon. Refractory brick (including those with anchor bolt recesses) are described as standard shapes (see 3.4.1, 4.6.1 and 6.2.1). Other brick and burner tile are described as special shapes (see 3.4.2, 3.4.3, 4.6.1 and 6.2.1).

3.4 Tolerances.

3.4.1 Standard shape brick. Length, width, and thickness of standard rectangular refractory brick (including those recessed for anchor bolts) as shown on Drawing S5102-1385784 shall be within the limits specified in table I (see 4.6.4.1 and 6.2.1).

TABLE I. Allowable dimensions of standard shape brick.

Nominal dimensions	Minimum	Maximum
(Inches)	(Inches)	(Inches)
Length:		
13-9/16	13.36	13.76
9	8.87	9.13
Width:		
6-3/4	6.62	6.88
4-1/2	4.41	4.59
2-1/4	2.20	2.30
Thickness:		
2-1/2	2.45	2.57
1-1/4	1.21	1.29
2	1.96	2.04

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3.4.2 Special shape brick. Special shape brick shall not deviate from specified dimensions more than plus or minus 2 percent on dimensions of 4 inches or over, or plus or minus 3 percent on dimensions under 4 inches (see 4.6.4.2 and 6.2.1).

3.4.3 Burner tile. Burner tile shall conform to the dimensions and tolerances shown on Drawing 810-1385708. Non-parallelism of abutting tile faces, arranged as shown on figure 1, shall not exceed 1/8 inch (see 4.6.4.3 and 6.2.1).

### 3.5 Warpage.

3.5.1 Standard shape brick. Any gap between adjacent, stacked standard shape brick shall not exceed 3/32 inch (see 4.6.5.1).

3.5.2 Special shape brick. Special shape brick shall be free of swells, warps, and distortions as would prevent ready and accurate laying up with a maximum joint gap of 1/8 inch (see 4.6.5.2).

3.5.3 Burner tile. Burner tile shall be free of swells, warps and distortions as would prevent ready and accurate laying with a maximum joint thickness of 1/8 inch between abutting surfaces. A straight edge laid along the longest dimension on the working face of the tile shall not reveal warpage greater than 1/8 inch (see 4.6.5.3).

3.6 Marking. The grade designation "AA", "A", or "B" and the brand (or such name or symbol as will serve to identify the manufacturer) shall be molded in each brick or tile (see 4.6.2 and 6.2.1).

### 3.7 Grade AA, super quality.

3.7.1 Spalling loss. The spalling loss after the preheat and spalling tests shall not exceed 4 percent weight loss of the bricks (see 4.7.6.2).

3.7.2 Modulus of rupture. The modulus of rupture shall average not less than 600 pounds per square inch (lb/in<sup>2</sup>) and no single specimen shall be less than 300 lb/in<sup>2</sup> (see 4.7.4).

3.7.3 Dimensional stability. The stability value shall not exceed 0.75 percent. Expansion, if any, in the length dimension shall not exceed 1 percent. Shrinkage, if any, in the length dimension shall not exceed 0.75 percent (see 4.7.5).

### 3.8 Grade A, alumina.

3.8.1 Alumina. The alumina content shall be not less than 57.5 percent (see 4.7.1).

3.8.2 Pyrometric cone equivalent (PCE). The PCE shall be not less than cone number 35 (3245 degrees Fahrenheit (°F)) (see 4.7.2).

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3.8.3 Permanent volume change. The permanent volume change after reheating at  $2910 \pm 10^{\circ}\text{F}$  for 5 hours shall be not more than plus 3 nor minus 1 percent after the first reheat. The brick shall not expand nor shrink more than an additional 1 percent by volume between the first and third reheat (see 4.7.3).

3.8.4 Spalling loss. The spalling loss after the preheat and spalling tests shall not exceed 4 percent of the bricks (see 4.7.6.2).

3.8.5 Modulus of rupture. The modulus of rupture shall average not less than 500 lb/in<sup>2</sup> for bricks only and no single specimen shall be less than 250 lb/in<sup>2</sup> (see 4.7.4).

3.9 Grade B, super duty.

3.9.1 Pyrometric cone equivalent. The PCE shall be not less than cone number 33 ( $3170^{\circ}\text{F}$ ) (see 4.7.2).

3.9.2 Permanent volume change. The permanent volume change after reheating at  $2910 \pm 10^{\circ}\text{F}$  for 5 hours shall be not more than plus 3 nor minus 1 percent (see 4.7.3).

3.9.3 Spalling loss. The spalling loss after the preheat and spalling tests shall not exceed 4 percent of the bricks (see 4.7.6.2).

3.9.4 Modulus of rupture. The modulus of rupture shall average not less than 500 lb/in<sup>2</sup> and no single specimen shall be less than 250 lb/in<sup>2</sup> (see 4.7.4).

3.10 Burner tile. Burner tile shall be of the same quality materials and processing as grade A brick.

3.10.1 Permanent linear change. The permanent linear change after reheating at  $2910 \pm 10^{\circ}\text{F}$  for 5 hours shall not be more than 1 percent after the first reheat. The sample shall not shrink more than an additional 1 percent in linear dimension between the first and third reheat (see 4.7.7).

3.11 Workmanship.

3.11.1 Brick. The bricks shall be compact, homogeneous in structure, free from voids, soft centers and cracks greater than 2 inches in length or 1/16 inch in width. Crumbling or chipping at corners and edges shall not exceed 3/8 inch (see figure 3). Corners and edges shall be sufficiently solid and strong to prevent more than 3/8 inch crumbling or chipping when thumb pressure is applied (see 4.6.3).

3.11.2 Burner tile. The burner tiles shall be compact, homogeneous in structure, free from voids, soft centers and cracks greater than 2 inches in length or 1/16 inch in width.

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3.11.2.1 Working surfaces. Crumbling or chipping at corners and edges of working surfaces shall not exceed 1/4 inch (see figure 2). Corners and edges shall be sufficiently solid and strong to prevent more than 1/4 inch crumbling or chipping when thumb pressure is applied. At feather edges where anchor bolt holes are close to the burner throat; crumbling or broken out areas are allowable to a maximum of 1/2 inch in depth (see 4.6.3).

3.11.2.2 Buried surfaces. At buried surfaces (see figure 3), crumbling or chipping of edges and corners shall not exceed 1/2 inch in depth. Defects on the surface itself shall not exceed 1/4 inch in depth by 1 inch long. Buried surface is defined as any other surface other than working surface (see 4.6.3).

## 4. QUALITY ASSURANCE PROVISIONS

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

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Qualification inspection (see 4.4 and 4.6).
- (b) Quality conformance inspection (see 4.5, 4.6 and 4.8).

4.3 Sample size. Sampling for qualification and quality conformance inspection shall be performed in accordance with MIL-STD-105 and table II. For purposes of sampling, an inspection lot for examinations and tests shall consist of all material of the same grade, size, and shape offered for delivery at one time. Unless otherwise specified, the unit of sample shall be one brick or one tile.

TABLE II. Sampling for qualification and quality conformance inspection.

Inspection	Test paragraph	Inspection level	Acceptance quality level (AQL)
Workmanship	4.6.3	S-1	2.5
Dimension			
(Standard brick)	4.6.4.1	S-3	2.5
(Special shape brick)	4.6.4.2	S-3	2.5
(Burner tile)	4.6.4.3	<u>1/</u>	<u>1/</u>
Warpage			
(Standard brick)	4.6.5.1	<u>1/</u>	<u>1/</u>
(Special shape brick)	4.6.5.2	<u>1/</u>	<u>1/</u>
(Burner tile)	4.6.5.3	<u>1/</u>	<u>1/</u>

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TABLE II. Sampling for qualification and quality conformance inspection. - Continued

Inspection	Test paragraph	Inspection level	Acceptance quality level (AQL)
Chemical analysis	4.7.1	<u>1/</u>	<u>1/</u>
Pyrometric cone equivalent	4.7.2	<u>1/</u>	<u>1/</u>
Permanent volume change	4.7.3	<u>1/</u>	<u>1/</u>
Modulus of rupture	4.7.4	<u>1/</u>	<u>1/</u>
Stability	4.7.5	<u>1/</u>	<u>1/</u>
Spalling loss	4.7.6	<u>1/</u>	<u>1/</u>
Permanent linear change	4.7.7	<u>1/</u>	<u>1/</u>
Preservation, packing and markings	4.8	<u>1/</u>	<u>1/</u>

1/ Sample size and accept or reject criteria as specified in test paragraph.

4.4 Qualification inspection. Qualification inspection shall be as specified in table III (see 3.1 and 6.3).

TABLE III. Qualification inspection.

Test	Test paragraph	Requirement paragraph
Workmanship	4.6.3	3.11
Chemical analysis	4.7.1	3.8.1 or 3.10.1
Pyrometric cone equivalent	4.7.2	3.8.2 or 3.10.2
Permanent volume change	4.7.3	3.8.3 or 3.9.2
Modulus of rupture	4.7.4	3.7.2 or 3.8.5 or 3.9.4
Stability	4.7.5	3.7.3
Spalling loss	4.7.6	3.7.1 or 3.8.4 or 3.9.3
Permanent linear	4.7.7	3.10.3

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4.5 Quality conformance inspection. Quality conformance inspections shall be as specified in table IV.

TABLE IV. Quality conformance inspection.

Test	Test paragraph	Requirement paragraph
Chemical analysis	4.7.1	3.8.1
Pyrometric cone equivalent	4.7.2	3.8.2 or 3.9.1
Permanent volume change	4.7.3	3.8.3 or 3.9.2
Modulus of rupture	4.7.4	3.7.2 or 3.8.5 or 3.9.4
Stability	4.7.5	3.7.3
Spalling loss	4.7.6	3.7.1 or 3.8.4 or 3.9.3
Permanent linear change	4.7.7	3.10.1

4.6 Examinations.

4.6.1 Shape. Shape of the brick or tile shall be as specified (see 3.3 and 6.2.1).

4.6.2 Marking. Marking of brick or tile identification shall be legible and correct (see 3.6 and 6.2.1).

4.6.3 Workmanship. Workmanship shall be as specified (see 3.11).

4.6.4 Dimensions.

4.6.4.1 Standard shape brick. Standard shape brick shall be as specified on the applicable drawing, and shall be within the limits as specified in table I (see 3.4.1 and 6.2.1).

4.6.4.2 Special shape brick. Special shape brick dimensions shall be as specified (see 3.4.2 and 6.2.1).

4.6.4.3 Burner tile. On a flat surface, a sufficient number of tile shall be assembled to form a simulated burner assembly, with a 1/16-inch spacer at each tile to tile joint. Dimensions A through E shall be measured as specified (see figure 1), at three or more positions for each dimension on the assembly in accordance with corresponding dimensions as specified on Drawing 810-1385708. See note 9 on Drawing 810-1385708 for additional dimensional guidance (see 3.4.3 and 6.2.1).

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4.6.5 Warpage.

4.6.5.1 Standard brick. Ten bricks shall be placed on a plane surface, with the thickness dimension vertical. The bricks shall be stacked such that the branded surface is alternated face up. Gaps between adjacent bricks on four sides shall not exceed 3/32 inch. If the gap between any two adjacent bricks exceeds 3/32 inch, then a second stack of ten bricks erected in the same manner shall be inspected. A gap between any two adjacent bricks that exceeds 3/32 inch on any four sides shall be cause for rejection of the lot (see 3.5.1).

4.6.5.2 Special shape brick. When surfaces of two special shape bricks are laid together (as they would be in furnace application), non-parallelism of the two surfaces shall not exceed 1/8 inch (see 3.5.2).

4.6.5.3 Burner tile. Abutting tile faces shall be inspected for non-parallelism greater than 1/8 inch (see figure 1). A straight edge laid along the longest dimension on the working face of the tile shall not reveal warpage greater than 1/8 inch (see 3.5.3).

4.7 Tests.

4.7.1 Chemical analysis. Alumina content of 57.5 percent for grade A brick or tile shall be determined for two bricks or tiles in accordance with ASTM C 573 (see 3.8.1). If both bricks or tiles fail, the lot shall be rejected without retest. If either fails, three additional bricks or tiles shall be tested. If any one of the three retest bricks or tiles fail, this shall be cause for rejection of the lot.

4.7.1.1 Chemical certification. Certification of chemical analysis may be presented in lieu of chemical analysis for those lots presented within 1 year of the previous acceptable analysis (see 6.2.2).

4.7.2 Pyrometric cone equivalent (grade A or B). Two test cones shall be made from two grade A or grade B bricks, or two tiles and tested in accordance with ASTM C 24. If both cones fail, the lot shall be rejected without retest. If either fails three additional cones shall be made and tested, one from each of the additional bricks. If any one of the three retest cones fail, this shall be cause for rejection of the lot (see 3.8.2 or 3.9.1).

4.7.3 Permanent volume change (grades A and B only). Three test bricks measured to the nearest 0.01 inch shall be placed in a gas-fired furnace and the temperature gradually raised to  $2910 \pm 10^{\circ}\text{F}$ . This temperature shall be maintained for 5 hours, after which the furnace shall be allowed to cool to room temperature. The bricks shall be again measured and the change computed. Grade A brick shall be given three cycles of this heat treatment and grade B one cycle. If the average of these three samples is found to be not in accordance with 3.8.3 or 3.9.2, as applicable, a retest shall be made on six additional bricks of the sample. If the average of nine samples fail to conform to this specification, this shall be cause for rejection of the lot.

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4.7.4 Modulus of rupture. Modulus of rupture shall be determined on five sample bricks in accordance with ASTM C 133. If the average of these samples is less than specified in 3.7.2, 3.8.5, or 3.9.4, as applicable, a retest shall be made on five additional bricks. If the average of ten samples fails to conform to this specification, this shall be cause for rejection of the lot.

4.7.5 Stability (grade AA only). Three test bricks shall be measured in length and width to the nearest 0.01 inch. The length dimension, if greater than 9 inches, shall be cut to 9 inches for this test. The brick shall be placed, laying on a 4-1/2 by 2-1/2 inch end, in a gas-fired furnace and the temperature gradually raised to  $3000 \pm 10^\circ\text{F}$ . The temperature shall be maintained for 5 hours, after which the furnace shall be allowed to cool to room temperature. The brick shall be measured, and the changes in length and width dimension shall be calculated as percent to the original dimensions. The stability value is calculated by subtracting the percent change in length from the percent change in width, except that negative width changes (indicating shrinkage) shall be adjusted to zero before calculating stability value. If the average of these three samples is found not in accordance with 3.7.3, a retest shall be made on each of six additional bricks of the sample. If the average of nine bricks fails to conform to this specification, this shall be cause for rejection of the lot.

4.7.6 Spalling.

4.7.6.1 Test sample. Spalling test is applicable to standard shape brick only with nominal width of 4-1/2 inches or greater and nominal thickness of 2-1/2 inches. Spalling test shall be performed on 14 sample bricks. If the average of the 14 samples does not conform to 3.7.1, 3.8.4, or 3.9.3, as applicable, a retest shall be made on 14 additional bricks of the sample. If the average of 28 samples fails to conform to this specification, this shall be cause for rejection of the lot.

4.7.6.2 Spalling test. The preheat and spalling tests shall be conducted in accordance with the methods specified in ASTM C 38 and ASTM C 122, except that the temperature of the panel faces during the preheat test for grade AA brick only shall be maintained at  $3000 \pm 10^\circ\text{F}$  for a period of 48 hours, and grades A and B for a period of 24 hours.

4.7.6.3 Spalling certification. Certification of spalling may be presented in lieu of spalling test results for those lots presented within 1 year of the previous acceptable spalling test results (see 6.2.2).

4.7.7 Permanent linear change, burner tile only. Permanent linear change shall be determined in accordance with ASTM C 133, or as specified below. If the average of the three samples is found not in accordance with 3.10.1, a retest shall be made on each of six additional tiles of the sample. If the average of the nine tiles fails to conform to this specification, this shall be cause for rejection of the lot.

- (a) Cut 3 sample tiles using a masonry saw so as to provide from each, a specimen having parallel ends approximately 9 inches apart (or as near 9 inches as possible) and perpendicular to a flat surface.

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- (b) Measure the lengths of the three specimens before and after heating. Measurements shall be to the nearest 0.01 inch using a vernier caliper or dial gage device. Specimens shall be heated at  $2910 \pm 10^{\circ}\text{F}$  according to schedule C of ASTM C 113. Calculate the percentage linear change based on the original length of each specimen.
- (c) Each specimen shall be given three cycles of this heat treatment (see 3.10.1).

#### 4.8 Preservation, packing and marking inspections.

4.8.1 Shipping containers. A sample shipping container shall be inspected for preservation, packing, marking, count and weight. The sample shipping container shall be fully packed and selected prior to closing, and sealing, and fully prepared for delivery (see section 5 and 6.2.1).

4.8.2 Palletized unit loads. A sample palletized unit load shall be inspected for packing, markings and count. The sample pallet shall be fully packed and prepared for delivery (see section 5 and 6.2.1).

### 5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the preparation for delivery requirements of referenced documents listed in section 2, see 6.4.)

5.1 Preservation. Brick shall be preserved level A. Packs shall contain brick of one size, shape, and grade only.

5.1.1 Straights. Straights of 9 inches shall be protected in unit packs of ten bricks. Each pack shall contain five courses of two bricks each, stacked in a crisscross formation (see figure 4). Each course of brick shall be separated by a sheet of solid or corrugated fiberboard and corners of each pack shall be protected by means of scored fiberboard sheet, extending the height of the pack and a minimum of 1-1/2 inches along each face (see figure 4, protector and separator sheet data). The top and bottom of each unit pack shall be provided with fiberboard caps as specified on figure 4. Separator sheets, fiber caps, and corner protectors shall be in accordance with W5c and W5s of PPP-F-320. Each pack shall be tension tied with a minimum of three uniformly spaced flat steel straps, 3/8 by 0.020 inch, in accordance with type I, finish B of QQ-S-781 as specified on figure 4.

5.1.1.1 Alternate unit pack. Straights of 9 inches shall be protected, ten brick for each pack, in close fitting fiberboard boxes conforming to weather-resistant, V3s or V3c, of PPP-B-636, style RSC or FOL. Bricks shall be separated from each other by fiberboard sheets conforming to W5c or W5s of PPP-F-320. Style RSC boxes when used, shall also have top and bottom pads of fiberboard of the same material as the separate sheets. Boxes shall be closed in accordance with method V of the appendix to the box specification. Boxes shall be reinforced with a minimum of two 1/2-inch wide pressure sensitive filament tapes applied girthwise on the container.

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5.1.2 Splits. Splits shall be protected as specified in 5.1.1 or 5.1.1.1 except that each unit pack shall consist of 20 bricks. When packed as specified in 5.1.1, splits shall be arranged in ten courses of two bricks each.

5.1.3 Anchor. Anchor bricks of nominal dimensions 9 by 6-3/4 by 2-1/2 inches or 13-9/16 by 4-1/2 by 2-1/2 inches shall be packed as specified in 5.1.1 except that each unit pack shall consist of six bricks arranged in a single stack and the single girthwise tension strap shall not be used. Anchor brick of nominal 9 by 4-1/2 by 2-1/2 inches shall be packed as specified in 5.1.1. Courses for anchor brick shall be so laid that notches shall be outside and visible.

5.1.4 Special shape brick and burner tile. Special shaped brick and burner tile shall be packed in snug fitting fiberboard boxes conforming to PPP-B-636, grade V3c or V3s, style RSC or FOL. Boxes shall have full height liners and partitions for brick separation and protection. RSC style boxes when used shall also include full size top and bottom fiberboard pads. Liners, partitions, and pads shall be of corrugated fiberboard as specified for separator sheets in 5.1.1. Large voids within the box shall be filled with fiberboard as specified herein, or equivalent cushion pads in such a manner so as to provide support to the box cover and prevent movement of the contained brick(s). Small special shapes may be wrapped with cushioning media, however, this wrapping will not eliminate the requirements for liners and partitions. Boxes shall be closed in accordance with method V of the appendix to the box specification, and reinforced with two girthwise 1/2-inch wide filament tapes. The gross weight of boxes, including contents shall not exceed 50 pounds except when the individual brick or tile exceeds 50 pounds.

5.2 Packing. Packing shall be level A or B, as specified (see 6.2.1).

5.2.1 Level A. Unless specified (see 6.2.1), pallets and shipping containers shall contain brick of one size, shape or grade only.

5.2.1.1 Straights, splits, and anchor. Straights, splits, and anchor brick preserved as specified in 5.1 shall be packed as follows:

- (a) Brick 9 by 4-1/2 inches by 2-1/2 inches shall be packed in unit loads on 40 by 48 inch pallets conforming to type 2 of NN-P-71. Unit load shall consist of 40 packs arranged 20 packs for each course and two courses for each load. Load strapping shall conform to MIL-STD-147. Weight limitation of MIL-STD-147 does not apply.
- (b) Bricks of nominal dimensions 9 by 6-3/4 by 2-1/2 inches or 13-9/16 by 4-1/2 by 2-1/2 inches shall be packed as specified in (a) above, except that unit loads shall consist of 52 packs arranged 26 packs for each course and two courses for each load.
- (c) Standard shape brick acquired in quantities not constituting a full pallet load, shall be packed in nailed wood boxes conforming to PPP-B-621, class 2, style 2, or in fiberboard boxes conforming to PPP-B-636, class weather-resistant. Unit pack shall be separated from each other by fiberboard sheets conforming to W5c or W5s of PPP-F-320. Gross weight of wood boxes shall not exceed 500 pounds and the boxes shall be

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modified by the addition of skids in accordance with PPP-B-621. Gross weight of fiberboard boxes shall not exceed the weight limitation of PPP-B-636. Fiberboard or equivalent material shall be used to fill all voids within the box to prevent damage. Boxes shall be closed and strapped in accordance with the applicable box specification, except that method V closure and reinforcement with non-metallic banding or pressure sensitive filament reinforced tape shall apply for PPP-B-636 boxes.

5.2.1.2 Special shape brick and burner tile. Special shaped brick and burner tile acquired in quantities not constituting a full pallet load (3000 pounds) will require no further packing. When pallet load quantities are acquired, pallets shall be in accordance with MIL-STD-147 type III with bonding means K. Fiberboard or wood strips shall be used as filler material to have the load fit the edges of the pallet.

5.2.2 Level B. Packing for level B shall be as specified for level A except that boxes referred to in 5.2.1.1(c) shall conform to PPP-B-621, class 1, style 2 or PPP-B-636 class domestic.

5.3 Marking. In addition to any special marking required (see 6.2.1) or herein, unit packs, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129.

5.3.1 Special marking. Each individual unit container for special shape brick and burner tile (see 5.1.4) shall have handling markings, arrow, and "up", in addition, either fragile, or precautionary legend (see figure 5).

## 6. NOTES

6.1 Intended use. Refractory bricks and burner tile covered by this specification are intended for use in industrial and Naval main propulsion boilers. The purpose of these items is to provide structural stability and protection of back-up insulation from maximum temperatures, flame erosion, slag attack and rapid temperature changes.

### 6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of specification.
- (b) Grade, as applicable to be furnished (see 1.2).
- (c) Dimensions and shape of brick and burner tile as specified on applicable drawings, special shapes of burner tile as specified (see 3.3 and 4.6.1).
- (d) Tolerance of brick as specified on the applicable drawing (see 3.4.1 and 4.6.4.1).
- (e) Special shape brick and dimensions as specified (see 3.4.2 and 4.6.4.2).
- (f) Dimensions and tolerances of burner tile as specified on the applicable drawings (see 3.4.3 and 4.6.4.3).
- (g) Special marking and palletization if required (see 3.6, 4.6.2 and 5.3).

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- (h) Sample shipping containers as specified (see 4.8.1 and 4.8.2).
- (i) Level of packing required (see 5.2).
- (j) If palletization is required for level A (see 5.2.1).

**6.2.2 Data requirements.** When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs.

<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
4.7.1.1, 4.7.6.3	Certificate of compliance	DI-E-2121	----

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L., Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL-15606 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362 and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

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6.4 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

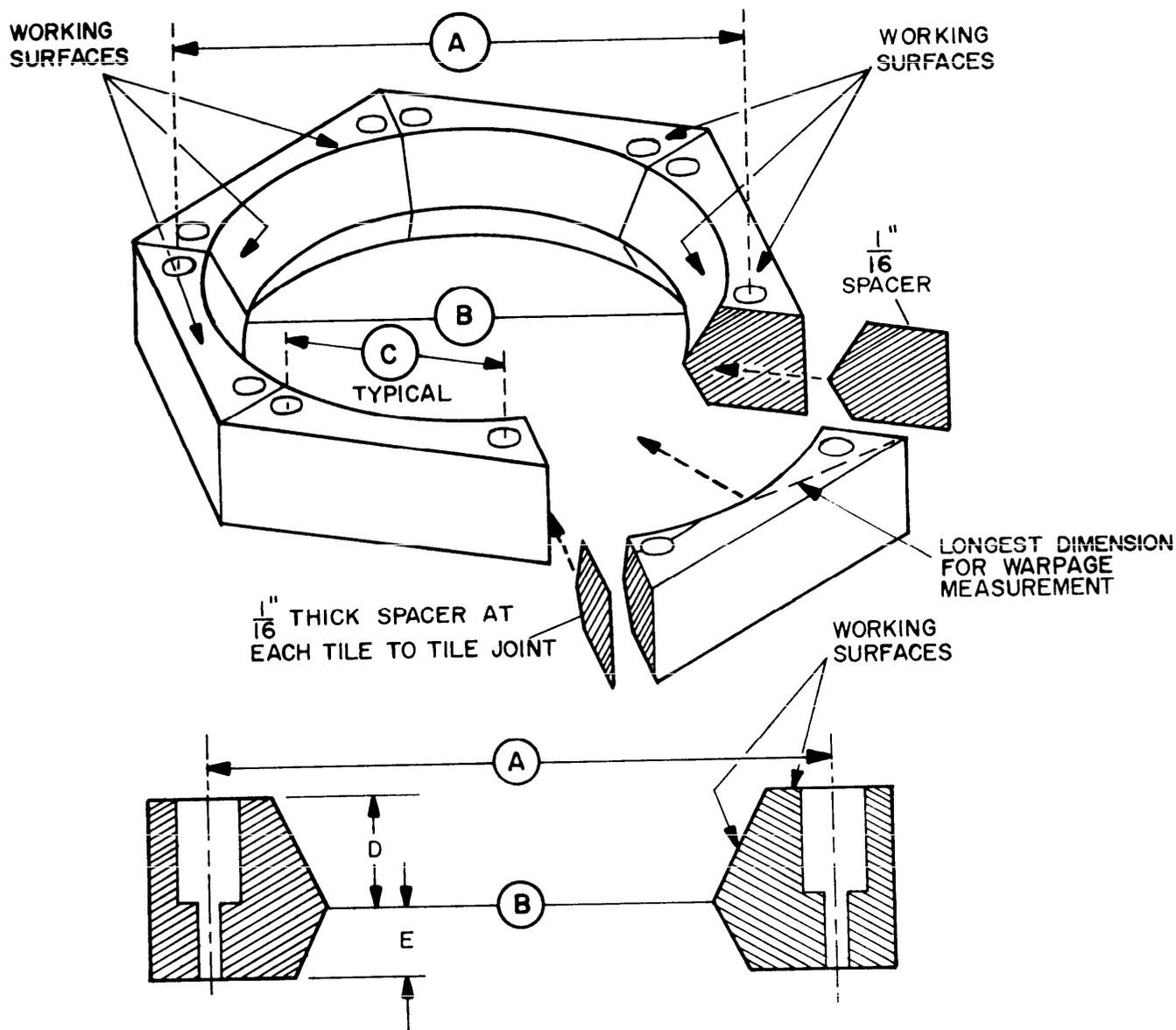
Custodians:  
Navy - SH

Preparing activity:  
Navy - SH  
(Project 9350-0087)

Review activity:  
DLA - GS

User activity:  
Navy - CG

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SH 12132

FIGURE 1. Typical burner tile arrangement.

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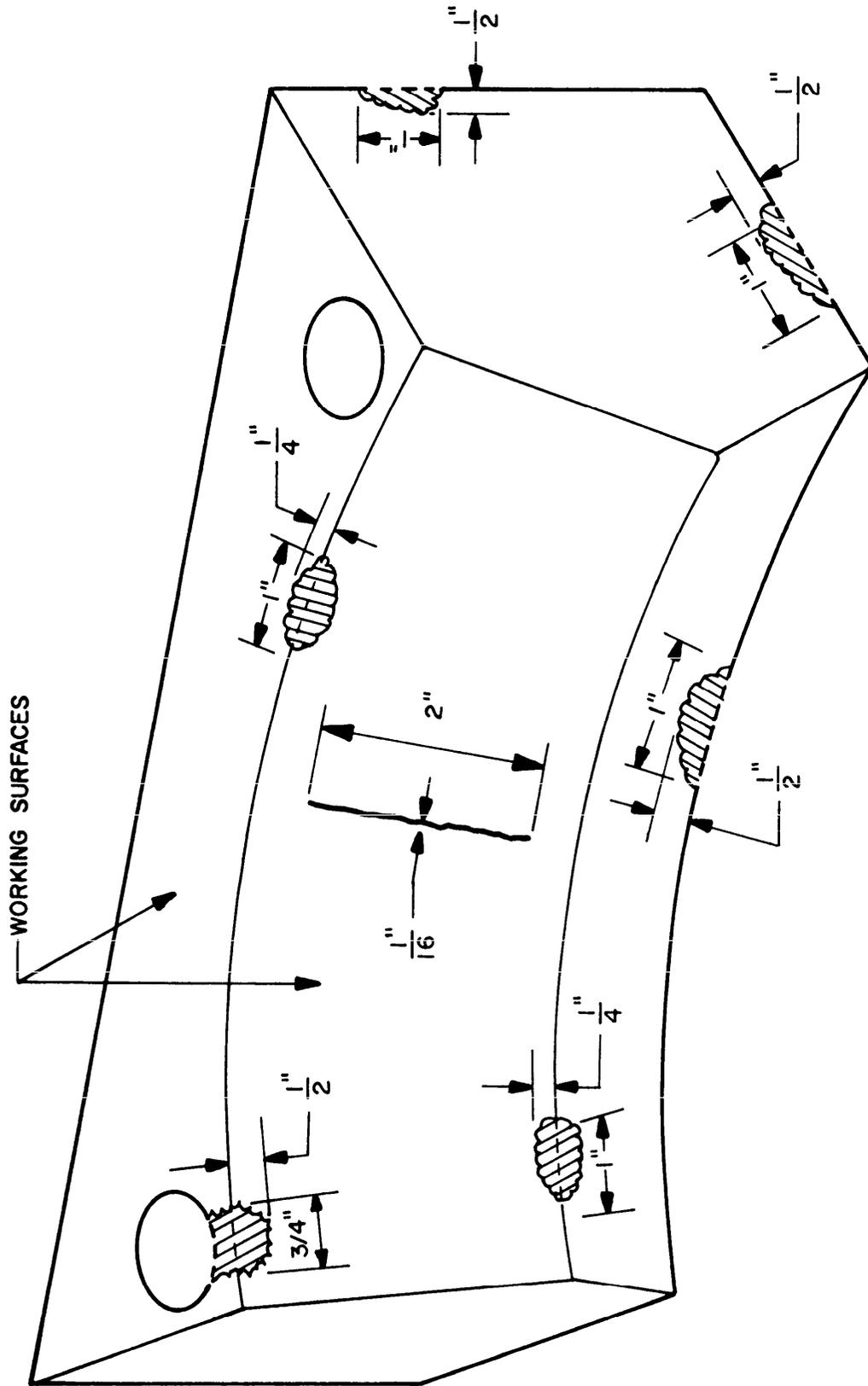


FIGURE 2. Maximum allowable dimensions of cracks and corner or edge crumpling or chipping in burner tile.

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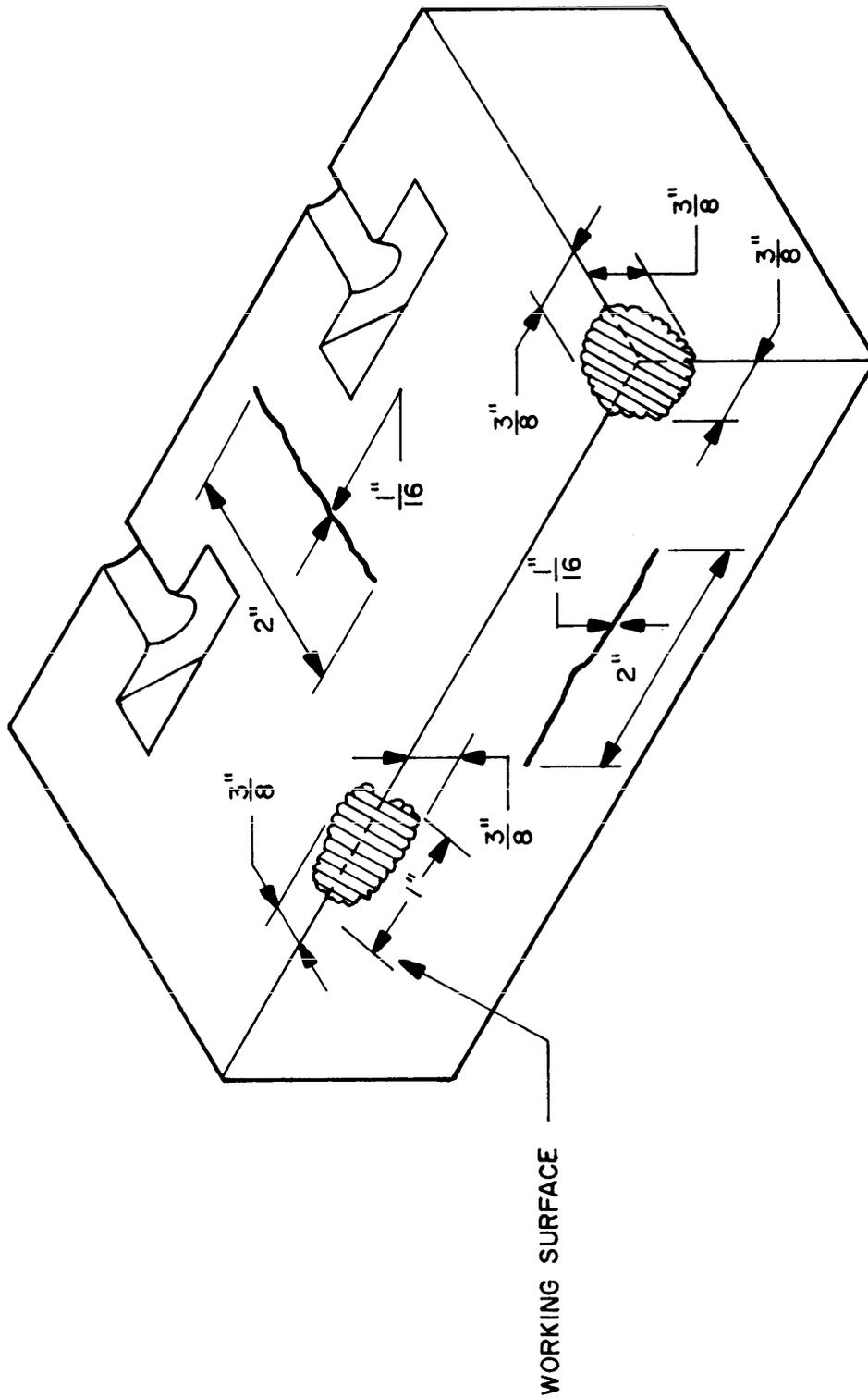
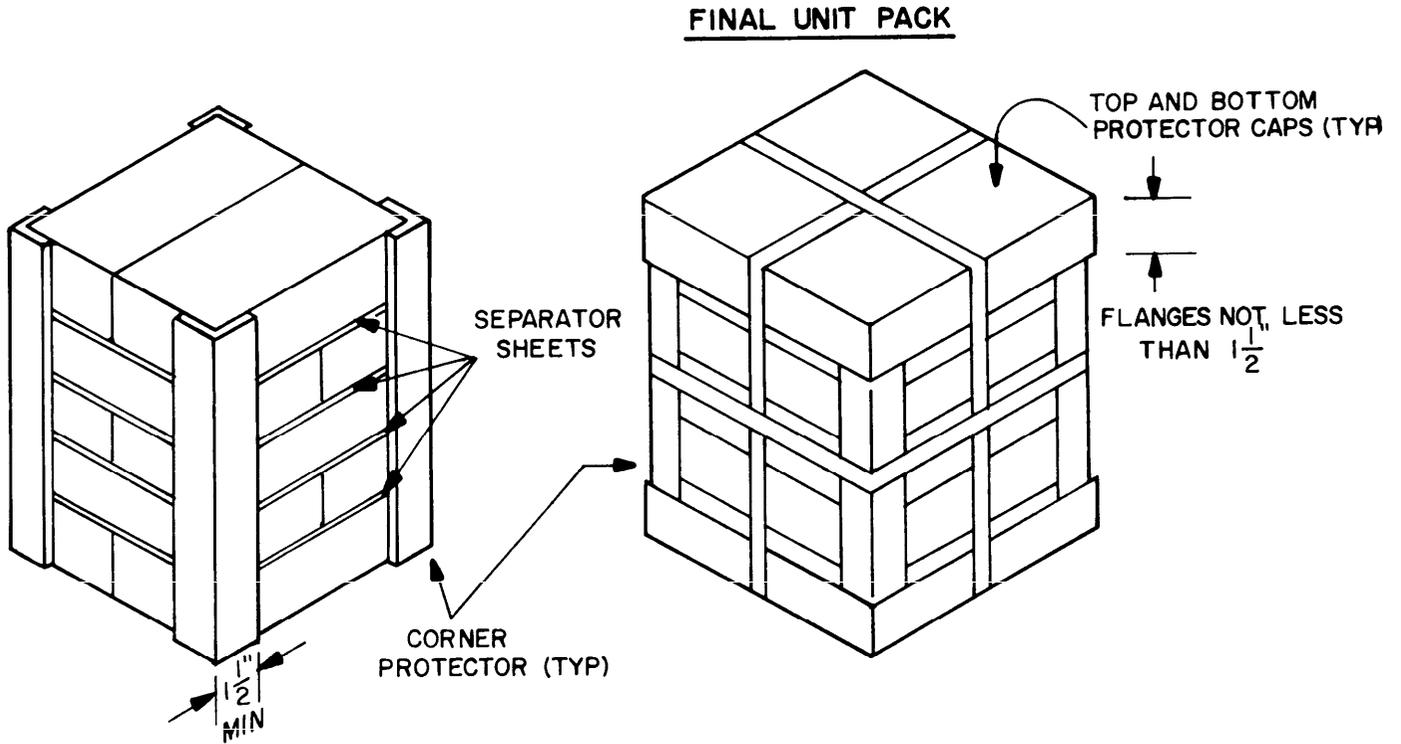


FIGURE 3. Maximum allowable dimensions of cracks and corner or edge crumbling or chipping in brick.

SH 12134

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SH 12135

PROTECTOR AND SEPARATOR  
SHEET DATA

W5s or W5c fiberboard sheets.  
Protector sheets must fit  
snugly over bricks.

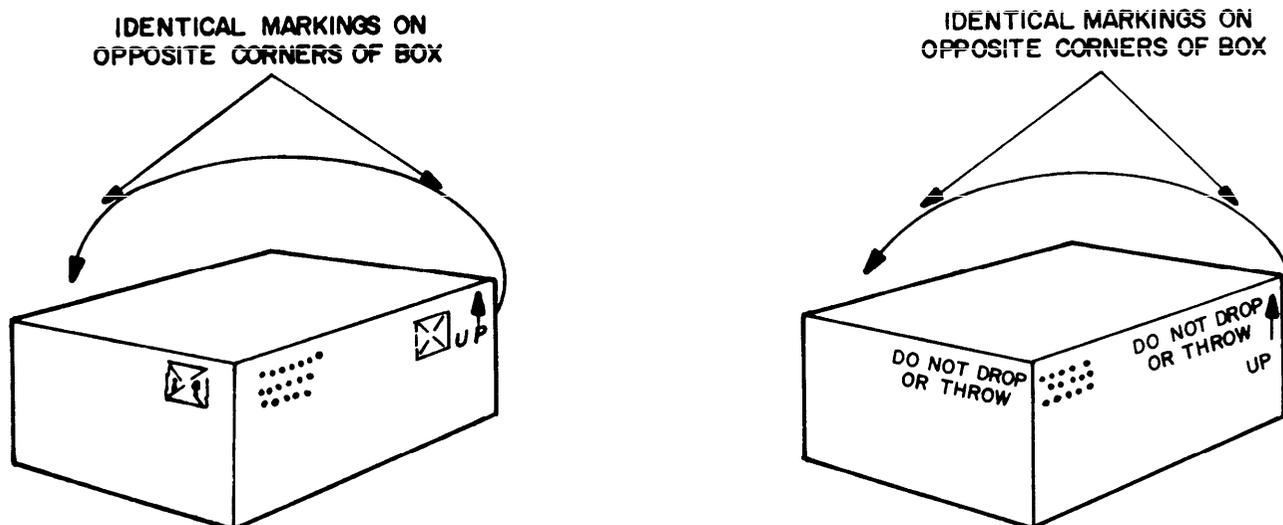
UNIT PACK DATA

For Level A Packing (5.2.1.1)

1. Unit package of 10-9 inch  
straights in 5 courses as shown.
2. Unit packages splits to contain  
20 bricks each.
3. Unit package to consist of only one  
size, grade, and shape of brick.

FIGURE 4. Detail of unit pack and protector sheet.

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SH 12136

WITH FRAGILE LABELS AND UP

WITH PRECAUTIONARY LEGEND AND UP

NOTE: Reference MIL-STD-129 paragraphs titled "arrows" and "fragile items".

FIGURE 5. Marking for unit packs of special shapes.

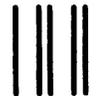
**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-R-15606H(NAVY)		2. DOCUMENT TITLE FINING QUALITY BRICKS, REFRACTORY, AND BURNER TILE, NAVAL BOILER FURNACE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	