

DEPARTMENT OF COMMERCE  
BUREAU OF STANDARDS  
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UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR  
BRICK, CLAY, COMMON

FEDERAL SPECIFICATIONS BOARD SPECIFICATION No. 504

This specification was officially promulgated by the Federal Specifications Board on July 11, 1927, for the use of the departments and independent establishments of the Government in the purchase of common clay brick.

[The latest date on which the technical requirements of this specification shall become mandatory for all departments and independent establishments of the Government is Oct. 11, 1927. They may be put into effect, however, at any earlier date, after promulgation.]

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I. GENERAL SPECIFICATIONS

There are no general specifications applicable to this specification.

II. CLASSES

This specification is applicable to common solid or hollow (not face) clay brick of any of the following four classes: V, vitrified; H, hard; M, medium; and S, soft.

### III. MATERIAL AND WORKMANSHIP

Brick under this specification shall be of clay or shale, be sound, of compact structure, reasonably uniform in shape, free from stones and pebbles that would effect their serviceability or strength, and without excessive laminations or warpings.

### IV. GENERAL REQUIREMENTS

The standard size of brick shall be  $2\frac{1}{4}$  by  $3\frac{3}{4}$  by 8 inches, with permissible variations of one-eighth inch in breadth or depth and one-fourth inch in length.

Bricks shall be delivered in good condition, with not more than 5 per cent of broken bricks.

At the completion of the absorption test the bricks shall show no evidence of disintegration.

### V. DETAIL REQUIREMENTS

The bricks shall meet the following absorption and strength requirements for their respective class. The standing of any set of bricks shall be determined by the requirements in which it is lowest. Unless otherwise specified in the request for bids, medium (M) or hard (H) brick shall be accepted in lieu of soft (S) brick and hard (H) brick in lieu of medium (M) brick.

Class	Absorption		Transverse breaking load, 7-inch span	
	Average of 5	Individual maximum	Average of 5	Individual minimum
	<i>Per cent</i>	<i>Per cent</i>	<i>Pounds</i>	<i>Pounds</i>
V.....	5 or less.....	6	2,170 or more.....	1,450
H.....	5 to 12.....	15	1,080 or more.....	725
M.....	12 to 24.....	23	810 or more.....	540
S.....	24 or more.....	No limit.	540 or more.....	360

### VI. METHOD OF SAMPLING AND TESTS

1. SAMPLING.—Ten bricks, selected by the inspector so as to be fairly representative of a quantity not exceeding 50,000 bricks, shall constitute a sample. If the bricks are delivered by car or boat, one sample shall be taken from each carload or boatload. If the bricks are delivered by truck or wagon, one or more samples shall be taken at the point of origin, covering all of the material from which shipments are to be made. Additional representative samples may be taken at any time or place at the discretion of the inspector.

2. TESTS.—The sample shall be dried to constant weight at a temperature of 212 to 220° F.

(a) *Absorption*.—When cool, 5 of the 10 bricks in the sample shall be weighed separately on scales sensitive to within one-half of 1 per cent of the weight. They shall then be completely immersed in soft, distilled, or rain water at room temperature. The water shall be brought to a boil within one hour and boiling continued for five hours. The bricks shall be allowed to cool to room temperature in the water. They shall then be removed from the water and weighed, after wiping the surface with a damp cloth. This weight, minus the weight of the dry bricks, equals the weight of the water absorbed, which is calculated to per cent of the weight of the dry bricks.

Where means are not available for boiling the bricks the absorption test may be made by immersing the dry bricks in soft, distilled, or rain water at ordinary temperature for five hours. When this method is used the absorption limits for the different classes shall be reduced one-fourth below the values given in Section V for both the average and the individual maximums.

In cases of disagreement as to the resulting classification the absorption shall be determined by the boiling method and the full percentage absorption for the respective classes given in Section V applied. The same bricks, redried to constant weight, may be used in any such retest.

(b) *Transverse strength*.—The other five bricks of the sample, previously dried, shall be tested laid flatwise on a span of 7 inches, and with the load applied at the mid-point of the span with a standard testing machine or a calibrated portable or semiportable testing equipment. A steel bearing plate about one-fourth inch thick by  $1\frac{1}{2}$  inches wide shall be placed between the upper knife-edge and the brick. The knife-edges in contact with the brick shall be mounted so they will adjust themselves to the irregularities in the shape of the brick, and one or both of the lower bearings shall be free to follow any movement of the brick during the test.

## VII. PACKING AND MARKING OF SHIPMENTS

### VIII. NOTES

1. **STRENGTH TESTS**.—The acceptance procedure has been simplified to permit making the necessary tests at the building site or at the manufacturer's plant without the use of laboratory equipment, although the latter should be used where available. Responsibility for the accuracy, calibration, and general sufficiency of the equipment used necessarily devolves on the purchasing or inspecting officer concerned. The following specification is suggested for portable or semiportable equipment for conducting the transverse test:

Portable or semiportable equipment for conducting transverse tests of building brick shall be capable of applying a center load of not less than 4,000 pounds on bricks laid flatwise on a span of 7 inches. A steel bearing plate about one-

fourth inch thick by  $1\frac{1}{2}$  inches wide shall be placed between the upper knife-edge and the brick. The knife-edges in contact with the brick shall be mounted so they will adjust themselves to the irregularities in the shape of the brick and one or both of the lower bearings shall be free to follow any movement of the brick during the test.

The equipment shall be constructed so it can be calibrated in a standard testing machine and shall accommodate bricks having one-half inch variation above or below the standard  $2\frac{1}{4}$  inch thickness and  $3\frac{3}{4}$  inch width. It shall be constructed so the load can be applied by hand with a maximum force of 50 pounds. The parts shall be designed so as not to be readily damaged or displaced by shipment or handling, and a suitable carrying case, with one handle for the portable and two handles for the semiportable equipment, shall be provided.

The weight of the portable equipment, inclusive of carrying case, shall be not more than 55 pounds, and the accuracy and sensitiveness shall be within 30 pounds up to 2,000 pounds applied load, and within 60 pounds for higher loads.

The weight of the semiportable equipment, inclusive of carrying case, shall be not more than 110 pounds, and the accuracy and sensitiveness shall be within 10 pounds up to 2,000 pounds applied load, and within 20 pounds for higher loads.

Bidders shall submit description of apparatus it is proposed to supply and the general limits of sensitiveness and accuracy obtainable with it.

The following manufacturers have, up to the date of issue of these specifications, indicated willingness to supply portable or semiportable equipment complying with the above specifications:

A. H. Emery Co., Stamford, Conn.

Morehouse Machine Co., York, Pa.

Riehle Bros. Testing Machine Co., Philadelphia, Pa.

Tinius Olsen Testing Machine Co., Philadelphia, Pa.

2. SIGNIFICANCE OF THE BRICK CLASSIFICATION.—The classification is based on strength and absorption values chosen so that generally bricks grading as medium or harder can be considered suitable for use in exterior walls. This should not be taken as a rigid distinction on account of the wide range in the character of clays and processes used in brick manufacture, which makes it difficult to define weathering resistance in terms of properties that can be determined in acceptance tests. The purchasing officer should be guided in part by the experience with comparable bricks in the locality where those under test are to be used. In cases of doubt, and where the time and equipment are available, acceptance in point of weathering resistance can be based on ability to withstand 100 alternations of freezing and thawing conducted according to generally accepted laboratory procedure. Failure is to be considered as reached when the samples are cracked or show superficial disintegration or spalling, with loss of weight of more than 5 per cent of the initial dry weight.

Where the wall is faced with 3 inches or more of stone, terra cotta, brick, or other veneer, the weathering resistance of the material for the backing is without significance.

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