

Australian/New Zealand Standard™

**Masonry units, segmental pavers and flags—
Methods of test****Method 4: Determining compressive strength of
masonry units**

This Standard incorporates Amendment No. 1 (August 2004) and Amendment No. 2 (September 2009). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

1 SCOPE

This Standard sets out the method for determining the unconfined compressive strength of masonry units.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

2193 Methods for calibration and classification of force-measuring systems

3700 Masonry structures

AS/NZS

4456 Masonry units, segmental pavers and flags—Methods of test

4456.0 Part 0: General introduction and list of methods

4456.1 Method 1: Sampling for testing

4456.2 Method 2: Assessment of mean and standard deviation

BS EN ISO

7500-1 Metallic materials. Verification of static uniaxial testing machines. Tension/compression testing machines. Verification and calibration of the force-measuring system.

NZS

4230 Code of practice for the design of masonry structures

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 4456.0 apply.

4 PRINCIPLE

A unit is placed in a compression testing machine and subjected to increasing load until it fails. From the maximum load, the unconfined compressive strength is calculated.

The specimen is tested with either full capping or face-shell capping appropriate to its intended use.

NOTE: The measured strength of a masonry unit will be, to some extent, influenced by the effects of platen restraint, which applies a degree of confinement to the specimen. The corrections for this effect are applied in the calculations of unconfined compressive strength.

5 APPARATUS

The following is required:

- (a) A compression testing machine that complies, as regards to accuracy, with the requirements for Grade A or B machines as given in AS 2193, or Grade 0.5, 1.0 or 2.0 machines to BS EN ISO 7500-1.

The machine shall be fitted with two steel platens one of which, preferably the upper, shall have a spherical seat allowing the platen to rotate or tilt through small angles in any direction.

The bearing faces of both platens shall exceed the test specimen by not less than 15 mm in length and breadth and shall not depart from a plane by more than 0.05 mm. Should the bearing faces of the platens be smaller than required, steel plates of adequate size may be placed centrally between them and the test specimen. Bearing faces of such plates shall not depart from a plane by more than 0.05 mm and their thickness shall be at least equal to the maximum overhang of the specimen beyond the machine platen.

- (b) A measuring device that can be read accurately to 1 mm over the dimensions of the units being tested.

6 PREPARATION OF TEST SPECIMENS

6.1 Selection

Specimens accumulated from continuous sampling shall be deemed to meet the requirements of this method, provided that the number of specimens accumulated is at least 10. For assessment of an individual lot, at least 10 units shall be selected in accordance with AS/NZS 4456.1.

6.2 Test Specimens

Test Specimens shall be conditioned in accordance with Clause 6.6, and treated in accordance with Clauses 6.3, 6.4 or 6.5, as applicable.

6.3 Where units can be tested whole

Compressive strength shall be determined on whole units. Where lack of machine capacity prevents this, part-units may be used.

6.4 Where units cannot be tested whole

Where the units are such that they exceed the machine capacity (either load capacity or platen size), they may be broken or cut into portions of approximately equal size comprising full or half units, or cubes with sides the lesser of the minimum unit dimensions or 100 mm. These portions shall be tested individually. For part units, the loads shall be added together and divided by the total area of the unbroken unit. Where part units are tested the aspect ratio factor (K_a) shall be determined using the dimensions of the individual parts tested (see Clause 6.7). For symmetrical fired clay units that have been saw cut into two halves, it is permissible to test one of the halves. The dimensions of cut units shall be recorded and included in the report.

Cut surfaces shall be clean, smooth and planar, and opposite faces shall be approximately parallel with one another.

Specimens shall be prepared in such a number and manner that they are representative of the whole of the unit and oriented for testing in the same orientation as they are intended to be laid.

6.5 Filling of recesses

Shallow recesses, which would normally be filled with mortar when laid in a wall, shall be filled with a mortar composed of one part of a high-alumina cement and three parts of well-graded, washed sand. The mortar shall be trowelled-off flush with the unit and the filling shall be cured by storing the units in a fog room or under damp sacks for 24 h after the frogs have been filled.

NOTES:

- 1 Cement fondue is a suitable high-alumina cement.
- 2 It may be necessary to pre-wet the unit to ensure effective adhesion.

6.6 Conditioning of specimens

Except for moisture introduced for the purpose of filling recesses (see Clause 6.2), the moisture content of the test specimens shall be as sampled. In the case of units of density less than 1000 kg/m^3 , the moisture content shall also be tested and reported. Such units with moisture content in excess of 25% shall be dried at $65 \pm 5^\circ\text{C}$ until the moisture content falls below 25%.

6.7 Dimensions used for calculations

Where the work sizes are known, these dimensions shall be used for the calculation of gross areas or face-shell areas, and aspect ratio.

Where the work sizes are not known, the dimensions shall be obtained from the mean of three measured specimens to an accuracy of 1 mm. For hollow units with face-shells, where work sizes are not known, the minimum face-shell area shall be used. Where only part of the unit is tested, the cut area shall be calculated on the basis of the work width multiplied by the measured cut length.

NOTE: In calculating the area, no reduction should be made for chamfers or perforations.

7 PROCEDURE

The procedure shall be as follows:

- (a) Clean and wipe the test specimen, the bearing surfaces of the platens on the testing machine, and any steel plate to be placed between the specimen and the platen.
- (b) Place the specimen between two pieces of nominal 4 to 6 mm plywood, hardboard or 12 mm thick fibreboard. The length and width shall exceed the corresponding dimensions of the specimen.

NOTES:

- 1 For test results relevant to AS 3700, plywood or hardboard should be used. For test results relevant to NZS 4230, fibreboard should be used.
- 2 Except for specific purposes, the specimen should be tested in the orientation in which it is to be used.
- 3 Fresh packing pieces should be used for each specimen and discarded following testing.

Where the specimen is to be tested through the face-shells, position it between two pairs of strips of nominal 4 to 6 mm plywood, hardboard or 12 mm fibreboard. The length and width of each strip shall exceed the corresponding dimension of the manufacturing dimension for the face-shell. The strips shall be positioned such that they overhang the face-shell over the web by approximately 1 mm (see Figure 1). A thin adhesive may be used to assist in positioning the plywood strips on the specimen.