

Australian/New Zealand Standard™

**Masonry units, segmental pavers and flags—
Methods of test****Method 8: Determining moisture content, dry
density and ambient density**

This Standard incorporates Amendment No. 1 (August 2004). The changes required by the Amendment 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 moisture content, dry density and ambient density of masonry units, segmental pavers and flags.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

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

3 DEFINITIONS

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

4 PRINCIPLE

A specimen is weighed as sampled, its volume determined by direct measurement or immersion weighing, then oven-dried and weighed. Mass differences are used to calculate moisture contents and densities of the specimen.

5 APPARATUS

The following is required:

- A well-ventilated drying oven with a cubic capacity not less than three times the total volume of the specimens being dried, and capable of maintaining a temperature of $110 \pm 8^\circ\text{C}$ or, if used for dimension stone, $65 \pm 5^\circ\text{C}$.
- A balance capable of weighing the saturated test specimen to a limit of performance of 1 g or better. The balance shall be capable of weighing a dry specimen and also one suspended and immersed in water.
- A basket made of wire mesh, of a size appropriate to hold the specimen and with a suitable hook arrangement for attachment to the balance or other means of suspending the specimens in water below the balance.

- (d) A bath of sufficient capacity to allow weighing of the specimen while the sample is completely immersed in water.
- (e) A desiccator of sufficient size to hold the test specimens, and with sufficient quantity of active desiccant such as dried silica gel.
- (f) Absorbent paper or cloth.
- (g) A calliper or other suitable measuring device, accurate to 0.5 mm over the length of the unit being tested.

6 PREPARATION OF TEST SPECIMENS

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 5. For assessment of an individual lot, 5 units shall be selected in accordance with AS/NZS 4456.1.

Where the units sampled for testing have at least one dimension >400 mm, they may be prepared as follows:

- (a) Where only the dry density property is required, specimens may be cut from units with a dry or water-lubricated diamond or carborundum saw. The cut surfaces shall be clean, smooth and planar or otherwise broken from a whole unit.
- (b) Specimens so prepared shall be taken from the units in such a manner that they are representative of the units used in practice.
- (c) Specimens so prepared shall have a volume of at least 500 000 mm³. The dimensions of the specimen and location from which it was cut from the unit shall be recorded and included in the report.

7 NOTATION

The following notation is used in this Standard:

m_o	=	ambient mass of specimen, as sampled, in grams
m_1	=	mass of soaked specimen in air, in grams
m_2	=	apparent mass of the soaked specimen when suspended in water, in grams
m_3	=	mass of the oven-dried specimen, in grams
V	=	volume of specimen, in cubic millimetres
W_c	=	moisture content of the specimen, in kilograms per cubic metre
$\overline{W}_c$	=	average moisture content of the sample in kilograms per cubic metre
W_d	=	moisture content of the specimen, as a percentage of dry mass
$\overline{W}_d$	=	average moisture content of the sample as a percentage of dry mass
W_a	=	moisture content of the specimen, as a percentage of ambient mass
$\overline{W}_a$	=	average moisture content of the sample as a percentage of ambient mass
D_d	=	density of the oven-dried specimen, in kilograms per cubic metre
$\overline{D}_d$	=	average density of the oven-dried sample, in kilograms per cubic metre
D_a	=	ambient density of the specimen, in kilograms per cubic metre
$\overline{D}_a$	=	average ambient density of the sample, in kilograms per cubic metre

8 PROCEDURE

The procedure shall be as follows:

- (a) Weigh the as-received specimen to the nearest gram and record the mass as m_0 .
- (b) Determine the volume (V) of the specimen by either one of the following methods:
 - (i) *Direct measurement (if the specimen has a regular rectangular shape)* Measure the dimensions corresponding to each of the three principal work sizes of the specimen and record the mean values to the nearest 0.5 mm.
 - (ii) *Immersion weighing* The procedure shall be as follows:
 - (A) Immerse the specimen in potable water for at least 2 h.
 - (B) After soaking, remove the specimen, allow it to drain for not more than 1 min, then remove any remaining water from the surface with absorbent paper or cloth. Within 3 min of removing the specimen from the water, weigh the specimen and record the mass as m_1 , to the nearest gram.
 - (C) After weighing, return the specimen to the water bath.
 - (D) Remove the specimen from the water, immediately insert it into the basket and lower it into the water bath, which has been positioned beneath the balance hook. Ensure that the specimen and basket will remain immersed during weighing, and that they will not touch the sides of the bath.
 - (E) Determine the apparent mass of the specimen to the nearest gram and record as m_2 , making sure that the balance has been initially tared off to correct for the mass of the basket when immersed in water.
- (c) Dry the specimen at $110 \pm 8^\circ\text{C}$ in the drying oven, except where materials are adversely affected, until consecutive weighing of the specimen, when made at intervals of not less than 4 h, show a change in mass of not greater than 0.1% m_0 . Record the lowest value determined at room temperature as the dry mass (m_3) to the nearest gram.

For materials adversely affected by temperatures of $110 \pm 8^\circ\text{C}$, lower temperatures may be used. Where lower temperatures are used, they shall be reported. For dimension stone, a temperature of $65 \pm 5^\circ\text{C}$ is appropriate.

Each consecutive weighing required may be carried out either—

- (i) by first allowing the specimen to cool from oven temperature to room temperature in the desiccator and then weighing; or
- (ii) by weighing the hot specimen within 1 min of its removal from the oven, then, if no further drying is required, cooling it to room temperature in the desiccator and re-weighing it as soon as possible, the latter reading being recorded as the dry mass (m_3).

9 CALCULATIONS

9.1 Volume

The volume (V) in cubic millimetres is calculated by either—

- (a) direct measurements (see Clause 8(b)(i)); or
- (b) immersion weighing (see Clause 8(b)(ii)), using the following equation:

$$V = (m_1 - m_2) \times 1000 \quad \dots 1$$