Australian/New Zealand Standard™

Methods of testing portland, blended and masonry cements

Method 18: Determination of water retention of masonry cement

1 SCOPE

This Standard sets out the method for determining the water retention of masonry cement prepared and tested as a standard mortar.

NOTES:

1 These testing procedures may involve the use of materials or equipment that require safety measures to be observed.

2 This Standard does not purport to address all of the safety concerns, if any, associated with its use.

3 The user of this Standard should establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

4 Test data for the determination of statements of repeatability and reproducibility have not yet been evaluated. Such statements will be included in a later revision of this test method or amendment when they become available.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
2349	Method of sampling portland and blended cements
AS/NZS	
2350	Methods of testing portland and blended cements
2350.3	Method 3: Normal consistency of portland and blended cements
ASTM	
C230	Specification for Flow Table for use in Tests of Hydraulic Cement
C778	Specification for Standard Sand

3 PRINCIPLE

A standard mortar is prepared by mechanically mixing 1 part masonry cement to 3 parts standard sand, by volume, with sufficient water to achieve a standard consistency as measured by the flow table. The standard fresh mortar is subjected to a vacuum and its ability to retain water is calculated from its change in consistency as measured by the flow table.

4 APPARATUS AND RELATED CONDITIONS

4.1 Laboratory

The air within the laboratory in which the specimens will be prepared and tested shall be maintained at a temperature of 23 ±2°C and a relative humidity of not less than 50%.

4.2 Balance

The balance shall have a capacity appropriate to the mass required and shall be capable of weighing to the nearest 1 g.

4.3 Mixer

The mixer shall comply with AS/NZS 2350.3 with the additional requirements of mixing at the high speed given in Table 1.

4.4 Flow table and flow mould

The flow table shall be in accordance with Appendix A.

The flow mould shall be in accordance with Paragraph A4 of Appendix A.

4.5 Tamper

The tamper shall be made of a non-absorptive, non-abrasive, non-brittle material such as a rubber compound having a Shoring A durometer hardness of 80 ±10, or of seasoned hardwood rendered non-absorptive by immersion for 15 min in paraffin wax at approximately 200°C, and shall have a cross-section of 13 by 25 mm and a convenient length (125–150 mm). The tamping face shall be flat and at right angles to the length of the tamper.

4.6 Water retention apparatus

The water retention apparatus shall be in accordance with Appendix B.

4.7 Straightedge

A steel straightedge not less than 200 mm long with thickness between 1.5 mm and 3 mm and approximately 25 mm wide.

4.8 Trowel

A trowel having a steel blade, 100 to 150 mm long, with straight edges.

4.9 Bulk density container

The bulk density container (with a capacity of approximately 15 L) shall be made of metal not less than 3 mm thick, and shall be watertight and sufficiently rigid to maintain its shape with rough usage. The inside surface shall be smooth and free from corrosion and the rim of the measure shall be machined to a plane surface perpendicular to the axis of the cylinder. The measure shall be provided with carrying handles. The diameter of the measure shall be between 0.75 and 1.25 times the height.

4.10 Scraper

A semi-rigid rubber or suitable plastic blade attached to a handle about 150 mm long, with a blade of about 75 mm long, 50 mm wide, and tapered to a thin edge about 1.5 mm wide.

TABLE 1

SPEEDS OF MIXER BLADE

Speed setting	Mixer blade r/min	Planetary movement r/min
Low speed	140 ±5	62 ±5
High speed	285 ±10	125 ±10

5 MATERIALS

5.1 Standard sand

5.1.1 *20–30 sand*

The 20–30 sand shall comply with the requirements of ASTM C778.

5.1.2 *Graded sand*

The graded sand shall comply with the requirements of ASTM C778.

6 PREPARATION OF MORTAR

Mortar for the determination of water retention shall be proportioned to give a mortar of approximately 1 part cement to 3 parts sand by volume, as follows:

Mass of sand: 1440 g

Mass of cement: $\left(\frac{1440}{3844} \times \text{bulk density of cement in kg/m}^3\right)\text{g}$

NOTE: To determine the bulk density of the cement with sufficient accuracy for the purpose of this Standard, the cement should be placed in a 15 L container, compacted lightly by tapping the sides of the container, and the surface struck off with a straightedge. The mass of cement in the container divided by the volume of the container in cubic metres is taken as the bulk density.

The sand shall consist of equal parts of standard graded sand and standard 20–30 sand.

The quantity of water, measured in grams, shall be such as will produce a flow of 110 ±5% determined by the flow table.

The procedure for mixing the quantities shall be as follows:

(a) Place the dry paddle and the dry bowl in the mixing position in the mixer.

(b) Place all the mixing water in the bowl.

(c) Add the cement to the water; then start the mixer and mix at low speed (140 ±5 rev/min) for 30 s.

(d) Slowly add the entire quantity of sand over a 30 s period while mixing at low speed.

(e) Stop the mixer, change to high speed (285 ±10 rev/min) and mix for 30 s.

(f) Stop the mixer and let the mortar stand for 1.5 min. During the first 15 s of this interval, quickly scrape down into the batch any mortar that may have collected on the side of the bowl and cover the bowl with the lid for the remainder of the interval.

(g) Finish by mixing for 1 min at high speed (285 ±10 rev/min).

7 DETERMINATION OF FLOW

Flow shall be determined in accordance with the following procedure:

(a) Measure and record, in millimetres, the internal diameter of the base of the flow mould (d_1), and then carefully wipe the flow-table top clean and dry, and place the flow mould at the centre.

(b) Place in the flow mould a layer of mortar about 25 mm thick and tamp it 20 times. Use just sufficient tamping pressure to ensure uniform filling of the flow mould.

(c) Repeat Step (b) until the flow mould is full.

(d) Cut the mortar off to a plane surface flush with the top of the flow mould, by drawing the straight edge of a trowel (held nearly perpendicular to the flow mould) with a sawing motion across the top of the mould.