



**Transport**  
Roads & Maritime  
Services

# Test method T402

## Compressive strength of sand-cement mortar cubes

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## Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D.Dash	May 1999
		Date on Test Method Revised to Agree with Date on Revision Summary	D.Dash	Feb 2001
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T402 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T402

## Compressive strength of sand-cement mortar cubes

### 1. Scope

This test method describes the procedure for the manufacture and testing of sand-cement mortar cubes for testing Portland and Blended Cements. The method conforms to the method described in Australian Standard 2350.6.

### 2. Apparatus

- (a) A balance of at least 2 kg capacity, readable to 0.5 g.
- (b) Volumetric Apparatus. Devices for measuring mixing water with sufficient capacity to measure the necessary quantity of water without refilling and to deliver the indicated volume at 23°C within a tolerance of 1 per cent.
- (c) Cube Mould. The form, dimensions and tolerances on dimensions of the cube mould, cube mould cramp, guide mould and plunger are to be as those shown in the AS 2350.6
- (d) Boehme hammer to conform to the tolerances shown in AS 2350.6
- (e) Compression testing machine of at least 9,000 kN capacity, capable of applying the test force at the rate specified in *Procedure (t)* and complying as regards accuracy with the requirements of AS 2193 for Grade A machines. The upper bearing block of the machine has a spherical seat, the centre of curvature being situated on the vertical axis of the machine and in the plane of contact between the head and the specimen. A suitable form is shown in AS 2350.6. The radius of curvature shall be not less than 50 mm.
- (f) Mixer unit, an electrically-driven mechanical mixer fitted with a motor of at least 125 W, which imparts to the mixer paddle, both a planetary and a revolving motion about a vertical axis. The paddle revolves at a rate of  $140 \pm 5$  rev/min, with the planetary motion at  $60 \pm 5$  rev/min. The dimensions of the machine are to comply with those set out in AS 2350.6

**Note:** The "Hobart" CM 10 or N50 food mixers, fitted with a 4.5 litre stainless steel bowl with stainless steel paddle, comply with the specification. Mixers of other manufacture may be used, provided that they are approved by the SAA Committee on Cement.
- (g) A scraper for use with the mixer, consisting of a semi-rigid rubber or suitable plastic blade attached to a handle 150 mm long: the blade is to be approximately 75 mm long, 50 mm wide and tapered to a thin edge about 1.5 mm thick.
- (h) Rubber gloves.
- (i) Soft-haired brush.
- (j) A moist cupboard with an internal atmosphere maintained at  $23 \pm 2^\circ\text{C}$  and a relative humidity of at least 90 per cent.
- (k) A water storage tank maintained at a temperature of  $23 \pm 2^\circ\text{C}$ . The water is to be kept free from accumulated sediment by weekly draining and replacement with fresh water adjusted to  $23 \pm 2^\circ\text{C}$ . The water level is maintained at least 12 mm and not more than 25 mm above the upper surface of the cubes in the water storage.

### 3. Standard Sand

Leighton-Buzzard sand passing the AS 850  $\mu\text{m}$  sieve and retained on the AS 600  $\mu\text{m}$  sieve, white variety, washed thoroughly and dried.

#### 4. Laboratory Conditions

The air within the laboratory in which the specimens are made and tested is maintained at a temperature of  $23 \pm 2^\circ\text{C}$ .

#### 5. Procedure

- (a) Three sand-cement cubes are made. Lightly oil each cube mould and cramp with mineral oil on all surfaces coming into contact with the sand-cement mortar. After assembly, wipe off all excess oil from the joints. Do not oil the guides and plungers.
- (b) Centre each mould cramp and guide and clamp firmly in the Boehme hammer.
- (c) Calculate the quantity of mixing water to be used from the following equation:-

$$W = 8.0 \times N \text{ (rounded off to the nearest 1 mL).}$$

Where

W = quantity of water (mL).

N = normal consistency of cement under test.

- (d) the mechanical mixer so that the mixing bowl is in the low position.
- (e) Weigh 2100 g of standard sand, place it in the bowl of the mixer and add 700 g of the cement under test.
- (f) Position the paddle in the mixer and switch the mixer on.
- (g) With the paddle operating and  $140 \pm 5$  rev/min, raise the bowl to the mixing position within 5 seconds and continue mixing for 1.5 minutes
- (h) While the mixer is still operating, add the calculated quantity of water and continue mixing for a further two minutes.
- (i) Stop the motor, lower the bowl and detach the paddle, allowing to remain within the bowl.
- (j) Using the scraper, return any material adhering to the sides of the bowl near the top and the paddle and dislodge any material adhering to the lower side and bottom of the bowl, the whole operation to occupy not more than 30 seconds.
- (k) Reconnect the paddle quickly, restart the mixer, raise the bowl to the mixing position and mix for a further 1 minute.
- (l) Remove the bowl from the mixer and empty the contents onto a clean, smooth, inert, non-absorbent surface using the scraper and the gloved hand. Neglect any small quantities adhering to the scraper or the bowl.
- (m) Place in each mould 915 g of the wet mortar, level the surface roughly without compressing it in any way. Place the plungers on top of the mortar and compact with 150 blows from the Boehme hammer.
- (n) Immediately remove each filled mould together with cramp, guide and plunger from the mould in such a manner as not to disturb the underlying mortar.
- (o) Screed off the surplus mortar level with the top of the mould and smooth by a few strokes of the trowel. Cover the cramped mould with a glass plate and place in the moist cupboard. The cramped moulds are to be placed in the moist cabinet within 9.5 minutes of the addition of water.
- (p) Strip the moulds from the hardened cubes after 24 hours, taking care not to damage the faces or edges of the cubes and place the cubes in the water storage tank for curing.
- (q) Test each specimen immediately after removal from the water. Remove the cube from the water after the specified curing time, wipe off the surplus water and adhering grit and remove all projecting fins.
- (r) Place the cube with one of its faces on the lower bearing block of the compression machine (not the screeded face or the one opposite to it) making the vertical axis of the cube coincident with the vertical axis of the machine.

- (s) Apply the upper bearing block to the upper surface of the cube, oscillating the bearing block on its spherical seat until contact is completed so that the load when applied is distributed evenly over the surface of the cube.
- (t) Apply the load at a rate of 0.5 MPa/s to 0.8 MPa/s until the specimen fails.

## **6. Calculation and Reporting**

Calculate the compressive strength of each cube on its nominal areas of 5000 mm<sup>2</sup>. Average the strength of the three cubes to the nearest 500 kPa and record as the compressive strength of the sample at that age.

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