



**Transport**  
Roads & Maritime  
Services

# Test method T401

Normal consistency and setting time of  
cement

OCTOBER 2012



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

The most recent revision to Test method T401 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T401

## Normal consistency and setting time of cement

### 1. Scope

This test method sets out the procedure to be used to determine the normal consistency and setting time of Portland and Blended Cement. The procedure conforms to the method described in Australian Standard 2350.3

### 2. Apparatus

- (a) A balance of at least 2 kg capacity accurate and readable 0.1 g within the operating range.
- (b) A 250 mL measuring cylinder complying with AS 2163.
- (c) Vicat apparatus. The Vicat apparatus conforming to the tolerances shown in Fig.1 in the AS 2350.3
- (d) Moist Cupboard. The atmosphere in the moist cupboard to be maintained at  $23 \pm 2^\circ\text{C}$  with a relative humidity of not less than 90 per cent.
- (e) A gauging trowel with a blade approximately 200 mm long, 90 mm wide at the broad end and 25 mm wide at the narrow end, weighing approximately 200 g.
- (f) Mixer unit, an electrically-driven mechanical mixer fitted with a motor of at least 123 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 AS2350.3
- (g) **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.
- (h) 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.
- (i) Rubber gloves
- (j) Soft-haired brush.

### 3. Laboratory Conditions

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

### 4. Procedure

#### 4.1 Normal Consistency

- (a) Weigh out and transfer 600 g of the sample directly from the balance pan to 4.5 litre bowl of the mixer.
- (b) Place the amount of water to be tried for the normal consistency in a 250 mL measuring cylinder situated at the right-hand side of the mixer.
- (c) Clamp the bowl in the mixer and set the mixer beater in motion  $(140 \pm 5 \text{ rev/min.})$
- (d) Raise the bowl quickly to the mixing position and pour the mixing water rapidly over the lip of the bowl and set a stop-watch in motion. The bulk of the water must be added within 1.5 seconds, the water being drained from the cylinder by holding it at an angle of  $<\$E70 \text{ sup size } 8 \text{ o}>$  to the horizontal for 3 seconds before the drop of water adhering to the spout of the cylinder is flicked into the bowl.
- (e) Continue mixing for 2.5 minutes from the addition of the water then stop the motor and lower the bowl. Transfer any large portions of paste adhering to the beaters with the scraper but do not scrape the beater clean.

- (f) Remove the bowl from the mixer and scrape the paste from the bowl with one smooth motion of the finger-edge of the gloved hand.
- (g) Form the paste into a ball in the rubber gloved hands
- (h) Press the ball into the larger end of the Vicat mould, completely filling the mould with paste. Strike off the excess paste at the larger end with a trowel and place the mould with its larger end onto a glass plate.
- (i) Strike off the excess paste at the smaller end by a single stroke of the trowel held at a slight angle to the top of the mould and smooth the paste with a few light strokes of the trowel.
- (j) Centre the filled mould on its glass plate under the plunger of the Vicat apparatus. Bring the lower end of the plunger into contact with the surface of the paste and clamp with the set screw.
- (k) Release the set screw 30 seconds after completion of the gauging and note the settlement of the plunger on the expiration of 30 seconds.

**Note:** The apparatus must rest on a firm base, free from vibration during the course of the consistency test and the plunger must be vertical.

- (l) The normal consistency is that proportion of water that will give a settlement of the Vicat plunger to a point 5 mm to 7 mm from the bottom of the cement paste in 30 seconds after being released as described.
- (m) Make trial pastes with varying percentages of water until the normal consistency is obtained. Make each trial with fresh paste.
- (n) Record the amount of water used as a percentage of the mass of the dry cement.

## 4.2 Setting time

- (a) Mix cement to a paste of normal consistency as described under "Normal Consistency" above, place in the Vicat mould on a glass plate as described and position under the needle of the Vicat apparatus.
- (b) At the end of one hour after the addition of water, bring the lower end of the needle into contact with the surface of the paste and clamp by means of the set screw.
- (c) Release the set screw and note the settlement of the needle on the expiration of 30 seconds.
- (d) Repeat at appropriate intervals until the first refusal of the needle to penetrate the paste to within 1 mm of the surface of the glass plate after the expiration of 30 seconds from release. Record the time to the nearest 15 minutes.

**Note:** Withdraw the needle after each application and wipe clean on the sides and lower end. Between applications, retain the paste in its mould and on the glass plate in the moist cupboard.

- (e) Continue the release of the needle until the first refusal of the needle to penetrate the surface of the paste by more than 0.5 mm. Record the time to the nearest 15 minutes.

## 5. Reporting

- (a) **Normal Consistency.** Record as the amount of water, expressed as a percentage of the mass of dry cement, that is required to permit the settlement of the Vicat plunger to a depth of 5 mm to 7 mm.
- (b) **Initial Setting Time.** Record as the time elapsing between the addition of water and the first refusal of the needle to penetrate within 1 mm of the surface of the glass plate.
- (c) **Hard Set Time.** Record as the time elapsing between the addition of water and the first refusal of the needle to penetrate the paste by more than 0.5 mm.