



Transport
Roads & Maritime
Services

Test method T172

Capillary rise and absorption of modified
or bound road construction materials

OCTOBER 2012



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	Generally Revised – Title changed. Incorporate and replace part of T151. Removed measurement of swell. Specimen preparation cross-referenced. Apparatus tolerances made consistent with other tests. Simplify formulas.	D Hazell	Mar 2009
Ed 3/ 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 T172 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T172

Capillary rise and absorption of modified or bound road construction materials

1. Scope

This test method sets out the procedure for determining the capillary rise and absorption of modified, bound or self cementing road construction materials.

2. General

- (a) The method is applicable to road construction materials that gain tensile strength with time (e.g. material blended in the field with a cementitious or bituminous binder, or self cementing materials such as slag)
- (b) The method is applicable to road construction materials that are modified using proprietary additives
- (c) The method is applicable to that portion passing a 19.0 mm AS sieve

3. Apparatus

- (a) A balance of suitable capacity and a limit of performance of 5g
- (b) A thermostatically controlled oven with good air circulation, which can be maintained within temperature ranges of $23 \pm 2^\circ\text{C}$ and $65 \pm 5^\circ\text{C}$
- (c) A 300 mm ruler marked in mm
- (d) Sealable airtight containers
- (e) Dishes of suitable size

4. Preparation

- (a) Specimens are prepared as follows:
 - (i) For materials modified or bound using cementitious binders, prepare the specimen according to T131 Step 3(ii) except that the specimen must be hand compacted
 - (ii) For self cementing materials, prepare the specimen according to T116 Step 5.1 Moulding except that the specimen must be hand compacted
 - (iii) For materials bound using bituminous binders according to T105 Appendix C except that the specimen must be hand compacted
 - (iv) For materials combined with proprietary additives according to the manufacturer's recommendations provided that the specimen must be hand compacted

NOTE: Machine compaction does not sufficiently compact material around the perimeter of the mould.

- (b) Determine the Dry Density (*DD*) for the specimen in t/m^3 according to the relevant test method

5. Procedure

5.1 Curing of Specimen

- (a) Place the specimens into the specified curing environment and cure based on the requirements in Table 1:
 - (i) Where required, wrap each specimen in wet newspaper and seal in foil to keep the specimen moist during curing
 - (ii) For accelerated curing, store the specimens in an oven within a temperature range of $65 \pm 5^\circ\text{C}$ and cure for 7 days \pm 6 hours

- (iii) For normal curing, store the specimens in an apparatus capable of maintaining a temperature of $23 \pm 2^\circ\text{C}$ and cure for 28 days \pm 6 hours

NOTE: *When specimens are cured in a water bath, they must be sealed in water-proof containers to prevent water ingress.*

Table 1 – Specimen Curing

Material	Curing
Cementitious binders	Wrap specimens and cure for 7 days accelerated curing or 28 days normal curing.
Self-cementing material	Wrap specimens and cure for 7 days accelerated curing or 28 days normal curing.
Bituminous binder	Cure in air at a temperature of $23 \pm 2^\circ\text{C}$ for 7 days.
Proprietary additives	As per manufacturer's recommendations.

5.2 Capillary rise and absorption

- Remove the specimen from the curing environment and remove any covering. If necessary, allow the specimen to cool
- Dry the specimen to constant mass at a temperature not exceeding 50°C . Determine the mass (M_3) at constant mass
- Determine the average height (H) of the specimen from two heights taken opposite each other to the nearest 1 mm
- Place the specimen with the compacted face upwards in water to a depth of $10+2/-5$ mm for 72 ± 6 hours.

NOTE: *Periodically top up the water to maintain the water depth.*

- Remove the specimen from the water, dry the surface to saturated surface dry condition and determine the following:
 - The mass (M_4) of the moist specimen
 - Note any break down of the specimen
- Carefully split the specimen longitudinally into halves. Measure the rise of moisture in the middle of each half and average the height (h) to the nearest 1 mm.

6. Calculations

6.1 Capillary rise

Calculate the capillary rise (CR) as a percentage of specimen height as follows:

$$CR = \left(\frac{h}{H} \right) \times 100\%$$

Where:

$$\begin{aligned} CR &= \text{Capillary Rise (mm)} \\ h &= \text{Moisture rise in the specimen (mm)} \\ H &= \text{Height of specimen (m)} \end{aligned}$$

6.2 Water Absorption

Calculate the water absorption (A) as a percentage by mass as follows:

$$A = \frac{(M_4 - M_3)}{DD \times V} \times 100\%$$

Where:

- A = Water absorption (%)
- M_4 = Mass of specimen after standing in water (g)
- M_3 = Mass of specimen dried to constant mass (g)
- DD = Dry Density of specimen (g/mL)
- V = Volume of the mould (mL)

7. Reporting

Include the following results in the report:

- (a) Source of sample (i.e. location)
- (b) The percentage by mass of material retained on the 19 mm sieve from T105 (to the nearest 1%)
- (c) Type, source and percentage of binder or additive where applicable
- (d) Where binder or additive has been incorporated in the field, the time between initial mixing of binder and completion of moulding in hours and minutes
- (e) Standard or Modified compaction
- (f) Moisture content at which specimens were compacted (to nearest 0.5%)
- (g) Dry density (DD) of specimens as moulded (to the nearest 0.01 t/m³)
- (h) Capillary rise (CR) of water
- (i) Water absorption (A) as a percentage of mass
- (j) Notes on any break down of the specimen (Step 5.2(e))
- (k) Reference to this Test Method