



**Transport**  
Roads & Maritime  
Services

# Test method T113

## Linear shrinkage of road construction materials

OCTOBER 2012



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## Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
Ed 1/ Rev 0	All	Reformatted and Revision Summary Added	D.Dash	May 1999
Ed 1/ Rev 1		Date on Test Method Revised to Agree with Date on Revision	D.Dash	Feb 2001
Ed 2/ Rev 0	All	New Issue Title Revised	D Hazell	Jan 2010
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 T113 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T113

## Linear shrinkage of road construction materials

### 1. Scope

This test method sets out the procedure to determine the linear shrinkage of the portion of road construction material passing a 2.36 mm AS sieve.

### 2. General

- (a) The procedure is similar to the method described in AS 1289.3.4.1 except that -2.36 mm material is used instead of -425  $\mu\text{m}$ , and after initial air drying the specimen is oven dried.
- (b) The following documents are referred to in this Test Method:
  - (i) T105 Preparation of Samples for Testing (Soils)
  - (ii) AS 1289.3.1.1 Determination of the Liquid Limit of a soil

### 3. Apparatus

- (a) A sheet of plate glass with the upper surface etched, at least 250x250 mm and about 10 mm thick.
- (b) Palette knives of convenient size (e.g. having a blade 200 mm long and 30 mm wide), having sufficient flexibility to avoid crushing of intact rock or mineral grains, while still allowing adequate pressure to be exerted on the sample during mixing and placement into the mould.
- (c) Plated steel, stainless steel or brass shrinkage moulds in the form of semi-circular troughs, 250 mm internal length (nominal) and 25 mm internal diameter (nominal), with ends brazed-on normal to the longitudinal axis of the mould and flush with the top of the mould.
- (d) A thermostatically controlled oven with good air circulation, capable of maintaining a temperature with the range of 105° to 110°C
- (e) Mould release agent (e.g. petroleum jelly, castor oil).
- (f) A 300 mm steel ruler graduated in mm.

### 4. Sampling and Preparation

- (a) Prepare samples in accordance with T105. Ensure that the curing requirements for the sample have been achieved.
- (b) Lubricate the inside of a clean shrinkage mould with a thin film of release agent and wipe off any excess.

### 5. Procedure

#### 5.1 Mixing

- (a) Place the sample on the glass plate and add an increment of water.
- (b) Record the presence of mica in the sample.
- (c) Mix the sample and water thoroughly together to uniformly distribute the moisture as follows:
  - (i) Mix for at least 3 min but over 5 min for high plasticity clay soils. Use the palette knives to form a paste, using firm pressure with the palette knives against the surface of the glass plate. In the case of highly plastic clays other techniques may be needed, in the initial stages of water addition, to bring the material to a suitable consistency.

*NOTE: Inadequate mixing may result in an erroneous value being obtained (usually below the true value). This is due to the time necessary for water to penetrate into absorptive particles and into the internal structure of some clays, and for mechanical disturbance to break up aggregations of finer particles, particularly clays.*

- (ii) Add another increment of water and mix the sample according to Step 5.1(b). When the consistency of the paste appears adequate,

(iii) Check the consistency of the paste using AS 1289.3.1.1 Clauses 3, 4 and 5(c) and adjust as follows:

NOTE: *Where there is evidence that the number of blows to close the groove increases with additional and/or firmer mixing (e.g. some granitic sands), increase the mixing times and/or pressure from the palette knives until no further change occur.*

- Return the portion to the sample after the test.
- If the groove closes in  $20 \pm 5$  blows the consistency is correct, proceed to Step 5.1(d).
- If the groove exceeds 25 blows, add another increment of water and mix the sample according to Step 5.1(b).
- If the groove closes in less than 15 blows the sample is too wet. After some drying mix the sample according to Steps 5.1(b).

(d) Seal the sample to prevent moisture loss and cure for at least 12 h at room temperature. Record the start and finish times of the curing period.

NOTE: *Some clayey soils may require about 24 h to allow thorough permeation of the water through the sample.*

(e) After curing, check the consistency of the paste using AS 1289.3.1.1 Clauses 3, 4 and 5(c) and adjust as follows:

- Return the portion to the sample after the test.
- If the groove closes in  $20 \pm 5$  blows the consistency is correct, proceed to Step 5.2.
- If the groove exceeds 25 blows, add another increment of water and mix the sample according to Step 5.1(c)(i) and then return to Step 5.1(e).
- If the groove closes in less than 15 blows the sample is too wet. After some drying mix the sample according to Steps 5.1(c)(i) and then return to Step 5.1(e).

## 5.2 Shrinkage

- (a) Measure the internal length of the shrinkage mould ( $L$ ).
- (b) Place the mixed sample in the mould and thoroughly remove all air bubbles from the specimen by lightly tapping the base of the mould. Slightly overfill the mould and then level off the excess material (e.g. with a palette knife). Remove all material adhering to the rim of the mould.
- (c) Allow the specimen to air dry at room temperature for at least 24 h and leave until a distinct change in colour on the surface can be observed. Record the start and finish times of air drying.

NOTE: *Clayey soils may require up to 4 days before reaching this state.*

- (d) Place the specimen still in the mould into an oven and dry at a temperature in the range of 105° to 110°C for at least 16 h and until dry. Record the start and finish times of oven drying.
- (e) Allow the specimen to cool in the mould.
- (f) Measure the length of the dry specimen ( $L'$ ) to the nearest 1 mm as follows.
  - (i) If the specimen cracks or breaks into pieces carefully push the separate parts together against one end of the mould and measure the length of the dry specimen ( $L'$ ).
  - (ii) If the specimen curls in the mould, carefully remove the specimen and measure the length of the top and bottom surfaces. Calculate the average of these two lengths as ( $L'$ ).
- (g) Record if the sample; cracks, breaks or curls.

## 6. Calculations

- (a) Calculate the linear shrinkage ( $LS$ ) of the specimen using the formula:

$$LS = \frac{(L - L')}{L} \times 100\%$$

Where:

$LS$  = Linear shrinkage of the specimen (%)

$L$  = Length of shrinkage mould (mm)

$L'$  = Length of dry specimen (mm)

## 7. Reporting

Include the following data and results in the report:

- (a) Sample description and source of the sample
- (b) The Linear Shrinkage ( $LS$ ) to the nearest 0.5%
- (c) Reference to this test method

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