



**Transport**  
Roads & Maritime  
Services

# Test method T146

Conductometric determination of the lime  
or cement content of stabilised material

OCTOBER 2012



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## Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added Title altered	D Dash	May 1999
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 T146 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

# Test method T146

## Conductometric determination of the lime or cement content of stabilised material

### 1. Scope

This test method sets out the procedure for the conductometric determination of the lime or cement content of lime or cement stabilised materials (including treated rock and modified or stabilised gravels and soils) either in the cured or uncured state, by measuring the hydrogen ion depletion of an acid solution with a conductance bridge, after reaction with the sample.

### 2. Apparatus

- (a) A balance, of 5 kg capacity, readable to 1 g
- (b) An analytical balance accurate and readable to 1 mg
- (c) A microwave oven with power level and time controls
- (d) Metal dishes about 240 mm diameter
- (e) Mixing apparatus such as a steel tray, trowel, small metal plates and brushes
- (f) Small riffle box
- (g) A 2.36 mm AS sieve
- (h) Small jaw crusher or other crusher capable of reducing the sample to pass 2.36 mm
- (i) General laboratory glassware
- (j) A water deionizing column
- (k) Two 50 mL auto dispensing pipettes (Jencons Zippettes have been found to be suitable).
- (l) 0 - 1000  $\mu$ L micropipette (SMI or equivalent)
- (m) Conductivity bridge complete with suitable cell of about 250 mL volume or immersible electrodes.
- (n) Plastic leak proof screw top bottles, preferably tall form rather than squat.

### 3. Reagents

- (a) Hydrochloric Acid solution (2M). Dilute 200 mL of concentrated hydrochloric acid (32%) to 1000 mL with de-ionized water (1:5 dilution). Commercial grade acid has been found to be satisfactory.

**CAUTION: Always add acid to the water when diluting NEVER the reverse. Add the acid in small amounts to the water with stirring. Safety goggles must be worn.**

### 4. Samples

- (a) Select the following samples for test:
- (b) Sample representative of the material to be stabilised
- (c) Lime or cement to be used in the stabilising work
- (d) Sample representative of the material after stabilisation

### 5. Preparation of Sample

- (a) By careful coning and quartering reduce the sampling size to about 1 - 2 kg then dry in the microwave oven to constant weight.
- (b) When dry, sieve the sample through the 2.36 mm sieve and continue crushing the retained fraction until all of the sample passes through the sieve.

- (c) Quarter the dried and sieved sample either by coning and quartering or passing through the riffle box to obtain sub-sample of approximately 50 g.
- (d) Weigh out 50.00 g into a 125 mL plastic screw top bottle.

## 6. Procedure

- (a) To the plastic bottle with its sample of soil add accurately 50.0 mL of 2M hydrochloric acid from the autopipette.
- (b) Replace the stopper and shake with a swirling action at ½ minute intervals for 4 minutes at room temperature. See *NOTE: 1*.
- (c) After 4 minutes add accurately 50.0 mL of deionized water from the second autopipette, replace the stopper, shake thoroughly and allow to flocculate by standing.
- (d) Using the autopipette dispense 100.0 mL of deionized water into the conduction cell.
- (e) Immerse micropipette in the supernatant liquid from *Procedure (c)* above and fill to the 1 mL mark, making sure to keep the micropipette vertical. Remove and wipe around tip with clean tissue. See *NOTE: 2*.
- (f) Discharge contents into the conduction cell, stir thoroughly and balance the cell. Do not use magnetic stirring during measurement as it can influence the readout.
- (g) Thoroughly clean the micropipette and cell.

## 7. Calibration

- (a) Make up sufficient standard soil samples to cover the expected range of test values. Leaving one sample blank, to the others add lime or cement, weighed, to the nearest 0.001 g to give 3 samples either side of the design value, making the soil plus lime or cement equal to 50.00 g.  
E.g. for 1% sample mass of soil = 49.50 g  
Mass of lime = 0.500 g
- (b) Measure the conductivity as given in *Procedure (a) - (g)* above, including the blank sample, and a sample of the acid without soil.
- (c) Draw a calibration plot of conductivity against percent lime.

## 8. Calculations

The value of the conductivity obtained when the bridge is balanced with a sample, is projected on the calibration plot and the percent additive read off.

## 9. Techniques

Extreme care is required in controlling liquid volume deliveries at all times. Therefore detailed attention to the correct operation and use of the autopipettes and micropipette is absolutely essential.

The micropipettor tip is subject to wear due to the presence of finely divided solids. It will manifest itself as a slow forming tip drop. If a tip drop forms replace piston and pipettor tip.

The method measures the conductivity of a solution containing hydrogen ion at infinite dilution. The hydrogen ion measured is that remaining from the addition of the 2M acid after reaction with the lime or cement in the sample. The conductivity of hydrogen ion at infinite dilution is very high and small inaccuracies in volume deliveries can lead to marked change in conductivity and lime or cement contents.

**NOTE 1: Highly reactive basic crushed rocks e.g. basalt give erratic results unless the digestion and settling times are strictly controlled. For these materials:**

- (i) DIGEST exactly TWO minutes.
- (ii) Control settling time exactly to be the same for all samples and only long enough to collect 1 mL of solution.

**NOTE 2: Experience has shown that the period of contact of the acid solution with the soil can effect the conductivity. This time period should not exceed one hour. Therefore the number of samples dealt with at any one time should be such that the**

**contact time with the acid does not exceed one hour prior to removing the aliquot for the conductivity measurement.**

RMS 12.399