



Transport
Roads & Maritime
Services

Test method T143

Lime content of lime stabilised materials

OCTOBER 2012



Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added - 4. Procedure 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 T143 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T143

Lime content of lime stabilised materials

1. Scope

This test method sets out the procedure for the determination of the lime content of lime stabilised materials, (including treated rock and modified or stabilised gravels and soils) either in the cured or uncured state by titrating with EDTA to determine the Ca^{2+} Content. Varying amounts of CaCO_3 in the soil will affect the accuracy of these tests.

2. Apparatus and Reagents

- (a) Analytical balance, accurate and readable to 0.2 mg
- (b) General laboratory glassware including burettes, pipettes etc
- (c) Pestle and mortar or mechanical pulveriser
- (d) 425 μm AS sieve
- (e) EDTA Solution (0.02 M). Dissolve 7.445 g ethylene diamine tetra-acetic acid disodium salt and dilute to 1 litre
- (f) Triethanolamine Solution (50 per cent). Dilute 100 mL triethanolamine to 200 mL with distilled water
- (g) Hydrochloric Acid (1:1). Dilute 100 mL concentrated hydrochloric acid to 200 mL with distilled water

CAUTION: Always add acid to water. Wear safety glasses.

- (h) Potassium Hydroxide Solution (20 percent). Dissolve 20 g in 70 mL distilled water. Cool. Make up to 100 mL and store in a plastic bottle

CAUTION Potassium Hydroxide Solution is very alkaline and corrosive and can cause severe burns. Avoid contact with eyes, skin and clothing; if spilt wash off immediately with water. The solid generates much heat when added to water. Safety glasses must be worn.

- (i) Potassium Cyanide
- (j) Patton and Reeder Indicator, 0.5 g of indicator is triturated with 50 g KNO_3 . Use 0.2 g for titration
- (k) Filter paper (equivalent to Whatman's No. 40)
- (l) Paper pulp filtering agent
- (m) Ammonium nitrate (if much clay is present)
- (n) A thermostatically controlled oven with good air circulation, capable of maintaining a temperature within the range of 105°C to 110°C

3. Samples

Select the following samples for test:

- (a) Material representative of the material to be stabilised
- (b) Lime representative of the stabilising material
- (c) Material representative of the material after stabilisation

An approximately 200 g sample of each material is to be obtained by use of drying, riffing and grinding processes as necessary.

4. Procedure

- (a) Take a 25 g sub-sample of each material and dry the sub-samples to constant mass at 105°C to 110°C. Grind the sub-sample to pass a 425 µm sieve. Use a magnet to remove any free iron present
- (b) Weigh out accurately, the following amounts of samples into separate 250 mL beakers
 - (i) Unstabilised material - 5g
 - (ii) Stabilised material - 5g
 - (iii) Lime - 1g

Working in a Fume Cupboard for Steps (c) to (l)

- (c) Add 80 mL of 1:1 HCl and digest at just below boiling point for 15 minutes. Allow to cool
- (d) Add a few grams of paper pulp and stir. If there is much clay present add about 10 mg ammonium nitrate and stir
- (e) Filter and wash the content of the beakers into 250 mL volumetric flasks, dilute to a final volume of 250 mL and mix. A small amount of sediment passing through the paper can be disregarded
- (f) Pipette out duplicate 50 mL aliquots of the prepared samples into 250 mL wide neck Erlenmeyer flasks

To the first flask of a duplicate:

- (g) Add 20 mL of 50% triethanolamine followed by 40 mL of 20% potassium hydroxide solution and mix
- (h) Add about 30 mg of potassium cyanide and swirl the flask until dissolved

CAUTION Potassium Cyanide is very poisonous by ingestion. Avoid contact with skin and as a precaution wash hands after completing titrations. Avoid contact of the solution with acids as HCN gas (extremely poisonous) is liberated. Before discarding, make the solution alkaline (pH >> 12) add calcium hypochlorite and stand for 24 hours.

- (i) Add 0.2 g of Patton and Reeder indicator and titrate with standard EDTA to a pure blue end point

To the second flask of a duplicate:

- (j) Add 20 mL of 50% triethanolamine and mix followed by an amount of EDTA equal to the amount required less 1 mL. Add 20% potassium hydroxide, potassium cyanide and indicator as previously
- (k) Continue the titration as for first sample. Record the volume of EDTA used
- (l) Titrate each sample in the same manner and record the volumes of EDTA used

5. Calculations

One millilitre of 0.02 M EDTA is equivalent to 1.4819 mg or 0.0014819 g of calcium hydroxide (Ca(OH)₂)

- (a) Calculate the percentage of Ca(OH)₂ in the unstabilised material, lime and lime stabilised material as follows:

$$\text{Ca (OH)}_2 \text{ per cent} = \frac{0.0014819A}{B} \times 100$$

Where

A = Volume of EDTA solution required for titration of the sample (mL).

B = Mass of sample represented by aliquot titrated, i.e., 1 g for soil or stabilised soil or 0.2 g of lime.

- (b) Calculate the percentage by mass of lime in the lime stabilised soil as follows:

$$\text{Lime per cent} = \frac{G - F}{E} \times 100$$

Where

E = Percentage of Ca(OH)₂ in the lime.

F = Percentage of Ca(OH)₂ in the unstabilised material.

G = Percentage of Ca(OH)₂ in the stabilised material.

NOTE: It has been assumed that all Ca²⁺ in the lime is present as Ca(OH)₂. If an exact Ca(OH)₂ content of lime is required this should be determined by the procedure described in Test Method T430 - Available Calcium Oxide or Calcium Hydroxide in Lime.

6. Reporting

Report the amount of lime as a percentage of the dry soil.