



DTZS 977

DRAFT TANZANIA STANDARD

Test methods - Determination of the California Bearing Ratio of lime treated materials.

TANZANIA BUREAU OF STANDARDS

0 National foreword

The Tanzania Bureau of Standards is the statutory national standards body for Tanzania, established under the Act.No.3 of 1975, amended by Act.No.2 of 2009.

This draft Tanzania Standard is being prepared by BCDC 5 Roads Technical Committee under the supervision of the Building and Construction Standards Divisional Committee (BCDC).

In the preparation of this Tanzania Standard, reference was made to. ***The United Republic of Tanzania-Ministry of Work - Laboratory Testing Manual (2000)***

1 Scope

This Draft Tanzania Standard applies to fine grained and coarse-grained soils and describes a method to determine the California Bearing Ratio (CBR) of a material treated with lime.

2 Definitions

For the purposes of this Tanzania Standard, the following definitions shall apply:

2.1 California bearing ratio CBR

force measured in kilo newton, required to penetrate the surface of a compacted or consolidated material using a circular piston of 1963 mm² area at a rate of 1 mm/min to a depth of 2.5 mm, 5.0 mm or 7.5 mm, expressed as a percentage of the standard force of 13.2 KN, as described in **Laboratory Testing Manual- (2000)**.

2.2 maximum dry density MDD

dry density value of the material tested, and that is defined by the peak of the laboratory compaction curve using the specified compaction effort.

2.3 Optimum moisture content OMC

moisture content at which the maximum dry density is achieved.

2.4 Fine grained Soil

fine natural particles of silt and clay size.

2.5 Coarse grained soil

Coarse particles of crushed stone, gravel and sand.

3 Apparatus

- 3.1** CBR compaction mould, split type, 152.4 mm in diameter and 152.4 mm high with a detachable collar and base plate and a 25.4 mm thick spacer plate fixed to the base plate.
- 3.2** A metal rammer having a 50 mm diameter circular face and weighing 4.5 kg.
- 3.3** A balance readable to 5 g.
- 3.4** A 20 mm and a 37.5 mm test sieves and receiver.
- 3.5** A large metal tray.
- 3.6** Apparatus for metal tray.
- 3.7** Suitable tools for extracting specimen from mould.
- 3.8** Apparatus for moisture content determination.
- 3.9** Galvanized iron mixing baths 450 x 650 x 200 mm deep (at least).
- 3.10** Suitable carrier plate to hold specimens.
- 3.11** Airtight containers with lids, about 20 litres in capacity (at least 4)

4 Sample

4.1 Normally CBR tests are carried out at three lime contents and thus three sets of specimen samples are usually prepared.

4.2 Prepare the field and test samples, as described in **Laboratory Testing Manual - (MoW -2000)**.

NOTE: The test samples are riffled from the scalped field sample. References to masses of test samples in the text are thus after scalping and riffling.

4.3 Place and seal 75 kg of the test sample in a container and set aside for CBR testing.

4.4 Prepare one set of specimen samples for MDD testing, as described in **Laboratory Testing Manual (2000)**.

5 Procedure

5.1 General

Lime contents are usually selected in increments of two percentage points, for example, 1 %, 3 %, and 5 % of lime.

5.2 Determining the MDD and OMC

5.2.1. Calculate the required quantity of lime to be added, as described in Central Materials Laboratory Manual-2000 (CML-Soil Mechanics test), and add it to each of the five specimen samples.

NOTE: While the CBR determinations are normally carried out at three different lime contents, it is only necessary to determine the MDD at the mid-range lime content.

5.2.2. Determine the MDD and OMC of the lime treated material, as described in **Laboratory Testing Manual (2000)**.

5.3 Preparing the specimen samples for the CBR test

5.3.1 Riffle the test sample as described in **Laboratory Testing Manual (2000)**, to obtain specimen samples each of approximately 7 kg. Sufficient material should be riffled out to provide the required number of specimen samples.

5.3.2 Weigh out the specimen sample, calculate and add the lime to the sample and, as described in **Laboratory Testing Manual (2000)** add the quantity of water for the material to achieve the OMC determined in 5.2.2.

5.3.3 Delay the compaction of each specimen sample for a period of 4 h \pm 15 min after the stabilizing agent and the water have been mixed in. Cover the specimen sample with the moist cover cloth, mixing the sample thoroughly with the trowel every 30 min \pm 5 min.

5.4 Compaction

Compact the specimen samples for the determination of the CBR at the three lime contents, as described in **Laboratory Material Manual - (2000)**.

5.5 Specimen preparation and curing

5.5.1 Prepare the specimens as described in **Laboratory Materials Manual - (2000)**.

5.5.2 Cure the moulded specimens at near ambient temperature, as described in **Laboratory Testing Manual (2000)**, at a temperature of $23.5\text{ }^{\circ}\text{C} \pm 1.5\text{ }^{\circ}\text{C}$, for 7 days.

NOTE: Because lime reacts differently to other stabilizing agents, particularly at the design stage, it may be necessary to investigate further samples cured for other periods such as 28 d or longer. For the purpose of uniformity, when additional long-term tests are required all the test samples should be prepared at the same time and from the same field sample.

5.6 Determination of CBR

Soak and penetrate the samples at each lime content, as described in **Laboratory Material Manual- (2000)**, in order to determine the lime treated CBR.

6 Calculations

Use the calculations given on **Laboratory testing manual 2000** (calculation on compaction test and CBR test – three point method).

7 Test report

Report the lime treated CBR to the nearest whole unit and the relative compaction to the nearest 0.1 %, or plot on a chart (or both). Report any variations of the curing period. Include the following information in the test report:

- a)** the date tested;
- b)** a description of the material;
- c)** the intended use of the material; and
- d)** the make, type and source of lime used together with any other relevant notation and where possible the date of manufacture

Bibliography

- **SANS 3001-GR41:2014** Determination of the California bearing ratio of lime treated