## 1. SCOPE

### 1.1. Description of Test

This test method describes the procedure for determining the density of soil cement base course in place.

## 2. APPARATUS AND MATERIALS

### 2.1. Equipment Required

Sampling tools - hammer, chisel, trowel, large spoon, banister brush.

Containers - two 2.3 L size mason jars for which the tare weights are known.

Balance - 0.1 g accuracy

Sand Cone Density Apparatus - consisting of a double cone assembly having a cylindrical valve between the cones with an orifice 12.7 mm in diameter. The upper cone will be large enough to serve as a hopper to hold the density sand.

Density Sand - prepare a supply of air dried clean flowing sand which passes the 2.00 mm sieve and is retained on the 900 mm sieve. Thoroughly mix and preweigh 5000 g samples and store in a clean dry place.

Sieves - a 18.00 mm, 200 mm, 900 mm and a 400 mm Canadian Metric Standard Sieve.

Calibration Mold - a cylindrical mold 127 mm in diameter with 28.6 mm wide flange around the upper rim. The volume of the mold will be stamped into the metal.

Drying Equipment - oven - capable of maintaining a temperature of 110$^{o}$C and a hot plate or stove.

Thermometers - ranging between 35$^{o}$C to 150$^{o}$C.

## 3. PROCEDURE

### 3.1. Test Procedure

#### 3.1.1. Determination of Unit Weight by Sand

Place the calibration mold in a pan.

Set the sand cone device in place on the flange of the calibration mold and close the valve.

Place the preweighed 5000 g sample of density sand in the hopper.

Open the valve and keep it open until the sand has stopped flowing and then close.

Reweigh the sand remaining in the hopper.

The difference between the original (5000 g) and final weight will be the "weight of sand to fill calibration mold and cone."

The weight of sand to fill the lower cone will be determined in a similar manner. Place the sand cone device on a flat surface and allow the sand (5000 g) to run into the cone. The difference between the original and final weight of sand in the hopper shall be recorded as the "weight of sand to fill cone."

Calculate the unit weight of sand from the above determinations.

If a base plate is to be used in the taking of density tests, the plate shall be placed between the flat surface and the cone. Test as above to determine the weight of sand to fill the cone and base plate.

#### 3.1.2. Density-In-Place by Sand Cone

Select the site to be tested at random or where sample for proctor has been taken.

Scrape smooth and remove all loose material at the location to be tested.

Start a small hole in the centre with a hammer and chisel.

Carefully enlarge the hole outwards and downwards with small hand tools until sufficient material has been removed to fill the two 2.3 L mason jars.

Exercise extreme care in removing the material so as not to cause a disturbance to surrounding material. Do not project the hole below the level of the material to be tested.

Place all the material removed from the hole in the mason jars except stone particles larger than 18 mm. These stones will be replaced in the hole during the volume measurement with density sand. The sealed jars will be taken to the lab and weighed to the nearest gram and the tare weight subtracted. The result will be recorded as "weight of material removed."

Carefully place and centre the sand cone device over the test hole with the valve closed.

Place the 5000 g of density sand into the storage hopper of the sand cone device.

Turn on the valve.

If stone particles are to be replaced in the hole, allow a small quantity of sand to run into the hole, close the valve, lift the apparatus, and partially imbed these particles into the sand. Replace the device, turn on the valve, allow the sand to run until the test hole and funnel are completely filled, and turn off the valve.

Remove the apparatus and remove the sand from the test hole and place in a large cloth bag along with other used sand for later reclaiming.

Weigh the unused sand in the hopper to determine the amount of sand used in the test. This weight of sand will be used to obtain the volume of hole and funnel.

Remove the soil cement mixture from the two mason jars and mix thoroughly together and obtain a representative sample for moisture determination.

Place sample in a suitable tared pan and weigh.

Dry sample carefully to a constant weight.

Weigh sample and pan after cooling.

The difference between the wet and dry weights will be recorded as "weight of moisture" and dry weight less weight of pan will be recorded as "weight of dry sample."

## 4. RESULTS AND CALCULATIONS

### 4.1. Calculations

Volume of calibration mold - as stamped.

$$\text{Unit Weight of Sand} = \frac{\text{weight of sand to fill calib. mold}}{\text{volume of calibration mold}}$$

$$\text{Volume of Funnel} = \frac{\text{weight of sand to fill funnel}}{\text{unit weight of sand}}$$

$$\text{Volume of Density Hole and Funnel} = \frac{\text{weight of sand to fill hole \& funnel}}{\text{unit weight of sand}}$$

$$\text{Volume of Density Hole} = \text{volume of hole \& funnel less volume of funnel}$$

$$\text{Moisture Content} = \frac{\text{weight of moisture}}{\text{weight of dry sample}} \times 100$$

$$\text{Dry Density} = \frac{\text{weight of material removed} \times 1000 \times 100}{\text{volume of density hole} \times (100 + \% \text{ moisture})}$$

### 4.2. Reporting Results

The dry density and moisture content will be reported.

## 5. ADDED INFORMATION

### 5.1. General

During the calibration for determining the unit weight of sand the counter and lab should be free of any sudden jars or vibrations.

The sand should be resieved after each use to remove any foreign matter gained from the surface tested and stored in a relatively dry place when not being used.

Great care must be taken to get the walls of the test hole as smooth as possible as this affects the volume measurement.

Materials excavated from the hole should be placed in sealed containers and weighed as quickly as possible to prevent moisture loss.

## APPROVAL SHEET

New __ Revision _X_ Date of Previous Document 85-04-01
Effective Date: - -

Description of Revision (Reason for Revision):
Format of test procedure updated.

Review/Implementation Process:
Reviewed by the Materials Section of the Technical Standards and Policies Branch.

Other Manuals/Policies Affected:
Nil

Follow Up/Training Required:
Nil

Comments/Concerns/Implications (Budget/Environment/Stakeholders):

Prepared and Recommended by D. MacLeod — 93-12-15
Quality Control Engineer — Date

Approval Recommended by R.A. Widger — - -
Senior Materials Engineer — Date

Approval Recommended by A.R. Gerbrandt — - -
Dir., Technical Standards & Policies Br. — Date

Approved by D.G. Metz — - -
Assistant Deputy Minister, Infrastructure — Date

Electronic File Updated - -
Update Mailed - -