GDT 24B

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine the theoretical maximum dry density and optimum moisture of soil or aggregate mixtures where the material contains more than 5 percent retained on the 2 in (50.8 mm) sieve.

B. Apparatus

The apparatus consists of the following:

1. Mold: Use a cylindrical metal mold approximately 12 in (304.8 mm) diameter, 6 in (152.4 mm) high, and fitted with a detachable base plate and a removable extension approximately 2.5 in (63.5 mm) high.
2. Rammer: Use a metal rammer that has a 2-in (50.8 mm) diameter circular face and weighs 5.5 lbs (2.5 kg). The rammer must have a suitable arrangement to control the height of drop to a free fall of 12 in (305 mm) above the material (WR-1).
3. Scales and Balances: Use a scale of at least 75 to 100 lbs (34 to 45 kg) capacity, sensitive to and graduated in 0.1 lb (0.045 kg); and a 4.5 kg capacity balance sensitive to 0.5 g.
4. Drying Device: Use a stove or oven capable of rapidly drying the moisture sample.
5. Straightedge: Use a steel straightedge at least 24 in (600 mm) long (WS-13-2).
6. Pans or Dishes: Use pie pans or evaporating dishes suitable for drying soil or aggregate samples (WP-01).
7. Graduated Cylinder: Use a 3.4 oz (100 ml) glass (Bit-04-100) or plastic (WC-P100) cylinder.
8. A suitable container for immersing the coarse aggregate.

C. Sample Size and Preparation

1. Determine the optimum moisture of the minus No. 10 (2.00 mm) portion of the sample with GDT 7.
2. Immerse the coarse aggregate (plus No. 10 (2.00 mm) material) in water for approximately 24 hours.
3. Remove the sample from the water.
4. Roll it in a large absorbent cloth or paper, until all visible films of water are removed, although the surfaces of the particles still appear to be damp. Wipe the large particles individually.
5. Do not evaporate the moisture during the operation of surface drying.

D. Procedures

1. Weigh the base plate and mold without extension.
2. Weigh a proportionate part of the minus No. 10 (2.00 mm) material equivalent to the percentage of minus No. 10 (2.00 mm) being used in the mixture.
3. Mix the sample with water to bring the material to optimum moisture content (see GDT 7).
4. Thoroughly mix the minus No. 10 (2.00 mm) material and the proportionate part of saturated surface dry aggregate.
5. Compact the mix into three layers by applying 225 blows per layer with the rammer.
6. After compacting all three layers, remove the mold extension.
7. Use a straightedge to carefully trim the specimen even with the top of the mold.
8. Weigh the mold and mixture.
9. Use the entire compacted mixture to determine the moisture content.

E. Calculations

1. Calculate the moisture content and maximum dry density of the mixture:

   where: $\%\ \text{Moisture} = \frac{(A - B) \times 100}{B}$

   A = weight of wet soil-aggregate

B = weight of dry soil-aggregate

and

where: $Dw = \frac{Ww - Wm}{0.3927\ ft^3\ (0.0111 m^3)}$

Dw = Wet Density in lbs/ft^3 (kg/m^3)

Ww = weight of mold, plate and soil-aggregate in pounds (kg)

Wm = weight of mold and plate in pounds (kg)

M = percent moisture expressed as a decimal

And

Where= $Dd = \frac{Dw}{1 + M}$

Dd= Dry density in lbs/ft^3 (kg/m^3)

M= % Moisture

NOTE: The volume of 12in (304.8 mm) mold is 0.3927 ft^3 (0.0111 m^3).

F. Report

Report the percent moisture, the wet density, and the maximum dry density on Form 408.