REMOLDED RING SAMPLES FOR DIRECT SHEAR, SWELL, AND CONSOLIDATION

(An Arizona Method)

SCOPE

1.   (a)   This procedure describes the method used to prepare remolded ring samples of soil for further testing of direct shear, swell, and consolidation. Samples are generally remolded at 95% or 97% of proctor maximum dry density and at minus 3% of optimum moisture. These values can be changed to suit the person ordering the test.

(b)   This test method may involve hazardous material, operations, or equipment. This test method does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of any regulatory limitations prior to use.

(c)   See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

(d)   Metric (SI) units and values are shown in this test method with English units and values following in parentheses. Values given for metric and English units may be numerically equivalent (soft converted) for the associated units, or they may be given as rounded or rationalized values (hard converted). Either the metric or English units along with their corresponding values shall be used in accordance with applicable specifications. See Appendix A2 of the Materials Testing Manual for additional information on the metric system.

APPARATUS

2.   Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual. Apparatus for this test procedure shall consist of the following:

(a)   Brass ring(s) with an inside diameter of 61.47 ± 0.03 mm (2.420 ± 0.001 inches), a height of 25.40 ± 0.05 mm (1.000 ± 0.002 inch), and a nominal wall thickness of 1.02 mm (0.040 inches). The brass ring(s) shall fit snugly inside the loading cylinder with no discernible free play in any direction.

(b)   Baseplate and loading cylinder, as shown in Figure 1.

(c)   Metal ram with a nominal outside diameter of 63.5 mm (2.5 inches).

NOTE: The brass ring(s), baseplate, loading cylinder, and ram should be free of bumps, dents, scratches, rust, dirt, and corrosion.

(d)   Rubber mallet.

(e)   A balance or scale capable of measuring the maximum weight to be determined and conforming to the requirements of AASHTO M 231, except the readability and sensitivity of any balance utilized shall be at least 0.1 gram.

SAMPLING

3.   (a)   Obtain 34 to 45 kilograms (75 to 100 pounds) of material for a proctor density test.

(b)   For the remolded ring samples, obtain 600 grams of minus 4.75 mm (No. 4) material from material for proctor density test. This amount of material is sufficient to remold 3 ring samples. Material should be split in accordance with AASHTO T 248.

NOTE: Direct shears require 3 rings. Swell and consolidation tests require only 1 ring.

(c)   Obtain approximately 100 grams of the minus 4.75 mm (No. 4) material for determination of percent hydroscopic moisture content.

PROCEDURE

4.   (a)   Determine the percent hydroscopic moisture content of the minus 4.75 mm (No. 4) material in accordance with AASHTO T 265.

(b)   Perform a Method A Proctor Density test in accordance with Arizona Test Method 225 or 232.
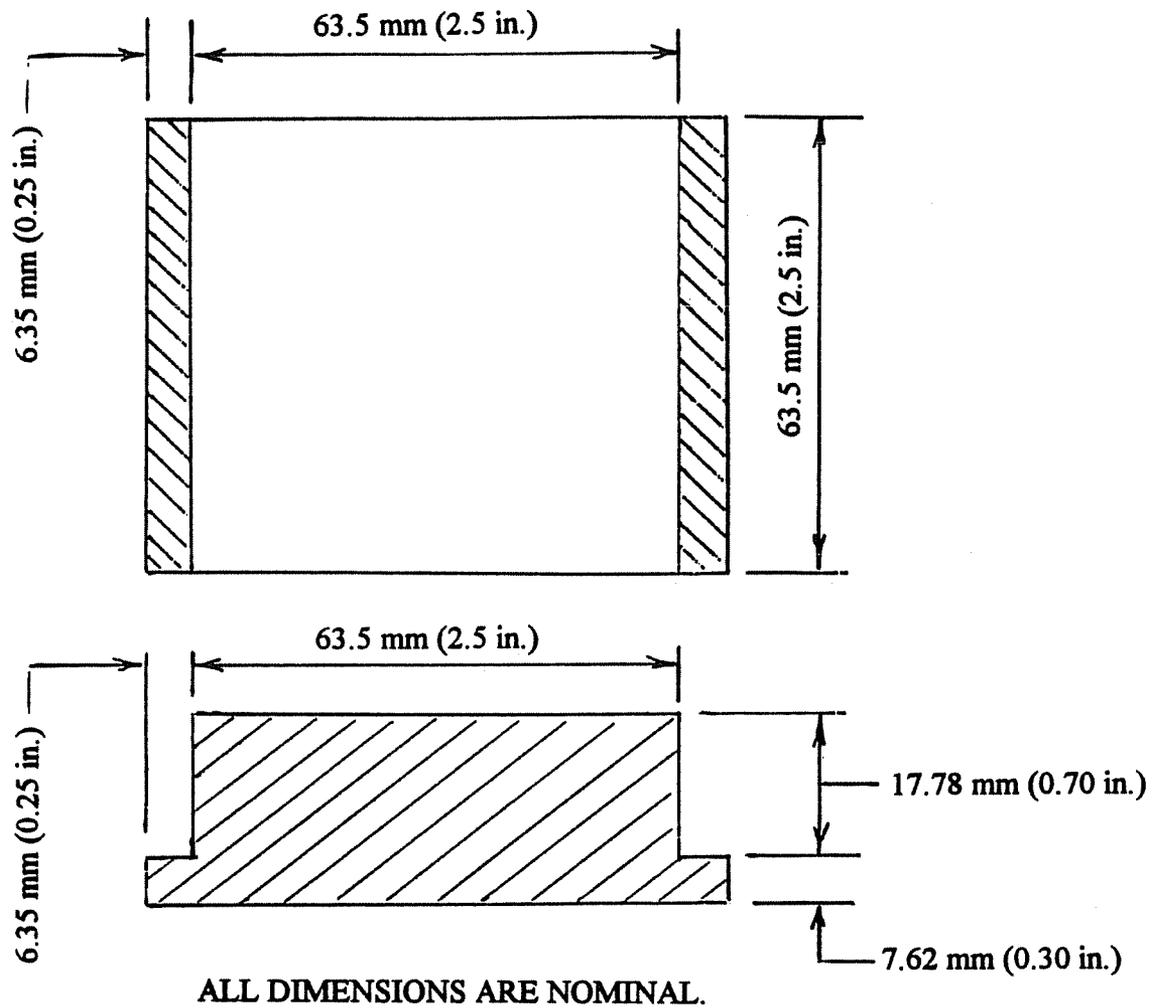
(c)   When the weight of soil and water "W_2" has been calculated as shown in the examples given in Figure 2 and Figure 3 (a blank worksheet is given in Figure 4), the soil and water must be thoroughly mixed, put into a sealed container, and left to cure for at least 12 hours.

(d)   After the soil has cured, the ring is ready to be loaded. Place ring in the bottom of the assembled baseplate and loading cylinder. Using a funnel, pour the soil mix into the cylinder. If it is necessary, gently tamp the material with your fingers. When all of the soil is loaded into the cylinder, insert the ram.

(e)   Using the rubber mallet, strike the ram 3 or 4 times. Remove the ram from the cylinder and, using a spatula, clean the soil from edge of ring. Insert ram and strike it 2 or 3 times.

(f)   Remove the ram from the cylinder and inspect the ring. If the ring is not showing, clean the soil from the edge of the ring using spatula, insert ram, and strike 2 or 3 times. If the ring is showing, remove loading cylinder from baseplate, and push the ring and soil gently out using the ram.

(g)   From this point on, direct shears follow ASTM D 3080, swell tests follow ASTM D 4546, and consolidation tests follow ASTM D 2435.

63.5 mm (2.5 in.)

6.35 mm (0.25 in.)

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6.35 mm (0.25 in.)

17.78 mm (0.70 in.)

7.62 mm (0.30 in.)

ALL DIMENSIONS ARE NOMINAL.

Baseplate and Loading Cylinder

FIGURE 1

REMOLDED SHEAR / SWELL / CONSOLIDATION
WORKSHEET

Lab No.: _____96-999_____   Date: _____10-25-96_____

Proctor Maximum Dry Density: _____1884_____ kg/m³ _____—_____ lb./cu. ft.

Optimum Percent Moisture: _____12.3_____

Maximum Dry Density at (95%) or 97% (D): _____1789_____ kg/m³ _____—_____ lb./cu. ft.

Percent Optimum Moisture minus 3% (w_1): _____9.3_____

Percent Hydroscopic Moisture Content (w): _____1.9_____

Brass Ring Volume/Density Factor (F): (0.0754) (for density in kg/m³) or
1.2074 (for density in lb./cu. ft.)

W = Weight of Dry Soil, grams $W = D \times F$ W = _____134.9_____

W_1 = Weight of Soil with $W_1 = W \times (1.00 + w/100)$ W_1 = _____137.5_____
       Hydroscopic Moisture, grams

W_2 = Weight of Soil $W_2 = W \times (1.00 + w_1/100)$ W_2 = _____147.4_____
       andWater, grams

w_2 = Weight of Water $w_2 = W_2 - W_1$ w_2 = _____9.9_____
       Added/Required, grams

Test Operator _____Joe DoGood_____

FIGURE 2

REMOLDED SHEAR / SWELL / CONSOLIDATION
WORKSHEET

Lab No.: _____*96 - 999*_____   Date: _____*10 - 25 - 96*_____

Proctor Maximum Dry Density: _____—_____ kg/m³ _____*117.6*_____ lb./cu. ft.

Optimum Percent Moisture: _____*12.3*_____

Maximum Dry Density at (95%) or 97% (D): _____—_____ kg/m³ _____*111.7*_____ lb./cu. ft.

Percent Optimum Moisture minus 3% (w_1): _____*9.3*_____

Percent Hydroscopic Moisture Content (w): _____*1.9*_____

Brass Ring Volume/Density Factor (F)   0.0754 (for density in kg/m³) or
                                        (1.2074) (for density in lb./cu. ft.)

W = Weight of Dry Soil, grams   W = D x F   W = _____*134.9*_____

W_1 = Weight of Soil with W_1 = W x (1.00 + w/100) W_1 = _____*137.5*_____
       Hydroscopic Moisture, grams

W_2 = Weight of Soil W_2 = W x (1.00 + w_1/100) W_2 = _____*147.4*_____
       and Water, grams

w_2 = Weight of Water w_2 = W_2 - W_1 w_2 = _____*9.9*_____
       Added/Required, grams

Test Operator _____*Joe Dogood*_____

FIGURE 3

REMOLDED SHEAR / SWELL / CONSOLIDATION
WORKSHEET

Lab No.: _____   Date: _____

Proctor Maximum Dry Density: _____kg/m³ _____lb./cu. ft.

Optimum Percent Moisture: _____

Maximum Dry Density at 95% or 97% (D): _____kg/m³ _____lb./cu. ft.

Percent Optimum Moisture minus 3% (w_1): _____

Percent Hydroscopic Moisture Content (w): _____

Brass Ring Volume/Density Factor (F):   0.0754 (for density in kg/m³) or
                                          1.2074 (for density in lb./cu. ft.)

W = Weight of Dry Soil, grams $W = D \times F$ W = _____

W_1 = Weight of Soil with $W_1 = W \times (1.00 + w/100)$ W_1 = _____
       Hydroscopic Moisture, grams

W_2 = Weight of Soil $W_2 = W \times (1.00 + w_1/100)$ W_2 = _____
       andWater, grams

w_2 = Weight of Water $w_2 = W_2 - W_1$ w_2 = _____
       Added/Required, grams

Test Operator _____

FIGURE 4