CALIBRATION OF STANDARD SAND AND SAND CONE.

(A Modification of AASHTO Designation T 191)

Scope

1. This method of test is to determine a weight per cubic foot of sand to be used in soil density determinations, and the volume of the sand to fill the funnel on the sand cone.

Apparatus

2. The apparatus shall be as follows:

(a) Sand Cone Assembly. - A 1-gal. jar and a detachable appliance consisting of a cylindrical valve with an orifice 1/2-in. in diameter and having a small funnel connecting to a standard G mason jar top on one end and a large funnel on the other end. The valve shall have stops to prevent rotating the valve past the completely open or closed positions. See Fig. 1.

(b) Sand to be standardized, clean, dry, free flowing and uncemented (obtained from warehouse).

(c) 1/13.33 (0.075) cu. ft. mold. (Volume of mold shall be recalibrated occasionally.)

(d) Straightedge

(e) Balance, 20 kg. capacity, accurate to 1.0 g., or 35 lb. capacity, accurate to 0.01 lb.

Procedure

3. The test shall be as follows:

(a) Fill the jar with the sand to be used and attach the funnel.

(b) Weigh the empty 0.075 cu. ft. mold.

(c) Set the mold in a flat square pan large enough to catch any excess sand.

(d) Invert the apparatus and set the funnel directly over the mold.

(e) Open the valve and let the sand flow freely into the mold being careful not to jar the apparatus, until the sand ceases to move in the jar.

(f) Close the valve sharply and carefully remove the apparatus from the mold.

(g) Using the straightedge, strike off the sand, being careful not to jar the mold. Work the straightedge in the least number of strokes possible until sand is level with the mold. Tap the edge of the mold and weigh and record.

(h) Repeat steps (a) through (g) twice more.

(i) The jar shall now be refilled with the

sand, the funnel attached, and the apparatus weighed and recorded.

(j) Place the base plate in the bottom of a level, smooth pan.

(k) Invert the apparatus and place on the base plate in the same manner as the apparatus would be placed over a field density hole.

(l) Open the valve all the way and allow the sand to flow freely, being careful not to jar the apparatus, until the sand ceases to move.
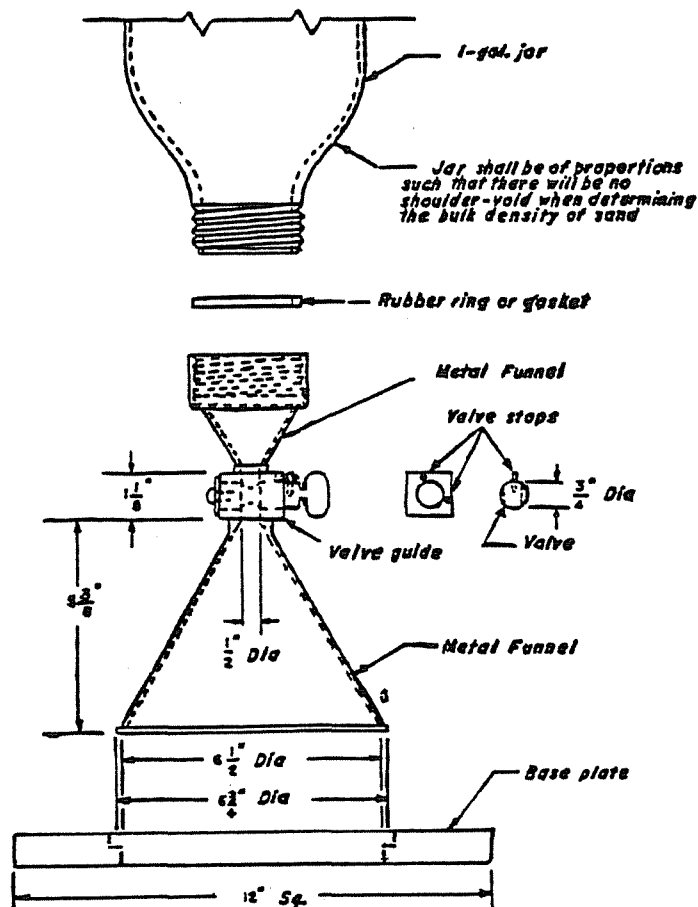

FIGURE 1
Density Apparatus

(m) Close the valve and carefully remove the apparatus from the base plate; weigh the jar and record the weight.

(n) Repeat steps (i) through (m) twice more.

Calculations

4. The calculations are as follows:

(a) Density, D_S, of standard sand, lb./cu. ft.:

	Initial Weight	Final Weight	Difference
Trial #1	5068 g.	1786 g.	3282 g.
Trial #2	5060 g.	1784 g.	3276 g.
Trial #3	5075 g.	1796 g.	3279 g.
		Total	9837 g.

Average $= \dfrac{9837 \text{ g.}}{3} = 3279$ g.

The average of three readings shall be used for computing density (D_S) of standard sand:

$$D_S = \frac{\text{Avg. of 3 wts. (g.)}}{(453.6 \text{ g/lb.}) \text{ (vol. of mold)}}$$

Example:

$$D_S = \frac{3279}{(453.6)\ (0.075)} = 96.4 \text{ lb./cu. ft.}$$

(b) Volume of Funnel & Base Plate:

	Initial Weight	Final Weight	Difference
Trial #1	5068 g.	3288 g.	1780 g.
Trial #2	5072 g.	3289 g.	1783 g.
Trial #3	5065 g.	3289 g.	1776 g.
		Total	5339 g.

Average $= \dfrac{5339 \text{ g.}}{3} = 1780$ g.

The average of three readings shall be used for computing the volume of the funnel and base plate.

$$\text{Vol., cu. ft.} = \frac{\text{Avg. of 3 wts. (g.)}}{(453.6)\ (D_S)}$$

Example:

$$\text{Vol., cu. ft.} = \frac{1780}{(453.6)\ (96.4)} = .0407 \text{ cu. ft.}$$