MODIFIED PROCTOR TEST

1. Objective: To obtain the graphical relationship of the "dry density' to "moisture content" in the form of "compaction curve', for determining the values of Optimum Moisture Content (OMC) and Maximum Dry Density (MDD).

2. Apparatus Required:

Fig. 1: Proctor Mould & Rammer

Metal mould (volume = 1000 cm^3 for 100 mm diameter mould and volume= 2250 cm^3 for 150 mm diameter mould & Metal rammer conforming to IS: 9189-1979. (weight = 4.89 kg)

Fig. 2: Balance

The balance to be used must be sensitive to the extent of 0.1% of total weight of sample taken

3. Reference: IS-2720 (Part-8):1983 (Reaffirmed- May 2015) "Methods of test for soils: Determination of water content - dry density relation using heavy compaction".

4. Procedure:

1. Take a representative portion of air-dried soil large enough to provide about 6 kg of material passing 19mm IS sieve (for soils not susceptible to crushing during compaction) or about 15 kg of material passing 19mm IS sieve (for soils susceptible to crushing during compaction. Sieve this on a 19mm IS sieve and

the reject the coarse fraction after its proportion of the total sample has been recorded.

2. Add suitable amount of water with the soil and mix it thoroughly. For sandy and gravelly soil add 3% to 5% of water. For cohesive soil the amount of water to be added should be 12% to 16% below the plastic limit.
3. Weigh the mould with base plate attached, to the nearest 1g and record the weight as W1. Attach the extension collar with the mould. Compact the moist soil into the mould in five layers of approximately equal mass, each layer being given 25 blows, with the help of 4.9 kg rammer, dropped from a height of 450mm above the soil. The blows must be distributed uniformly over the surface of each layer.
4. After completion of the compaction operation, remove the extension collar and level carefully the top of the mould by means of straightedge. Weigh the mould with the compacted soil to the nearest 1 g and record this weight as W2.
5. Remove the compacted soil from the mould and place it on the mixing tray. Determine the water content of a representative sample of the specimen. Record the moisture content as 'M'.
6. The remainder of the soil shall be broken up and repeat Steps (iii) to (v) above, by adding suitable increment of water to the soil. For sandy and gravelly soils the increment is generally 1% to 2% and for cohesive soils the increment is generally 2% to 4%. The total number of determinations made shall be at least five, and the moisture contents should be such that the optimum moisture content, at which the maximum dry density occurs, is within that range.
7. For compacting soil containing coarse material up to 37.5 mm size, the 2250 cm3 mould should be used. A sample weighing about 30 kg and passing the 37.5 mm IS sieve is used for the test. Soil is compacted in five layers, each layer being given 56 blows of the 4.9 kg rammer.

5. Calculation:

1. Bulk density, γ_m in g/cm^3 of each compacted specimen is calculated from the following equation.

$$\gamma_m = (W_2 - W_1)/V_m$$

Where,

W_1 = Weight in g of mould + base plate

W_2 = Weight in g of mould + base plate + soil

V_m = Volume of mould i.e. 1000 cm^3.

1. Dry density, γ_d in g/cm^3 of each compacted specimen is calculated from the following equation.

$$\gamma_d = 100\ \gamma_m / (100+M)$$

Where,

γ_m = Bulk density of soil in g/cm^3.

M = Moisture content of soil

6. Graph: The dry densities, γ_d, obtained in a series of determinations is plotted against the corresponding moisture content 'M'. A smooth curve is then drawn through the resulting points and the position of the maximum on this curve is determined, which is called maximum dry density (M.D.D). And the corresponding moisture content is called optimum moisture content (O.M.C.).

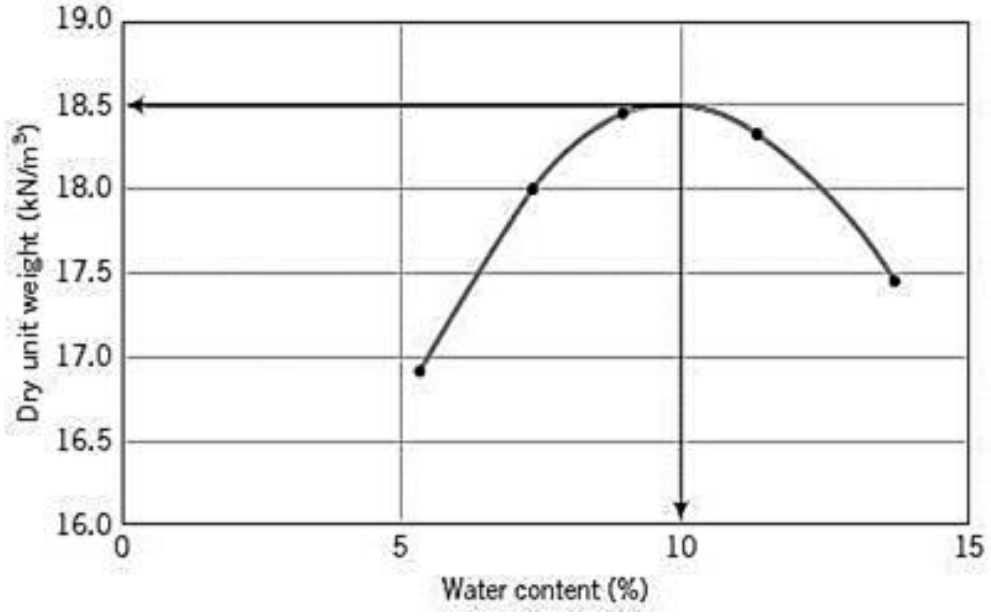

Fig. 3: Plot of dry Unit Weight v/s Moisture Content (Compaction Curve)