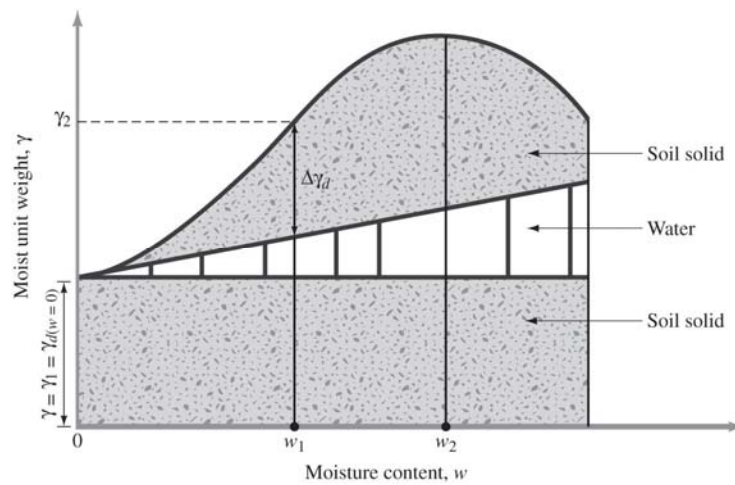


Soil Compaction

Chapter 5



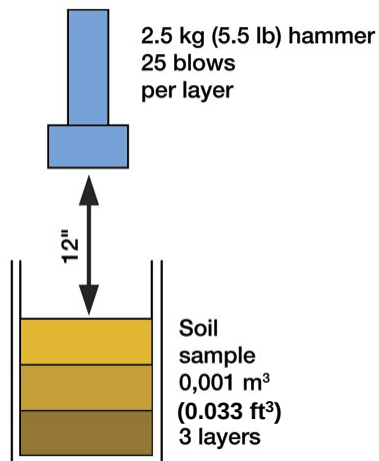
Compaction Principles



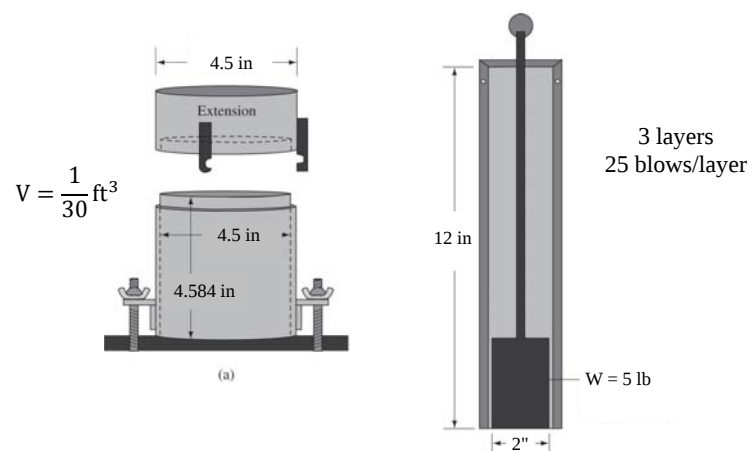
Standard Proctor Test



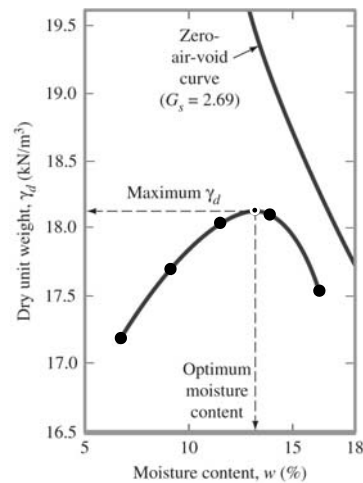
Standard Proctor Test



Standard Proctor Test



Standard Proctor Test

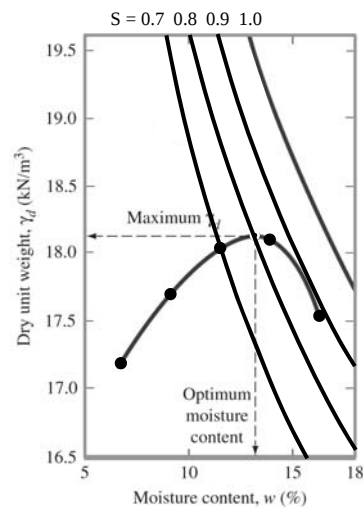


$$\gamma_d = \frac{W_s}{V} = \frac{G_s \gamma_w}{1 + e}$$

$$\frac{1}{Se} = w G_s$$

$$\gamma_{zav} = \frac{G_s \gamma_w}{1 + w G_s} = \frac{\gamma_w}{w + \frac{1}{G_s}}$$

Standard Proctor Test

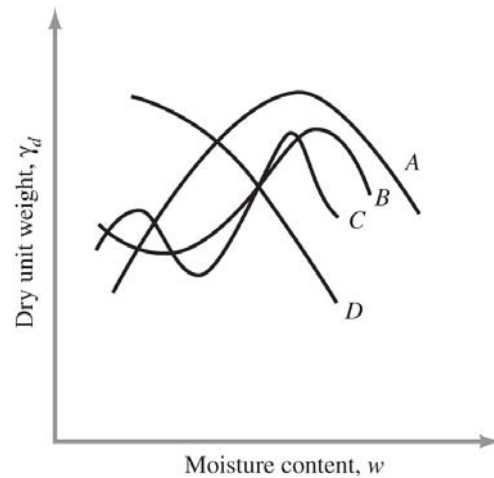


$$\gamma_d = \frac{W_s}{V} = \frac{G_s \gamma_w}{1 + e}$$

$$Se = w G_s$$

$$\gamma_d = \frac{G_s \gamma_w}{1 + \frac{w G_s}{S}} = \frac{\gamma_w}{\frac{w}{S} + \frac{1}{G_s}}$$

Factors Affecting Compaction



Factors Affecting Compaction

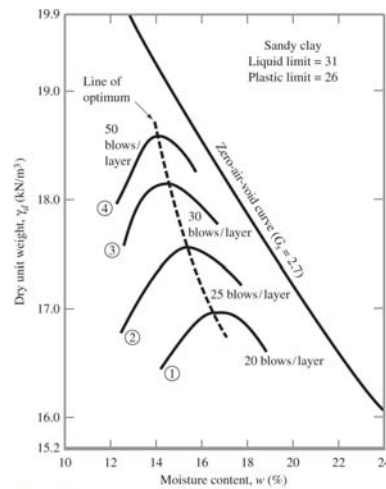
Energy = force applied through a distance

$$E = \frac{\left(\begin{array}{c} \text{number} \\ \text{of blows} \\ \text{per layer} \end{array} \right) \times \left(\begin{array}{c} \text{number} \\ \text{of} \\ \text{layers} \end{array} \right) \times \left(\begin{array}{c} \text{weight} \\ \text{of} \\ \text{hammer} \end{array} \right) \times \left(\begin{array}{c} \text{height of} \\ \text{drop of} \\ \text{hammer} \end{array} \right)}{\text{volume of mold}}$$

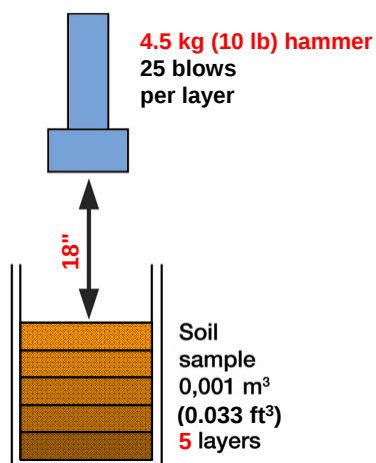
Table 5.1 Compaction energy for tests shown in Figure 5.6

Curve number in Figure 5.6	Number of blows/layer	Compaction energy (kN-m/m ³)
1	20	473.0
2	25	591.3
3	30	709.6
4	50	1182.6

Factors Affecting Compaction



Modified Proctor Test



Soils with Gravel

Table 5.2 Specifications for standard Proctor test (Based on ASTM Test Designation 698)

Item	Method A	Method B	Method C
Diameter of mold	101.6 mm	101.6 mm	152.4 mm
Volume of mold	943.3 cm ³	943.3 cm ³	2124 cm ³
Weight of hammer	24.4 N	24.4 N	24.4 N
Height of hammer drop	304.8 mm	304.8 mm	304.8 mm
Number of hammer blows per layer of soil	25	25	56
Number of layers of compaction	3	3	3
Energy of compaction	591.3 kN-m/m ³	591.3 kN-m/m ³	591.3 kN-m/m ³
Soil to be used	Portion passing No. 4 (4.75 mm) sieve. May be used if 20% or less by weight of material is retained on No. 4 sieve.	Portion passing 9.5-mm sieve. May be used if soil retained on No. 4 sieve is more than 20%, and 20% or less by weight is retained on 9.5-mm sieve. 3/8" sieve	Portion passing 19-mm sieve. May be used if more than 20% by weight of material is retained on 9.5-mm sieve, and less than 30% by weight is retained on 19-mm sieve. 3/4" sieve

Soils with Gravel

Table 5.3 Specifications for modified Proctor test (Based on ASTM Test Designation 1557)

Item	Method A	Method B	Method C
Diameter of mold	101.6 mm	101.6 mm	152.4 mm
Volume of mold	943.3 cm ³	943.3 cm ³	2124 cm ³
Weight of hammer	44.5 N	44.5 N	44.5 N
Height of hammer drop	457.2 mm	457.2 mm	457.2 mm
Number of hammer blows per layer of soil	25	25	56
Number of layers of compaction	5	5	5
Energy of compaction	2696 kN-m/m ³	2696 kN-m/m ³	2696 kN-m/m ³
Soil to be used	Portion passing No. 4 (4.75 mm) sieve. May be used if 20% or less by weight of material is retained on No. 4 sieve.	Portion passing 9.5-mm sieve. May be used if soil retained on No. 4 sieve is more than 20%, and 20% or less by weight is retained on 9.5-mm sieve. 3/8" sieve	Portion passing 19-mm sieve. May be used if more than 20% by weight of material is retained on 9.5-mm sieve, and less than 30% by weight is retained on 19-mm sieve. 3/4" sieve