SOIL'S COMPACTION
PEMADATAN TANAH

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Pemadatan Tanah

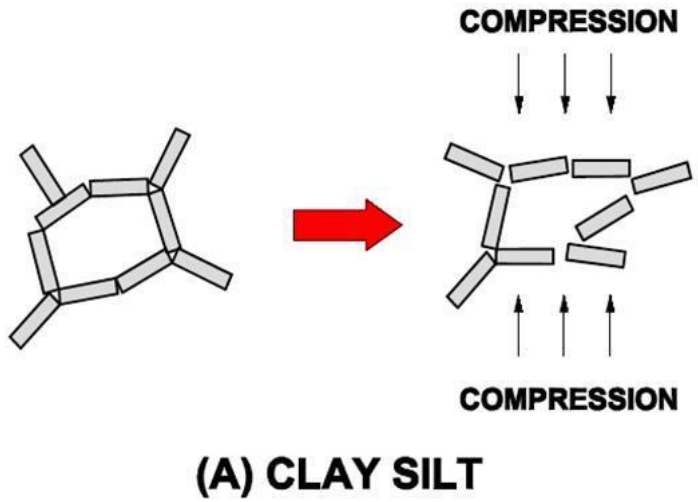
- Definisi & Tujuan Pemadatan
- Uji kepadatan tanah di Laboratorium
- Hal hal yang mempengaruhi kepadatan tanah
- Pemadatan Tanah di Lapangan
- Pengendalian kepadatan tanha di Lapangan (Field control)
- Stabilisasi Tanah dengan pemadatan

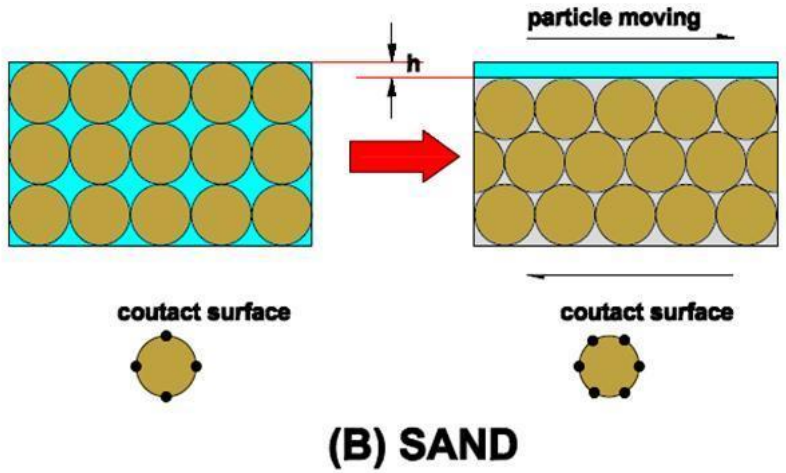
DEFINISI DAN TUJUAN

- Pemadatan adalah proses mengeluarkan udara dari dalam pori[2] tanah. Ini adalah cara murah dan efektif untuk memperbaiki sifat[2] tanah.
- Pemadatan akan meningkatkan kerapatan (berat isi) tanah sehingga:
  - Kuat geser meningkat
  - Penurunan tanah berkurang
  - Permeabilitas tanah menurun

Pengertian Pemadatan

Menambah berat volume kering dengan beban dinamis sehingga butiran tanah akan merapat mengurangi rongga





JENIS PEMADATAN TANAH

a. Pemadatan Dangkal : yang dipadatkan top soil, menggunakan penumbuk sederhana atau penumbuk mesin.

b. Pemadatan Dalam : Precompression, peledakan, **dynamic compaction**, compaction grouting, vibroflotation

PEMADATAN TANAH PASIR

- Kepadatan tanah pasir dinyatakan sebagai densitas relative (Relative density):

$$D_r = \frac{e_{max} - e}{e_{max} - e_{min}} = \frac{1/\gamma_{dmin} - 1/\gamma_d}{1/\gamma_{dmin} - 1/\gamma_{dmax}}$$

- Angka pori tertinggi atau densitas kering terendah dicapai pada kondisi gembur.
- Angka pori terendah atau densitas kering tertinggi dicapai pada kondisi paling padat.

PEMADATAN TANAH LEMPUNG

- Pemadatan dinyatakan sebagai bert jenis kering:

$$\gamma_d = \frac{\gamma}{1+\omega}$$

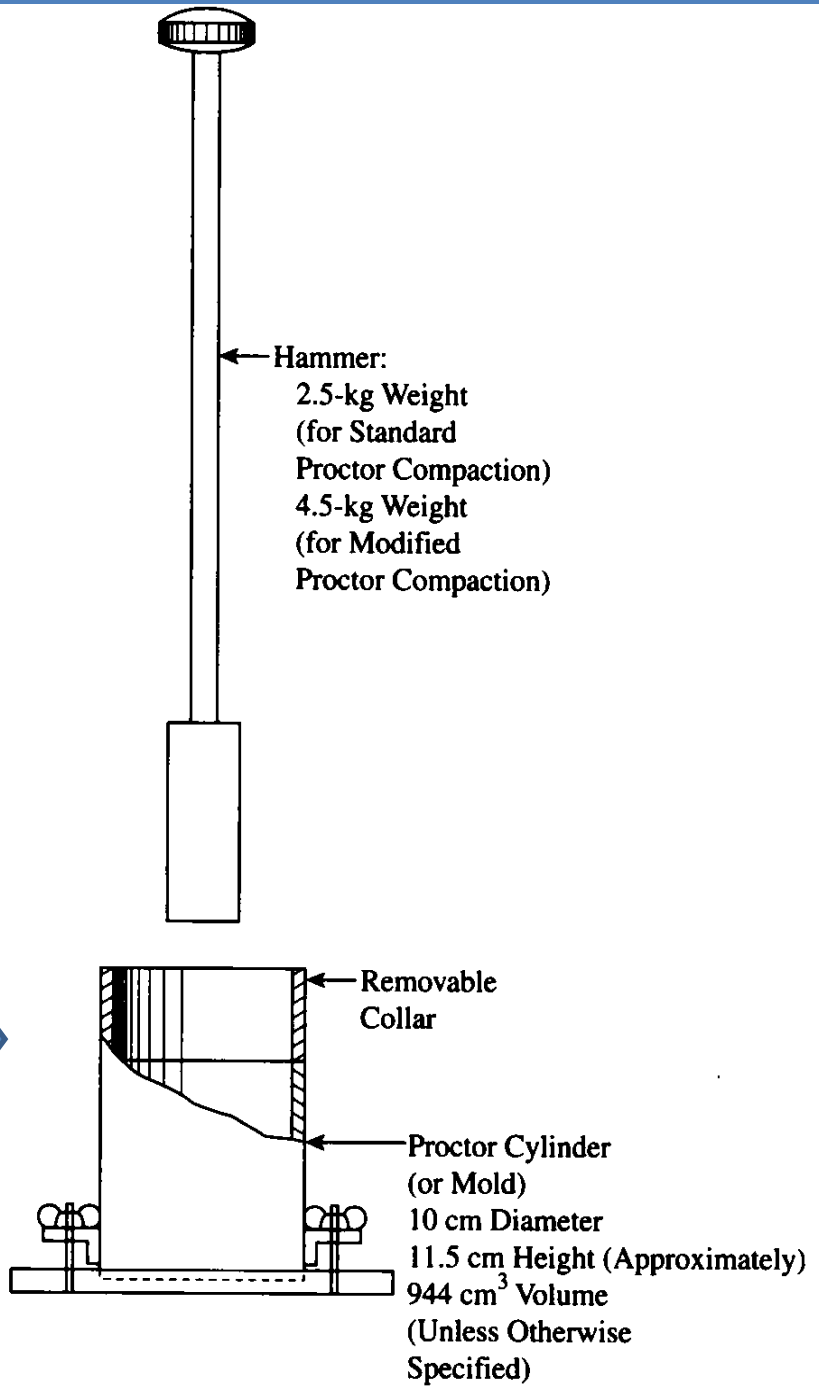
- Berat jenis kering dicapai pada kadar air optimum
- Tanah harus di padatkan sampai tercapai berat jenis kering maximum yang ditentukan di lab
- Berat isi kerng digunakan untuk menentukan kekuatan geser tanah

Uji Laboratorium

dilakukan untuk menentukan:

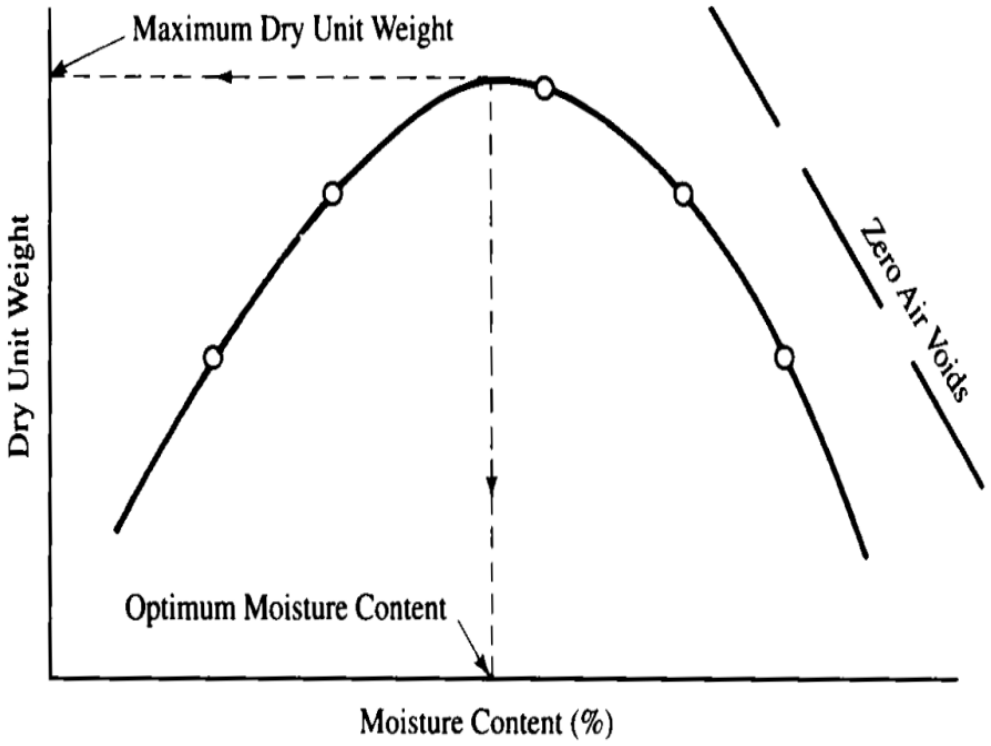
- *Kadar air optimum*
- *Berat jenis kering Maximum*

Pengujian stardard Proctor



Hasil uji pemadatan

- The coordinates at the peak gives the maximum dry unit weight & optimum moisture content
- To achieve the maximum dry unit weight, field compaction should be done at or near optimum moisture content



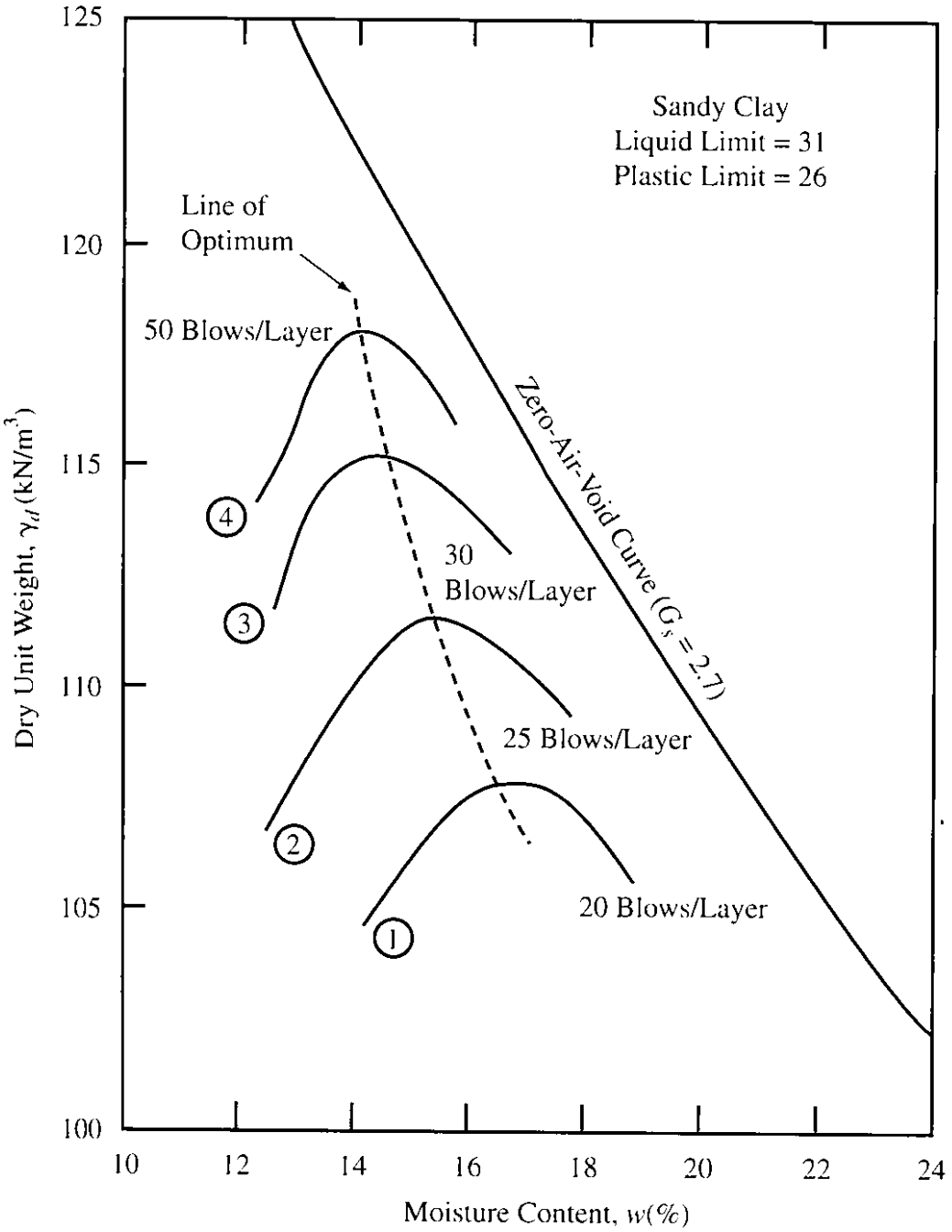
- The right side of the curve roughly parallels the dashed line labeled “Zero Air Voids”
- This line represents the dry unit weight when saturation is 100% which can be determined from

$$\gamma_{ZAV} = \frac{G_s \gamma_w}{1 + \omega G_s}$$

Factors affecting compaction of soil

- Compaction of soil can be affected by:
  - Moisture content
  - Compaction effort
  - Type of soil
- Compaction effort
  - can be quantified in terms of the compaction energy per unit volume
  - The greater the compaction energy per unit volume, the greater the compaction

- Influence of Compaction energy on the compaction of sandy clay
- As the no of blows ↑, the max γ_d ↑ & optimum moisture content ω ↓

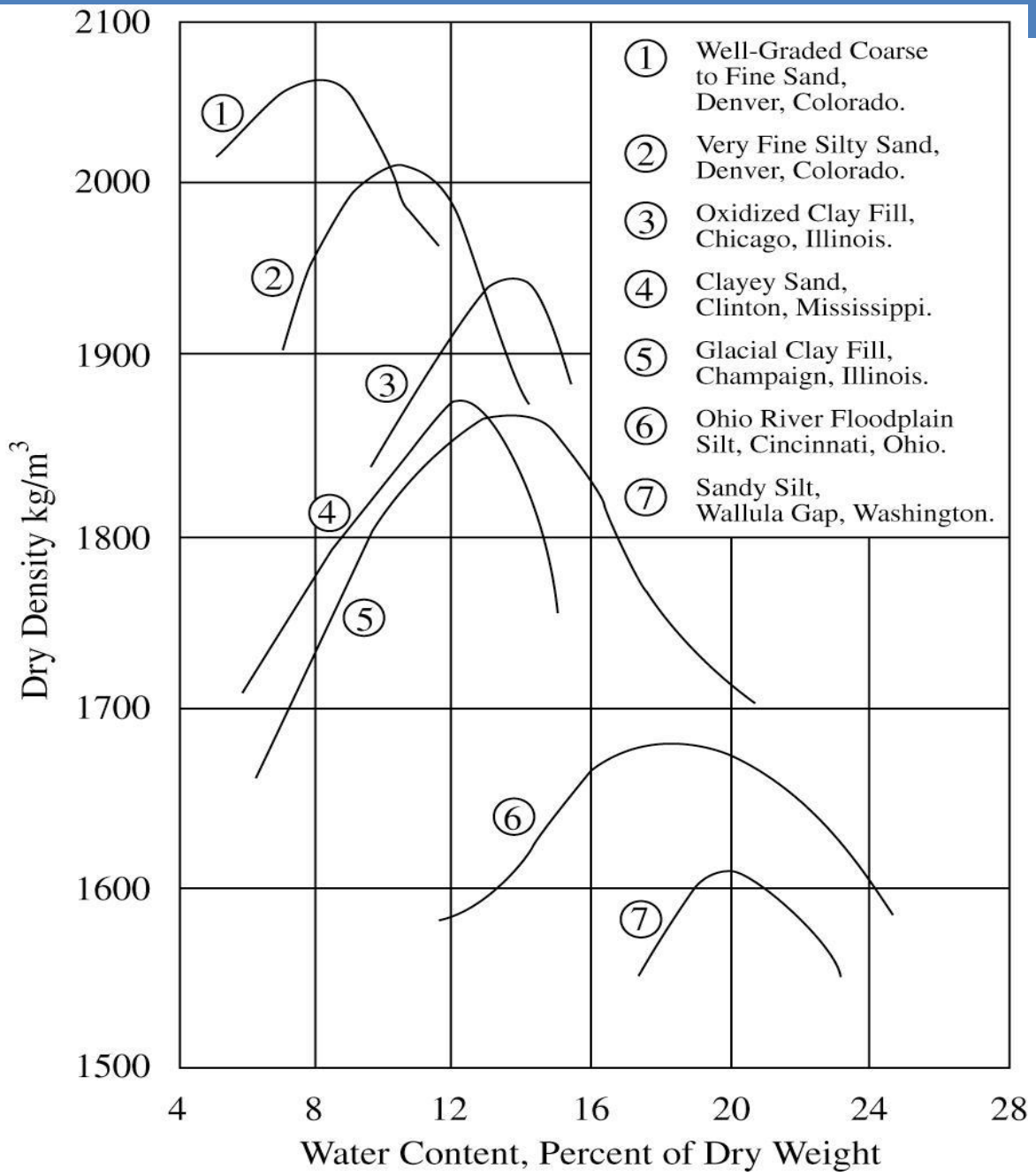


Influence of type of soils is due to

- Grain-size distribution of soil
- Shape & specific gravity of solids
- Type & amount of clay minerals present

- Max dry unit weight can range from 9.42 kN/m^3 for organic soils to about 22.78 kN/m^3 for well-graded granular material
- Optimum moisture content can range from 5% to 35%
  - Higher optimum moisture contents are associated with lower dry unit weights
  - Higher dry unit weights are associated with well-graded granular materials
  - Uniformly graded sand, clays of high plasticity and organic silts & clays respond poorly to compaction

Both the shapes & positions of the curves change as the texture of soil varies



Example

- A set of laboratory compaction test data & results is tabulated as follows

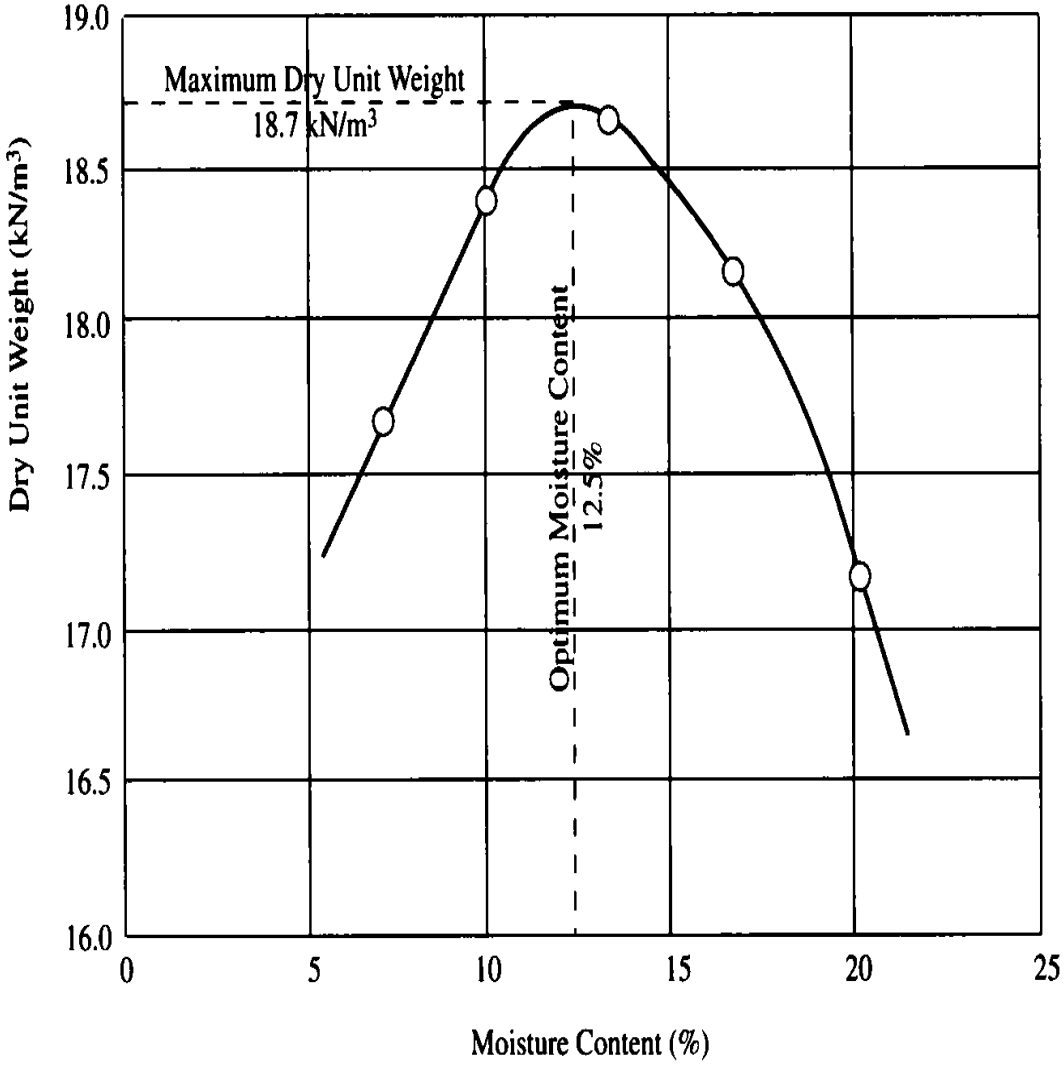
Test No.	1	2	3	4	5
Dry unit wt (kN/m^3)	17.61	18.32	18.57	18.09	17.11
Moisture content	7.1	10.0	13.4	16.7	20.1

- The test was conducted in accordance with the ASTM D 698 Standard Proctor Test
- Plot a Proctor curve (i.e. dry unit weight vs moisture content)
- Determine the soil's maximum dry unit weight & optimum moisture content

Example

Solution

- The Proctor curve is plotted as shown
- From the graph plotted,
  - Max dry unit weight = 18.7 kN/m^3
  - Optimum moisture content = 12.5%



Thanks for your attention