HIGHWAY MATERIALS

Part 2

Compaction and CBR

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How to determine the strength or bearing capacity of soil?

Two major processes

Compaction test

(determine Maximum Dry Density, MDD and Optimum Moisture Content, OMC)

California Bearing Ratio test

(determine CBR value)

Compaction

Sample preparation

dry soil (particle size ≤ 20mm)	5 different moisture contents

Compaction of sample

Tools: mold 2.3L, hammer 4.5 kg	Procedures: compacted for 5 layers, 62 blows/layer

Data and analysis

Calculate dry density and moisture content (plot DD vs. MC)	Determine MDD and OMC

Compaction steps

1

2

Compaction steps

3

4

Compaction steps

4

5

Example Data:

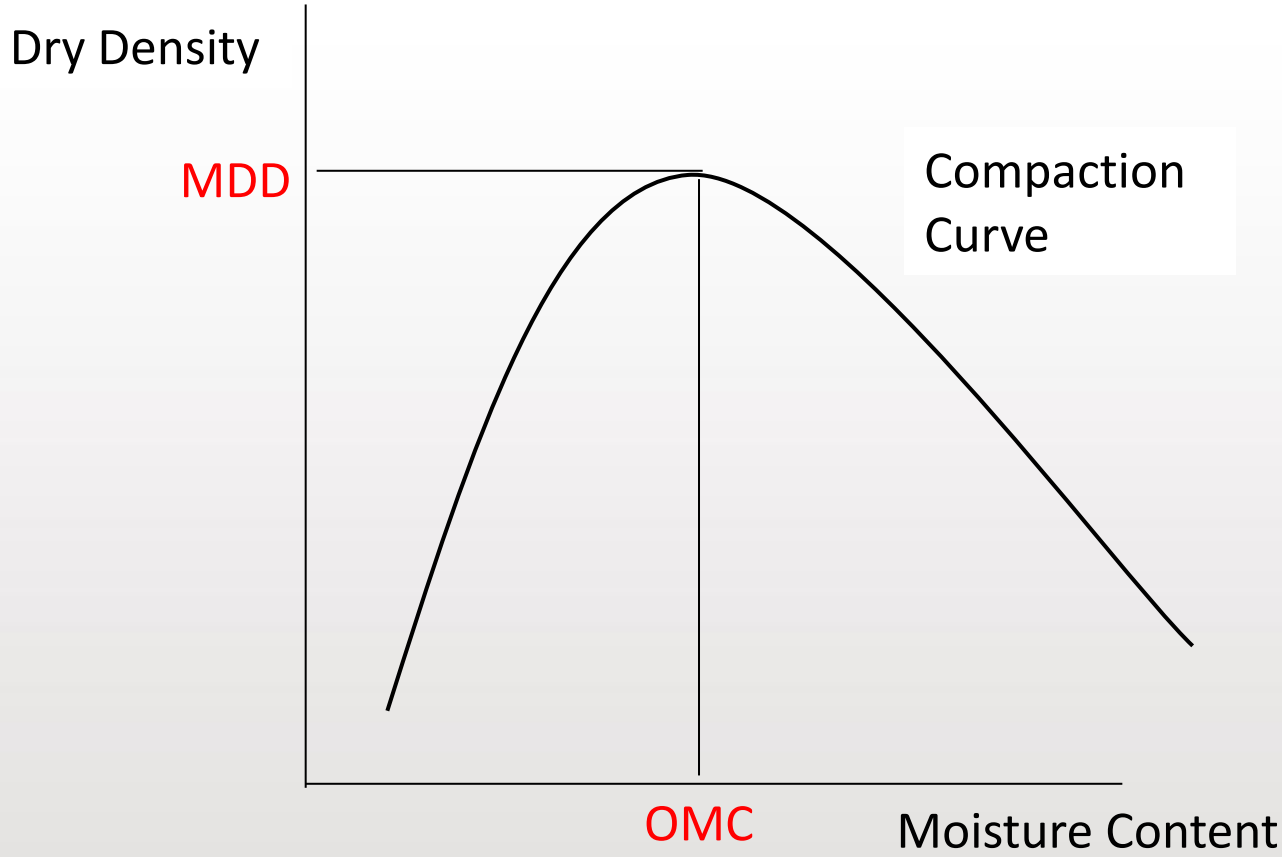
Compaction data:

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Mass of mould (g)					
Mass of mould + compacted sample (g)					
Mass of compacted sample (g)					
Bulk Density (Mg/m^3)					
Dry density (Mg/m^3)					

Moisture content data:

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Mass of container (g)					
Mass of container + wet sample (g)					
Mass of container + dry sample (g)					
Moisture content (%)					

Dry Density vs. Moisture Content



CBR Test

Sample preparation

dry soil (particle size ≤ 20mm)	optimum moisture content

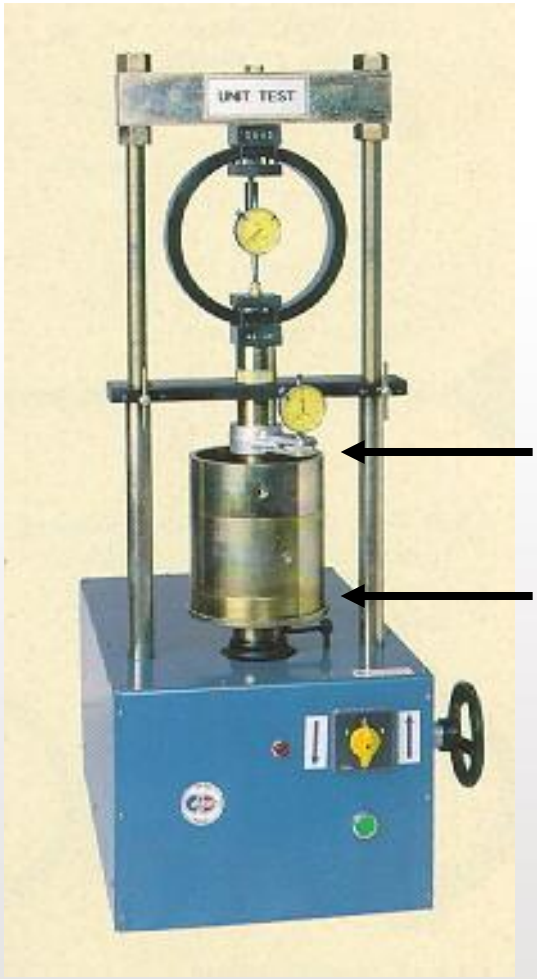
Compaction of sample

Tools: mold 2.3L, hammer 4.5 kg	Procedures: 3 samples, compacted for 5 layers, 65, 35, 15 blows/layer, soaked in water for 4 days

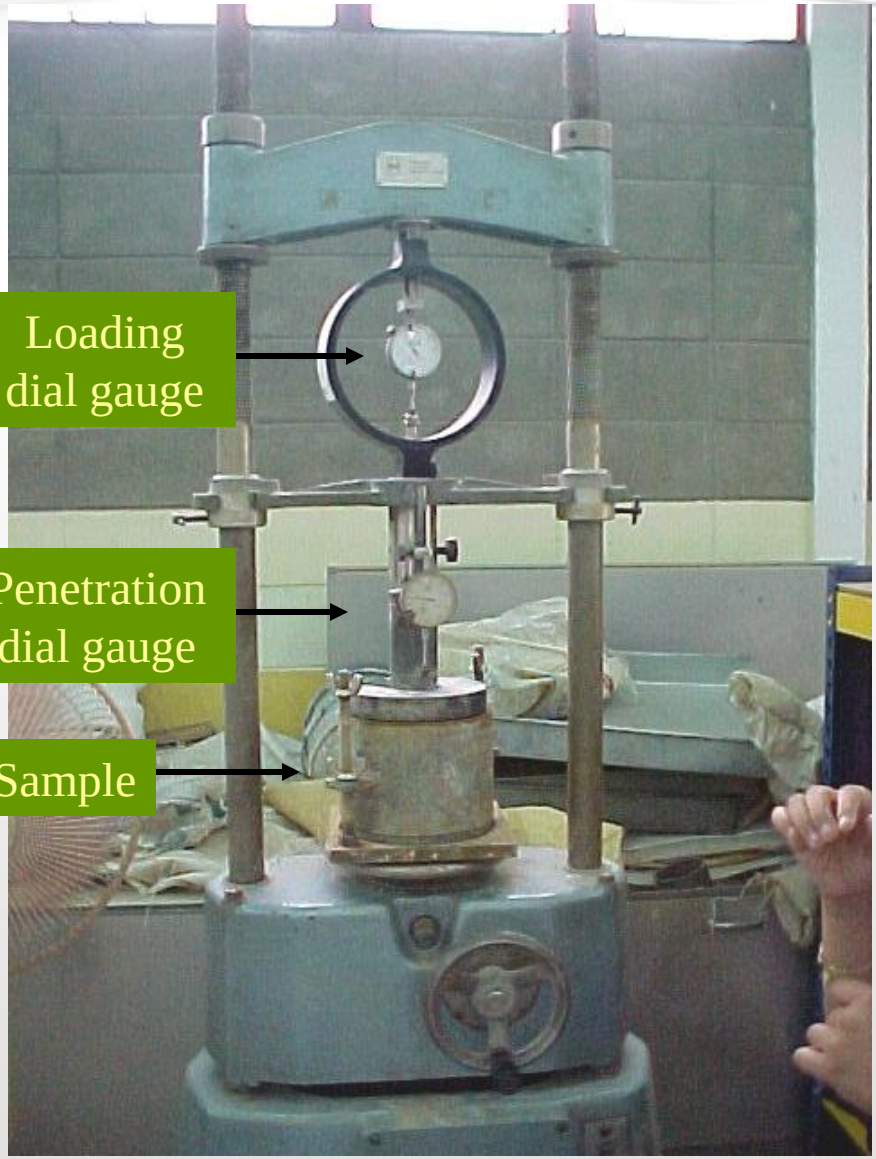
Data and analysis

Determine dry density, Plot Load (kN) vs. Penetration of Plunger (mm)	Determine Top and bottom CBR values at 2.5 and 5 mm pen.

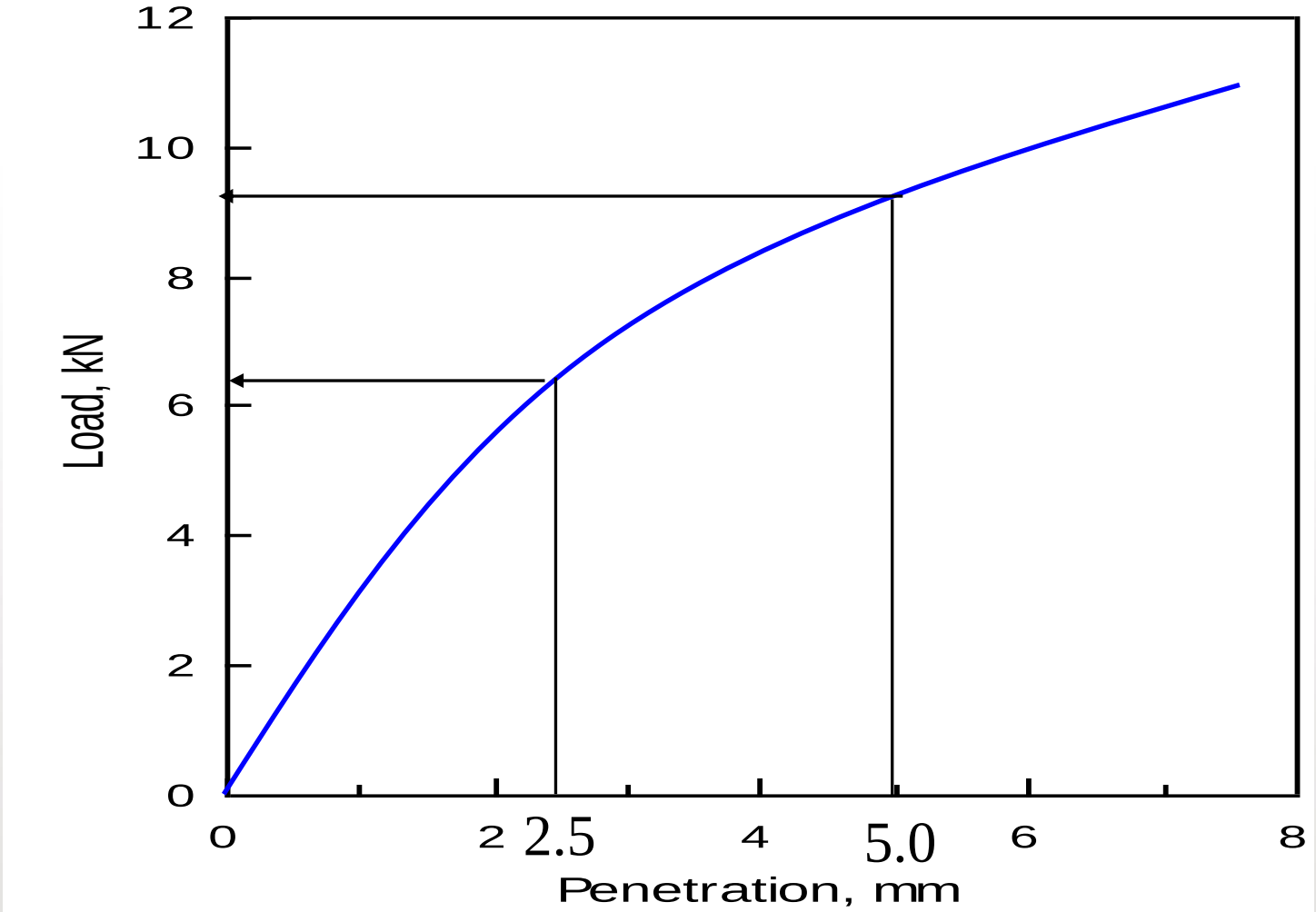
Soaked CBR



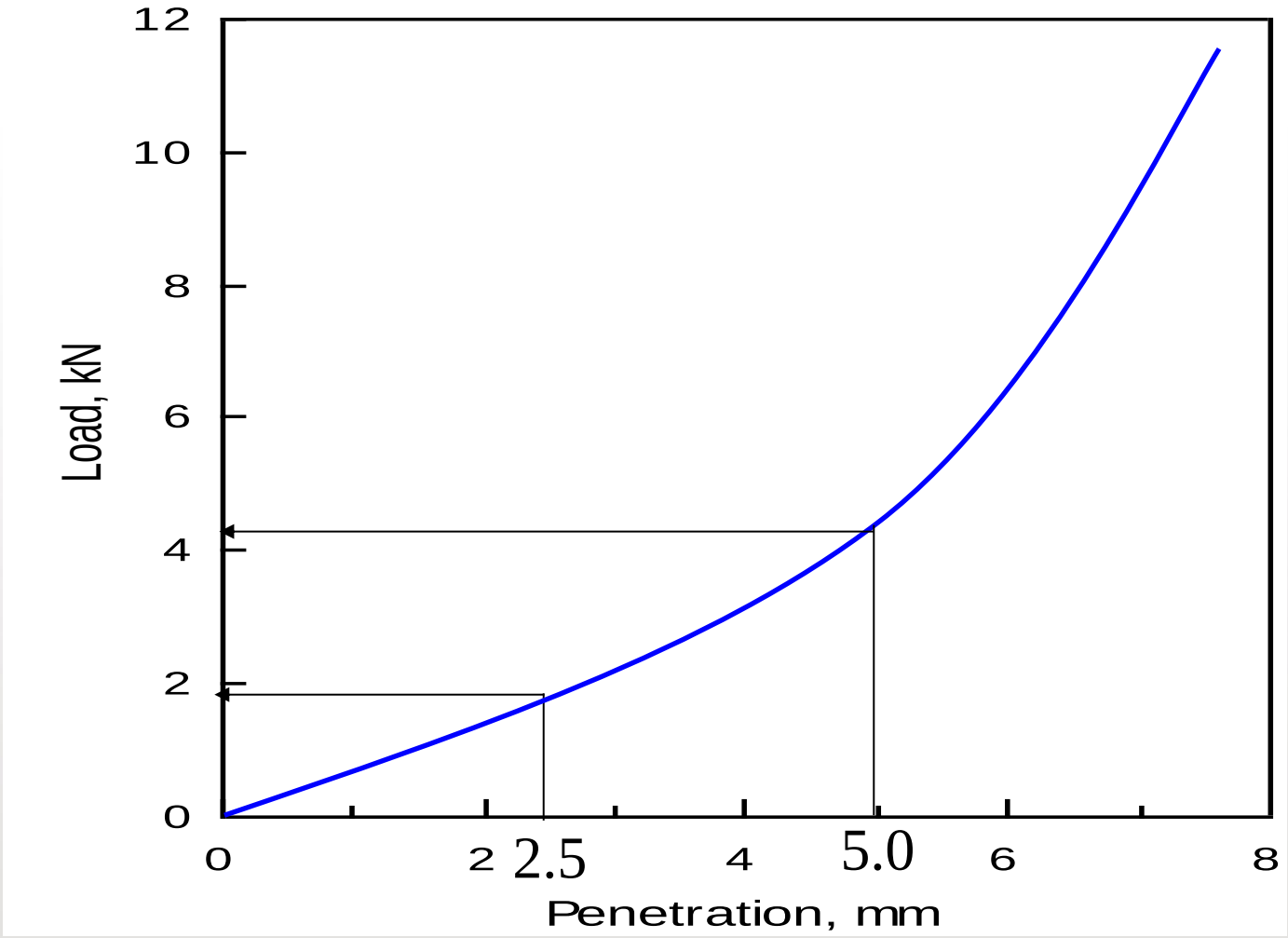
CBR Testing



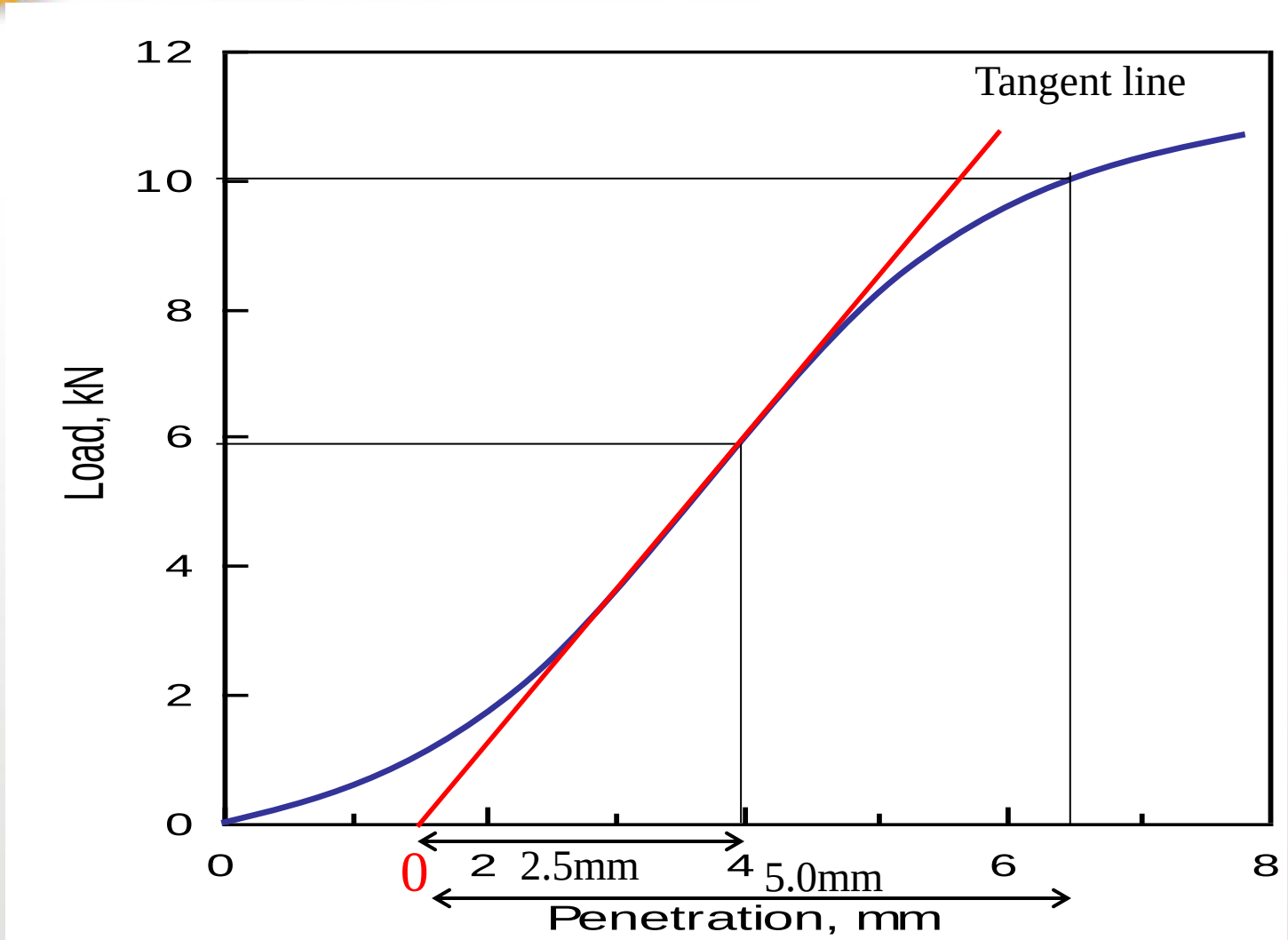
CBR 1



CBR 2



CBR 3


Tangent line
12
10
8
6
4
2
0
Load, kN
0
2
4
6
8
0
2.5mm
5.0mm
Penetration, mm

CBR analysis

1. Calculate CBR values of top and bottom @ 2.5 and 5.0mm:

   CBR@2.5mm = load at 2.5mm/13.24 x100

   CBR@5.0mm = load at 5.0mm/19.96 x100

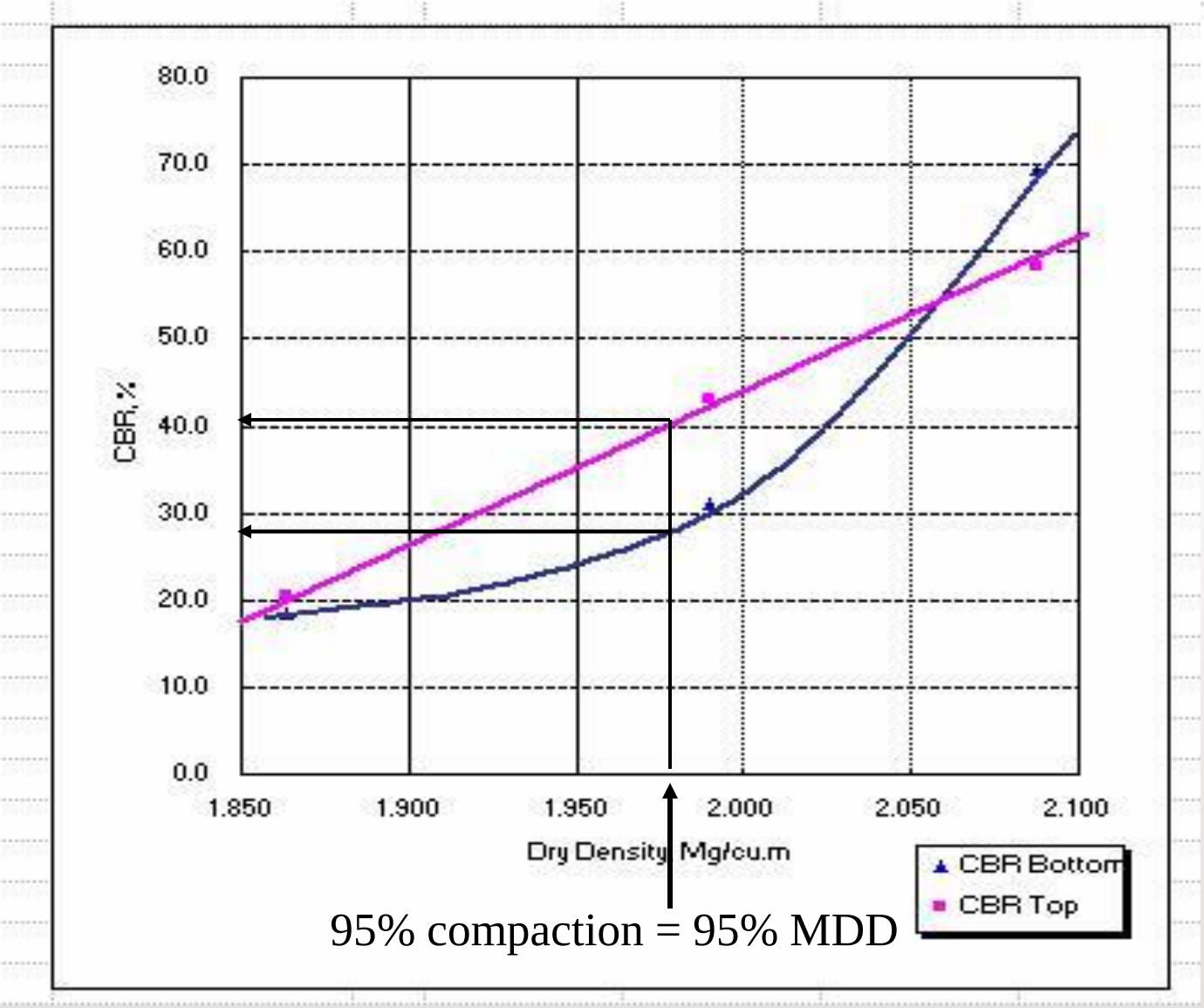
2. Report the highest CBR values for top and bottom and dry density for all 3 samples

3. Plot CBR values versus dry density and determine CBR at 95% compaction (95% MDD)

CBR vs. DD Data

Number of Blows		15	35	65
Dry density, g/cu.m	Mg/cu.m	1.864	1.989	2.088
CBR Top	%	20.4	43.1	58.2
CBR Bottom	%	18.5	31.1	69.5

CBR vs. DD



95% compaction = 95% MDD

In-situ CBR

THANK YOU