



# ***SOIL COMPACTION***

***AND ITS EFFECTS ON  
PROPERTIES***

# *TOPICS*

- ◆ *INTRODUCTION TO COMPACTION*
- ◆ *EFFECTS OF COMPACTION ON SOIL PROPERTIES*

# ***INTRODUCTION***

- ◆ *Compaction means pressing of the soil particles close to each other by mechanical methods.*
- ◆ *Air is expelled from soil mass and mass density is increased.*
- ◆ *It is done to improve the engineering properties*
- ◆ *Like shear strength, stability etc...*
- ◆ *Reduces compressibility and permeability.*

# *COMPACTION*



# ***EFFECTS OF COMPACTION***

◆ *Now we will discuss about effects of compaction on the properties of soil. The following properties are effected...*

*1) Soil structure*

*2) Permeability*

*3) Swelling*

*4) Pore Water Pressure*

# ***EFFECTS OF COMPACTION***

*5) Shrinkage*

*6) Compressibility*

*7) Stress-Strain Relationship*

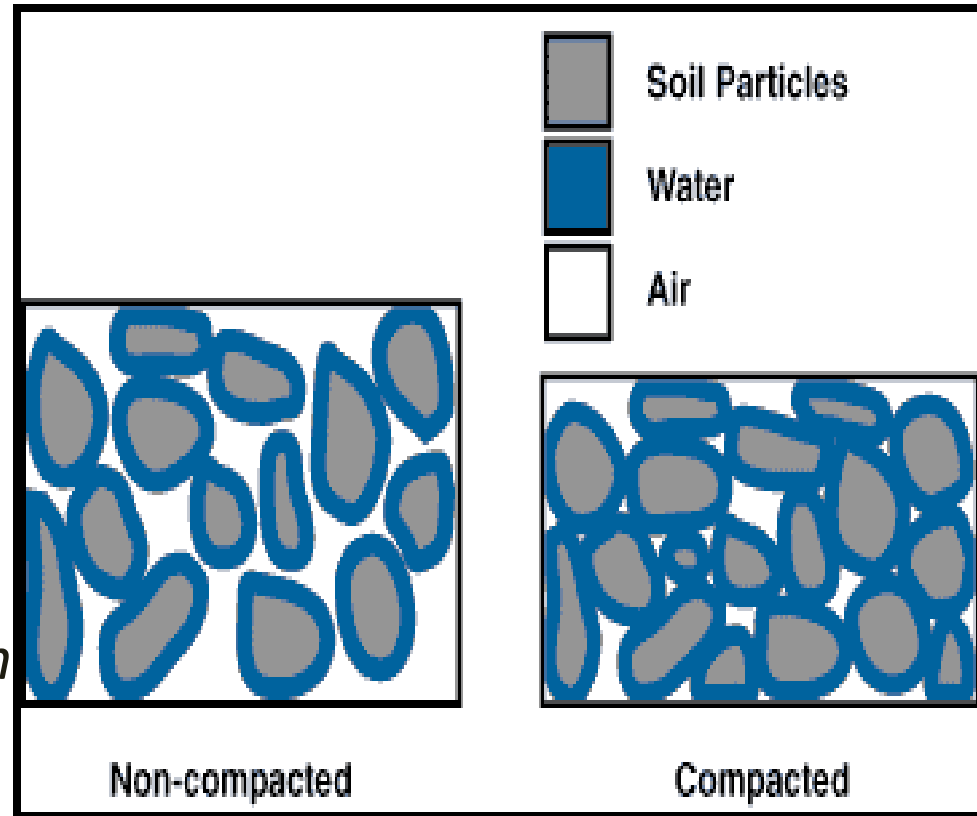
*8) Shear Strength*

*a) Shear strength at moulded water content*

*b) Shear strength after saturation*

# EFFECT ON SOIL STRUCTURE

- ◆ *The water content at which the soil is compacted plays an important role in soil structure.*
- ◆ *Soils compacted at water content less than optimum water content have flocculated structure.*
- ◆ *Soils compacted at water content more than optimum water content have dispersed structure.*



# EFFECT ON SOIL STRUCTURE

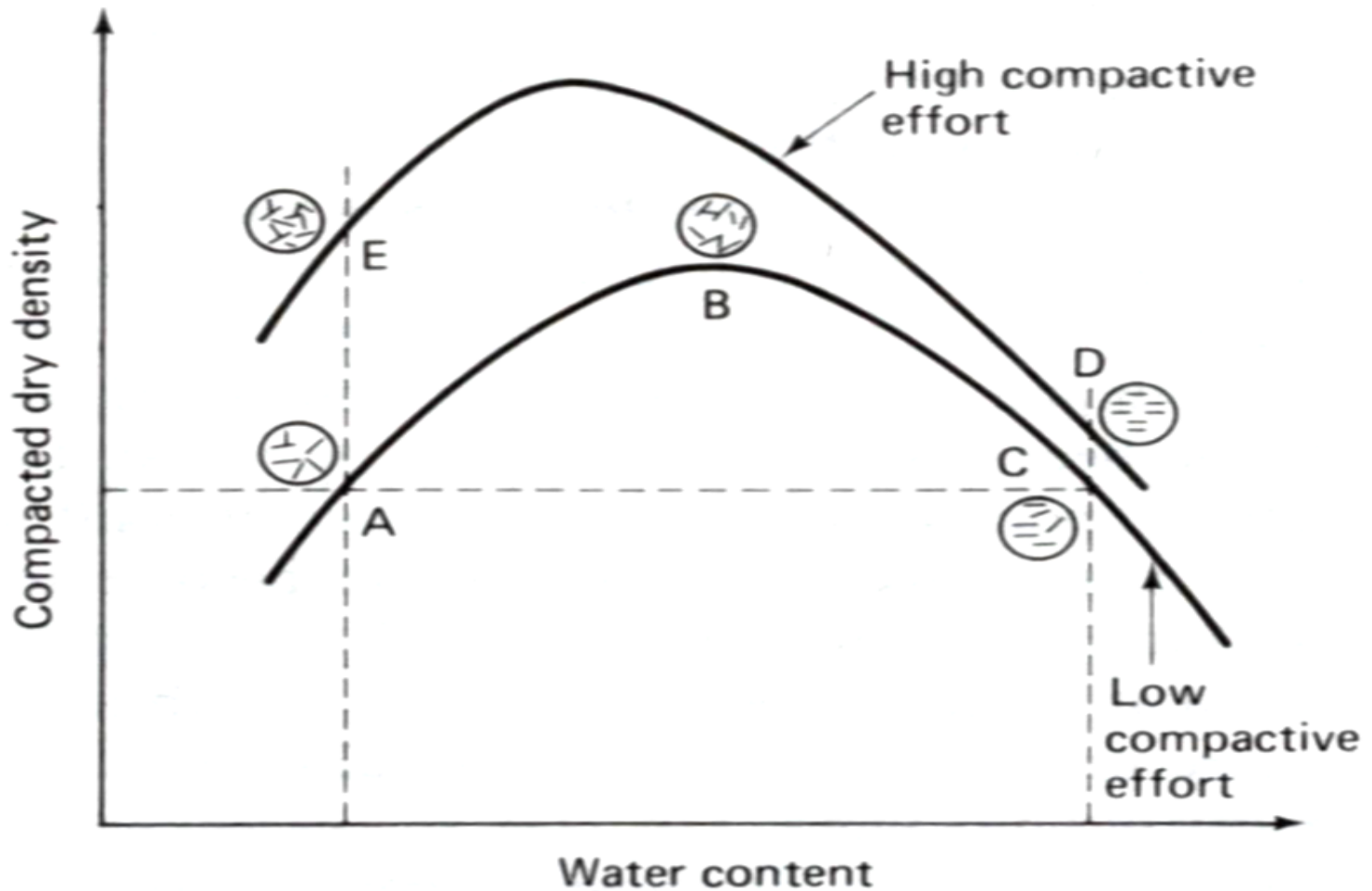


Fig. 5.5 Effect of compaction on soil structure (after Lambe, 1958a).



# ***EFFECT ON SOIL STRUCTURE***

- ❖ *At Point A, the water content is low and attractive forces are predominant, so results in flocculated structure.*
- ❖ *As the water content is increased beyond optimum, the repulsive forces increase and particles get oriented into a dispersed structure.*

# EFFECT ON PERMEABILITY

- ◆ *Permeability of soil depends on void size.*
- ◆ *As water content increases, there is an improved orientation of particles resulting in reduction of void size and permeability.*
- ◆ *Above optimum water content, the permeability slightly increases.*
- ◆ *If compactive effort is increased, the permeability decreases due to increased dry density.*



# ***EFFECT ON SWELLING***

- ◆ *The effect of compaction is to reduce void space.*
- ◆ *Hence swelling is enormously reduced.*
- ◆ *Further soil compacted dry of optimum exhibits greater swell than compacted on wet side because of random orientation and deficiency of water.*



# ***EFFECT ON PORE WATER PRESSURE***

- ◆ *It is defined as pressure of ground water held within a rock or soil, in gaps between particles (pores).*
- ◆ *The pore water pressure for soil compacted dry of optimum is therefore less than that for the same soil compacted wet of optimum.*

# ***EFFECT ON SHRINKAGE***

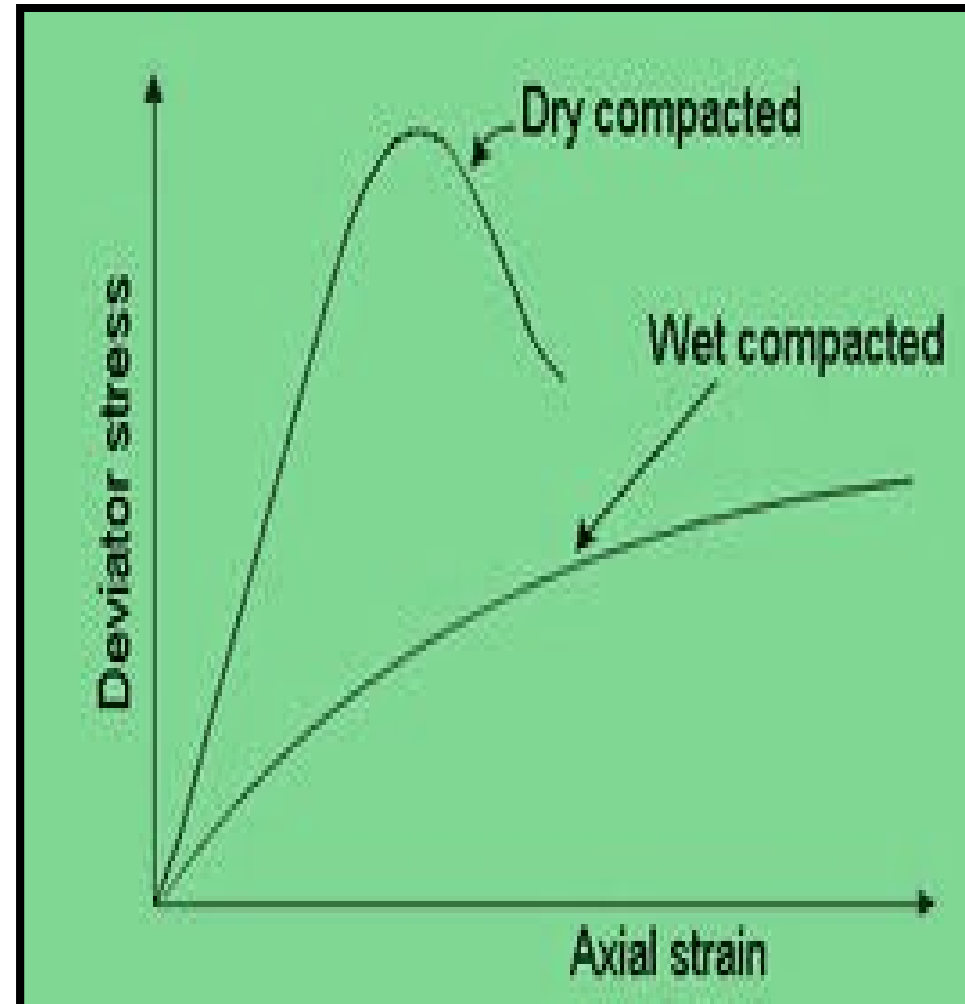
- ❖ *Soils compacted dry of optimum shrink less when compared to compacted wet of optimum.*
- ❖ *The soils compacted wet of optimum shrink more because the soil particles in dispersed structure can pack more efficiently.*

# ***EFFECT ON COMPRESSIBILITY***

- ❖ *The flocculated structure on the dry side of optimum offers greater resistance to compression than the dispersed structure on wet side.*
- ❖ *So, the soils compacted dry of optimum are less compressible.*

# EFFECT ON STRAIN-STRESS RELATIONSHIP

- ◆ *The soil compacted dry of optimum have steeper stress-strain curve than those on wet side.*
- ◆ *The strength and modulus of elasticity of soil on dry side of optimum will be high.*
- ◆ *Soil compacted dry of optimum shows brittle failure.*
- ◆ *And soils compacted on wet side experience increased strain*



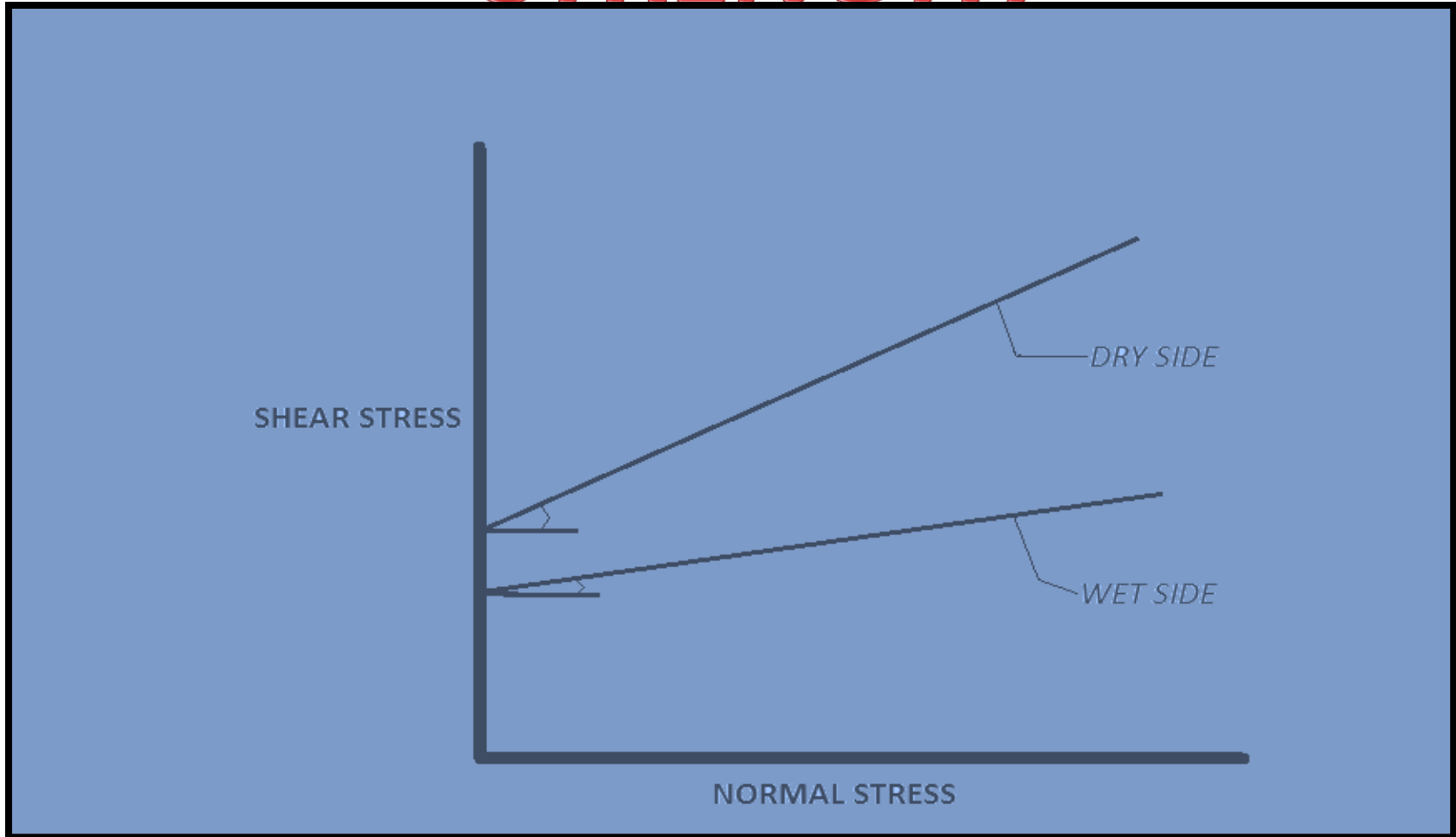
# ***EFFECT ON SHEAR STRENGTH***

- ❖ *In general, the soils compacted dry of optimum have a higher shear strength than wet of optimum at lower strains.*
- ❖ *However at large strains the flocculated structure of soil is broken and ultimate strength will be equal for both dry and wet sides.*



# EFFECT ON SHEAR STRENGTH

## STRENGTH



# ***SUMMARY***

	<i><b>DRY SIDE</b></i>	<i><b>WET SIDE</b></i>
<i>STRUCTURE</i>	<i>MORE RANDOM</i>	<i>MORE ORIENTED</i>
<i>PERMEABILITY</i>	<i>MORE PERMEABLE</i>	<i>LESS PERMEABLE</i>
<i>COMPRESSIBILITY</i>	<i>MORE COMPRESSIBLE IN HIGH PRESSURE RANGE</i>	<i>MORE COMPRESSIBLE IN LOW PRESSURE RANGE</i>
<i>SWELLING</i>	<i>SWELL MORE</i>	<i>SHRINK MORE</i>
<i>STRENGTH</i>	<i>HIGHER</i>	<i>LESSER</i>