

SOIL MECHANICS

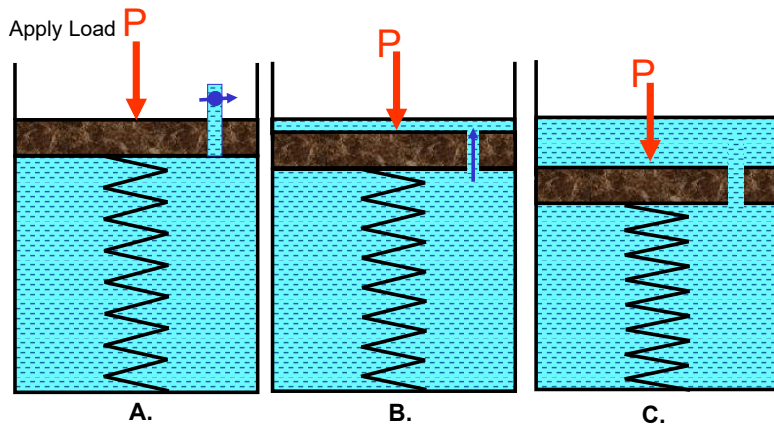
VOLUME 2

EFFECTIVE STRESS

PERMEABILITY AND SEEPAGE

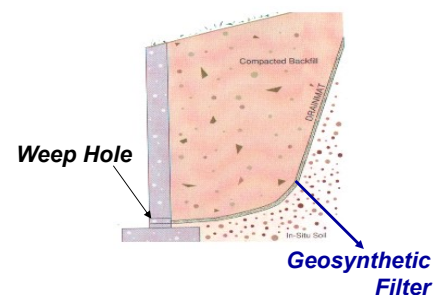
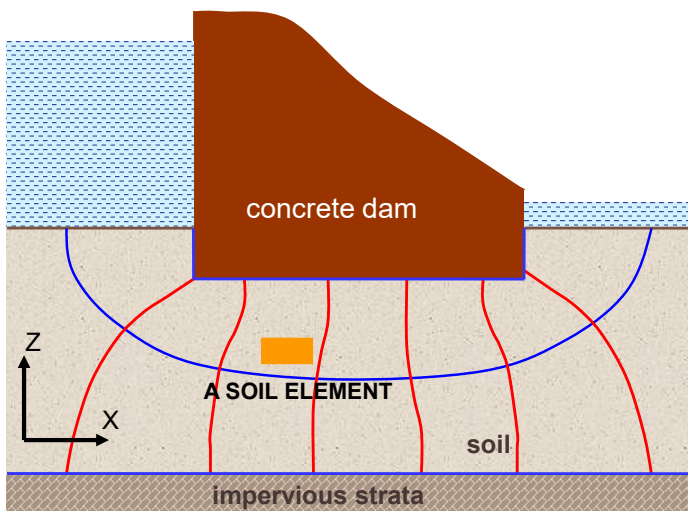
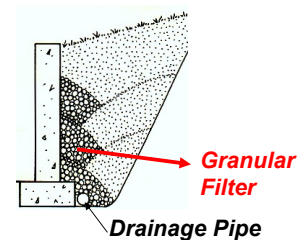
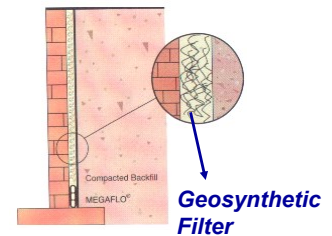
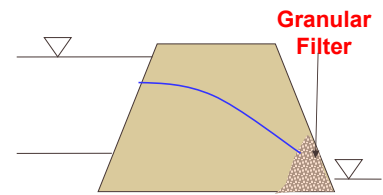
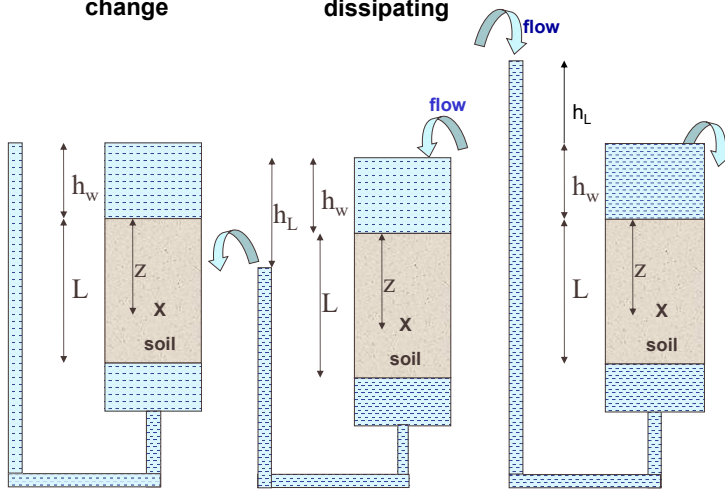
FLOW NET - ISOTROPIC

FLOW NET - ANISOTROPIC



$$\tau_f = c' + \sigma' \tan \phi'$$

$$\sigma = \sigma' + u$$



SOIL MECHANICS VOL.2

Effective Stress

Permeability and Seepage

Flow Net – Isotropic

Flow Net – Anisotropic

| | |
|--|---------------|
| Effective Stress Concept | SM03-1 |
| 1. Effective Stress Concept..... | SM03-1 |
| • Consider two pieces of rock in contact | |
| • Forces in the soil structure | |
| • Effective stress | |
| • Effective unit weight | |
| • Changes in effective stress and pore water pressure | |
| • Important notes | |
| 2. Calculation of Effective Stress (static water level)..... | SM03-11 |
| 3. Effective Stress when there is Seepage | SM03-16 |
| 4. Effective Stress Calculation Example with Artesian Pressure..... | SM03-22 |
| | |
| Permeability and Seepage | SM04-1 |
| 1. Permeability Definition | SM04-2 |
| 2. Bernoulli's Principle | SM04-3 |
| • Groundwater flow | |
| • Bernoulli's equation | |
| • Flow energy | |
| • Head, Total head, pressure head, and elevation head | |
| 3. Head Calculation | SM04-7 |
| 4. Darcy's Law | SM04-10 |
| • Flow volume | |
| • Hydraulic gradient | |
| • Vertical flow, Horizontal flow | |
| 5. Permeability | SM04-13 |
| • Typical permeability values for each type of soils | |
| • D_{10} vs permeability | |
| • Estimation of permeability for coarse sand: Hazen, Chapuis and Bayer equations | |
| • Estimation of permeability for fine grained soil | |
| 6. Permeability Measurement | SM04-18 |
| • Constant head permeameter | |
| • Variable head permeameter | |
| 7. Effective Stresses due to Flow | SM04-21 |

- Static, downward flow, upward flow
 - Quick condition in granular soil
8. Seepage..... SM04-26
- Seepage through earth dam
 - Flow line, equipotential line, flow net
 - Seepage quantity
 - Piping
 - Filters
9. References SM04-35

Flow Nets for Isotropic Soil SM05-1

1. Steady State Seepage – Flow Equation..... SM05-2
2. Steady State Seepage – Flow through Dam..... SM05-4
3. Flow Nets SM05-5
 - Properties of equipotential lines
 - Properties of flow lines
 - Flow lines perpendicular to equipotential lines
 - Geometric properties of flow nets
 - Drawing flow nets
4. Common Boundary Conditions..... SM05-11
5. Calculation Example..... SM05-13
 - Calculation of equipotential
 - Calculation of flows
 - Calculation of pore pressures

Flow Nets for Anisotropic Soil SM06-1

1. Average Permeability in Layered Soils..... SM06-2
2. Horizontal Flow in a Layered Soil Deposit SM06-2
3. Vertical Flow in a layered Soil Deposit..... SM06-3
4. The Average Permeability in Layered Soils..... SM06-4
5. Flow Nets for Anisotropic Soils SM06-6