

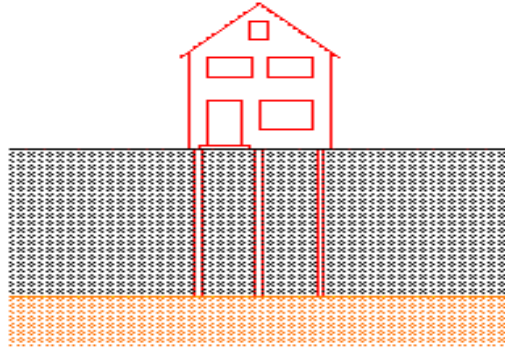
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Soil Mechanics

Introduction:

Soil problems in civil engineering

Soil $\begin{matrix} \rightarrow \\ \rightarrow \end{matrix}$ to support loads from the foundation of buildings in embankments.
As a construction materials : Fill materials: dams , highways.



Criteria of Foundation Design:-

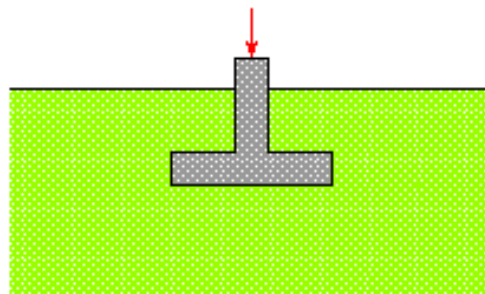
- bearing Capacity (B.C)
- Settlement
- Overall Stability

B.C:- actual foundation Pressure or contact pressure = $\frac{\text{Load}}{\text{footing Area}} > \text{B.C} \leftrightarrow \text{B.C}$

failure

Hence, Actual foundation Pressure \geq B.C

F.S against B.C failure = $\frac{\text{Unit B.C}}{\text{Contact pressure}} (< 2-3)$



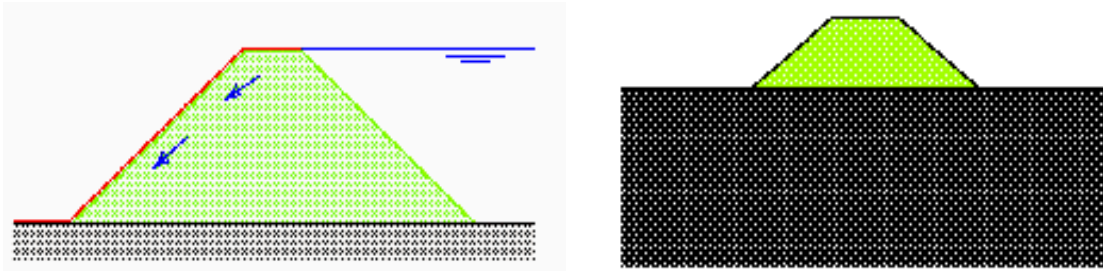
Settlement: computed settlement or actual settlement < Acceptable values that depend on:

- Structure
- Soil

- Foundation

Soil as a construction material

1 Earth Dams

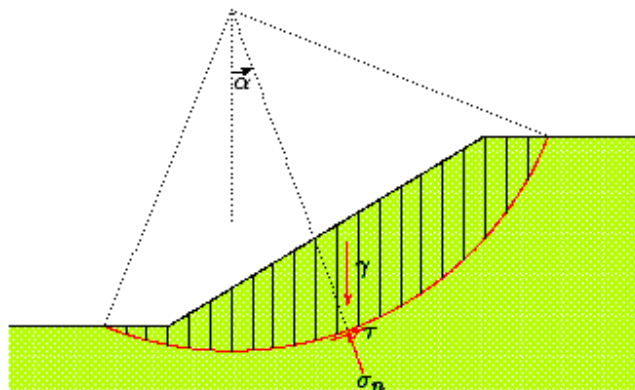


2 Highways

3 Slopes and Excavations

T driving force

if $T > \text{resisting force} \leftrightarrow \text{slope failure}$



4 Excavations

For deep Excavation:

Lateral pressure \leftrightarrow Side failure

Hence bracing is to be used



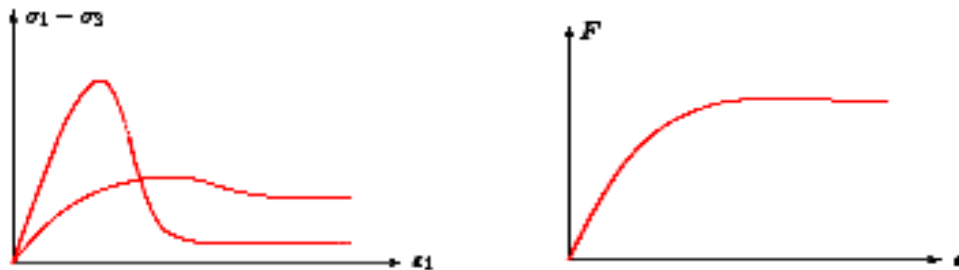
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**The solution of soil engineering problems:**

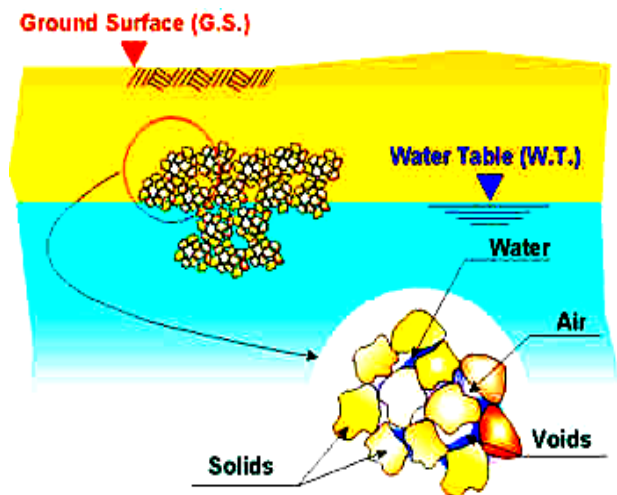
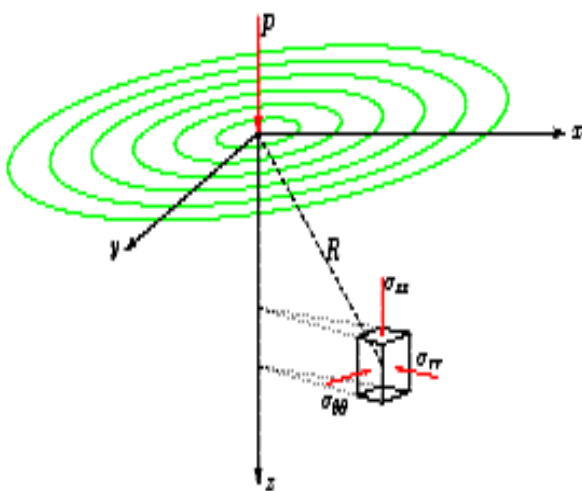
- 1 Soil Mech.: stress-strain properties analysis of soil mass
  - 2 Geology Experience
  - 3 Economic
  - 4 Experience
- } + Eng. Judgment → Solution to soil Eng. problems

**Soil problems are statically indeterminate, since:**

1-Stress-strain relationship of soils is not linear.



2-Soil behavior depends on pressure, time and environments (بيئة)



3-Soils are not homogeneous (غير متجانس)

4-Soil mass can not be seen entirely and its properties evaluated on the basis of small samples.

5-Most soils are very sensitive (حساس) to disturbance (تشوش) and the behavior measured by a laboratory test may be unlike that of the in situ soil.

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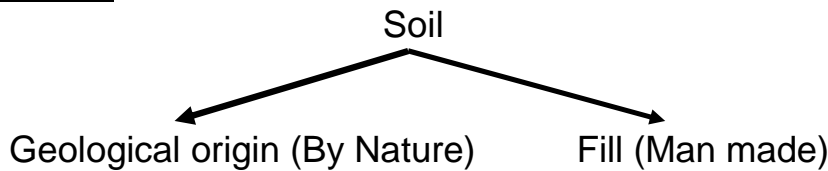
**Definitions:**

**Soil mechanic:** is application of laws of mechanics and hydraulics to engineering problems relating to soils.

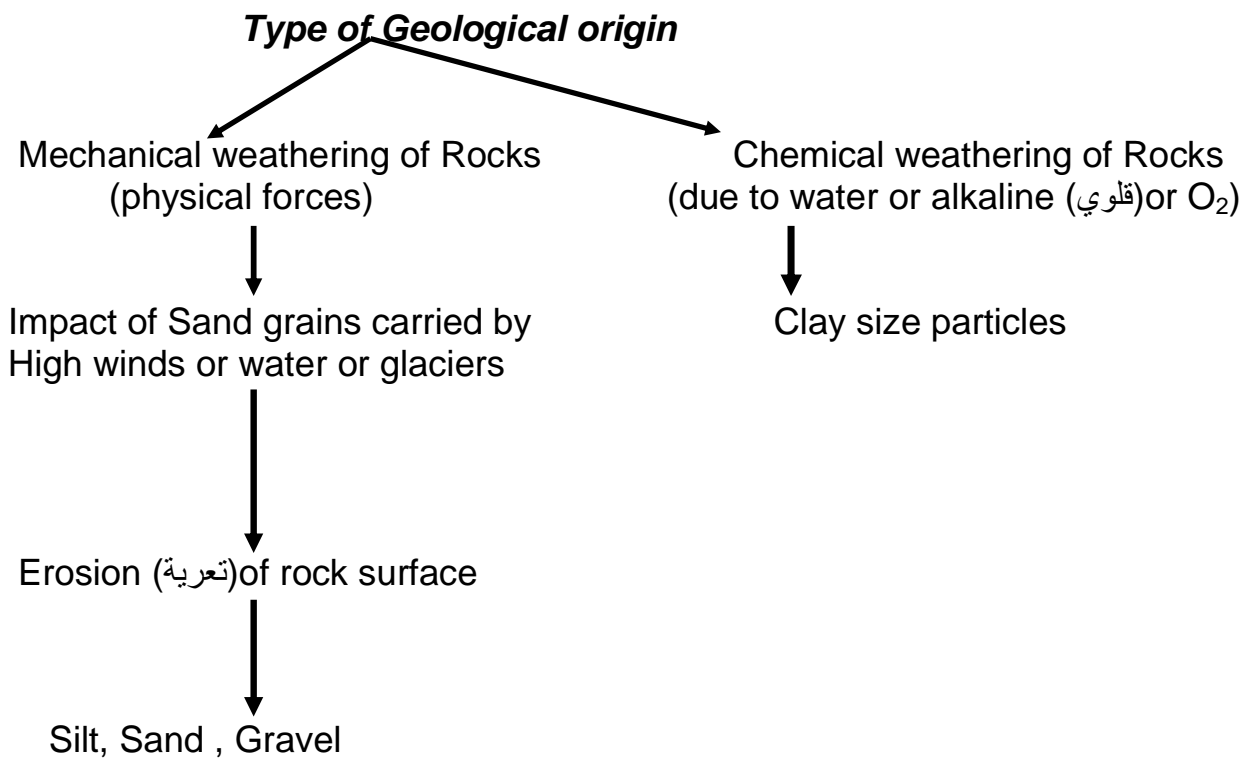
**Geotechnology :** is overall study of geology ,soil mechanics and rock mechanics

**Geotechnical Engineering:** is the application of civil engineering technology to some aspects of the earth.

**Soil Formation:**



**Geological origin :** weathering process → Disintegration(تحلل) of Rock → Soil formation



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### **Definitions**

**Residual Soils**(التربة المتبقية): is the products of weathering remain at their original location.

**Transported Soils**(التربة المنقولة): is the products of weathering transported by water (alluvium soils ترسبات نهريّة), wind (Aeolian soils غبار ناعم جدا), glaciers (glacial soils ترسبات جليدية) or gravity.

**Marine Soils**(التربة البحرية) ; Soils formed by deposition in the sea.