Soil Engineering

Soil engineering means the application of the principles of soil mechanics in the investigation, evaluation and design of civil works involving the use of earth (Soil) materials and the inspection and testing of the construction thereof.

The term 'soil' in soil engineering is defined as an unconsolidated material composed of solid particles, produced by the disintegration of rocks

Geotechnical engineering, also known as geo technics, is the branch of civil engineering concerned with the engineering behavior of earth materials. It uses the principles of soil mechanics and rock mechanics for the solution of its respective engineering problems.

The soil is defined differently by soil scientists, and its definition has changed over time. The soil has changed since the early 1800s by selecting and listing 81 definitions given in a wide range of soil science books, handbooks, glossaries, and dictionaries.

soil engineering and engineering geology reports shall be required as specified. **Soil engineering**: soil mechanics, foundation design and tunnel engineering.

What Is a Soil Engineer?

The job of a soil engineer is to analyze the soil structure of a proposed building or construction site and to understand problems of existing structures due to conditions of the ground underneath them. To learn more about the field of soil engineering, as well as the education and licensing required, read on. A soil engineer, also known as a soils engineer or a geotechnical engineer, is a civil engineer who specializes in evaluating the characteristics of the ground upon which a structure is built. A soil engineer investigates and analyzes a site for such qualities as soil characteristics, composition, and drainage. Soil engineers also consider the weight-bearing capacity of the ground under a building's foundation. They evaluate the likelihood that the building will settle or shift over time.

Soil

-Soil is the mixture of mineral, organic matter, gases, liquid and countless organisms that together support life on earth.

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-Soil is considered to be ‘’the skin of earth’’

-It includes widely different materials like sand gravels, clays and silt.

The type of soil depends upon the size of particle i.e. sandy soil, loamy soil etc and on the color of soil i.e yellow soil black soil ect.

Among properties of soils highly important in engineering are:

1- **Permeability. 2-Strength. 3-Compaction characteristics. 4-Drainage.**

5-Shrink-swell potential. 6-Grain size. 7-Plasticity, and reaction.

8-Depth to the water table. 9-Depth to bedrock. 10-Soil slopes.

Soil engineering properties, considered broadly, are physical, chemical, and biological characteristics that are observable, measurable, and influence behavior to the extent that they are important in engineering analyses and design, and in performance of components, systems, or processes

History of using soil Engineering:

1. The use of soil as an engineering material may be said to be as old as mankind itself. Since that time, man has been confronting many types of problems while dealing with soils.
2. Excellent pavements – Egypt and India much before the Christian Era.
3. Some earth dams have been used for storage of water in India for more than 2000 years.
4. The hanging gardens at Babylon (Iraq) were also built during the period.
5. The leaning tower of Pisa was also built around same time. The tower has leaned on one side because of the differential settlement of its base.
6. In the 17^{th} century, Leonardo da Vinci constructed a number of structures in France, and the London Bridge in England.

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7. In 1773, a French engineer Coulomb gave the theory of earth pressure on retaining walls. Coulomb also introduced the concept that the shearing resistance of soil consists of two components – cohesion and friction.
8. Darcy in 1856 gave the law of permeability. This law is used for the computation of seepage through soils.
9. In the same year, Stokes gave the law for the velocity of fall of solid particles through fluids. This law is used for determining the particle size.
10. O-Mohr in 1871 gave the rupture theory for soils. He gave a graphical method of representation of stresses. Popularly known as Mohr's circle, it is extremely useful for determining stresses on inclined planes.
11. Boussinesq in 1885 gave the theory of stress distribution in a semi-infinite homogeneous, isotropic, elastic medium due to an externally applied load. The theory is used for determining stresses in soils due to loads.

Scope of Soil Engineering

The scope of soil engineering in the construction field is very vast because all the civil engineering structures are lies on or below the surface of the soil.

Here is a list of the scope of soil engineering in the field of the construction industry-

1- Foundations

Soil engineering helps us to determine the strength of soil and also helps us to decide which type of foundations are required to sustain the structure. The goal is to ensure that the foundation can support the structural loads while considering soil conditions and potential settlement.

2- Retaining Structures

Soil engineering helps us to determine which type of retaining structure (such as walls, dams, barriers, or bins) is suitable for the hold Earth materials or water

3- Slopes Stability

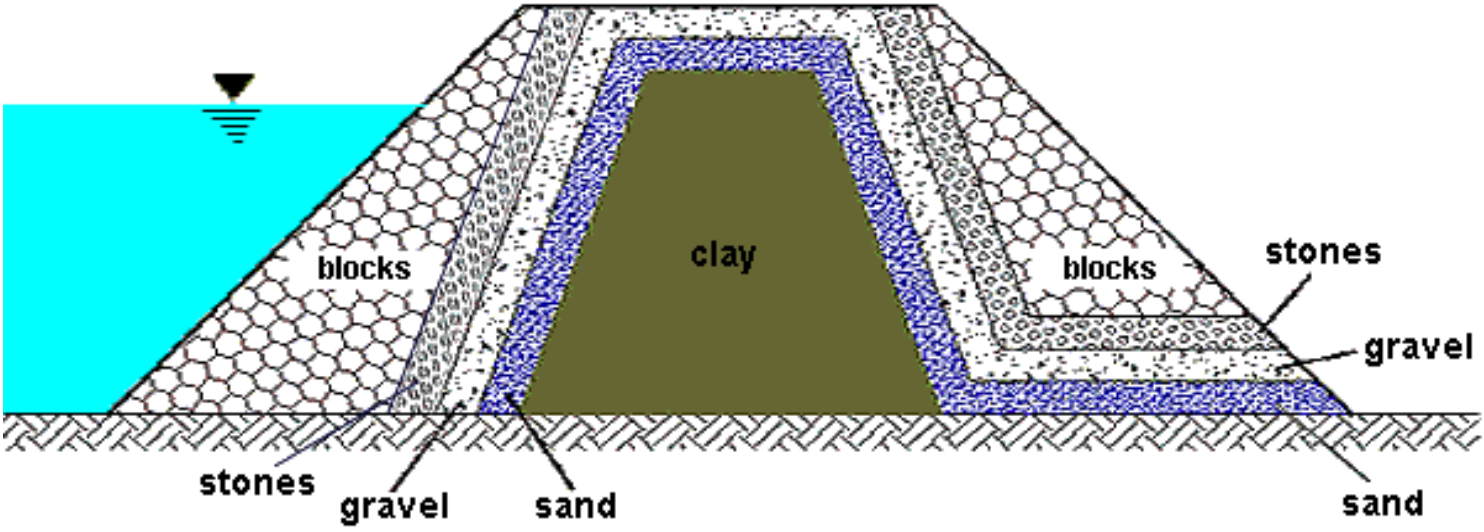
Soil engineering provides us with various methods for checking the stability of slopes and gives the idea to stop slope failure. Soil engineers evaluate factors like soil type, slope angle, and groundwater conditions to determine the stability of slopes. Soil engineers evaluate factors like soil type, slope angle, and groundwater conditions to determine the stability of slopes.

4- Underground Structures

Soil engineering helps us to determine the strength of forces exerted by the soil on underground structures.

5- Earth Dam

deep knowledge of the properties of the soils is required while constructing the earth dam. An earth dam is a type of dam constructed primarily with natural materials such as soil, sand, clay, or rock. It is designed to impound water and create a reservoir or pond behind the dam. Earth dams are widely used for water storage, flood control, irrigation, hydropower generation, and other water-related purposes.



6- Pavement Design

Behavior of the soil under different loading conditions is studied in soil engineering. Pavement design is a crucial aspect of civil engineering that involves the planning, analysis, and construction of road and pavement systems to ensure durability, safety, and cost-effectiveness.