

SOIL AND ITS ORIGIN



Soil

- The unconsolidated mineral or organic material on the immediate surface of the Earth that serves as a natural medium for the growth of land plants.
- Soil is the accumulation of unconsolidated sediments and deposits of solid particles as a result from the disintegration of rocks.
- Rocks is a natural aggregate of minerals that are connected by strong bonding of attractive forces considered as consolidated materials

SOIL TYPES

- The major categories of soils are GRAVEL, SAND, SILT, and CLAY. Gravel and sand are universally considered as coarse grained soil because of their individual particles that are large enough to distinguish without magnification. On the other hand, silt and clays are considered as fine grained soil because of their tiny particles.

Soil Types :

Sandy Soil

- This soil type has the biggest particles; and the bigger size of the particles in a soil the better is aeration and drainage of the soil. This soil is granular and consists of rock and mineral particles that are very small.
- To check if soil is sandy, moisten a small sample of soil and try to make a ball using your palms. If the soil is sandy, then no dirt balls will form and the soil will crumble and fall through the fingers.

Silty Soil

- Silty soil is considered to be one of the most fertile of soils. It can occur in nature as soil or as suspended sediment in water column of a water body on the surface of the earth. It is composed of minerals like quartz and fine organic particles.
- To check if the soil you have is silty, take a small amount of moist soil and rub it between your fingers. If the soil is silty soil, it will feel slick and stick to your fingers.

Clay Soil

- Clay is a kind of material that occurs naturally and consists of very fine grain material with very less air spaces. Due to this it is difficult to work with this soil, because the drainage in this soil is low.
- To identify if the soil is clay soil, take a soil sample and damp it with water. Feel it between your palms. You will find clay soil is sticky and retains a good amount of water.

Loamy Soil

- This soil consists of sand, silt and clay to some extent. It is considered to be the perfect soil for gardening. The texture is gritty and retains water very easily, yet the drainage is good.

Peaty Soil

- This kind of soil is basically formed by the accumulation of dead and decayed organic matter, it naturally contains much more organic matter than most of the soils. It is generally found in marshy areas. The decomposition of the organic matter in this soil is blocked by the acidity of the soil. This kind of soil is formed in wet climate.

Chalky Soil

- Unlike peaty soil, chalky soil is very alkaline in nature and consists of a large number of stones. The fertility of this kind of soil depends on the depth of the soil that is on the bed of chalk.

CHARACTERISTICS OF SOIL

- Soil consists largely of mineral matter formed by the disintegration or decomposition of rocks. This disintegration into soil may be caused by the action of water, ice, frost, or temperature changes, or by plant or animal life. Almost all soils contain water in varying amounts and in free or absorbed form. Soils in most cases are blends or mixture of particles of many sizes, and parent rock materials making it very difficult to predict its behavior.

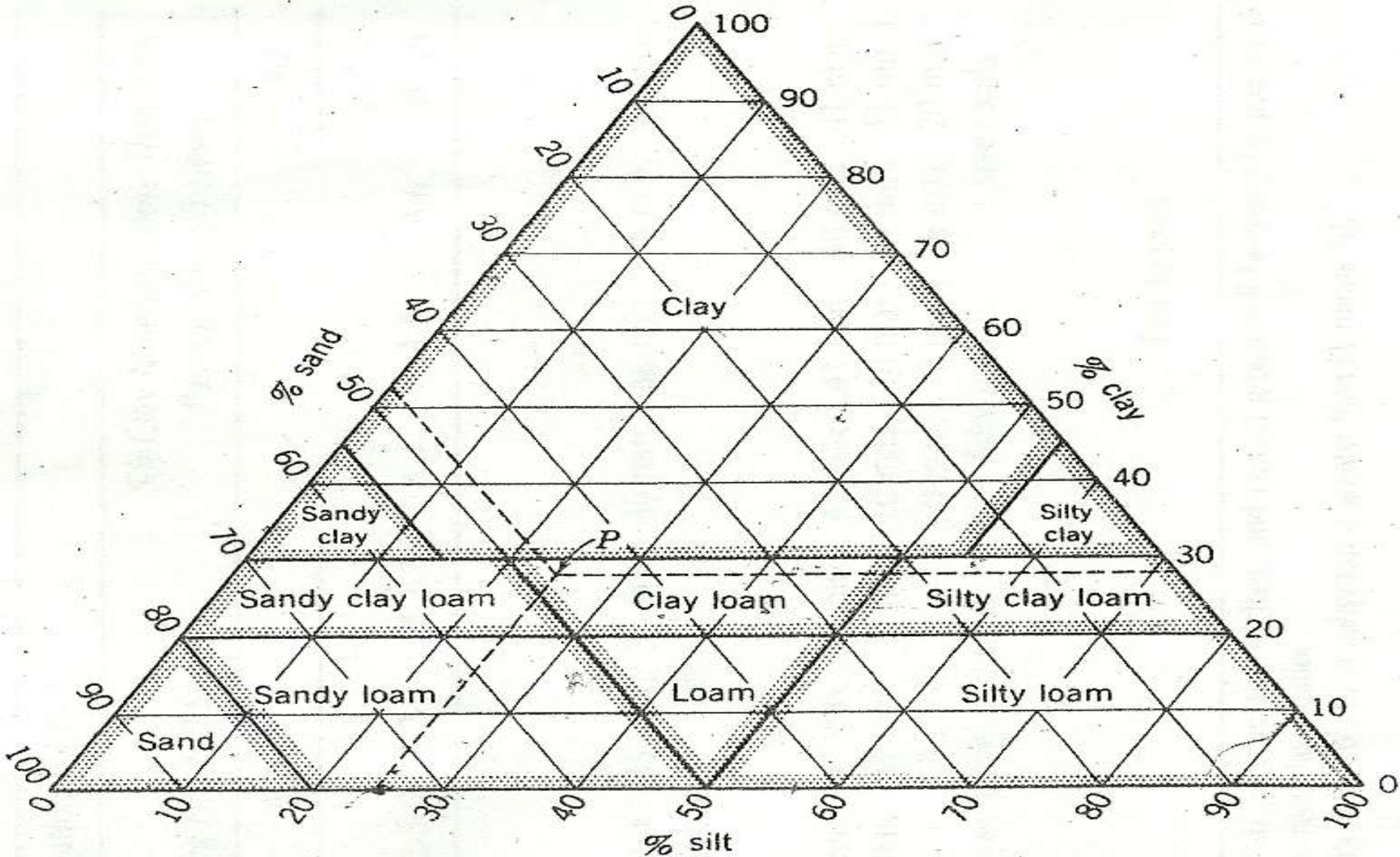
TABLE 1.1

		U.S.A Standard	Series
Class	Particle Diameter(mm)	Passing	Retained
Gravel	75-2.0	3 in.	No. 10
Course Sand	2.0-0.425	No. 10	No. 40
Fine Sand	0.425-0.075	No. 40	No. 200
Silt	0.075-0.002	No. 200	-
Clay	0.002-0.001	-	-
Colloidal clay	Smaller than 0.001	-	-

- Table 1.1 classifies the grains of which a soil is composed in terms of size by the American Association of State Highway and Transportation Officials (AASHTO)

SOIL CLASSIFICATION

- **The Textural Classification of Soil** is based purely on the grain size distribution and is classified into three groups, namely **sand, silt and clay**.
- The position of every point inside the triangle represents the sieve analysis of soil of particular grading. After determining the grain size of a sample, the chart is read as follows:
 - Spaces vertically upward starting from zero at the bottom represent clay percentage.
 - Spaces from left to right diagonally downward starting with zero at the left, represent silts.
 - Spaces from right to left diagonally downward starting with zero at the right, represent sand.



Grade

Size of Particles (mm)

Coarse sand

2.0–0.25

Fine sand

0.25–0.05

Silt

0.05–0.005

Clay

Smaller than 0.005

- **The Unified Soil Classification System** is a soil classification system used in engineering and geology disciplines to describe the texture and grain size of a soil. It was introduced by the U.S. Army Corps and the Bureau of Reclamation using letters instead of number to designate the different groups. The mechanical analysis, liquid and plastic limit tests are the primary classification tools. The classification system can be applied to most unconsolidated materials, and is represented by a two-letter symbol. Each letter is described below (with the exception of Pt). The principal symbols and soil designations are(**Table .2**)

The **USCS** recommended several ways for quick field identification of the fine grained portions of the soil, namely:

- A sample is mixed with sufficient water to have putty like consistency, then formed into pat and dried completely.
- If the pat is broken by the finger and the dry strength is high, the plasticity of the sample is considered high.
- If the dry strength of sample is high, then, it exhibits clay and colloidal characteristics.
- If the sample is a pat of fine silty sand, it will easily break in the finger
- Fine sand will cause the pat to feel gritty on the fingers and silts will be smooth.
- Dilatancy or reaction to shaking is another way of classifying is another way of classifying the soil mortar. About one cubic inch of soil is mixed with water and formed into a pat of soft but not sticky consistency. If the material is of fine sand, shaking and jolting the sample on the palm of the hand will bring water to surface of the sample. Squeezing it between fingers causes the moisture to disappear. Silts react less completely and clay does not.