

2.1 Soil water:

Water present in the voids of soil mass is called soil water .It can be classified in several ways given below:

(a) Broad classification

1. Free water or gravitational water
2. Held water

- (i) Structural water
- (ii) Adsorbed water
- (iii) Capillary water

(b) Classification on phenomenological basis

- (i) Groundwater
- (ii) Capillary water
- (iii) Adsorbed water
- (iv) In filtered water

(c) Classification on structural aspect

- i) Pore water
- ii) Solvate water
- iii) Adsorbed water
- iv) Structural water

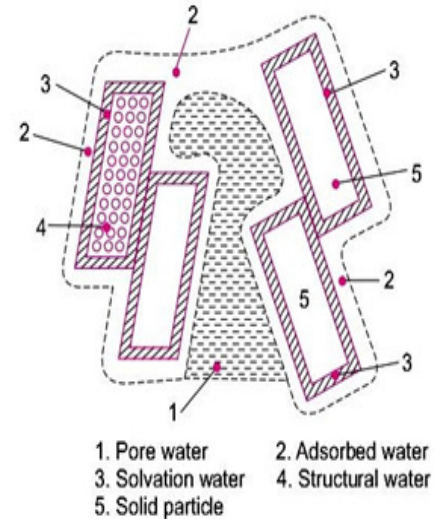
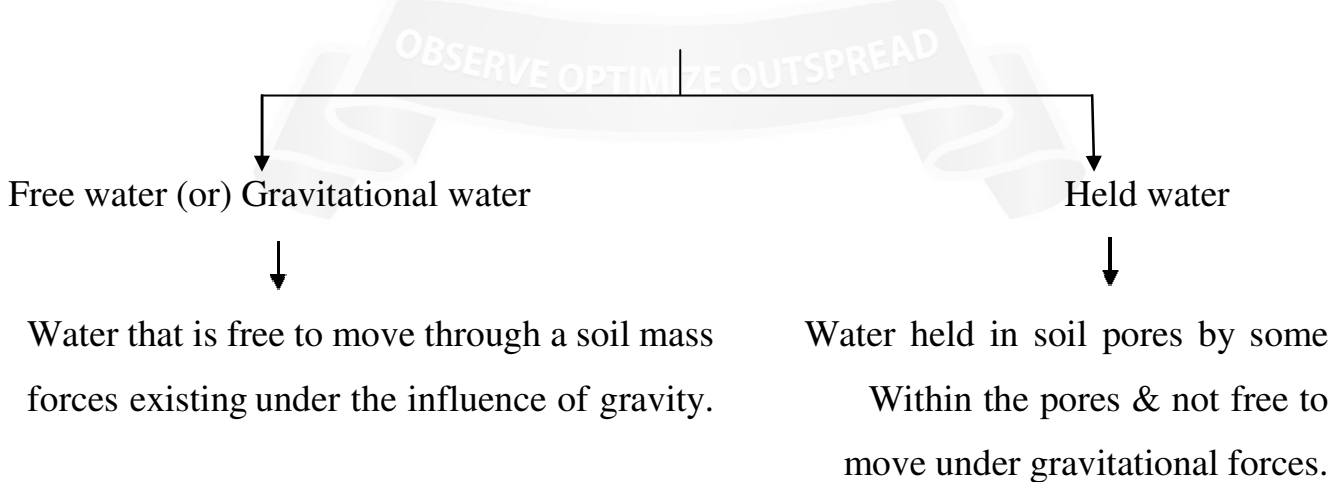


Fig 2.1 Structure of water

Soil Water



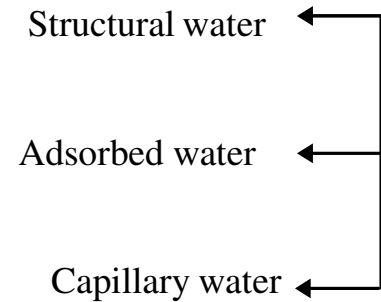


Fig 2.2 Structure of soil water

1) Structural water

Water chemically combined in the crystal structure of soil mineral and can be removed only by breaking structure.

2) ADSORBED WATER (OR) HYGROSCOPIC WATER:

It is the part where the soil particles freely absorbed from atmosphere by the physical forces of attraction and is held by the forces of adhesion.

The soil particles having negative charge, due to this charge they attract water. The attractive forces between soil and water forms soil water forces.

If an oven-dried soil sample is placed in moist air the sample absorb moisture, till its water content reaches some constant value.

The quantity of adsorbed water for a given soil varies with the temperature and the relative humidity of air, and the characteristics of soil particles.

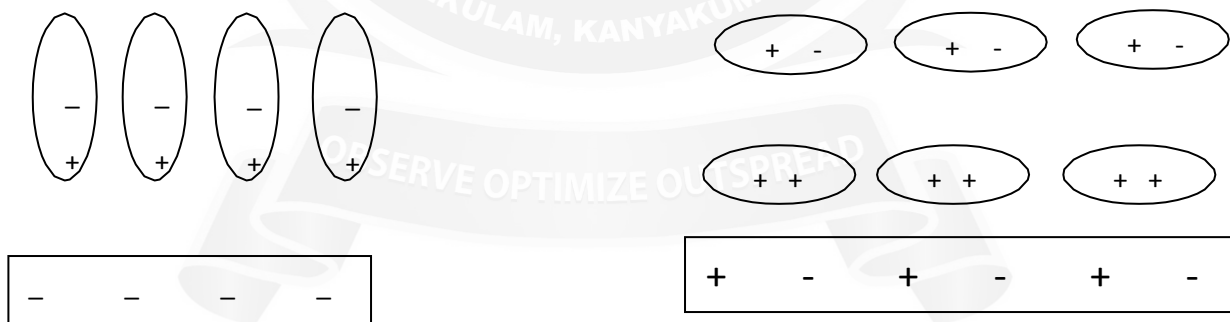


Fig 2.3 Adsorbed Water (After Lambe)

3) CAPILLARY WATER:

It is held in the interspace of soil due to capillary forces. Capillary action (or) Capillarity is the phenomenon of movement of water in the interstices of a soil due to capillary forces. The minute pores of soil serve as capillary tubes through which the moisture rises above the ground water table.

The capillary force depends on surface tension of water, pressure in water and size of pores.

4) In filtered water:

It is that portion of surface precipitation which soaks into ground, moving downwards through air-containing zones. It is subject to capillary forces.

5) Pore water:

From the point of view of inter-particle forces, soil water can also be divided into two heads: the adsorbed water which is attracted by forces within the soil strong enough to influence its behaviour, and pore water which is essentially free of strong soil attractive forces (Lambe, 1953). The capillary water and the gravitational water may be considered as the two types of pore water. It exhibits the physical and chemical properties of ordinary liquid water. It is capable of moving under Hydro dynamic forces unless restricted in its free movement, such as when entrapped between air bubbles or by retention due to capillary forces that in fine pores may overcome the hydrodynamic forces.

6) Solvate water: It is that water which forms a hydration shell (presumably not more than 200 molecules thick) around soil grains. It is subject to polar, electrostatic and ionic binding forces. It remains mobile under hydro dynamic forces, though its density and viscosity are greater than those of ordinary water.

7) Structural water: It is the water chemically combined in the crystal structure of the soil mineral. It refers to hydroxyl groups that constitute parts of crystal lattice. Under loading encountered in soil engineering, the structural water cannot be separated or removed and is, therefore, unimportant. It can also not removed by oven drying at 105°C-110°C. However, it can only be driven off at such high temperatures as would cause the destruction of the crystal structure. We will therefore, consider the structural water as part and parcel of the soil particle