INFILTRATION

DEFINITION:

The downward movement of water from the land surface into the soil medium is called infiltration. When water is applied at the surface of the soil , four moisture zones are created....

1. At the top, a thin layer of saturated zone is created.
2. Beneath zone one, there is a transition zone.
3. The next lower zone is the transmission zone where the downward motion of the moisture takes place. The moisture content in this zone is above field capacity but below saturation.
4. The last zone is the wetting zone. The soil moisture in this zone will be at or near field capacity and the moisture content decreases with the depth. The boundary of the wetting zone is the wetting front where a sharp discontinuity exists between the newly wet soil and the original moisture content of the soil. Depending upon the amount of infiltration and physical properties of the soil , the wetting front can extend from a few cm to metres.

FIELD CAPACITY:

The total volume of water that the ground can hold is the field capacity.

INFILTRATION CAPACITY:

The infiltration capacity of a soil under given conditions is defined as the maximum rate at which it is capable of absorbing water and is denoted by f. The actual infiltration observed in a given soil, fa, will be equal to or less than its infiltration capacity f depending on the rate of rainfall. The information regarding the infiltration rates is required in the estimation of surface runoff and ground water recharge.

FACTORS AFFECTING INFILTRATION CAPACITY

The infiltration capacity is not a constant but varies depending on the following factors..

1. **Characteristics of soil**

a) Soil texture: The type of soil viz sand, silt and clay have different infiltration capacity based on texture. Sandy soil has greater than clay and silt.

b) Porosity: **Porosity** is a measure of how much of a rock is open space. This space can be between grains or within cracks or cavities of the rock.

c) Permeability: **Permeability** is a measure of the ease with which a fluid (water in this case) can move through a porous rock.

d) Soil moisture: A dry soil can absorb more water than one whose pores are already full.

2.Vegetation: The presence of dense vegetation on the surface increases infiltration capacity by the following ways...

A. The vegetative cover retards the movement of overland flow and causes high depth of detention.

B. It reduces the effect of rain drop compaction.

C. It also provides a layer of decaying organic matter which promotes the activity of burrowing insects and animals.

D. Transpiration by vegetation tends to keep the soil moisture at low levels.

3. Compaction: The clay surfaced soils are compacted even by the impact of rain drops which reduce f. Compaction not only reduces the porosity but also the pore sizes. Overgrazing pastures, playgrounds and areas subjected to heavy vehicular traffic will have less infiltration capacities.

4. Surface cover conditions: Except vegetation surface covered with snow , and paved urban areas will obviously have very low or zero infiltration capacity.

5. Temperature: The effect of temperature is explained through viscosity. The flow through soil pores is by and large laminar for which the resistance is directly proportional to viscosity. At high temperature since viscosity of water is low , high infiltration capacities are expected

6. Fluid characteristics: Water infiltrating into the soil will have many impurities, both in solution and in suspension. The turbidity of the water , especially the clay and colloid content , is an important factor and such suspended particles block the fine pores in the soil and reduce infiltration capacities.

7. Presence of entrapped air in soil: It increases the resistance to flow and therefore reduces infiltration.

MEASUREMENT OF INFILTRATION

Infiltration rates are required in many hydrologic problems such as runoff estimation, soil moisture budgeting and in irrigation. There are several methods of infiltration measurement. These are….

1.Using Flooding –type Infiltrometers

A. Tube-Infiltrometer B. Double ring Infiltrometer

2. Measurement of subsidence of free water in a large basin or pond.

3. Rainfall simulator

4. Hydrograph Analysis.

5. Using Infiltration Equation

A. Horton's equation B. Philips equation

C. Kostiakov equation D. Green-Ampt equation