**SOIL PERMEABILITY AND HOW TO MEASURE IT**

The permeability of a soil is the ability of water to move through it (permeate it). It depends on the physical and chemical properties of the soil, notably particle size distribution (the range of particle sizes present), pore space, pore size and the continuity of the spaces.

The formal name is **hydraulic conductivity**, which refers to the ability of a soil to conduct water. Hydraulic conductivity, or *K*, is measured in cm/hour – that is, how far water will move through soil in a give time.

Hydraulic conductivity is a complex feature of soils, varying with location, soil type, depth, soil moisture content and direction of flow; for example, horizontal conductivity is often greater than vertical on account of soil horizons.

There are two main types of hydraulic conductivity that we want to know:

1. **Surface infiltration rate.** This is the rate at which a soil surface will take in irrigation or rainfall. It is the number an irrigation farmer or sports field manager wants to know. It is influenced by plant cover, the initial moisture content, and the texture and structure of the soil. Surface compaction, slaking, dispersion and crusting impede surface infiltration. Typically the surface infiltration rate starts off faster in a dry soil and slows down as the soil swells and the cracks close.

2. **Saturated hydraulic conductivity (*K*sat).** This is the rate at which a soil that is already saturated with water will conduct water away from the source. It is necessary for predicting such things as whether a purchased soil will have good drainage, whether a dam will hold water, how quickly a subsoil will allow ponded or perched water to drain away, and whether a landfill liner will leak contaminants into the surrounding ground water.

Obtaining accurate measurements of hydraulic conductivity is very difficult, mainly because of the wide variability of soils and the presence or absence of pores, cracks, worm holes etc. In particular, measurements depend greatly on the size of the sample tested, as hydraulic conductivity usually increases as the sample size decreases.

**Measurement of soil permeability in the field**

To measure soil permeability in the field, you can use one of the following tests:

* The visual evaluation of the permeability rate of soil horizons;
* A simple field test for estimating soil permeability;
* A more precise field test measuring permeability rates.

**Determining coefficients of permeability**

To obtain a more accurate measurement of soil permeability, you can perform the following test in the field which will give you a value for the coefficient of permeability:

* Using a bucket auger, drill a hole about 1 m deep in the soil at the location where you wish to determine the coefficient of permeability;
* Fill the hole with water to the top;
* Every five minutes, for at least 20 minutes, refill the hole to the top to be sure that the soil is fully saturated;
* Top the water in the hole and start measuring the rate at which the water surface goes down, using a watch to measure time and a centimetre-graduated ruler to measure the distance P between the water surface and the top of the hole. Stop measuring when the rate becomes nearly constant;



* Measure exactly the total depth of the hole (H) and its diameter (D). **Express all measurements in metres** (m): for example

**H = 1.15 m and D = 12 cm or 0.12 m**

* For each of the above two consecutive measurements of time/distance, calculate the **coefficient of permeability K**using the following formula:

**K= (D÷2) x In (h1÷ h2) / 2 (t2- t1)**