IN SITU HYDRAULIC CONDUCTIVITY TESTS

P1.60
Parts List
Pg 330

Determination of the water permeability, also called hydraulic conductivity, is important for agricultural- as well as for environmental soil research. On the basis of the permeability factor (K-factor) irrigation- and drainage systems are designed. Also with respect to the extend of the spreading of possible pollution the permeability factor of the soil is of great importance. The permeability of the soil can be determined in the laboratory (see P1.87) as well as directly in the field.

09.01 Hydraulic conductivity test kit, model Hooghoudt

In case of direct measurement in the field the auger hole method according to Hooghoudt can be applied. Following this method the determination of the permeability to water of a soil takes little time (by comparison to other methods), requires a limited number of instruments and the procedure is simple.

The principle of this method is quite simple. A hole is bored in the ground to a certain depth below the groundwater level and after a time the water in the hole will rise to the said water level.

The water is consequently bailed out and the time it takes for a new water level to establish itself is recorded.

With the help of formulae and/or nomogrammes this rate of water rise can be translated to the average water permeability factor of the different strata of soil.

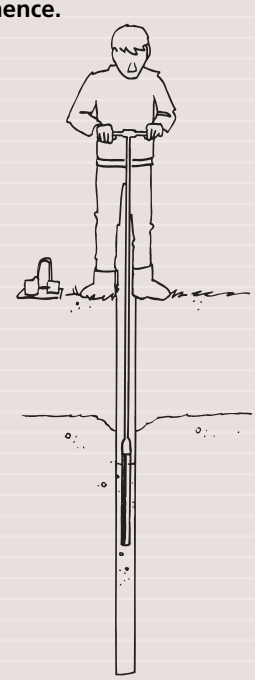
The depth of the bore hole is dependant upon the groundwater level and the thickness and the permeability of the successive layers in the ground profile.

The standard set is suitable for measurements to a depth of 2 meter. Basically it contains:

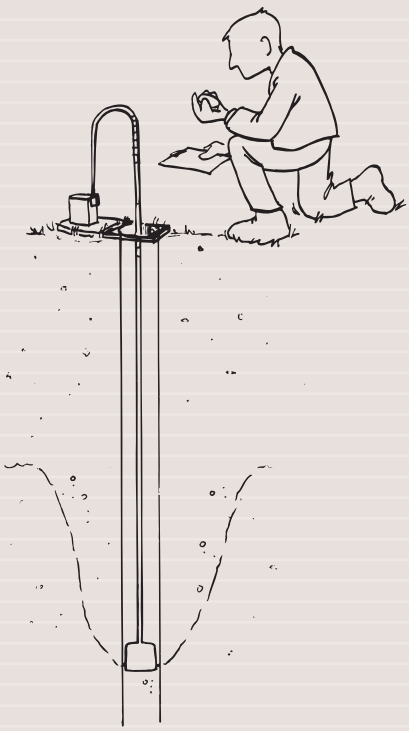
an Edelman- and a Riverside auger with an upper part and an extension rod, a bailer, measuring tape with holder and float, a filter and a stopwatch. The complete set can be transported in the field in a strong carrying bag.

Hydraulic conductivity test kit, model Hooghoudt

Applying a bailer a portion of the water is removed from the bore hole after which measurement can commence.



The rise rate of the groundwater is determined by using a measuring tape with a float and a stopwatch.

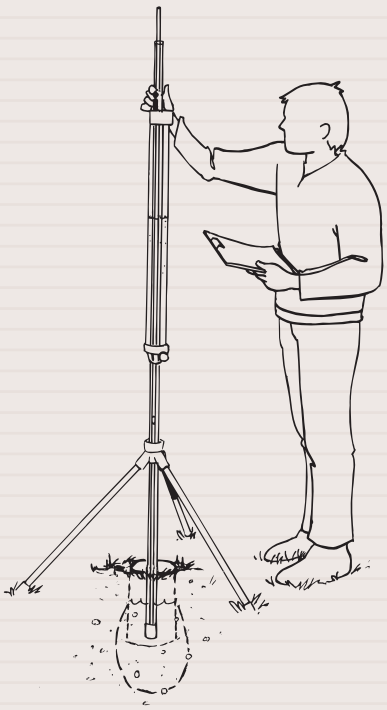


IN SITU HYDRAULIC CONDUCTIVITY TESTS

Eijkelkamp Agrisearch Equipment
ISO 9001-CERTIFIED
manufacturer of environmental research equipment

The Plácido-meter is read.

The determination of the saturated water permeability using the Guelph permeameter.



09.10 Hydraulic conductivity test kit, model Plácido

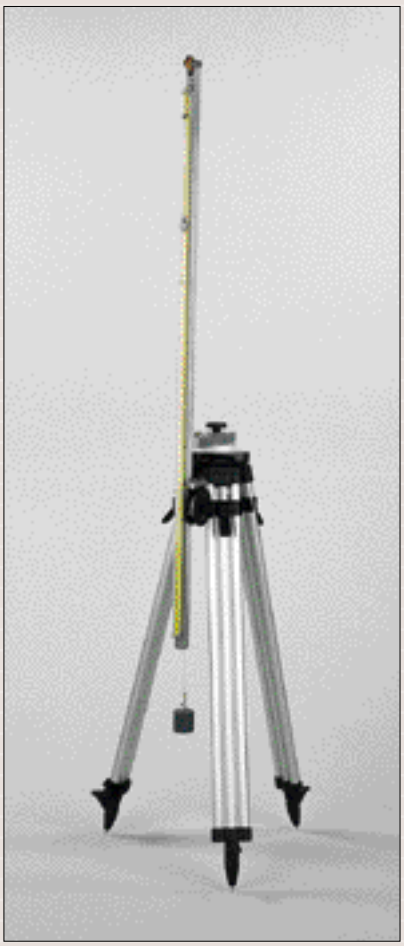
The determination of the water permeability (or hydraulic conductivity) with this set is based on the same principle as the previously described set (the auger hole method). By using the water fluctuation meter, model Plácido, a stable measuring unit becomes available that is not sensitive to weather influences (for instance wind, rain, dust, etc.). In addition this set can be used for measurement to a greater depth. Another important advantage is that measurement can be done standing.

The standard set is suitable for measurements to a depth of 5 m. Basically it contains: an Edelman- and a Riverside auger with an upper part and extension rods, two bailers, the water fluctuation meter, type Plácido (including a strong carrying bag), filters and various accessories. The parts of this set can be transported in a carrying bag with shoulder strap.

09.07 Guelph constant head permeameter

The Guelph permeameter is a 'constant head' permeameter that operates in accordance with the principle of the Mariotte bottle. After boring a hole the Guelph permeameter is placed. The water from the permeameter slowly flows into the auger hole and penetrates into the soil. At a certain moment a saturated 'bulb' is formed and the out-flow of water from the storage cylinder reaches a constant value (that is measured).
These measuring data together with the diameter of the auger hole and the level of the water in the auger hole, are used to determine the (saturated) hydraulic conductivity of the soil.

The complete standard set, for measurement up to a depth of 75 cm, fits in a carrying bag and, among other items, contains: the Guelph permeameter, a tripod, drill bits, a vacuumtest manual pump, a fold-up jerry can and various accessories.



Plácido meter with tripod

Plácido meter, complete set

Guelph constant head permeameter

IN SITU HYDRAULIC CONDUCTIVITY TESTS

P1.60
Parts List
Pg 331

09.11 Ksat constant head permeameter

The Ksat constant head permeameter is an instrument that provides the means to collect data for determining in situ saturated hydraulic conductivity of the vadose (unsaturated) zone easily and conveniently. The measuring procedure is known as constant head well permeameter technique, shallow well pump-in method or borehole infiltration test. Before the equipment is used a hole is augered (the bottom of the hole must be plane (use the Riverside auger).

The main unit is used for measuring hydraulic conductivity to a depth of 2 m. The depth of measurement can be easily increased to 4 m by attaching a set of constant head tubes to the main unit. To measure below 4 m depths, a special flow measuring reservoir and a pressure transducer (available as optionals) are required.

The standard set (for a depth of 2 m) contains: the compact constant head permeameter and augers for installation.

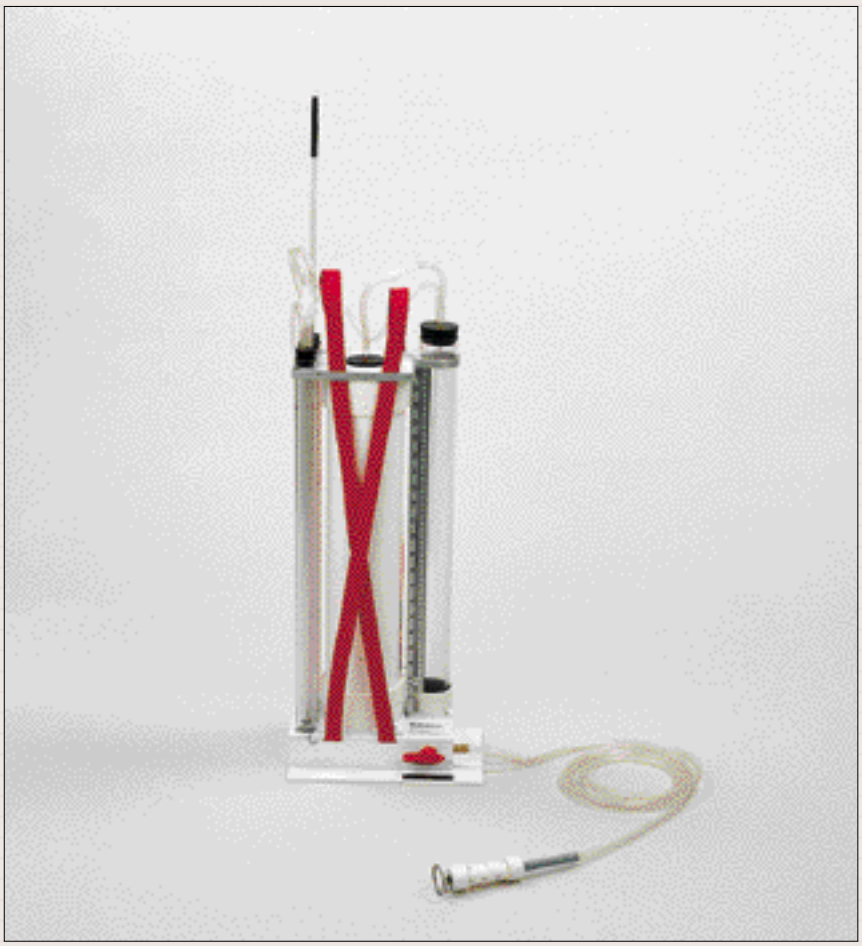
Advantages

- Compact, portable and versatile.
- No field assembly is required.
- 5 Liter useful water capacity allows measurement of hydraulic conductivity in most soils.
- Large opening for quick filling and refilling of the reservoirs.
- Can be used on any landscape position without an external support.
- Can be easily transported as a back pack for measurement in remote locations.
- Constructed of durable PVC and polycarbonate to withstand field use.

Applications

- In situ permeability tests for drainage and/or irrigation.
- Determination of hydraulic conductivity of the unsaturated zone for septic system design, landfill design, and retention pond construction.

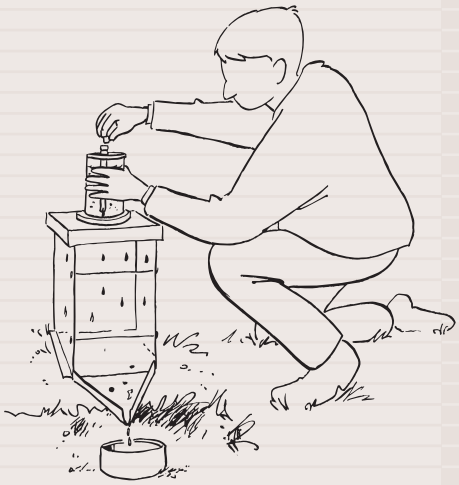
By using an extension kit hydraulic conductivity can be measured below 4 m.



Ksat constant head permeameter

IN SITU HYDRAULIC CONDUCTIVITY TESTS

By pulling the plug, the measurement is started. At the bottom of the slope, water and soil particles are collected in a reservoir.



09.06 Rainfall simulator

The extent to which the soil is sensitive to erosion is determined largely by the composition of the soil. Knowledge of the sensitivity to erosion is important for the development of a certain plot.

The sensitivity to erosion is hard to measure. Absolute values can not be obtained. It is, however, possible to obtain a reasonable indication by means of a relative measurement. For such a measurement a rainfall simulator can be applied.

The simulator allows erosion to take place on a small section of the plot. With the apparatus rainfall is simulated on a slanting surface. Through small capillaries in the plate under the water filled cylinder, the drops fall down on the slanting surface.

Once fallen to the surface of the soil, the droplet loosens soil particles. These particles jump up and fall down again, slightly lower, on the slope. At the bottom of the slope, water and soil particles are collected in a reservoir.

Through research in the laboratory of the soil particles collected, an indication can be derived concerning the composition and the sensitivity to erosion of the soil under research.
By comparing the measuring results to other measuring results, the researcher may set up a scale for sensitivity to erosion of the researched soil.

To be able to obtain reliable results it is important to keep the factors influencing the process (such as for instance the temperature of the water) as constant as possible.

It is also recommended to gather information concerning the history of the use of the soil. This may then be taken into account when translating the measuring results.

Rainfall simulator