

# European Turfgrass Laboratories Ltd

## Information Sheet – Physical Properties Explained

### **PERCOLATION RATE (SATURATED HYDRAULIC CONDUCTIVITY)**

This is the rate at which soils, sands and rootzones drain (normally expressed in mm/hour) and can be affected by the depth of the rootzone. Samples are usually equilibrated overnight to 30cms tension - this being the standard depth of a USGA green, from the surface to the gravel drains. After 16 hours, and compacting to 45 ft/lbs pressure, they are transferred to a permeameter, and percolation rate is determined once the samples have been percolating for a minimum of four hours. Equilibrating to higher or lower tensions will cause the percolation rate to rise or fall. 45 ft/lbs compaction is considered the average compaction a golf green will be subjected to as a result of foot and vehicle traffic.

USGA Recommends: > 150 mm/hr

### **BULK DENSITY**

This is a measure of the weight of dry soil per unit of bulk volume, including air space (normally expressed as g/cc). ETL results are based on compacted, dried rootzone. Sand/peat rootzones with high levels of organic material are likely to have lower bulk densities than sand/soil rootzones that have lower organic contents. Average bulk densities in rootzones tend to range from 1.4 – 1.65 g/cc.

### **PARTICLE DENSITY**

This is a measure of the weight per unit volume of the soil particles (normally expressed as g/cc). The particle density is influenced by the chemical composition and crystal structure of the mineral particles and is not affected by pore space.



FILLING PERMEAMETER CYLINDERS



COMPACTING SAMPLES  
FOR BULK DENSITY



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## TOTAL POROSITY

This is the sum of air-filled and water-filled pore spaces present in the rootzone in the compacted state (normally expressed as %v/v). The ideal rootzone should consist of a good balance of air-filled and water-filled pore spaces leading to favourable drainage properties with enough moisture retention for grass growth.

USGA Recommends : 35 – 55 %

## AIR-FILLED POROSITY

This is a measure of the air-filled pores (large pores) present in compacted rootzone (normally expressed as %v/v). These pore spaces are the ones through which water drains and air enters the rootzone. Grass roots are also able to penetrate the rootzone through these pore spaces. Greater depths of rootzone will encourage a higher % of air-filled pore space because the greater tension draws more water out of the rootzone.

USGA Recommends : 15 – 30 %

## WATER-FILLED POROSITY (CAPILLARY POROSITY)

This is a measure of water-filled pores (small pores) present in compacted rootzone (normally expressed as %v/v). These are the pores that retain water and are obviously necessary within a rootzone in order to sustain grass growth. Greater depths of rootzone will discourage water retention while shallower rootzones will retain more water.

USGA Recommends : 15 – 25 %

## WATER RETENTION

This is a measure of the %w/w of water present in the rootzone at a given tension.

No USGA recommendation is given for this parameter.



**RUNNING SAMPLES ON PERMEAMETER**



**BRINGING SAMPLES TO EQUILIBRIUM ON THE TENSION TABLE – This is required to establish the porosity levels and water retention for each sample**

