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Soil quality — Determination of pore water pressure — Tensiometer method

Qualité du sol — Détermination de la pression d'eau dans les pores — Méthode du tensiomètre

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11276 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 5, *Physical methods*.

Annex A forms an integral part of this International Standard. Annexes B, C, D, E and F are for information only.

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Soil quality — Determination of pore water pressure — Tensiometer method

1 Scope

This International Standard specifies methods for the determination of pore water pressure in both unsaturated and saturated soil using tensiometers. The methods are applicable for *in situ* pore water pressure measurements in the field, as well as for monitoring pore water pressure in, for example, plant containers or soil cores used in experimental procedures.

At normal atmospheric pressures, i.e. about 100 kPa, the application of these methods is limited to a range of pressures down to about − 85 kPa. The range is reduced at lower atmospheric pressures. Tensiometers will not function if sub-zero temperatures occur at the measurement depth. Their accuracy is influenced by soil and air temperature fluctuations. Tensiometer response time ranges from a few seconds to several days. To obtain reliable measurements under field conditions, tensiometers require frequent servicing.

A tensiometer provides point measurements of pore water pressure. To measure pore water pressure at different depths, several tensiometers will be necessary. In the field, replicate sets of instruments will be required if the spatial variability of the soil is to be allowed for.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

NOTE 1 Additional definitions are given in E.2, for information only.

2.1 pore water pressure: The sum of matric and pneumatic pressures.

NOTES

2 Pore water pressure is also referred to as tensiometer pressure.

3 The pore water pressure represents the sum of the pressures due to interfacial forces acting between the water, air and solid phases of the soil (matric pressure), the part of the mass of overlying material not carried by the soil skeleton and therefore carried by the soil water (overburden pressure; this pressure is often considered as part of the matric pressure) and the local air pressure within the soil (pneumatic pressure). Under most circumstances, the overburden and pneumatic pressures are zero.

2.2 matric pressure: The amount of work that must be done in order to transport reversibly and isothermally an infinitesimal quantity of water, identical in composition to the soil water, from a pool at the elevation and the external gas pressure of the point under consideration, to the soil water at the point under consideration, divided by the volume of water transported.

2.3 pneumatic pressure: The amount of work that must be done in order to transport reversibly and isothermally an infinitesimal quantity of water, identical in composition to the soil water, from a pool at atmospheric pressure and at the elevation of the point under consideration, to a similar pool at an external gas pressure of the point under consideration, divided by the volume of water transported.

NOTE 4 Soil water pressure can be considered as a pressure equivalent of soil water potential. The same applies to the soil water head, the head equivalent of soil water potential.

The relationship between these is

$$\Psi \cdot \rho_w = p - h \cdot g \cdot \rho_w$$

where