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SLOVENSKI STANDARD
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Geosintetične ovire - Ugotavljanje prepustnosti za tekočine

Geosynthetic barriers - Determination of permeability to liquids

Geosynthetische Dichtungsbahnen - Bestimmung der Flüssigkeitsdurchlässigkeit

Géomembranes - Détermination de la perméabilité aux liquides

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59.080.70 Geotekstilije Geotextiles

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English Version

Geosynthetic barriers - Determination of permeability to liquids

Géomembranes - Détermination de la perméabilité aux liquides

Geosynthetische Dichtungsbahnen - Bestimmung der Flüssigkeitsdurchlässigkeit

This European Standard was approved by CEN on 29 April 2019.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14150:2019) has been prepared by Technical Committee CEN/TC 189 “Geosynthetics”, the secretariat of which is held by NBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

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This document supersedes EN 14150:2006.

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1 Scope

This document specifies a method for measuring the steady-state liquid flow through a geosynthetic barrier, used to contain liquids in long-term applications.

The test method and described apparatus allow the measurement of flows accurately down to 10^{-6} m^3/m^2/day. In particular circumstances where testing indicates that values obtained for a geosynthetic barrier lie below the threshold of sensitivity of this test method, then the value of liquid flow is declared as being less than10^{-6} m^3/m^2/day.

Due to its long duration, this test method is not suitable for production control testing.

Clay geosynthetic barriers cannot be tested with this apparatus.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Principle

A differential hydraulic pressure is applied between the two sides of a geosynthetic barrier. It is kept constant during the test at 100 kPa, the upstream pressure being set to 150 kPa and the downstream pressure to 50 kPa.

The flow through the geosynthetic barrier is calculated from the variations of the liquid volume measured on both sides of the geosynthetic barrier.

NOTE This test is conducted with water but can also be performed with other liquids, providing chemical resistance and compatibility of the apparatus is ensured.

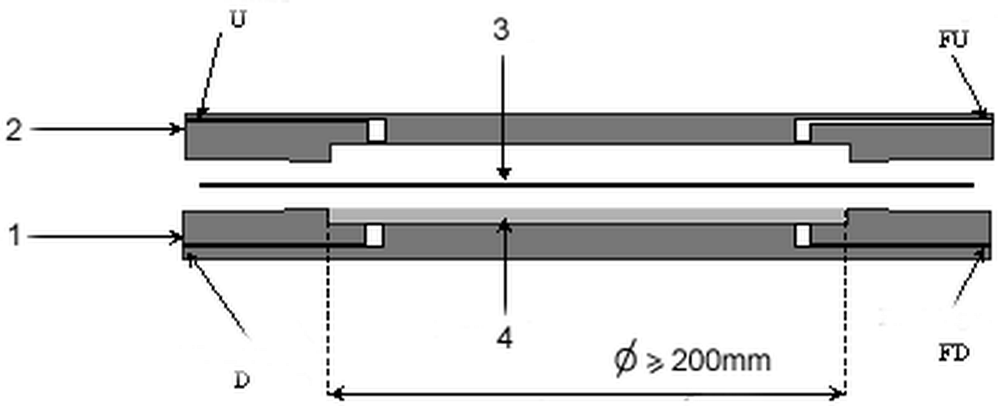
In the light of laboratory experience, it is recommended that the test procedural improvement and equipment enhancement of the sensitivity threshold of the test procedure be reviewed and the applicability of the test procedure to the product permeability assessed at regular intervals, not exceeding 12 months.

Other pressure levels may be applied with the agreement of all concerned persons or parties. In this case it is recommended that the pressure levels applied be described in the test report

5 Apparatus

5.1 Cell

The two-part cell (see Figure 1) shall resist oxidation and hydraulic pressure applied along the test. In each part of the cell, a cavity allows to apply a hydraulic pressure. A porous disc resisting oxidation placed in the downstream cavity prevents deformations of the geosynthetic barrier.



Key

1	downstream part	U	upstream water inlet
2	upstream part	D	downstream water inlet
3	geosynthetic barrier	FU	flushing valve upstream
4	porous plate	FD	flushing valve downstream

Figure 1 — Schematic representation of a test cell

The cell shall be designed to clamp the specimen without any leaks. There is no tightening system necessary, as clamping between flat surfaces is usually sufficient. For some materials, a sealant may be necessary. Any sealant non-sensitive to water and avoiding leaks can be used. In the case of bituminous geosynthetic barriers, a bitumen rubber sealant can be used.

The cavities shall be constructed in such a way that the exposed diameter of the specimen be equal to or greater than 200 mm. This diameter shall be measured with a maximum permissible measurement error of ± 1 mm.

The cell is equipped with a liquid inlet on the upstream part (U-valve) and a liquid outlet on the downstream part (D-valve) and flushing valves on each part (FU- and FD-valves).

The cell shall be oriented vertically to allow an easier and better air flushing. The flushing valves (FU and FD) shall be placed on top of the cell and the inlet (U) and outlet (D) shall be on the bottom of the cell.

NOTE The cell can also include, on both parts, a ring-shaped control cavity. In this case the downstream control cavity will be equipped with a porous ring-shaped plate. Each ring-shaped cavity will be connected to an independent volume measuring device and a pressure delivery system, in order to apply the same pressure as in the corresponding measuring cavity. These ring-shaped cavities are there to minimize deformation in the measuring cavity.

5.2 Volume measuring devices and pressure delivery system

These two devices are generally associated.

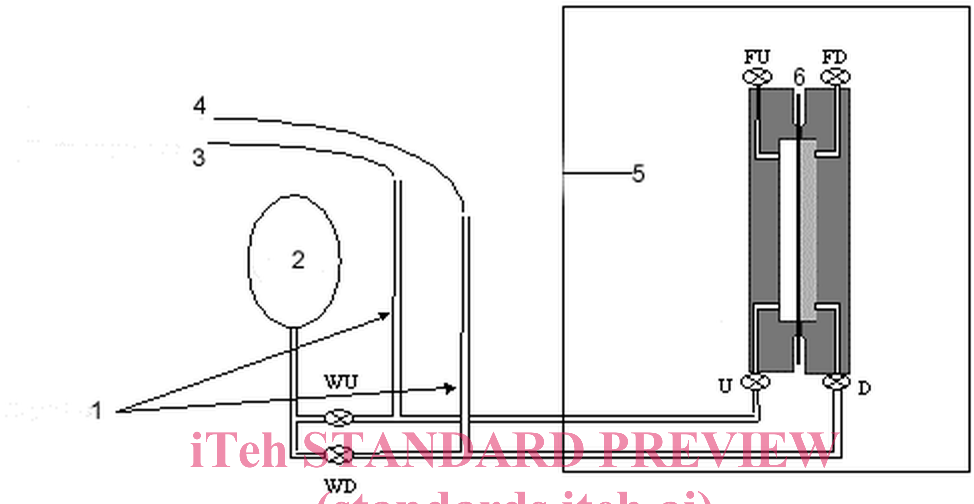
The volume measuring equipment shall be able to measure liquid flows through the geosynthetic barrier smaller than 10^{-6} m^3/m^2/d.

The maximum permissible measurement error tolerated for the volume measurement shall be ± 10^{-8} m^3.

The maximum permissible measurement error of the pressure applied on each side of the geosynthetic barrier shall be ± 2 kPa.

The volume measurements can be achieved using capillary tubes (Type A device) or pressure-volume controllers (Type B device).

— Type A (see Figure 2): 0,3 m long tubes can be used. To reduce the effects of evaporation the tube diameter shall be less than 3 mm. The pressure is applied by means of air pressure in capillary tubes and controlled with a regulator. A liquid vessel connected to the cell, between each capillary tube and the cell, allows the cavities to be filled before the test and enables the adjustment of liquid levels in capillary tubes during the test. Due to temperature effects on volume, tests performed with this kind of apparatus shall be carried out in a thermostatic chamber at (23 ± 0,2) °C.

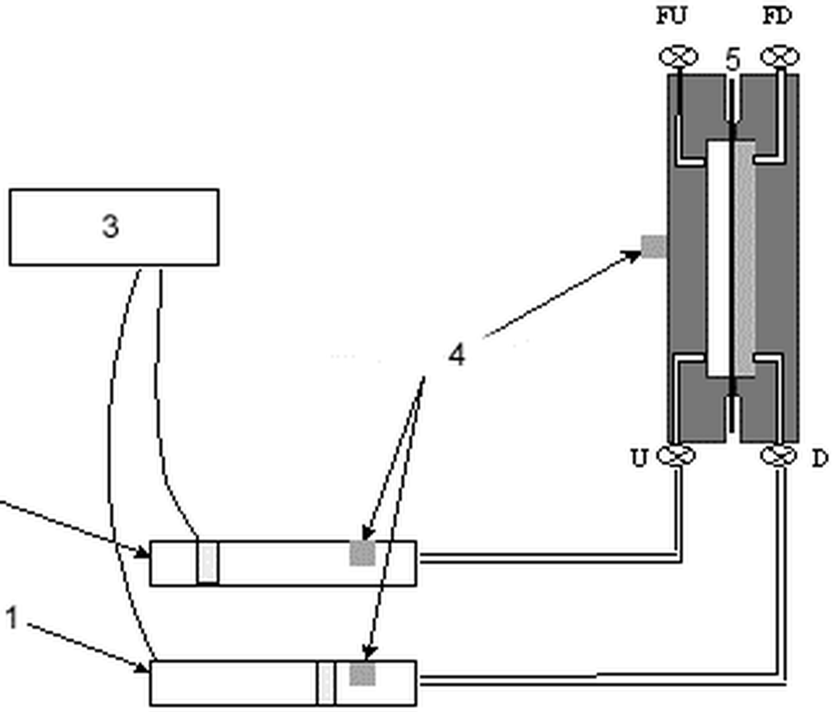


Key

1	capillary tubes	WU	water regulator valve upstream
2	vessel	WD	water regulator valve downstream
3	upstream pressure	FU	flushing valve upstream
4	downstream pressure	FD	flushing valve downstream
5	thermostatic chamber (to ± 0,1 °C)	U	upstream water inlet
6	geosynthetic barrier	D	downstream water inlet

Figure 2 — Schematic representation of a Type A volume measuring device

— Type B (see Figure 3): this device allows the application of a constant pressure when measuring the volume. It consists of a cylinder in which a piston slides. A numerically controlled motor enables the application of the required pressure by moving the piston. A pressure sensor included in the system measures the pressure. The piston displacement corresponds to a variation of the volume of liquid. The volume of the controllers shall be greater than 10^{-4} m³.



Key

1	downstream controller	U	upstream water inlet
2	upstream controller	D	downstream water inlet
3	computer	FU	flushing valve upstream
4	temperature transducers	FD	flushing valve downstream
5	geosynthetic barrier		

Figure 3 — Schematic representation of a Type B volume measuring device

5.3 Liquid supply

It is recommended to use de-aired water (less than 1 mg/l of dissolved oxygen). De-aired liquid is necessary to minimize variations of volume due to temperature variations.

If the test is conducted with other liquids, it is recommended that volatility and safety problems be taken into account.

5.4 Temperature control

When the test is carried out using a type A device then this shall be performed under a temperature of (23 ± 0,2) °C (using a thermostatic chamber). When the test is carried out using a type B device then a temperature of (23 ± 1) °C (in a controlled temperature room) shall be used.

With a type B device, at least three temperature transducers, placed on each pressure-volume controller and on the cell, shall be used. Temperature measurements will then be used to correct volume variations if required (see 8). The maximum permissible measurement error for temperature transducers shall be ± 0,2 °C.