SLOVENSKI STANDARD

SIST EN 14150:2006

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Geosintetiļ ne ovire ï Ugotavljanje prepustnosti za tekoļ ine

Geosynthetic barriers - Determination of permeability to liquids

Geosynthetische Dichtungsbahnen - Bestimmung der Flüssigkeitsdurchlässigkeit

Géomembranes - Détermination de la perméabilité aux liquides

Ta slovenski standard je istoveten z: EN 14150:2006

ICS:

59.080.70 Geotekstilije Geotextiles

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

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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 4 May 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

Foreword

This European Standard (EN 14150:2006) has been prepared by Technical Committee CEN/TC 189 “Geosynthetics”, the secretariat of which is held by IBN/BIN.

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of an identical text or by endorsement, at the latest by December 2006, and conflicting national standards shall be withdrawn at the latest by December 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard 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 than 10^{-6} $m^3/m^2/day$.

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

Geosynthetic clay liners cannot be tested with this apparatus.

2 Normative references

Not applicable

3 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.

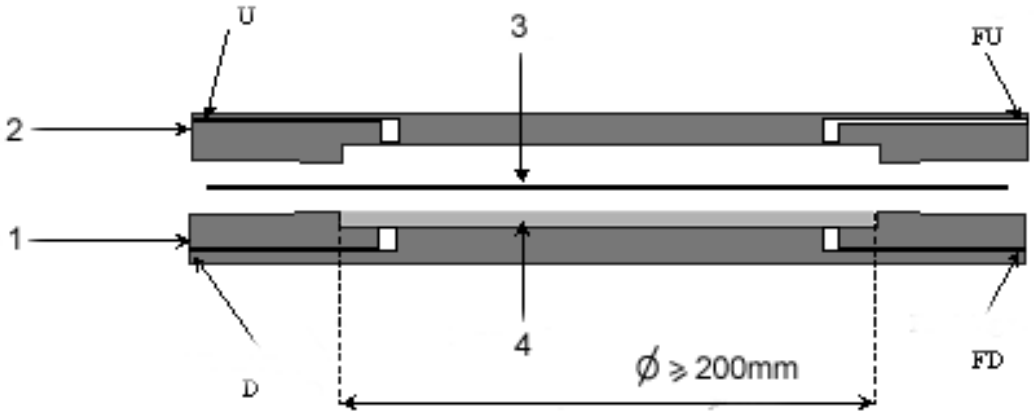
NOTE 1 This test is conducted with water, but can also be performed with other liquids, providing chemical resistance and compatibility of the apparatus is ensured.

NOTE 2 In the light of laboratory experience, test procedural improvement and equipment enhancement the sensitivity threshold of the test procedure should be reviewed and the applicability of the test procedure to the product permeability assessed at regular intervals, not exceeding 12 months.

4 Apparatus

4.1 Cell

The two-part cell (see Figure 1) is made of stainless steel. The cell shall resist to oxidation during long-term immersion. In each part of the cell, a cavity allows to apply a hydraulic pressure. A porous disc placed in the downstream cavity prevents deformations of the geosynthetic barrier.



Key

1	downstream part	U	water inlet
2	upstream part	D	water outlet
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 measuring chambers shall have a nominal diameter equal to or greater than 200 mm. This diameter shall be measured with an accuracy equal to or better than 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 should be oriented vertically to allow an easier and better air flushing. The flushing valves (FU and FD) should be placed on top of the cell and the inlet (U) and outlet (D) should be on the bottom of the cell.

NOTE The cell can also include, on both parts, a ring-shaped control chamber. The downstream control chamber will be equipped with a porous ring-shaped plate. Each ring-shaped chamber 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 chamber. These ring-shaped chambers are there to minimise deformation in the measuring chamber.

4.2 Volume measuring devices and pressure delivery system

These two devices are generally associated.

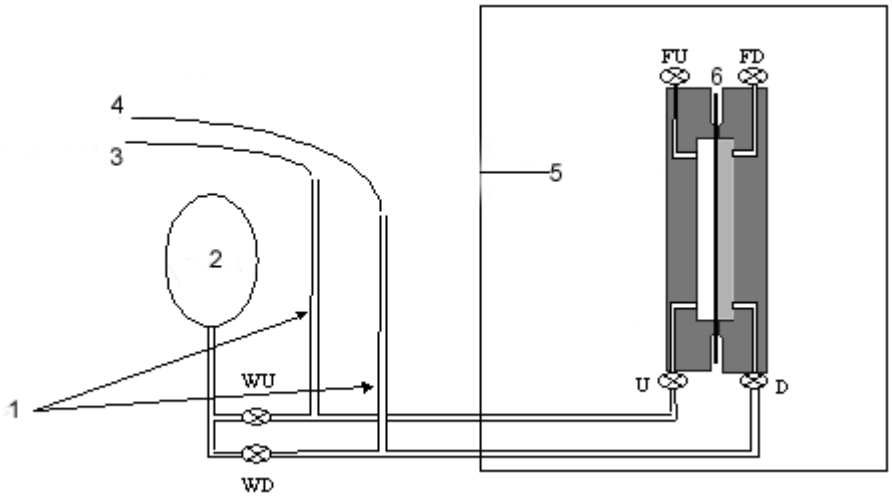
The volume measuring equipment shall be able to measure liquid flows through the geosynthetic barrier smaller than 10^{-6} m^3 /m^2/day.

The accuracy of the volume measurement shall be at least 10^{-8} m^3.

The accuracy 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): 30 cm long tubes can be used. To reduce the effects of evaporation the tube diameter should 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 should be carried out in a thermostatic chamber (23 ± 0,2) °C.

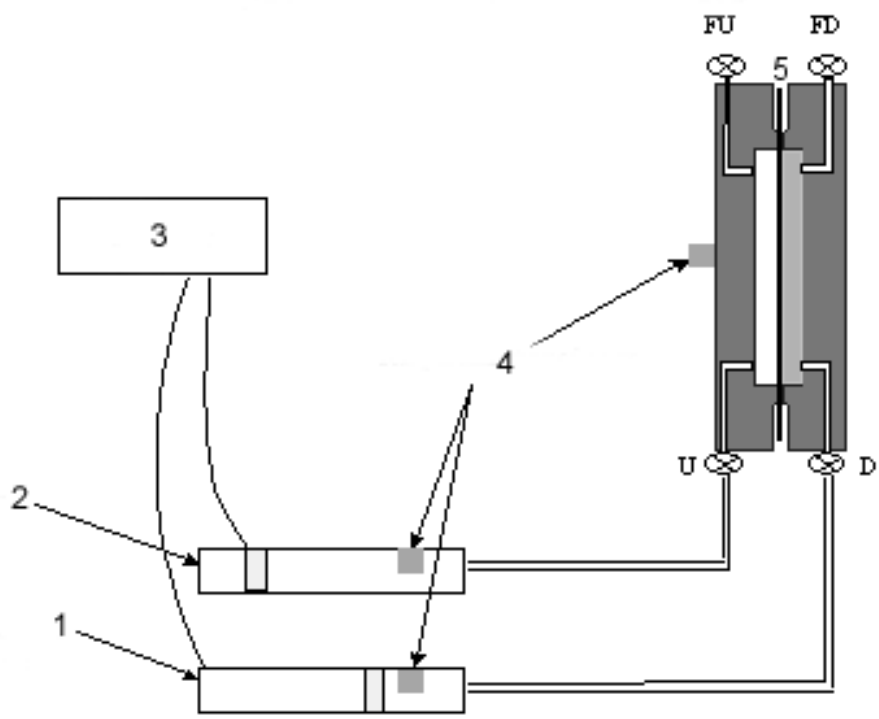


Key

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	water inlet
6	geosynthetic barrier	D	water outlet

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 should be greater than 10^{-4} m^3.



Key

1	downstream controller	U	water inlet
2	upstream controller	D	water outlet
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

4.3 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.

NOTE If the test is conducted with other liquids, volatility and safety problems should be taken into account.

4.4 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, should be used. Temperature measurements will then be used to correct volume variations (see 8.2). The temperature is measured with a precision of 0,2 °C.