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01-marec-2006

Geosintetiļ ne ovire ï Preskusna metoda za ugotavljanje vpliva ciklusov zamrzovanja-odtajanja na prepustnost geosintetiļ nih bentonitnih ovir

Geosynthetic barriers - Test method for the determination of the influence of freezing-thawing cycles on the permeability of clay geosynthetic barriers

Geosynthetische Dichtungsbahnen - Prüfverfahren zur Bestimmung des Einflusses von Frost-Tau-Wechselbeanspruchungen auf die Durchlässigkeit von geosynthetischen Tondichtungsbahnen

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Barrieres géosynthétiques - Méthode d'essai pour la détermination de l'influence de cycles de gelée-dégel sur la perméabilité a l'eau des barrieres géosynthétiques bentonitiques

Ta slovenski standard je istoveten z: **CEN/TS 14418:2005**

ICS:

59.080.70 Geotekstilije Geotextiles

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2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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English Version

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This Technical Specification (CEN/TS) was approved by CEN on 3 April 2005 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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Foreword

This Technical Specification (CEN/TS 14418:2005) has been prepared by Technical Committee CEN/TC 189 "Geosynthetics", the secretariat of which is held by IBN/BIN.

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

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Introduction

This Technical Specification defines a method for testing the influence of freezing-thawing cycles on the permeability of clay geosynthetic barriers. Such resistance is a requirement for many uses of these products.

The influence ratio is an indication of the behaviour of the product when exposed to repeated freezing and thawing cycles in earth constructions. The permeability of saturated clay geosynthetic barriers may increase in consequence of repeated freezing-thawing cycles.

This Technical Specification does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

The current Technical Specification has not yet been widely validated. The organisation of interlaboratory-tests to acquire more experience is recommended.

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1 Scope

This Technical Specification specifies an index test to determine the influence ratio of freezing-thawing cycles on the flux through saturated clay geosynthetic barriers.

This test is applicable to clay geosynthetic barrier products with a geotextile backing. It is not necessarily applicable to clay geosynthetic barrier products with a geomembrane backing.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 10320, *Geotextiles and geotextile-related products – Identification on site (ISO 10320:1999)*

EN ISO 3696, *Water for analytical laboratory use – Specification and test methods (ISO 3696:1987)*

3 Terms and definitions

For the purposes of this Technical Specification, the following term and definition applies.

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3.1
influence ratio
ratio of the flux value of a specimen exposed to wetting-drying cycles and divided by the flux through an unexposed reference specimen, expressed in percent

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4 Principle

The flux through 100 mm diameter clay geosynthetic barrier specimens is determined with a flexible wall permeameter both on specimens exposed to freezing-thawing cycles and on unexposed reference specimens.

Geosynthetic clay barrier samples of 300 mm x 300 mm are saturated under a pressure of (4 ± 0,2) kPa for 48 h at constant room temperature. After saturation, one sample is stored in the freezer at –5 °C for 24 h, while the reference sample remains at normal room temperature. After the freezing period the first sample is allowed to thaw at room temperature for 24 h. Then the samples are submerged again for 24 h at room temperature. This freezing-thawing cycle is performed four times before cutting the test specimens.

The specimen is mounted in a flexible-wall permeameter, subjected to a cell pressure of 550 kPa and a back pressure of 515 kPa for a period of 48 h. Flow is initiated using deionized water by raising the pressure on the inlet side of the test specimen to 530 kPa. The flux is determined when inflow and outflow are approximately equal (within ± 25 %).

NOTE This test does not provide a hydraulic conductivity value. Hydraulic conductivity can be determined in a similar way, but requires knowledge of the thickness of the specimen. This test does not include procedures for thickness measurement of the clay geosynthetic barrier or of its clay component.

5 Reagent

De-aired, de-ionized water shall be in accordance with EN ISO 3696 grade 3.

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Water is used to permeate the test specimen and also to exert a back pressure on the test specimen. As the flux can be substantially influenced by the nature of the test liquid, de-aired, de-ionized water shall be used in this test method.

The water shall be de-aired as well as de-ionized. The water is usually de-aired by boiling, by spraying a fine mist of water in a vessel connected to a vacuum source, or by forceful agitation of water in a container connected to a vacuum source. The de-aired water shall not be exposed to air for prolonged periods to prevent the dissolving of air back into water.

6 Apparatus

NOTE The apparatus used in this test method is commonly used to determine the hydraulic conductivity of soil specimens. However, flux values measured in this test are typically much lower than those commonly measured for natural soils. The leakage rate of the apparatus should be less than 10 % of the flux.

6.1 Hydraulic system

The system shall be designed to facilitate rapid and complete removal of free air bubbles from flow lines and be capable of maintaining constant hydraulic pressures within ± 5 %. It may be one of the following types:

— method A: a constant head system, e.g. the system specified in ASTM D 5887:2003; provided it meets the criteria specified in this method;

— method B: a falling head method;

— method C: a constant rate of flow.

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Pressures shall be measured by any device of suitable accuracy, e.g. a pressure gage or an electronic pressure transducer.

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The hydraulic system shall be capable to apply and to maintain a backpressure within ± 5 % on the specimen, to facilitate saturation throughout the duration of the measurements.

The backpressure may be provided by a compressed gas supply, a dead-weight acting on a piston, or by any other suitable means.

6.2 Flow measurement system

For the determination of flow volume within an accuracy of ± 5 %, a system shall be used with a graduated accumulator, a graduated pipette, a vertical standpipe in conjunction with an electronic pressure transducer or any other suitable device.

Both inflow and outflow volumes shall be measured unless the absence of leakage, the continuity of the flow and the cessation of consolidation or swelling can be verified by other means.

6.3 Permeameter cell

An apparatus shall be used in which the specimen and porous end pieces, enclosed by a flexible membrane sealed to the cap and base, are subjected to controlled fluid pressures.

The permeameter cell may allow for observation of changes in height of the specimen, either by observation through the cell wall using a cathetometer or other instrument, or by monitoring of either a loading piston or an extensometer extending through the top plate bearing on the top cap and connected to the dial indicator or other measuring device. The piston or extensometer should pass through a bushing and seal incorporated into the plate and shall be loaded with sufficient force to compensate for the cell pressure acting over the cross-sectional area of the piston where it passes through the seal. If deformations are measured, the

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deformation indicator shall be a dial indicator or cathetometer graduated to 0,3 mm or better and having an adequate travel range, or any other suitable measuring device of the same accuracy.

6.4 Impermeable rigid top cap and base

This is intended to support the specimen, to provide for transmission of the permeant liquid and to form the specimen.

The diameter or width of the top cap and the base shall be equal to the diameter of the specimen within ± 5 %. The base shall prevent leakage, lateral motion or tilting and the top cap shall be designed to receive the piston or extensometer if used, so that the contact area is concentric with the cap. The surface of base and top cap in contact with the sealing membrane shall be smooth and free of scratches.

6.5 Flexible membrane

This membrane is intended to encase the specimen and to provide a reliable protection against leakage.

The membrane shall be carefully inspected prior to use and shall be discarded if any flaws or pinholes are present. To minimize restrain of the specimen, the diameter shall be between 90 % and 95 % of that of the specimen. The membrane shall be sealed to the specimen base and cap with rubber O-rings for which the unstressed internal diameter or width is less than 90 % of the diameter or width of the base and cap.

6.6 Porous end pieces

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These end pieces shall be made of silicon carbide, aluminium oxide or other material that is not attacked by the specimen or the permeating liquid, with a diameter of (99 ± 1) mm and a thickness sufficient to prevent breaking.

The end pieces shall have plane and smooth surfaces and be free of cracks, chips, and non-uniformities. They shall be checked regularly to ensure that they are not clogged.

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The hydraulic conductivity of the porous end pieces shall be substantially greater than that of the specimen to be tested to avoid significant flow impedance.

6.7 Filter paper

This filter paper shall be used to prevent intrusion of material into the pores of the porous end pieces.

One or more sheets of filter paper shall be placed between the top and bottom porous end pieces and the specimen. The hydraulic conductivity of the filter paper shall be substantially greater than that of the specimen to ensure that there is no significant impedance of flow.

6.8 Devices for measuring the dimensions of the specimens

These devices shall be capable of measuring to the nearest 0,3 mm or better and constructed in such a way that their use will not disturb the specimen.

6.9 Membrane expander or cylinder

This shall include a ring for expanding and placing O-rings on the base and a top cap to seal the membrane.

6.10 Auxiliary equipment

— Silicone grease;

— template;