SLOVENSKI STANDARD
SIST EN 14414:2004

01-julij-2004

Geosintetika - Presejalna preskusna metoda za ugotavljanje kemične odpornosti zemljišč za potrebe deponij

Geosynthetics - Screening test method for determining chemical resistance for landfill applications

Geokunststoffe - Auswahlprüfverfahren zur Bestimmung der chemischen Beständigkeit bei der Anwendung in Deponien

Géosynthétiques - Méthode d'essai sélective permettant de déterminer la résistance chimique pour l'utilisation dans les centres de stockage de déchets

Ta slovenski standard je istoveten z: EN 14414:2004

ICS:

13.030.40	Naprave in oprema za odstranjevanje in obdelavo odpadkov	Installations and equipment for waste disposal and treatment
59.080.70	Geotekstilije	Geotextiles

SIST EN 14414:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14414

May 2004

ICS 59.080.70

English version

Geosynthetics - Screening test method for determining chemical resistance for landfill applications

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14414:2004: E

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Foreword

This document (EN 14414:2004) has been prepared by Technical Committee CEN/TC 189, "Geosynthetics", the secretariat of which is held by IBN.

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of an identical text or by endorsement, at the latest by November 2004, and conflicting national standards shall be withdrawn at the latest by November 2004.

This document includes a Bibliography.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

In landfills and contaminated soil geosynthetics can be in contact with leachates or other potentially aggressive chemicals. This European Standard defines a method for testing the resistance of the geosynthetics to these liquids.

The standard does not purport to address all of the safety problems, if any, associated with its use.

1 Scope

This European Standard describes a test method to determine the chemical resistance of geosynthetics to liquid municipal, agricultural and industrial wastes, using a laboratory immersion procedure.

The procedure includes three chemical compounds chosen to initiate known types of chemical degradation, and a synthetic leachate representative of a landfill containing domestic waste. The procedure can also be applied using a site-specific leachate. These options are denoted by methods A to E:

— method A: hydrolysis under acidic conditions;

— method B: hydrolysis under basic conditions;

— method C: solvation/swelling;

— method D: synthetic leachate;

— method E: any site-specific leachate;

The method of evaluation (see clause 9) differs according to whether the material is a geotextile, a polymeric or bituminous geosynthetic barrier, or a geosynthetic clay barrier. In the case of geosynthetic clay barriers only the polymeric component will be tested.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 527-1	*Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1:1993 including Corr 1:1994)*
EN ISO 527-3	*Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets (ISO 527-3:1995)*
prEN ISO 10318:2000	*Geosynthetics - Geotextiles, geotextile-related products, geomembranes and geosynthetic clay liners - Terms and their definitions (ISO/DIS 10318:2000)*
EN 12226:2000	*Geotextiles and geotextile-related products - General tests for evaluation following durability testing*
ISO 554	*Standard atmospheres for conditioning and/or testing – Specifications*

3 Terms and Definitions

For the purposes of this European Standard, the terms and definitions given in prEN ISO 10318:2000 apply.

4 Principle

Samples are immersed at 50°C for 56 days in chemical solutions which represent the chemical reactions characterizing the action of landfill leachates. Samples are evaluated by measuring the change in elongation at break and by visual inspection.

NOTE Resistance to oxidation and leaching of stabilizers are the subject of ENV ISO 13438 and EN 14415 respectively.

5 Apparatus

5.1 Exposure tank

Exposure tank for containment of the solution and the test geosynthetic, chemically resistant and impermeable to the solution being used.

NOTE Stainless steel or glass is recommended. Glass should not be used with strongly basic solutions. The volume of the exposure tank should be at least 50 ml for each gram of mass of specimen. If sufficiently large exposure tanks are not possible, or if it is suspected that trace amounts of chemicals may be depleted from the liquid during the exposure, smaller tanks may be used provided that the immersion liquid is replaced with fresh solution after each test period.

5.2 Lid for sealing the exposure tank

The sealing lid shall be fabricated from a chemically resistant material.

To maintain ambient atmospheric pressure in the tank there shall be a method for allowing gas pressure relief while minimizing changes in the chemical composition of the test solution, e.g. a reflux condenser open to the air or a pressure relief valve. The purpose of this feature is to prevent pressure build-up in the exposure tank from gases generated by chemical reactions or biological activity.

NOTE Pressurized tanks that maintain a constant pressure may be used as an alternative when the maintenance of a pressure other than ambient atmospheric pressure is specified, agreed upon, or required.

5.3 Temperature control equipment

Temperature control equipment with means for maintaining the temperature of the immersion solution to (50 ± 2) °C.

NOTE Examples of methods that have worked well are the following:

- a hot water bath to contain the exposure tank;
- a heating coil wrapped around the tank, or a hot plate used in conjunction with a thermostat and thermocouple;
- a room controlled at the exposure temperature for storing the tank.

Placing a heating coil directly in the exposure solution is not recommended since corrosion can affect the coil and chemical reactions, that may not otherwise occur, may happen on a hot coil.

5.4 Sample holder

Rack, capable of holding or suspending samples of geosynthetic barrier, such that each specimen shall be separated by at least 10 mm from all other specimens and from the tank wall.

5.5 Stirrer

Either a magnetically moved stirring bar, or a mechanical stirrer entering the tank through the lid.

6 Reagents and materials

6.1 Hydrolysis under acid conditions (method A)

— a 10% solution of H_2SO_4.

6.2 Hydrolysis under basic conditions (method B)

— calcium hydroxide ($Ca(OH)_2$), used as a saturated suspension, i.e. approximately 2,5 grams per litre

NOTE See also EN 14030, method B.

6.3 Solvation and swelling (method C)

A mixture of:

— 35 vol% diesel fuel

— 35 vol% paraffin ($C_{10} – C_{20}$)

— 30 vol% lubricating oil HD 30

NOTE This fuel, specified as Test Liquid F in EN 12759, can be purchased as "Prüfgemisch A 20/NPII" from: Firma Haltermann AG, Ferdinandstrasse 55-57, D-20095 Hamburg, Germany (www.haltermann.com). This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of this product.

6.4 Synthetic leachate (method D)

A mixture consisting of:

— 7,5 g/l acetic acid ($C_2H_4O_2$);

— 2,5 g/l propionic acid ($CH_3.CH_2.COOH$);

— 0,4 g/l isobutyric acid ($(CH_3)_2.CH.COOH$);

— 7,0 g/l butyric acid ($CH_3.(CH_2)_2.COOH$);

— 0,4 g/l isovaleric acid ($(CH_3)_2.CH.CH_2.COOH$);

— 1.8 g/l valeric acid ($CH_3.(CH_2)_3.COOH$);

— 4,5 g/l hexanoic acid ($CH_3.(CH_2)_4.COOH$);

— 4,0 g/l heptanoic acid ($CH_3.(CH_2)_5.COOH$);

— 0,2 g/l glucose ($\underline{O.(CH.OH)_4.C}H.CH_2OH.H_2O$);

— 0,35 g/l sodium chloride (NaCl);

— 0,3 g/l anhydrous sodium sulfate (Na_2SO_4);

— 0,1 g/l calcium chloride ($CaCl_2.2\ H_2O$);

— 0,2 g/l magnesium sulfate ($MgSO_4.7H_2O$);

— 0,5 g/l diammonium hydrogen phosphate $(NH_4)_2HPO_4$ (see NOTE);

— deionized water to 1 litre.

NOTE If not commercially available, this can be replaced by a mixture of 0,44 g/l of 85 % concentrated phosphoric acid and 0,51 g/l of 25% concentrated ammonia.

The pH of this synthetic leachate shall be adjusted to a final pH of 6 using 16 ml of ammonia solution (4N) and then subsequently with NaOH.