
Geosintetične ovire -Značilnosti, ki se zahtevajo pri gradnji začasnih shramb za trdne odpadke in odlagališč

Geosynthetic barriers - Characteristics required for use in the construction of solid waste storage and disposal sites

Geosynthetische Dichtungsbahnen - Eigenschaften, die für die Anwendung beim Bau von Deponien und Zwischenlagern für feste Abfallstoffe erforderlich sind

Géomembranes, géosynthétiques bentonitiques - Caractéristiques requises pour l'utilisation dans la construction des ouvrages de stockage et d'enfouissement de déchets solides

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Ta slovenski standard je istoveten z: EN 13493:2005

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 13493:2005**en**

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EUROPEAN STANDARD

EN 13493

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 2005

ICS 91.100.50; 59.080.70

English version

Geosynthetic barriers - Characteristics required for use in the construction of solid waste storage and disposal sites

Géomembranes - Géosynthétiques bentonitiques -
Caractéristiques requises pour l'utilisation dans la
construction des ouvrages de stockage et d'enfouissement
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This European Standard was approved by CEN on 25 March 2005.

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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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 13493:2005) 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 November 2005, and conflicting national standards shall be withdrawn at the latest by February 2007.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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.

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Introduction

This European Standard allows manufacturers to describe geosynthetic barriers on the basis of declared values for characteristics relevant to the intended use and if tested to the specified method. It also includes procedures for evaluation of conformity and factory production control.

This European Standard can also be used by designers, end-users and other interested parties as a tool to define relevant and appropriate characteristics for specifications and on-site quality control. It should be emphasised however that not all characteristics and test methods quoted in this standard are suitable for the purpose of on-site quality control.

Tests for some non-mandated characteristics are still under study and will be included when the standard is revised.

The term "product" used in this standard refers to a geosynthetic barrier, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers.

This European Standard is part of a group of standards, addressing the requirements for geosynthetic barriers when used in a specific application.

Particular application cases can contain requirements about additional properties and - preferably standardised - test methods, if they are technically relevant and not conflicting with European Standards.

The design life of the product should be determined, since its function may be temporary, as a construction expediency, or permanent, for the lifetime of the structure.

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1 Scope

This European Standard specifies the relevant characteristics of geosynthetic barriers, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers, when used as fluid barriers in the construction of solid waste storage and disposal sites, and the appropriate test methods to determine these characteristics.

The intended use of these products is to control the leakage of fluids through the construction.

This document is not applicable to geotextiles or geotextile-related products.

This document provides for the evaluation of conformity of the product to this document.

This document defines requirements to be met by manufacturers and distributors with regard to the presentation of product properties.

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 495-5, *Flexible sheets for waterproofing – Determination of foldability at low temperature – Part 5: Plastic and rubber sheets for roof waterproofing*

EN 1109, *Flexible sheets for waterproofing – Bitumen sheets for roof waterproofing – Determination of flexibility at low temperature*

EN 1849-1, *Flexible sheets for waterproofing – Determination of thickness and mass per unit area – Part 1: Bitumen sheets for roof waterproofing*

EN 1849-2, *Flexible sheets for waterproofing – Determination of thickness and mass per unit area – Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12224, *Geotextiles and geotextile-related products – Determination of the resistance to weathering*

EN 12225, *Geotextiles and geotextile-related products – Method for determining the microbiological resistance by a soil burial test*

EN 12226, *Geotextiles and geotextile-related products – General tests for evaluation following durability testing*

EN 12310-1, *Flexible sheets for waterproofing – Part 1: Bitumen sheets for waterproofing – Determination of resistance to tearing (nail shank)*

EN 12311-1, *Flexible sheets for waterproofing – Part 1: Bitumen sheets for roof waterproofing – Determination of tensile properties*

EN 13361, *Geosynthetic barriers – Characteristics required for use in the construction of reservoirs and dams*

EN 13362:2005, *Geosynthetic barriers – Characteristics required for use in the construction of canals*

EN 13491, *Geosynthetic barriers – Characteristics required for use as a fluid barrier in the construction of tunnels and underground structures*

EN 13492, *Geosynthetic barriers – Characteristics required for use in construction of liquid waste disposal sites, transfer stations or secondary containment*

prEN 14150:2001, *Geosynthetic barriers – Determination of permeability to liquids*

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prEN 14151:2001, *Geosynthetics – Determination of burst strength*

EN 14196, *Geosynthetics – Test methods for measuring mass per unit area of clay geosynthetic barriers*

EN 14414, *Geosynthetics – Screening test method for determining chemical resistance for landfill applications*

EN 14415, *Geosynthetic barriers – Test method for determining the resistance to leaching*

prCEN/TS 14416:2002, *Geosynthetic barriers – Test method for determining the resistance to roots*

prCEN/TS 14417:2002, *Geosynthetic barriers – Test method for the determination of the influence of wetting-drying cycles on the permeability of clay geosynthetic barriers*

prCEN/TS 14418:2002, *Geosynthetic barriers – Test method for the determination of the influence of freezing-thawing cycles on the permeability of clay geosynthetic barriers*

EN 14575, *Geosynthetic barriers – Screening test method for determining the resistance to oxidation*

EN ISO 527-1:1996, *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)*

EN ISO 9862, *Geosynthetics – Sampling and preparation of test specimens (ISO 9862:2005)*

EN ISO 9863-1, *Geosynthetics – Determination of thickness at specified pressures – Part 1: Single layers (ISO 9863-1:2005)*

prEN ISO 10318:2000, *Geosynthetics – Geotextiles, geotextile-related products, geomembranes and geosynthetic clay liners - Terms and their definitions (ISO/DIS 10318:2000)*

EN ISO 10319, *Geotextiles – Wide-width tensile test (ISO 10319:1993)*

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

EN ISO 12236, *Geotextiles and geotextile-related products – Static puncture test (CBR-Test) (ISO 12236:1996)*

EN ISO 12957-1:2004, *Geosynthetics – Determination of friction characteristics – Part 1: Direct shear test (ISO 12957-1:2005)*

EN ISO 12957-2:2004, *Geosynthetics – Determination of friction characteristics – Part 2: Inclined plane test (ISO 12957-2:2005)*

EN ISO 13438:2004, *Geotextiles and geotextile-related products – Screening test method for determining the resistance to oxidation (ISO 13438:2004)*

ISO 34, *Rubber, vulcanized or thermoplastic*

ASTM D 696, *Standard test method for coefficient of linear thermal expansion of plastics between –30 °C and 30 °C*

ASTM D 1434, *Standard test method for determining gas permeability characteristics of plastic film and sheeting*

ASTM D 5397, *Standard test method for evaluation of stress crack resistance of polyolefin geomembranes using notched constant tensile load test*

ASTM D 5887, *Standard test method for measurement of index flux through saturated geosynthetic clay liner specimens using a flexible wall permeameter*

ASTM D 5890, *Standard test method for swell index of clay mineral component of geosynthetic clay liners*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

product

geosynthetic barrier, including polymeric, bituminous and clay barriers

3.1.2

specification

document in which the works, functions, specific conditions and required material property values of the geosynthetic barrier of use are described

3.1.3

waste disposal site

site for the deposit of waste, including internal waste disposal sites, but excluding facilities where waste is unloaded in order to permit its preparation for further transport for recovery, treatment or disposal elsewhere

3.1.4

solid waste

waste in solid form including liquid-solid mixtures having capability to be handled as, or mixed with solid waste for storage purposes

3.1.5

basal liner

material which forms the main barrier to prevent the escape of contained fluids from the base of the facility

3.1.6

side liner

material which forms the main barrier to prevent the escape of contained fluids from the sides of the facility

3.1.7

capping liner

material placed above the waste or contaminated material to prevent the ingress of water and the uncontrolled escape of fluids and/or gases

3.2 Abbreviations

For the purpose of this document, the abbreviations given in prEN ISO 10318:2000 and the following apply.

GBR-P: polymeric geosynthetic barrier

GBR-B: bituminous geosynthetic barrier

GBR-C: clay geosynthetic barrier

4 Required characteristics and corresponding methods of test

4.1 General

The main function of geosynthetic barriers used in the construction of solid waste storage and disposal sites, is to prevent the movement of fluids through the construction and to prevent the leachate of the stored materials to

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move into the surrounding ground. This includes the use of a geosynthetic barrier as a basal, side or capping liner. Damage during installation has not been addressed in this document.

4.2 Relevant characteristics

The characteristics and the test methods to be used are given in Table 1. The list of characteristics in Table 1 includes those relevant to all conditions of use and subject to harmonisation (H) (see Annex ZA), those relevant to all conditions of use and not subject to harmonisation (A), and those relevant to specific conditions of use and not subject to harmonisation (S).

The functions and conditions of use, corresponding with the characteristics, marked with “S” in Table 1, are specified in 4.3.

The manufacturer shall provide the data based on the results of tests specified in this standard and, where relevant, in accordance with 5.1.

The manufacturer shall provide information on how functioning joints can be made. Where products are jointed in the factory the water permeability and, if relevant, the strength of the joints shall be tested and data presented.

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Table 1 - Geosynthetic Barriers used in the construction of solid waste storage and disposal sites - Functions, function-related characteristics and test methods to be used

		Geosynthetic Barrier			Test methods			Remarks
Nr	Property to be tested	GBR-P	GBR-B	GBR-C	GBR-P	GBR-B	GBR-C	
	Physical properties							
1	Thickness	A	A	A	EN 1849-2	EN 1849-1	EN ISO 9863-1	
2	Mass per unit area	A	A	A	EN 1849-2	EN 1849-1	EN 14196	
	Hydraulic properties							
3	Water permeability (liquid tightness)	H	H	H	prEN 14150:2001	prEN 14150:2001	ASTM D 5887	
4	Gas permeability (gas tightness)	H	H	S	ASTM D 1434	ASTM D 1434	Annex C of this standard	see 4.3.2.
5	Swell Index	-	-	A	-	-	ASTM D 5890	
	Mechanical properties							
6	Tensile strength	H	H	H	EN ISO 527-1 and -3 or -4	EN 12311-1	EN ISO 10319	For GBR-P use EN ISO 527 Parts 1 and 3, test specimen type 5 at a speed of 100 mm/min. For reinforced GBR-P use EN ISO 527 Parts 1 and 4, specimen type 2, width 50 mm, at a speed of 5 mm per minute. Report in all cases the maximum strength measured according to the test method.
7	Elongation	A	A	A	EN ISO 527	EN 12311-1	EN ISO 10319	For GBR-P use EN ISO 527 Part 1 and 3, test specimen type 5 at a speed of 100 mm/min. For reinforced GBR-P use EN ISO 527 Parts 1 and 4, specimen type 2, width 50 mm, at a speed of 5 mm per minute. Elongation at maximum strength shall in all cases be calculated as defined in EN ISO 527-1:1993, 10.2, using grip separation measurement.
8	Static puncture	H	H	H	EN ISO 12236	EN ISO 12236	EN ISO 12236	
9	Bursting strength	S	S	S	prEN 14151:2001	prEN 14151:2001	prEN 14151:2001	This test apply to GBR-C only if they contain a polymeric or bituminous barrier element.

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Nr	Property to be tested	Geosynthetic Barrier			Test methods			Remarks
		GBR-P	GBR-B	GBR-C	GBR-P	GBR-B	GBR-C	
10	Tear strength	S	S	-	ISO 34	EN 12310-1	-	For GBR-P use method B, angle specimen (see Figure 2) without nick at a speed of 50 mm/min.
11	Friction direct shear	S	S	S	EN ISO 12957-1:2004	EN ISO 12957-1:2004	EN ISO 12957-1:2004	For determining the bonding strength of GBRs an internal shear or peel bond test may be applicable.
12	Friction inclined plane	S	S	S	EN ISO 12957-2:2004	EN ISO 12957-2:2004	EN ISO 12957-2:2004	
	Thermal properties							
13	Low temp behaviour (flexure)	S	S	-	EN 495-5	EN 1109	-	
14	Thermal expansion	A	A	-	ASTM D 696	-	-	
	Durability and chemical resistance							
15	Weathering	H	H	S	EN 12224	EN 12224	EN 12224	GBR-C: see 4.3.7
16	Micro organisms	A	A	A	EN 12225	EN 12225	EN 12225	
17	Oxidation	H	H	H	EN 14575	EN 14575	EN ISO 13438:2004	For the geotextile elements and reinforcement yarns of GBR-C barriers EN ISO 13438 is applicable.
18	Environmental stress cracking	H	-	S	ASTM D 5397 (appendix)	-	ASTM D 5397 (appendix)	GBR-C: Only applicable to polymeric membrane element of the GBR-C
19	Leaching (water soluble)	A	A	A	EN 14415	EN 14415	EN 14415	
20	Chemical resistance	A	A	A	EN 14414	EN 14414	EN 14414	
21	Wetting/drying	-	-	S	-	-	prCEN/TS 14417:2002	
22	Freezing / thaw	-	-	S	-	-	prCEN/TS 14418:2002	
23	Root penetration	S	S	S	prCEN/TS 14416:2002	prCEN/TS 14416:2002	prCEN/TS 14416:2002	
Relevancy: H : required for harmonisation; A : relevant to all conditions of use; S : relevant to specific conditions of use; - : not relevant								