

SLOVENSKI STANDARD

SIST EN 13493:2013

01-december-2013

Nadomešča:
SIST EN 13493:2005

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

Ta slovenski standard je istoveten z: **EN 13493:2013**

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 13493:2013 en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 13493:2013

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

EUROPEAN STANDARD

EN 13493

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2013

ICS 59.080.70; 91.100.50

Supersedes EN 13493:2005

English Version

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

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

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

This European Standard was approved by CEN on 23 May 2013.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

[SIST EN 13493:2013](https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013)

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviations	8
3.1 Terms and definitions	8
3.2 Abbreviations	9
4 Required characteristics and corresponding methods of test	9
4.1 General.....	9
4.2 Types of applications	9
4.2.1 General.....	9
4.2.2 Application 1: "Composite lining system"	9
4.2.3 Application 2: "Single lined system"	10
4.3 Relevant characteristics	11
4.4 Characteristics relevant to specific conditions of use	15
4.4.1 General.....	15
4.4.2 Gas permeability	15
4.4.3 Tear strength	15
4.4.4 Burst strength	15
4.4.5 Friction characteristics (direct shear and inclined plane tests)	15
4.4.6 Low temperature behaviour	15
4.4.7 Weathering	15
4.4.8 Resistance to wetting and drying	16
4.4.9 Freeze-thaw cycle resistance	16
4.4.10 Resistance to root penetration.....	16
4.5 Release of dangerous substances.....	16
5 Evaluation of conformity.....	16
5.1 Presentation of characteristics	16
5.2 Verification of values.....	16
5.3 Initial type tests.....	17
5.4 Factory production control.....	17
5.5 Inspection	18
6 Marking	18
Annex A (normative) Factory production control — Factory production control scheme	19
A.1 General.....	19
A.2 Product design.....	19
A.3 Production	19
A.3.1 Raw or incoming materials	19
A.3.2 Production process	19
A.4 Finished products.....	19
A.4.1 Raw or incoming materials	19
A.4.2 Alternative tests	22
A.4.3 Equipment	22
A.5 Provisions applicable to A.2, A.3 and A.4 (to be used where appropriate)	23
A.5.1 Records.....	23
A.5.2 Assessment of results	23
A.5.3 Traceability	23

A.5.4	Corrective action for non-conforming materials and products	23
A.5.5	Personnel	23
A.5.6	Quality management	23
Annex B	(normative) Durability of geosynthetic barriers	24
B.1	Introduction	24
B.1.1	Standards to which this annex is common	24
B.1.2	Mechanisms of degradation	24
B.1.3	Service life	25
B.1.4	Use of rework materials	25
B.2	Test requirements	25
B.2.1	General requirement	25
B.2.2	Requirements for repeat testing	25
B.2.3	Requirements for individual materials	26
B.3	Durability tests	27
B.3.1	Introduction	27
B.3.2	Weathering	27
B.3.3	Resistance to micro-organisms	29
B.3.4	Resistance to environmental stress cracking	29
B.3.5	Resistance to leaching	29
B.3.6	Resistance to oxidation	30
B.3.7	Chemical resistance	30
B.4	Evaluation tests and acceptance criteria	30
B.4.1	General	30
B.4.2	Evaluation by comparison of tensile properties	30
B.4.3	Evaluation by comparison of Oxidative Induction Time (OIT) values	31
B.4.4	Evaluation by change in mass	31
B.4.5	Evaluation by change in water permeability	31
Annex ZA	(informative) Clauses of this European Standard addressing the provisions of the EU	
	Construction Products Directive	32
ZA.1	Scope and relevant characteristics	32
ZA.2	Procedure for attestation of conformity of geosynthetic barriers	33
ZA.2.1	System of attestation of conformity	33
ZA.2.2	EC Certificate and Declaration of Conformity	34
ZA.3	CE marking and labelling	35
	Bibliography	39

Foreword

This document (EN 13493:2013) 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 January 2014, and conflicting national standards shall be withdrawn at the latest by January 2014.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13493:2005.

The following technical changes were introduced in comparison with the previous edition:

- The normative references were updated.
- Table 1 was revised.
- "Chemical resistance" was added to Clause 4.
- "Release of dangerous substances" was added to Clause 4.
- Annex A revised: "raw or incoming material" and Tables A.1 to A.3 were added.
- Annex B was revised.

ITeH STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

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 organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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.

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

EN 13493:2013 (E)**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 solid waste 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 1844, *Flexible sheets for waterproofing — Determination of resistance to ozone — Plastic and rubber sheets for roof waterproofing*

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*

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 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 12311-2, *Flexible sheets for waterproofing — Determination of tensile properties — Part 2: Plastic and rubber sheets for roof waterproofing*

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

EN 13362, *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 the construction of liquid waste disposal sites, transfer stations or secondary containment*
- EN 14150, *Geosynthetic barriers — Determination of permeability to liquids*
- EN 14151, *Geosynthetics — Determination of burst strength*
- EN 14196, *Geosynthetics — Test methods for measuring mass per unit area of clay geosynthetic barriers*
- EN 14414:2004, *Geosynthetics — Screening test method for determining chemical resistance for landfill applications*
- EN 14415, *Geosynthetic barriers — Test method for determining the resistance to leaching*
- CEN/TS 14416, *Geosynthetic barriers — Test method for determining the resistance to roots*
- CEN/TS 14417, *Geosynthetic barriers — Test method for the determination of the influence of wetting-drying cycles on the permeability of clay geosynthetic barriers*
- CEN/TS 14418, *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 14576, *Geosynthetics — Test method for determining the resistance of polymeric geosynthetic barriers to environmental stress cracking*
- EN 15382, *Geosynthetic barriers — Characteristics required for use in transportation infrastructure*
- EN 16416, *Geosynthetic clay barriers — Determination of water flux index — Flexible wall permeameter method at constant head*
- EN ISO 527-1:2012, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:2012)*
- EN ISO 527-3:1995, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets (ISO 527-3:1995)*
- EN ISO 527-4:1997, *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites (ISO 527-4:1997)*
- EN ISO 9862, *Geosynthetics — Sampling and preparation of test specimens (ISO 9862)*
- EN ISO 9863-1, *Geosynthetics — Determination of thickness at specified pressures — Part 1: Single layers (ISO 9863-1)*
- EN ISO 9864, *Geosynthetics — Test method for the determination of mass per unit area of geotextiles and geotextile-related products (ISO 9864)*
- EN ISO 10318:2005, *Geosynthetics — Terms and definitions (ISO 10318:2005)*
- EN ISO 10319, *Geotextiles — Wide-width tensile test (ISO 10319)*
- EN ISO 10320, *Geotextiles and geotextile-related products — Identification on site (ISO 10320)*

STANDARD PREVIEW
 iTeh (standards.iteh.ai)

SIST EN 13493:2013

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-1bb7caa6bd29/sist-en-13493-2013>

EN 13493:2013 (E)

EN ISO 10773, *Clay geosynthetic barriers — Determination of permeability to gases (ISO 10773)*

EN ISO 11358, *Plastics — Thermogravimetry (TG) of polymers — General principles (ISO 11358)*

EN ISO 12236, *Geosynthetics — Static puncture test (CBR test) (ISO 12236)*

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

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

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

ISO 34-1:2010, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces*

ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT)*

ASTM D696, *Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 °C and 30 °C With a Vitreous Silica Dilatometer*

ASTM D1434, *Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting*

ASTM D5890, *Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners*

3 Terms, definitions and abbreviations

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 10318:2005 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 (landfills), including facilities where solid waste is unloaded and stored 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 purposes of this document, the abbreviations given in EN ISO 10318:2005 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 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.

[SIST EN 13493:2013](https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013)

4.2 Types of applications

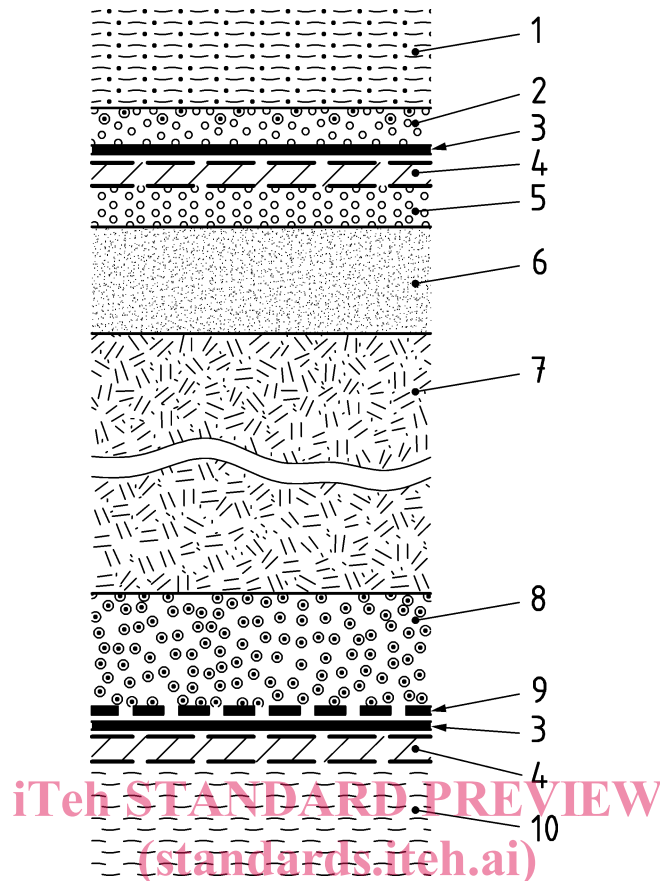
<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

4.2.1 General

The main function of geosynthetic barriers used in the construction of solid waste disposal sites is to prevent or reduce the flow of fluid through the structure.

4.2.2 Application 1: "Composite lining system"

Application where geosynthetic barriers are used as a composite lining system in the base and/or cover. Figure 1 shows a typical cross-section.

**Key**

- 1 top soil
 2 rain water collection layer <https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>
 3 geosynthetic barrier (GBR-P or GBR-B)
 4 geosynthetic barrier (GBR-C)
 5 gas drainage layer
 6 leveling layer
 7 waste body
 8 leachate collection system
 9 geotextile
 10 subgrade

SIST EN 13493:2013

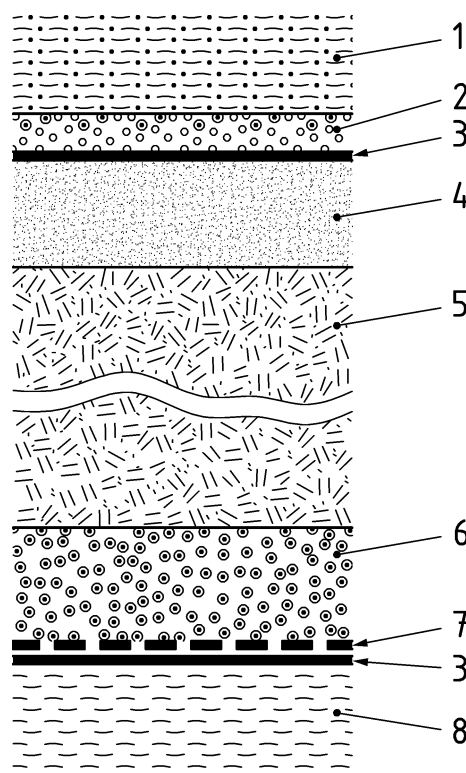
<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

fbb7caa6bd29/sist-en-13493-2013

Figure 1 — A geosynthetic barrier as a typical high performance composite lining system for municipal solid waste disposal sites

4.2.3 Application 2: "Single lined system"

Application where a single geosynthetic barrier is used in the base and/or cover. Figure 2 shows a typical cross-section.



iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 13493:2013

<https://standards.iteh.ai/catalog/standards/sist/76a22b38-9818-4473-9e86-fbb7caa6bd29/sist-en-13493-2013>

Key

- 1 top soil
- 2 rain water collection layer
- 3 geosynthetic barrier
- 4 leveling layer
- 5 waste body
- 6 leachate collection system
- 7 geotextile
- 8 subgrade

Figure 2 — A geosynthetic barrier as a single lined system for solid waste disposal sites

4.3 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 4.4.

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.