

<b>STN</b>	<b>Geosyntetické zábrany</b> <b>Vlastnosti požadované na použitie v konštrukcii</b> <b>retenčných nádrží, kontajnérov druhotných</b> <b>kvapalín (nad aj pod úrovňou terénu) a ďalších</b> <b>kontajnérov na chemikálie, znečistenú vodu a</b> <b>vyprodukované kvapaliny</b>	<b>STN</b> <b>EN 16993</b>  80 6226
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Geosynthetic barriers - Characteristics required for use in the construction of storage lagoons, secondary containment (above and below ground) and other containment applications for chemicals, polluted water and produced liquids

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

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**Geosynthetic barriers - Characteristics required for use in  
the construction of storage lagoons, secondary  
containment (above and below ground) and other  
containment applications for chemicals, polluted water  
and produced liquids**

Géomembranes et géosynthétiques bentonitiques -  
Caractéristiques requises pour l'utilisation dans la  
construction des bassins de retenue, enceintes de  
confinement secondaire (au-dessus et au-dessous du  
sol) et autres applications de confinement pour les  
produits chimiques, les eaux polluées et les liquides  
produits

Geosynthetische Dichtungsbahnen - Geforderte  
Eigenschaften für die Anwendung beim Bau von  
Speicherbecken, Auffangwannen (ober- und  
unterirdisch) und anderen Anwendungen für  
Chemikalien, verschmutztes Wasser und produzierte  
Flüssigkeiten

This European Standard was approved by CEN on 30 October 2017.

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.

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**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

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## **European foreword**

This document (EN 16993:2018) 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 September 2018, and conflicting national standards shall be withdrawn at the latest by December 2019.

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

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

For relationship with Regulation (EU) No 305/2011, 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, 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 16993:2018 (E)****Introduction**

This document 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 assessment and verification of constancy of performance (AVCP) including the factory production control.

This document can also be used by designers, end-users and other interested parties as a tool to define relevant and appropriate characteristics for specifications.

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 document refers to a geosynthetic barrier, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers.

This document 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 standardized - 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 construction expediency, or permanent, for the lifetime of the structure.

## 1 Scope

This European Standard specifies the characteristics of geosynthetic barriers, including polymeric geosynthetic barriers, clay geosynthetic barriers and bituminous geosynthetic barriers used as fluid barriers and separation layer in the construction of hazardous liquid containment and secondary containment around storage facilities for hazardous liquids and the appropriate test methods to determine these characteristics.

NOTE This document is not applicable to applications where one geosynthetic barrier is manufactured in direct contact with a second geosynthetic barrier in order to reduce the overall permeability of the barrier. Such “multicomponent” products are subject to the required characteristics for the relevant component.

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

This European Standard is not applicable to geotextiles or geotextile-related products as defined in EN ISO 10318-1.

This European Standard provides for the assessment and verification of constancy of performance (AVCP) of the product to this European Standard including factory production control procedures.

This European Standard defines characteristics to be considered with regard to the presentation of performance.

## 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 495-5:2013, *Flexible sheets for waterproofing — Determination of foldability at low temperature — Part 5: Plastic and rubber sheets for roof waterproofing*

EN 1109:2013, *Flexible sheets for waterproofing — Bitumen sheets for roof waterproofing — Determination of flexibility at low temperature*

EN 1110:2010, *Flexible sheets for waterproofing — Bitumen sheets for roof waterproofing — Determination of flow resistance at elevated temperature*

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EN 1427:2015, *Bitumen and bituminous binders — Determination of the softening point — Ring and Ball method*

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EN 1849-2:2009, *Flexible sheets for waterproofing — Determination of thickness and mass per unit area — Part 2: Plastic and rubber sheets*

EN 12224:2000, *Geotextiles and geotextile-related products — Determination of the resistance to weathering*

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EN 13251:2016, *Geotextiles and geotextile-related products — Characteristics required for use in earthworks, foundations and retaining structures*

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EN 13254:2016, *Geotextiles and geotextile-related products — Characteristics required for the use in the construction of reservoirs and dams*

EN 13255:2016, *Geotextiles and geotextile-related products — Characteristics required for use in the construction of canals*

EN 13256:2016, *Geotextiles and geotextile-related products — Characteristics required for use in the construction of tunnels and underground structures*

EN 13257:2016, *Geotextiles and geotextile-related products — Characteristics required for use in solid waste disposals*

EN 13265:2016, *Geotextiles and geotextile-related products — Characteristics required for use in liquid waste containment projects*

EN 14150:2006, *Geosynthetic barriers — Determination of permeability to liquids*

EN 14151:2010, *Geosynthetics — Determination of burst strength*

EN 14196:2016, *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 14415:2004, *Geosynthetic barriers — Test method for determining the resistance to leaching*
- CEN/TS 14416:2014, *Geosynthetic barriers — Test method for determining the resistance to roots*
- CEN/TS 14417:2014, *Geosynthetic barriers — Test method for the determination of the influence of wetting-drying cycles on the permeability of clay geosynthetic barriers*
- CEN/TS 14418:2014, *Geosynthetic Barriers — Test method for the determination of the influence of freezing-thawing cycles on the permeability of clay geosynthetic barriers*
- EN 14575:2005, *Geosynthetic barriers — Screening test method for determining the resistance to oxidation*
- EN 14576:2005, *Geosynthetics — Test method for determining the resistance of polymeric geosynthetic barriers to environmental stress cracking*
- EN 16416:2013, *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)*
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- EN ISO 1133-1:2011, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method (ISO 1133-1:2011)*
- EN ISO 1183-1:2012, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2012)*
- EN ISO 1183-2:2004, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method (ISO 1183-2:2004)*
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- EN ISO 3696:1995, *Water for analytical laboratory use — Specification and test methods (ISO 3696:1987)*
- EN ISO 9863-1:2016, *Geosynthetics — Determination of thickness at specified pressures — Part 1: Single layers (ISO 9863-1:2016)*
- EN ISO 9864:2005, *Geosynthetics — Test method for the determination of mass per unit area of geotextiles and geotextile-related products (ISO 9864:2005)*
- EN ISO 10318-1:2015, *Geosynthetics — Part 1: Terms and definitions (ISO 10318-1:2015)*
- EN ISO 10319:2015, *Geosynthetics — Wide-width tensile test (ISO 10319:2015)*
- EN ISO 10773:2011, *Clay geosynthetic barriers — Determination of permeability to gases (ISO 10773:2011)*

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EN ISO 12957-2:2005, *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 34-1:2015, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces*

ISO 11465:1993, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

ASTM D696, *Standard test method for coefficient of linear thermal expansion of plastics between -30 °C and 30 °C*

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

ASTM D4603, *Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer*

ASTM D5890, *Standard test method for swell index of clay mineral component of geosynthetic clay liners*

ASTM D7409, *Standard Test Method for Carboxyl End Group Content of Polyethylene Terephthalate (PET) Yarns*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**