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Geotextiles and geotextile-related products — Characteristics required for use in earthworks, foundations and retaining structures

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National foreword

This British Standard is the UK implementation of EN 13251:2014+A1:2015. It supersedes BS EN 13251:2014 which is withdrawn.

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Géotextiles et produits apparentés - Caractéristiques requises pour l'utilisation dans les travaux de terrassement, les fondations et les structures de soutènement

Geotextilien und geotextilverwandte Produkte - Geforderte Eigenschaften für die Anwendung im Erd- und Grundbau sowie in Stützbauwerken

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Foreword

This document (EN 13251:2014+A1:2015) 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of an identical text or by endorsement, at the latest by August 2015, and conflicting national standards shall be withdrawn at the latest by November 2016.

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 [A1⟩ EN 13251:2014 ⟨A1].

This document includes Amendment 1 approved by CEN on 2014-12-13.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1⟩ ⟨A1].

Annex D provides details of significant technical changes between this European Standard and the previous edition.

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 Regulation (EU) Nr. 305/2011.

For relationship with Regulation (EU) Nr. 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

This European Standard allows manufacturers to describe geotextiles and geotextile-related products 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 the assessment and verification of constancy of performance and factory production control.

This European Standard may also be used by designers, end-users and other interested parties to define which functions and conditions of use are relevant.

The term “product” used in this standard refers to a geotextile or geotextile-related product.

This European Standard is part of a series of standards, addressing the requirements for geotextiles and geotextile-related products when used in a specific application. Annex C provides guidance on how to select the appropriate standard.

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1 Scope

This European Standard specifies the relevant characteristics of geotextiles and geotextile-related products used in the construction of earthworks, foundations and retaining structures, and the appropriate test methods to determine these characteristics.

The intended use of these geotextiles or geotextile-related products is to fulfil one or more of the following functions: filtration, separation, and reinforcement. The separation function will always occur in conjunction with filtration or reinforcement, and hence will not be specified alone.

This European Standard is not applicable to geosynthetic barriers, as defined in EN ISO 10318.

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

NOTE Particular application cases may contain requirements regarding additional properties and – preferably standardised – test methods, if they are technically relevant.

This European Standard may be used to derive design values by taking into account factors within the context of the definitions given in EN 1997-1 (Eurocode 7), e.g. factors of safety. 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.

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

EN 12226, *Geosynthetics — General tests for evaluation following durability testing*

EN 12447, *Geotextiles and geotextile-related products — Screening test method for determining the resistance to hydrolysis in water*

[A1⟩ EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696)* ⟨A1]

EN ISO 9862, *Geosynthetics — Sampling and preparation of test specimens (ISO 9862)*

EN ISO 10318, *Geosynthetics — Terms and definitions (ISO 10318)*

EN ISO 10319, *Geosynthetics — Wide-width tensile test (ISO 10319)*

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

EN ISO 10321, *Geosynthetics — Tensile test for joints/seams by wide-width strip method (ISO 10321)*

EN ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics (ISO 1043-1)*

EN ISO 10722, *Geosynthetics — Index test procedure for the evaluation of mechanical damage under repeated loading — Damage caused by granular material (ISO 10722)*

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EN ISO 11058, *Geotextiles and geotextile-related products — Determination of water permeability characteristics normal to the plane, without load (ISO 11058)*

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

EN ISO 12956, *Geotextiles and geotextile-related products — Determination of the characteristic opening size (ISO 12956)*

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 13426-1, *Geotextiles and geotextile-related products — Strength of internal structural junctions — Part 1: Geocells (ISO 13426-1)*

EN ISO 13426-2, *Geotextiles and geotextile-related products — Strength of internal structural junctions — Part 2: Geocomposites (ISO 13426-2)*

EN ISO 13431, *Geotextiles and geotextile-related products — Determination of tensile creep and creep rupture behaviour (ISO 13431)*

EN ISO 13433, *Geosynthetics — Dynamic perforation test (cone drop test) (ISO 13433)*

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

ISO 10390, *Soil quality — Determination of pH*

ASTM D7409 — 07e1, *Standard Test Method for Carboxyl End Group Content of Polyethylene Terephthalate (PET) Yarns*

ASTM D4603 — 03(2011)e1, *Standard Test Method for Determining Inherent Viscosity of Poly(Ethylene Terephthalate) (PET) by Glass Capillary Viscometer*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 10318 and the following apply.

3.1.1
product
geotextile or geotextile-related product

3.1.2
specification
any document in which the work, functions and specific conditions of use of the product are described

3.1.3
rework material (RWM)
material that is generated in a process and capable of being reclaimed within the same process that generated it

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3.1.4
post-consumer material (PCM)
material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain

3.1.5
post-industrial material (PIM)
material diverted from the waste stream during a manufacturing process

3.2 Abbreviations

For the purposes of this document, the abbreviations given in EN ISO 1043-1 and EN ISO 10318 and the following apply.

— AR: aramid

— GCO-R: geocomposite reinforcement

4 Required characteristics and corresponding methods of test

4.1 General

The main functions of geotextiles and geotextile-related products used in the construction of earthworks, foundations and retaining structures are filtration, separation and reinforcement. If a drainage or erosion control system is integrated in the construction, the requirements of the appropriate standards shall also be fulfilled. As the separation function is always used in conjunction with another function, the separation function shall never be specified alone.

The specification shall define which functions and conditions of use are relevant (see Table 1). The producer shall provide the necessary data based on the requirements and test methods specified in this European Standard, as described in 5.1.

The characteristics, their relevance to the conditions of use, and the test methods to be used, are specified in Table 1. The list of characteristics in Table 1 includes those needed for regulatory purposes (H), those relevant to all conditions of use (A), and those relevant to specific conditions of use (S). The indication "–" means that the characteristic is not relevant for that function.

Where, for the same property, data for more than one function shall be provided, the following ranking order shall be observed: H overrules A, A overrules S, and S overrules "–".

The functions and conditions of use, corresponding with the S-coded characteristics in Table 1, are specified in 4.3.

Durability shall be assessed in accordance with the requirements of Annex B.

4.2 Selection of the appropriate standard in a specific application

Guidelines for the selection of the appropriate standard in a specific application are given in Annex C.

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Table 1 — Geotextiles and geotextile-related products used in the construction of earthworks, foundations and retaining structures – Functions, function-related characteristics and test methods to be used

Characteristic	Test method	Functions		
		Filtration	Separation	Reinforcement
(1) Tensile strength [b)]	EN ISO 10319	H	H	H
(2) Elongation at maximum load	EN ISO 10319	H	H	H
(3) Stiffness at 2 %, 5 % and 10 %	EN ISO 10319	–	–	S
(4) Tensile strength of seams and joints [c) d)]	EN ISO 10321	S	S	S
(5) Static puncture resistance (CBR test) [a), b)]	EN ISO 12236	S	H	H
(6) Dynamic perforation resistance (cone drop test) [a)]	EN ISO 13433	H	A	H
(7) Friction	EN ISO 12957-1; EN ISO 12957-2	S	S	S
(8) Tensile creep	EN ISO 13431	–	–	S
(9) Damage during installation resistance	EN ISO 10722	A	A	A
(10) Characteristic opening size	EN ISO 12956	H	H	–
(11) Water permeability normal to the plane (velocity index)	EN ISO 11058	H	H	S
(12) Durability	According to Annex B	H	H	H

Relevance of codes:

H: required for regulatory purposes

A: relevant to all conditions of use

S: relevant to specific conditions of use

"–": indicates that the characteristic is not relevant for that function.

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[a] Static puncture resistance may not be relevant for some types of products, e.g. GGR, GCO-R or GST.

[b] If the mechanical properties (tensile strength and static puncture) are coded “H” in this Table, the producer shall provide data for both. The use of only one, either tensile strength or static puncture, is sufficient in a tender specification.

[c] The strength of internal structural junctions of geocells shall be tested in accordance with EN ISO 13426-1.

[d] The strength of internal structural junctions of geocomposites shall be tested in accordance with EN ISO 13426-2.

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4.3 Characteristics relevant to specific conditions of use

4.3.1 Stiffness at 2 %, 5 % and 10 %

Data on stiffness are necessary for the reinforcement function if the deformation of the structure needs to be evaluated.

4.3.2 Tensile strength of seams and joints

Data on tensile strength of seams and joints are necessary for all functions if the product is to be mechanically jointed and if load is transferred across the seams and joints.

4.3.3 Static puncture

Data on static puncture or - as an alternative - on tensile strength, are necessary for the filtration function if required by the specification, i.e. when the site loading conditions are such that there is a potential risk of static puncture of the filter layer.

4.3.4 Friction characteristics

Data on friction characteristics are necessary for the functions separation and filtration when the product is used in a situation where a differential movement can take place between the product and adjacent material that may endanger the stability of the works. The friction characteristics can be measured, using site specific materials, by a direct shear test according to EN ISO 12957-1 or, in the case of loads up to 5 kPa, by an inclined plane test according to EN ISO 12957-2.

Friction behaviour with the adjacent construction materials, e.g. the soil or the geosynthetic barrier, should also be considered.

4.3.5 Tensile creep

Data on tensile creep may be used to give an indication of the resistance to sustained loading, when the product fulfils a reinforcement function.

4.3.6 Water permeability normal to the plane

Data on water permeability are necessary when the reinforced structure is subject to water flow.

4.4 Release of dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this European Standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: *http://ec.europa.eu/enterprise/construction/cpd-ds/*.

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5 Assessment and verification of constancy of performance (AVCP)

5.1 General

The compliance of geotextiles and geotextile-related products with the requirements of this European Standard and with the declared values shall be demonstrated by:

— Product type determination (PTD);

— Factory production control (FPC) by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the product.

5.2 Presentation of characteristics

The characteristics specified in Table 2, except for durability, shall be expressed as mean values and tolerance value(s) corresponding to the 95 % confidence level. The values expressed may be verified using the procedure referred to in 5.5.

NOTE The 95 % confidence level corresponds to the mean value minus (and/or plus) 1,0 tolerance value(s).

Information on durability shall be expressed in accordance with Annex B.

5.3 Product type determination (PTD)

PTD tests shall be carried out by the manufacturer to define the values of the properties to be declared for the product to satisfy the requirements of this European Standard.

PTD tests shall also be carried out on existing products when a change in the basic materials or manufacturing procedures affects the declared properties or the use of a product. In these cases, the PTD tests are those for the properties which are affected or shall be confirmed and new properties introduced by a change of use.

The tests to be conducted shall be reference tests as specified in this European Standard and shall be selected from the characteristics specified in Table 2, consistent with the product's intended use:

Table 2 — Characteristics required for PTD and AVCP

Characteristic	Functions
Tensile strength	Filtration, separation, reinforcement
Elongation at maximum load	Filtration, separation, reinforcement
Static puncture resistance (CBR test)	Separation, reinforcement
Dynamic perforation resistance (cone drop test)	Filtration, reinforcement
Characteristic opening size	Filtration, separation
Water permeability normal to the plane	Filtration, separation
Durability [a]	Filtration, separation, reinforcement
[a] For the durability aspects, see Table 1 and Annex B.	

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The results of PTD tests shall be recorded and be available for inspection.

The sample for the PTD tests shall be drawn according to EN ISO 9862 from a normal production run using the same materials and forming processes as used for the full production process. The size of the sample shall be big enough to allow the determination of the characteristics specified in Table 2. Handmade samples, short trial batches and other development prototypes may be tested by the same methods, but shall not be used for establishing characteristic values in PTD tests.

5.4 Factory production control (FPC)

A FPC scheme shall be established and documented in a manual prior to a product type being placed on the market. Subsequently, any fundamental changes in raw materials and additives, manufacturing procedures or the control scheme that affect the properties or use of a product shall be recorded in the manual.

The manual shall include the FPC procedures relevant to the declared properties, as confirmed by the product type determination.

The FPC procedures shall consist of a permanent internal production control system to ensure that such products comply with this European Standard and that the measured values conform to the declared values.

Annex A (normative) lists all the items that shall be considered to determine the appropriate control measures for a product. The manufacturer shall establish control measures for the relevant items and record them in his FPC manual. These measures shall be described in detail, including the type of tests to be performed and the frequency of these tests (see also A.2).

When relevant, the procedure given in A.2.3 shall be used to check the conformity of the product for one or more characteristics.

5.5 Verification of values

If verification of values is required, the compliance of characteristics with the values defined in 5.2 shall be based on measurements made on two representative samples (A and B), taken from two different rolls. Sampling shall be made in accordance with EN ISO 9862.

For on-site quality control purposes CEN/TR 15019 may also be considered.

The characteristics given in Table 2 shall be measured in accordance with the corresponding European Standards on specimens prepared from sample A.

If the test result(s) for a particular characteristic is (are) within the tolerance value(s) given by the manufacturer, the product is accepted as complying with respect to this characteristic.

If the test result(s) for a particular characteristic is (are) outside 1,5 times the tolerance value(s), the product does not comply with respect to that characteristic. If the test result(s) for a particular characteristic is (are) within 1 and 1,5 times the tolerance value(s), specimens prepared from sample B shall be tested.

If the test result(s) of the sample B specimens for the same characteristic is (are) within the given tolerance value(s), the product is accepted as complying with respect to that characteristic. If the test result(s) is (are) outside the tolerance value(s), the product is not accepted.

5.6 Initial inspection of factory and of FPC

Initial inspection of factory and of FPC shall be carried out when the production process has been finalized and in operation. The factory and FPC documentation shall be assessed to verify that the requirements of 5.4 and Annex A are fulfilled.

During the inspection, it shall be verified that:

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