BRITISH STANDARD

BS EN 13251:2001

Incorporating Amendment No. 1

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

The European Standard EN 13251:2000, with the incorporation of amendment A1:2005, has the status of a British Standard

ICS 59.080.70; 93.020

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National foreword

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The start and finish of text introduced or altered by CEN amendment is indicated in the text by tags ▶A1⟩ ⟨A1◀. Tags indicating changes to CEN text carry the number of the amendment. For example, text altered by CEN amendment A1 is indicated by ▶A1⟩ ⟨A1◀.

The UK participation in its preparation was entrusted to Technical Committee B/553, Geomembranes and geotextiles, which has the responsibility to:

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English version

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

(includes amendment A1:2005)

Géotextiles et produits apparentés – Caractéristiques requises pour l'utilisation dans les travaux de terrassement, foundations et structures de soutènement
(inclut l'amendement A1:2005)

Geotextilien und geotextilverwandte Produkte – Geforderte Eigenschaften für die Anwendung in Erd- und Grundbau sowie in Stützbauwerken
(enthält Änderung A1:2005)

This European Standard was approved by CEN on 18 November 2000; amendment A1:2005 approved by CEN on 15 December 2004.

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by June 2001, and conflicting national standards shall be withdrawn at the latest by September 2002.

This European Standard 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 standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document (EN 13251:2000/Al :2005) has been prepared by Technical Committee CEN/TC 189 "Geosynthetics", the secretariat of which is held by IBN.

This Amendment to the European Standard EN 13251:2000 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2005, and conflicting national standards shall be withdrawn at the latest by July 2005.

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 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 evaluation of conformity and factory production control.

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

Performance tests for several characteristics are still under study and will be included when the standard is revised.

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. In annex C guidance is given on how to select the appropriate standard.

1 Scope

This European Standard specifies the relevant characteristics of geotextiles and geotextile-related products used in the construction of railways, 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 is always used in conjunction with filtration or reinforcement, accordingly separation will never be specified alone.

This standard is not applicable to geomembranes.

This standard provides for the evaluation of conformity of the product to this European Standard and for factory production control procedures.

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

NOTE 1 Particular application cases or national specifications may contain requirements regarding additional properties and - preferably standardised - test methods, if they are technically relevant and not conflicting with European Standards.

NOTE 2 This European Standard may be used to derive design values by taking into account factors within the context of the definitions given in Eurocode 7 (ENV 1997-1), 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

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are quoted 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 918	Geotextiles and geotextile-related products - Dynamic perforation test (cone drop test)
EN 963	Geotextiles and geotextile-related products - Sampling and preparation of test specimens
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

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Full document details: BS EN 13251:2001

ENV 12447	Geotextiles and geotextile-related products - Screening test method for determining the resistance to hydrolysis
EN ISO 1043-1	Plastics - Symbols and abbreviated terms - Part 1: Basic polymers and their special characteristics (ISO 1043-1:1997)
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 10321	Geotextiles - Tensile test for joints/seams by wide-width method (ISO 10321:1992)
▌A1⟩ EN ISO 10390: 1994	Soil quality - Determination of pH ⟨A1▌
ENV ISO 10722-1	Geotextiles and geotextile-related products - Procedure for simulating damage during installation - Part 1: Installation in granular materials (ISO 10722-1:1998)
EN ISO 11058	Geotextiles and geotextile-related products – Determination of water permeability characteristics normal to the plane, without load (ISO 11058:1999)
EN ISO 12236	Geotextiles and geotextile-related products - Static puncture test (CBR-test) (ISO 12236:1996)
EN ISO 12956	Geotextiles and geotextile-related products Determination of the characteristic opening size (ISO 12956:1999)
prEN ISO 12957-1: 1997	Geotextiles and geotextile-related products - Determination of the friction characteristics- Part 1: Direct shear test (ISO/DIS 12957-1:1997)
prEN ISO 12957-2: 1997	Geotextiles and geotextile-related products - Determination of the friction characteristics - Part 2: Inclined plane test (ISO/DIS 12957-2:1997)
ENV ISO 12960	Geotextiles and geotextile-related products - Screening test method for determining the resistance to liquids (ISO/TR 12960:1998)
EN ISO 13427	Geotextiles and geotextile-related products - Abrasion damage simulation (sliding block test)
EN ISO 13431	Geotextiles and geotextile-related products - Determination of tensile creep rupture behaviour (ISO 13431:1999)
CR ISO 13434	Guidelines on durability of geotextiles and geotextile-related products
ENV ISO 13438	Geotextiles and geotextile-related products - Screening test method for determining the resistance to oxidation (ISOITR 13438:1999)
ISO 10318	Geotextiles - Vocabulary

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions of ISO 10318 apply. The term "product" used in this standard refers to a geotextile or geotextile-related product. Furthermore the following terms and definition apply:

3.1.1
specification

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

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3.2 Abbreviations

For the purposes of this European Standard the following abbreviations from EN ISO 1043-1 apply:

PA: polyamide
PE: polyethylene
PET: polyethylene terephthalate (polyester)
PP: polypropylene

Furthermore the following abbreviations apply:

MD: machine direction
CMD: cross machine direction

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 railways 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 (see annex C).

The characteristics, their relevancy to the conditions of use, and the test methods to be used, are given in Table 1. The list of characteristics in Table 1 includes those essential to harmonisation(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 characteristics, marked with "S" in Table 1, are specified in 4.2. As the separation function is always used in conjunction with another function, the separation function shall never be specified alone.

The producer of the geotextile or geotextile-related product shall provide the data based on the results of tests specified in this standard, as described in 5.1.

For the assessment of durability aspects the rules described in Annex B shall be observed.

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Table 1 - Geotextiles and geotextile-related products used in the construction of railways - Functions, function-related characteristics and test methods to be used

Characteristic	Test method	Functions		
		Filtration	Separation	Reinforcement
(1) Tensile strength "	EN ISO 10319	H	H	H
(2) Elongation at maximum load	EN ISO 10319	A	A	H
(3) Tensile strength of seams and joints	EN ISO 10321	S	S	S
(4) Static puncture (CBR test) [a]	EN ISO 12236	S	H	H
(5) Dynamic perforation resistance (cone droptest) [a]	EN 918	H	A	H
(6) Abrasion	EN ISO 13427	S	S	S
A1 (7) Compressive creep – EN 1897 A1	prEN ISO 12957-1:1997 and rEN ISO 12957-2:1997	S	S	A
(8) Tensile creep	EN ISO 13431	--	--	S
(9) Damage during installation	ENV ISO 10722-1	A	A	A
(10) Characteristic opening size	EN ISO 12956	H	A	--
(11) Water permeability normal to the plane	EN ISO 11058	H	A	A
(12) Durability	According to annex B	H	H	H
(12.1) Resistance to weathering	EN 12224	A	A	A
(12.2) Resistance to chemical ageing	ENV ISO 12960 or ENV ISO 13438, ENV 12447	S	S	S
(12.3) Resistance to microbiological degradation	EN 12225	S	S	S

Relevancy:

H: required for harmonization
A: relevant to all conditions of use
S: relevant to specific conditions of use
"--": indicates that the characteristic is not relevant for that function.

[a] It should be considered that this test may not be applicable for some types of products, e. g. geogrids.
[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 the specification.

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4.2 Characteristics relevant to specific conditions of use

The specification shall define which functions and conditions of use are relevant (see Table 1). The producer of the product shall provide the necessary data based on the requirements and test methods described in this standard.

The list of characteristics in Table 1 includes those required by the Mandate (H), those relevant to all conditions of use (A), and those relevant to specific conditions of use (S). These specific conditions of use are listed from 4.2.1 to 4.2.3.

4.2.1 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.

4.2.2 Static puncture

Data on static puncture are necessary for the function filtration if required by the specification. When the site loading conditions are such that there is a potential risk of static puncture of the filter, data on static puncture or, as an alternative, on tensile strength, shall be supplied.

4.2.3 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 prEN ISO 12957-1:1997 or, in the case of loads up to 50 kPa, by an inclined plane test according to prEN ISO 12957-2:1997.

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

5 Evaluation of conformity

5.1 Presentation of characteristics

The characteristics specified in Table 2, except for durability, expressed as mean values and tolerance value(s) corresponding to the 95% confidence level, shall be given by the manufacturer, based on the statistical interpretation of his internal quality control measurements. Information on durability shall be expressed in accordance with the guidelines of Annex B.

5.2 Verification of values

The marking and labelling of the rolls and of the products shall be checked. The marking of the products shall be according to EN ISO 10320.

A1 NOTE This method should not be used for on-site control purposes. On-site control procedures are described in CEN/TR 15019. A1

The compliance of characteristics with the values defined in 5.1 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 963.

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

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Full document details: BS EN 13251:2001

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.

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

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.

5.3 Initial type tests

Initial type 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 standard.

Initial type 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 initial type 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 standard and shall be selected from the characteristics specified in Table 2, consistent with the product's intended use:

Table 2 - Characteristics required for initial type testing and evaluation of conformity

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

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

The sample for the type tests shall be drawn according to EN 963 from a normal production run using the same materials and forming processes as 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 type tests.

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5.4 Factory production control

A factory production control 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 factory production control procedures relevant to the declared properties, as confirmed by the initial type tests.

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

Annex A (normative) lists all the items that shall be considered to determine which is appropriate for the control exercised for a product. The manufacturer shall establish the applicable items and record them in his factory production control manual. [A1⟩ The tasks of the manufacturer shall be described in detail including the type of tests to be performed and the frequency of these tests (see also Annex A, Clause A.2). ⟨A1]

When relevant, the procedure given in 5.2 shall be used to check the conformity of the product for one or more characteristics.

5.5 Inspection

[A1⟩ Inspection of the factory and of the factory production control shall be made not less than once a year, given constant production conditions, on the provisions contained in Clause 5.4 and Annex A. The inspection shall include an initial inspection of the factory and a continuous surveillance, assessment and approval of the factory production control, where required. The single steps of this inspection are specified in Annex A, Clause A.2. ⟨A1]

6 Marking

The manufacturer shall clearly and indelibly mark the geotextile or geotextile-related product with the information specified in EN ISO 10320.

NOTE For CE marking see ZA.3.

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Annex A
(normative)

A1 Factory Production Control

A.1 Scheme of factory production control

The items to be addressed in the factory production control manual relating to the system of control determined from Clause 5.4, are given in Clause A.1. The single steps of factory production control are addressed in the checklist (A.2).

NOTE Manufacturers operating a quality system conforming to EN ISO 9001:2000 are presumed to meet requirements of this Annex A.

A.1.1 Product design

A.1.1.1 The manufacturer shall describe how product design requirements and criteria are identified, checked, controlled and updated to be unambiguous and relevant to the use of the product and its specification.

A.1.1.2 The manufacturer shall describe the communication of the product design to the internal production departments or to external subcontractors.

A.1.2 Production

A.1.2.1 Raw or incoming materials: the manufacturer shall define the acceptance criteria of raw or incoming materials and the procedures that he operates to ensure that these are met.

A.1.2.2 Production process: the relevant features of the plant and production process shall be defined giving the frequency of the inspections, checks and tests, together with the values or criteria required, both on equipment and on work in the process. The actions to be taken when control values or criteria are not obtained, shall be recorded. These records shall be available for inspection by relevant parties.

A.1.3 Finished products

A.1.3.1 Tests on the finished product: the size of the samples and the frequency of sampling, together with the results obtained, shall be recorded. These records shall be available for inspection by relevant parties.

A.1.3.2 Alternative tests: where alternative tests to the reference tests are used, details of the alternative tests and procedures together with their correlation with the reference tests shall be recorded and shall be made available upon request from a relevant party.

A.1.3.3 Equipment: test equipment having an influence on test results shall be calibrated to traceable national or international standards.

The manufacturer shall have or have available the installations, equipment and personnel which enable him to carry out the necessary verifications and tests. He may meet this requirement by concluding a subcontracting agreement with one or more organisations or persons having the necessary skills and equipment.

The manufacturer shall calibrate or verify measuring or test equipment and maintain it in good operating condition, whether or not it belongs to him, with a view to demonstrating conformity of the product with its technical specification.

The appropriate calibrations shall be carried out with defined measuring and test instruments according to standards or manufacturer's test procedures.

The equipment shall be used in conformity with the specification or the test reference system to which the specification refers. A1

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