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Geosynthetics — Installing and retrieving samples in the field for durability assessment

Géosynthétiques — Installation et prélèvement d'échantillons sur le terrain pour l'évaluation de la durabilité

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 189, *Geosynthetics*, in collaboration with ISO Technical Committee TC 221, *Geosynthetics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 13437:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

— The standard has been modified to cover all geosynthetics, rather than only geotextiles. The specific references to individual polymer types have been removed to make the standard cover all geosynthetic products.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Geosynthetics — Installing and retrieving samples in the field for durability assessment

1 Scope

This document specifies a method for the on-site installation and retrieval of geosynthetic samples, irrespective of the particular degradation mechanisms to which they are exposed.

The method is also appropriate to test for mechanical damage, much of which occurs during installation, and to provide an owner with information about the state of the geosynthetic product in their structure.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

ISO 10318-1, *Geosynthetics — Part 1: Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10318-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
control specimen
test specimen taken from the material delivered on site before its installation in the structure

3.2
testing sample
sample installed during construction for the purpose of installation damage or degradation assessment

3.3
retrieval sample
either *testing sample* (3.2) or sample of in-service materials retrieved after a predetermined time

4 Principle

The properties of the geosynthetic after a certain period in service (used material) are compared to the same properties determined on control specimens (control material). For determining installation damage, the sample can be retrieved immediately after installation.

5 Test method

5.1 Identification of the initial conditions

The following information shall be indicated:

— identification and description of the structure;

— description of the geosynthetic environment;

— identification and characteristics of the geosynthetics with testing standard references and number of samples and their dimensions.

NOTE For each of the above, examples of suitable form are given in Annex A where possible variation about the mean value can be given.

5.2 Durability testing samples

5.2.1 The number of samples is determined by the dimensions of the structure, the physical and chemical variations in the environment in which the geosynthetic is installed and the repercussions that a failure of the geosynthetic function would cause.

5.2.2 A certain number of samples can be retrieved at different stages. The number of retrievals depends on the expected service life of the geosynthetic. The following schedule shall be observed unless otherwise agreed:

— prepare durability testing samples and take control samples on delivery of material;

— make a first retrieval directly following construction;

— make a second retrieval after 10 years;

— then make a retrieval every 20 years or less if the results obtained command an earlier retrieval, or if major environmental factors are known to have changed;

— make a final retrieval on completion of service life.

Thus three retrievals are needed for a 30-year expected service life, and eight retrievals for a 120-year expected service life.

5.2.3 The samples shall be subjected to the same physical and chemical environments as the ones to which the geosynthetic is exposed in the structure. As far as possible, this also includes mechanical stresses and hydraulic features.

5.2.4 The dimensions of the durability testing samples shall be in accordance with the tests which will be conducted on the samples.

5.2.5 Report the following:

— description, origin and numbering of the samples;

— date of installation and exact location in the structure (drawing);

— retrieval schedule.

5.3 Preparation of control specimens

Take control specimens of the geosynthetic from the material before installation. The control specimens shall be taken as close as possible to the material used for the durability testing samples.

The dimension of the control specimens is identical to the dimension of durability testing samples. Their number is equal to the number of scheduled retrievals.

The specimens shall be taken in accordance with ISO 9862.

Avoid folding or cutting if possible. However, if it is essential, the specimens shall be folded or cut in parts parallel to the machine direction or to the main tensile strength direction. A copy of the geosynthetic identification form (see Annex A) with copy of product delivery reference label is to be placed inside each bag. The specimens should be kept in a depository at a temperature between 0 °C and 20 °C and relative humidity of 50 % to 65 %, with no condensation.

5.4 Retrieval of samples

There are two possible retrieval situations:

— durability testing samples have been installed during construction, in which case the operation is simply to retrieve the specimens, or

— no such provisions were made and it is necessary to sample a piece of geosynthetic in service.

In the second case, the selection of the location for sampling is dependent on several parameters such as accessibility, disturbance of traffic and cost. If a choice exists, the most interesting areas are where there is local deformation or differential settlement in the facing of the structure or on the road surface, or indications of water leakage.

The retrieval of samples can impair the stability of structures and/or the mechanical and hydraulic functionality, hence a detailed analysis of the position of samples within the structure and of the retrieval operations should be carried out. Also, a procedure for repair of the hole left in the geosynthetic shall be defined.

In all cases:

— perform the sampling carefully in order to avoid any damage to the product. The excavation operation may begin with a mechanical digger but shall be stopped at a distance before reaching the geosynthetic. This distance should be equal to the minimum earth cover specified during the installation process. Continue the work manually with shovel and trowel to remove the remaining soil gently over a surface area of 1 m^2;

— take a sample of soil or other material in contact with the geosynthetic to conduct the relevant tests (for example pH, chemical analysis, mechanical characteristic, etc.);

— photograph the site and report the visual appearance of the geosynthetic, with particular attention to holes, tears, root penetration and presence of water;

— cut the sample along the sides by appropriate means, lift it carefully and place it flat into the transportation media. The transportation media should be able to prevent any degradation, chemical reaction or desiccation and should keep the sample as close as possible to the conditions as dug out.

The retrieved samples shall be tested as soon as possible after retrieval to prevent possible changes:

— during transportation, care shall be given not to damage the samples;

— label the samples with the date, structure reference and reference number and send them to the laboratory.

NOTE In particular cases, it can be interesting to take a core sample of geotextile with its surrounding soil medium to analyse further any clogging of the geotextile.

5.5 Testing and analysis

5.5.1 Testing on retrieval samples

Examine the geosynthetic visually, with particular attention to holes (size and number) and tears.

Process the samples on site if necessary.

Conduct all tests which are necessary in a laboratory.

5.5.2 Testing on retrieval samples and control specimens

The following tests can be performed:

— wide-width tensile test (in accordance with ISO 10319);

— examination by scanning electron microscopy to reveal possible chemical or microbiological attack, surface degradation or environmental stress cracking.

NOTE One or several tests relevant to the function of the geosynthetics can be added.

Report all results of these tests with those obtained on control specimens.

6 General report

The general report shall include:

a) the identification of the initial conditions (see 5.1);

b) the retrieval operation (see 5.4), including date of sampling and dimensions of samples;

c) the laboratory report including the sample;

d) reference to this document, i.e. ISO 13437:2019;

e) the method used;

f) the result(s), including a reference to the clause which explains how the results were calculated;

g) any deviations from the procedure;

h) any unusual features observed;

i) the date of the test (see 5.5);

j) detail of unpredictable conditions not described in this document, and all detail about any incident that could influence the results.

The organization in charge of monitoring the structure shall add its comments and conclusions.

Annex A
(informative)

Identification forms for structure, environment and geosynthetic

Table A.1 — Form 1/3 Structure

XYZ company	Civil engineering structure using a geosynthetic product	Form 1/3 STRUCTURE
Structure reference:		
Exact location of the structure:		
Description of the structure:		
Design service life:		
Function(s) of the geosynthetic:		
Location of the geosynthetic in the structure (drawing):		
Loads		
Mechanical:		
Hydraulic:		
Remarks		
Date:	Name:	

Table A.2 — Form 2/3 Environment

XYZ company	Civil engineering structure using a geosynthetic product	Form 2/3 ENVIRONMENT
Structure reference: …… …… ……		
Soils in contact with the geosynthetic Nature: in place ……or Backfill …… Mechanical characteristics: Sieve: d_{95}……% (75 µm)……% (2 µm)…… Atterberg limits…… Physico–chemical characteristics: Water content…… pH …… Organic matter:…… Other chemicals: …… Temperature: …… Remarks: …… …… **Other environmental factors** Sunlight exposure: …… …… Water flow: …… …… **Remarks** …… …… …… **Give reference to standards**:……		
Date: ……	Name: ……	

Table A.3 — Form 3/3 Geosynthetic

XYZ company	Civil engineering structure using a geosynthetic product	Form 3/3 GEOSYNTHETIC

Structure reference: .....

.....

.....

Geosynthetic description

Supplier / Manufacturer: .....

Product name / Type / Description: .....

.....

Reference: .....

Description and nature of constituents (with chemical names):

1) .....

.....

2) .....

.....

3) .....

.....

PROPERTIES (NOMINAL / MESURED) Give reference to standards

Mechanical characteristics

Tensile strength: .....

Elongation: .....

Tensile modulus: .....

Hydraulic characteristics

Mass per unit length or unit area: .....

Linear density of fibres and yarns: .....

Molecular parameters (solution viscosity): .....

.....

Density: .....

Infrared spectrometry: .....

Differential scanning calorimetry: .....

Remarks

.....

.....

Reports in enclosures: .....

.....

Date:	Name: .....