SLOVENSKI STANDARD
SIST EN 1897:2001

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Nadomeġļ a:
SIST ENV 1897:1999

Geotekstilije in geotekstilijam sorodni izdelki - Ugotavljanje lastnosti lezenja pri tlaļ enju

Geotextiles and geotextile-related products - Determination of the compressive creep properties

Geotextilien und geotextilverwandte Produkte - Bestimmung des Kriechverhaltens unter Druckbeanspruchung

Géotextiles et produits apparentés - Détermination des propriétés de fluage en compression

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59.080.70 Geotekstilije Geotextiles

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EUROPEAN STANDARD

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Geotextiles and geotextile-related products - Determination of the compressive creep properties

Géotextiles et produits apparentés - Détermination des propriétés de fluage en compression

Geotextilien und geotextilverwandte Produkte - Bestimmung des Kriechverhaltens unter Druckbeanspruchung

This European Standard was approved by CEN on 9 June 2001.

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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 Management Centre has the same status as the official versions.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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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of an identical text or by endorsement, at the latest by January 2002, and conflicting national standards shall be withdrawn at the latest by January 2002.

This European Standard replaces ENV 1897:1996.

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.

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1 Scope

This European Standard specifies index test methods for determining the compressive behaviour of geotextiles and geotextile-related products.

The test specimens can be subjected either to normal compressive loading or to a combination of normal compressive loading and shear loading. Products which are sensitive to shear failure, i.e. which have a columnar or cuspated structure, should be tested with both normal and shear loads applied (see clause 6), all other products can be tested with a normal load only (see clause 5).

The tests are carried out with the specimen dry or immersed in water.

2 Normative References

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate points 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).

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EN 963	Geotextiles and geotextile-related products - Sampling and preparation of test specimens.
EN 964-1	Geotextiles and geotextile-related products - Determination of thickness at specified pressures - Part 1 : Single layers
ISO 554	Standard atmospheres for conditioning and/or testing – Specification.
ISO 3696	Water for analytical laboratory use - Specification and test methods

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3 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1
thickness
the distance, in millimetres, between the two rigid plates in contact with the specimen at any stage in the test (see Figures 1 and 2).

3.2
compression creep (Δt_g)
time dependent change in thickness of a material subjected to a constant compressive load after the initial compression (t_o) of the specimen.

3.3 initial thickness(t_i)
the thickness, in millimetres, of the specimen when subject to an applied normal stress of 5 kPa, when measured in accordance with EN 964-1.

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3.4
compressive strain (ε):
the time dependent change in thickness, expressed as a percentage of the initial thickness.

3.5
initial compression (t_o)
the change in thickness which occurs immediately after the specimen is loaded; the difference between the initial thickness and the thickness measured at 1 min (normal loading only) or 4 min (normal and shear loading).

3.6
compressive creep collapse
sudden increase in the rate of change in thickness of a specimen subject to a constant compressive load.

4 Test specimens

4.1 Sampling

Take specimens in accordance with EN 963.

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4.2 Number and dimensions of test specimens

Cut eight specimens from the test sample for each test procedure to be followed; a new specimen is required for each test.

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The size of each specimen shall satisfy the following criteria:

- the specimen shall be square and have a minimum size of 100 mm x 100 mm (see Figure 1);
- if the specimen has a structure in which loading is resisted at defined points or areas, then the loading plate shall cover at least three of these points or areas in both directions (see Figure 2);
- specimens shall be cut with the sides parallel to the length and width of the sample.

4.3 Conditioning

The test specimens shall be conditioned and the tests conducted in the standard atmosphere for testing, i.e. at a relative humidity of (65 ± 5) % and a temperature of (20±2) °C (according to ISO 554). The test specimens can be considered to have been conditioned when the change in mass of the test specimen in successive weighings made at intervals of not less than 2 h does not exceed 0,25 % of the mass of the test specimen.

The test shall be carried out with the specimen immersed in water, where any part of the geotextile or geotextile-related product contains a hydrophilic polymer. Where the test is to be carried out with the specimen immersed in water, the specimen shall be soaked in water for 24 h prior to the test. The water shall be maintained at a temperature of (20±2) °C. The water to be used shall be deionised water according to ISO 3696.

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5 Normal compressive load method

5.1 Principle

The geotextile specimen is placed on the fixed base of a compression machine with an upper loading plate, the vertical compressive load is applied and the change in thickness is recorded with time. The vertical compressive load is applied to the specimen for a period of 1000 h with greater or lesser times by agreement.

5.2 Apparatus

5.2.1 Compression testing machine.

A compression testing machine with a vertical travel greater than the initial thickness of the specimen, shall be used. It shall be capable of sustaining the applied stress to within 1% accuracy for the duration of the test.
The compressive stress may be applied mechanically, pneumatically, or hydraulically. Where hydraulic or pneumatic loading systems are used, the stress applied shall be constant for the duration of the test.The loading device, however, shall be capable of applying the full stress in one controlled step, i.e. without significant impact, within a period of 60 s.

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Some systems may use dead weights to apply the stress. In systems using dead weights the loading system shall be fully supported while being assembled such that no load is applied to the specimen until the support is smoothly released (see Figure 3).
The compression testing apparatus shall include a fixed base plate and a parallel moveable top plate, both with a flat steel surface. The dimensions of the top plate shall be at least equal to those of the specimen and its thickness shall be such that it will result in a normal pressure of not greater than 5 kPa to the specimen (see Figure 2).

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5.2.2 Specimen container

If the test is to be carried out with the specimen immersed in water, a container to keep the specimen immersed and at a constant temperature shall be used. The water level in the container shall cover the specimen but the height of water above the specimen shall not exceed 25 mm.

5.2.3 Thickness measurement

A means of measuring the mean thickness of the specimen to a precision of 0,02 mm shall be used. Unless measurements are taken at the centre of the specimen, measurements shall be taken at a minimum of three equally spaced points. If three or more measurement points are used, the thickness is the mean of the values recorded.

5.2.4 Timer

Time shall be recorded throughout the test period.

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5.3 Test procedure

Measure the initial thickness of the sample in accordance with EN 964-1, using a normal stress of 5 kPa.

Ensure that the specimen is placed symmetrically on the base plate and covered with the top plate.

Apply the load needed to give the required normal compressive stress in less than 60 s.

The normal stresses to be applied shall be as follows:

20 kPa, 50 kPa, 100 kPa and 200 kPa

A new specimen shall be used for each test, two specimens shall be tested at each of the specified stresses.

Record the thickness of the specimen at the following time intervals after the application of the test stress:

1 min, 2 min, 4 min, 15 min, 30 min, 60 min,
2 h, 4 h, 8 h, 24 h,
and 2 days, 4 days, 7 days, 14 days, 28 days, 42 days.

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NOTE The test may be terminated when the recorded thickness of the specimen is less than 10% of the nominal thickness.

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Repeat the test on the other specimens. Carry out calculations as defined in 5.4 .

5.4. Calculations

Applied normal stress is calculated as follows:-

$$\sigma = N/A$$

where σ = normal stress in kilopascals (kPa);
N = applied load in kilonewtons (kN);
A = area of specimen in square metres (m^2).

The area of a cuspated or columnar sample shall be calculated by counting the number of contact points in a 1,0 m width and length to determine the number of contact points in 1,0 m^2. The area of specimen is then calculated as :

$$A = \frac{\text{Number of contact points in the specimen}}{\text{Number of contacts in one square metre}}$$

Compressive strain is calculated for each time interval as follows:

$$\varepsilon_n = (\Delta t_g / t_i) \times 100$$

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where ε_n is the strain in percent (%);
Δt_g is the time dependent change in thickness, in millimetres (mm);
t_i is the nominal thickness, in millimetres (mm).

5.5 Test report

The test report shall include the following information:-

a) number and date of this Standard;
b) identification of the sample, date of receipt and date of testing;
c) conditioning atmosphere;
d) whether the test was carried out dry or with the specimen immersed in water;
e) the initial thickness of the specimen at 5 kPa;
f) the pressure(s) used in the test;
g) the mean thickness in millimetres (mm) and compressive strain in percent (%) of the specimens at 1 h and 1000 h for each of the specified pressures;
h) any agreed departures from the procedure;
i) any unusual behavior, e.g. compressive creep collapse or shear collapse of the core structure;
j) for cuspated or columnar geocomposite products the number of points in contact with the loading plates;
k) a plot of the thickness against log time for each specimen and each of the normal pressures used in the test;
l) a plot of compressive strain (ε) against log time for each specimen and each of the normal pressures used; Figure 5 shows a typical response.

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6 Combined normal and shear load method

6.1 Principle

The geotextile specimen is placed on the fixed base of a compression machine with an upper loading plate, of sufficient roughness to permit the development of any required shear forces.

The vertical compressive load and horizontal shear forces are applied to the geotextile specimen and the change in thickness is recorded with time. The vertical compressive load and the shear force are to be applied for a minimum period of 1 000 h.

6.2 Apparatus

6.2.1 Compression testing machine

A suitable compression testing machine with a vertical travel greater than the nominal thickness of the specimen shall be used. It shall be capable of sustaining the applied stress to within 1% accuracy for the duration of the test. The compressive stress may be applied mechanically, pneumatically, or hydraulically. Where a hydraulic or pneumatic system is used, the stress applied shall be constant for the duration of the test. The loading device, however, shall be capable of applying the full magnitude of the vertical test load in one controlled step, i.e. without significant impact, within a period of 60 s. Some systems may use dead weights to apply the stress. In systems using dead weights the loading system shall be fully supported while being assembled such that no load is applied to the specimen until the support is smoothly released (see Figure 4). The horizontal force can be applied