SLOVENSKI STANDARD
SIST EN 14576:2005

01-julij-2005

Geosintetika - Preskusna metoda za ugotavljanje odpornosti polimernih geosintetiļ nih ovir proti razpokam zaradi okoliğkih napetosti

Geosynthetics - Test method for determining the resistance of polymeric geosynthetic barriers to environmental stress cracking

Geokunststoffe - Prüfverfahren zur Bestimmung der Beständigkeit von geosynthetischen Kunststoffdichtungsbahnen gegen umweltbedingte Spannungsrissbildung

Géosynthétiques - Méthode d'essai pour la détermination de la résistance des barrieres géosynthétiques polymériques a la fissuration sous contrainte environnementale

Ta slovenski standard je istoveten z: **EN 14576:2005**

ICS:

59.080.70 Geotekstilije Geotextiles

SIST EN 14576:2005 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14576

April 2005

ICS 59.080.70

English version

Geosynthetics - Test method for determining the resistance of polymeric geosynthetic barriers to environmental stress cracking

Geosynthétiques - Méthode d'essai pour la détermination de la résistance des géomembranes polymériques à la fissuration sous contrainte environnementale

Geokunststoffe - Prüfverfahren zur Bestimmung der Beständigkeit von geosynthetischen Kunststoffdichtungsbahnen gegen umweltbedingte Spannungsrissbildung

This European Standard was approved by CEN on 3 March 2005.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 14576:2005) has been prepared by Technical Committee CEN/TC 189 “Geosynthetics”, the secretariat of which is held by IBN/BIN.

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of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

This document includes a Bibliography.

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.

Introduction

Stress cracking is a phenomenon observed in most thermoplastic materials. It is defined as internal or external cracking of the material caused by tensile stresses less than the short time mechanical strength of the material. Stress cracking may limit the durability of e.g. thermoplastic pipes and geosynthetic barriers. In addition to the influence of the stress, stress cracking is accelerated by elevated temperature and the presence of certain molecular species, such as surfactants, in the surrounding environment.

The ability of a material to withstand stress cracking is known as its stress crack resistance. Stress crack resistance is measured by the time required to failure when a specimen of the material is immersed in a particular medium at elevated temperature while under a defined stress. Stress crack resistance is primarily a function of the resin (thermoplastic raw material) type but may be adversly influenced by the geosynthetic barrier manufacturing process particularly certain procedures for friction enhancement. The so-called "bent strip" test described in ASTM D 1693, was used as a screening test for many years. However this method has been found to provide misleading results due to relaxation of the specimen and reduction of the stress level during increased testing periods. In consequence the "bent strip" test has been unable to differentiate the performance of improved resins requiring longer testing periods.

To meet the requirement to accurately quantify and differentiate the performance of modern resins the Geosynthetics Institute (formerly Geosynthetics Research Institute) developed an alternative method GRI-GM5. The GRI method is frequently referred to as the notched constant tensile load" (NCTL) test as the apparatus used ensures a constant level of stress in the specimen throughout the test and the specimen is notched to provide a concentration point for stress and failure. The NCTL test is now used extensively throughout the geosynthetic barrier industry.

The NCTL test can be performed under two separate procedures that are described in GRI-GM 5 (a) and 5 (b). In the procedure GRI-GM 5 (a), the so-called full curve test", specimens are immersed in the test liquid at a range of stresses, typically from 20 % to 65 % of the yield strength of the material. The time to failure and the failure mode (brittle or ductile) is recorded at each level of stress. Failure time is plotted against stress. Typically the resulting curve will show an abrupt change in slope at a point that coincides with a change in failure mode. The time at which this occurs is recorded as the transition time".

The second variant of the test, GRI-GM 5 (b), which is simpler and quicker to perform, is known as the "single point" test. In this case the specimens are tested at 30 % of the measured yield stress of the material at normal room temperature, and the time to failure is recorded. The procedure described in this document is based on GRI-GM 5 (b).

1 Scope

This document specifies a test method for screening the resistance of polymeric geosynthetic barriers to stress cracking. The test is applicable to polypropylene and polyethylene based products and to all other polymeric geosynthetic barriers which have a partially crystalline structure.

NOTE The described method is suitable for conformance testing of smooth surfaced (non-textured) geosynthetic barriers. However the resistance to stress cracking of the resin used in the manufacture of structured surface materials can be evaluated by carrying out the test on a plaque formed from the relevant resin (see 4.5) or, where structuring is carried out as a separate processing step, on a preformed smooth surface geosynthetic barrier, the test can be performed on the intermediate smooth material.

The data are suitable for screening and determination of conformity but not for deriving performance data such as lifetime, unless supported by further evidence.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN ISO 9862, *Geosynthetics - Sampling and preparation of test specimens (ISO 9862:2005)*

3 Principle

Dumbbell shaped notched test specimens cut from the geosynthetic barrier are subjected to a constant tensile load in the presence of a surface active agent at an elevated temperature. The time to failure of each test specimen is recorded.

4 General requirements and procedure

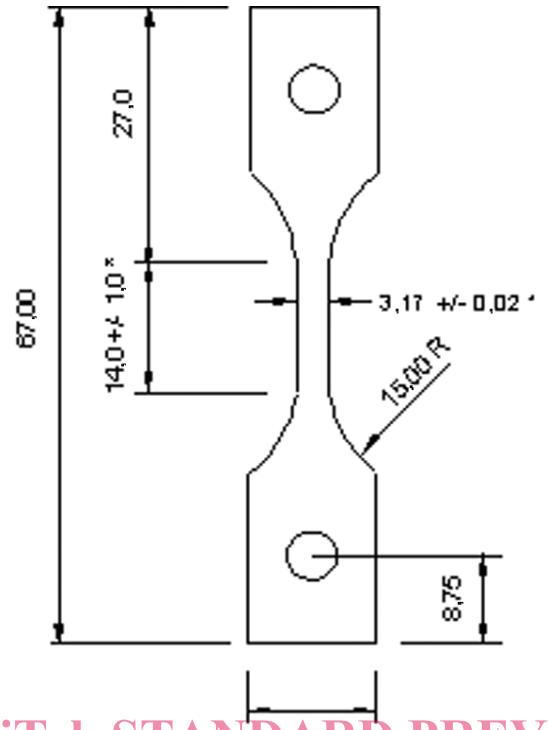
4.1 Apparatus

4.1.1 Blanking die

A die suitable for cutting test specimens to the dimensions and tolerances is shown in Figure 1a.

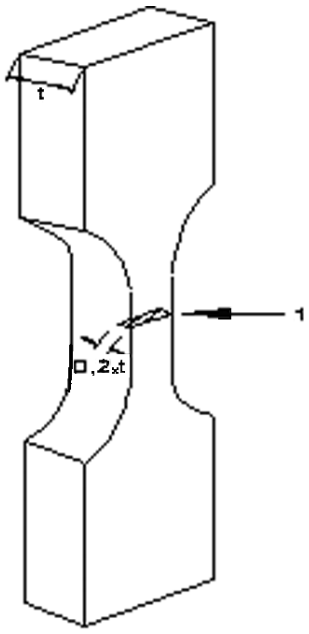
NOTE The length of the specimen can be changed to suit the design of the test apparatus. However, there should be a constant width neck section at least 13 mm long. The width of the neck section should be 3,17 mm. The tab widths may be enlarged to accommodate grommets of different sizes with which to attach hooks for the purpose of loading.

Dimensions in millimetres



NOTE Dimensions may be varied to suit equipment with the exception of the neck dimensions shown*

Figure 1a – Dimensions of test specimen

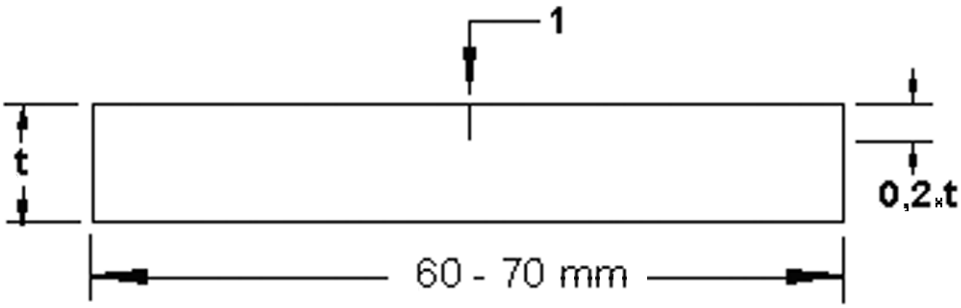


Key

t Thickness

1 Notch (0,2 × t)

Figure 1b – Isometric view of cut specimen (not to scale)



Key

t Thickness

1 Notch (0,2 × t)

Figure 1c – Side view of cut specimen (not to scale)