

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

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# National foreword

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### Summary of pages

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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

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of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.

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## 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 adversely 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).