SLOVENSKI STANDARD
SIST EN 1108:2000

01-junij-2000

Hidroizolacijski trakovi - Bitumenski trakovi za tesnjenje streh - Določevanje stabilnosti oblike pri cikličnih spremembah temperature

Flexible sheets for waterproofing - Bitumen sheets for roof waterproofing - Determination of form stability under cyclical temperature changes

Abdichtungsbahnen - Bitumenbahnen für Dachabdichtungen - Bestimmung der Formstabilität bei zyklischer Temperaturänderung

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Feuilles souples d'étanchéité - Feuilles d'étanchéité de toiture bitumineuses - Détermination de la stabilité de forme lors d'une variation cyclique de température

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Ta slovenski standard je istoveten z: **EN 1108:1999**

ICS:

91.060.20	Strehe	Roofs
91.100.50	Veziva. Tesnilni materiali	Binders. Sealing materials

SIST EN 1108:2000 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1108

August 1999

ICS 75.140

English version

Flexible sheets for waterproofing - Bitumen sheets for roof waterproofing - Determination of form stability under cyclical temperature changes

Feuilles souples d'étanchéité - Feuilles d'étanchéité de toiture bitumineuses - Détermination de la stabilité de forme lors d'une variation cyclique de température

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This European Standard was approved by CEN on 11 July 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 254 "Flexible sheets for waterproofing", the secretariat of which is held by BSI.

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 February 2000, and conflicting national standards shall be withdrawn at the latest by September 2001.

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.

Introduction

This European Standard is intended for the characterisation and/or classification of bitumen sheets as manufactured or supplied before use. The test method relates exclusively to products, or to their components where appropriate, and not to waterproofing membrane systems composed of such products and installed in the works.

This test is used for determining the form stability of bitumen sheets whilst fully bonded to a substrate and subjected to thermal cycling. The aim is to demonstrate permanent form stability under the thermal stressing occurring in practice. The test can be used to demonstrate the basic properties of direct relevance to the fitness for purpose of the bitumen sheet.

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1 Scope

This European Standard specifies the determination of form stability under cyclical temperature changes. It is mainly applicable to metal faced and/or metal cored bitumen sheets fully bonded to a substrate. This test is not intended to be applied to vapour control layers.

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2 Normative references

This European Standard incorporates by dated or undated references provisions from other publications. These normative references are cited 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.

ISO 5725 : 1986 Precision of test methods - Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests.

3 Definitions

For the purposes of this standard the definitions indicated in 3.1 and in the corresponding European Standards on product specifications apply.

3.1 form stability: The change in length of a test specimen taken from a bitumen sheet, containing a metal foil, when subjected to specified cyclical temperature change.

4 Principle

The test specimens taken from the test sample are fully bonded to a dimensionally stable and heat resistant insulant and subjected to ten cycles of thermal stressing of the upper face. The change in dimensions is measured after each cycle and evaluated at the end of the test.

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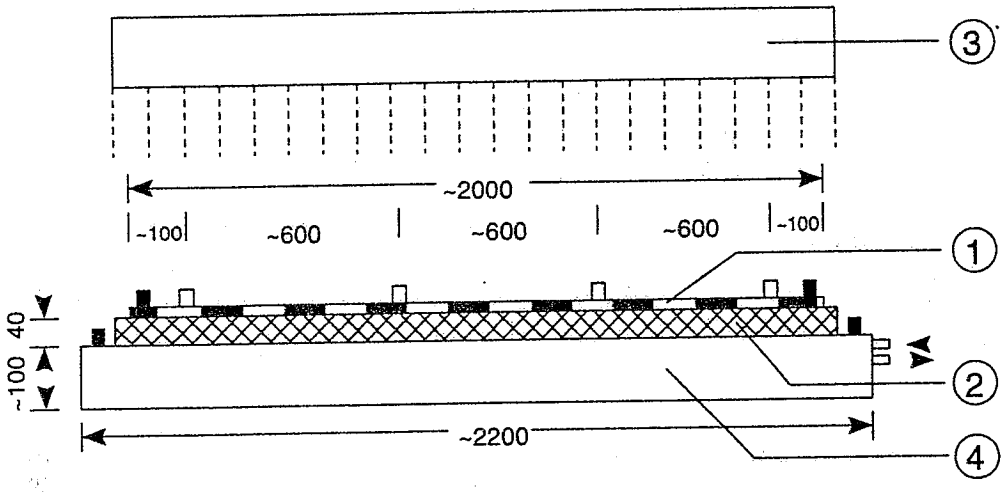
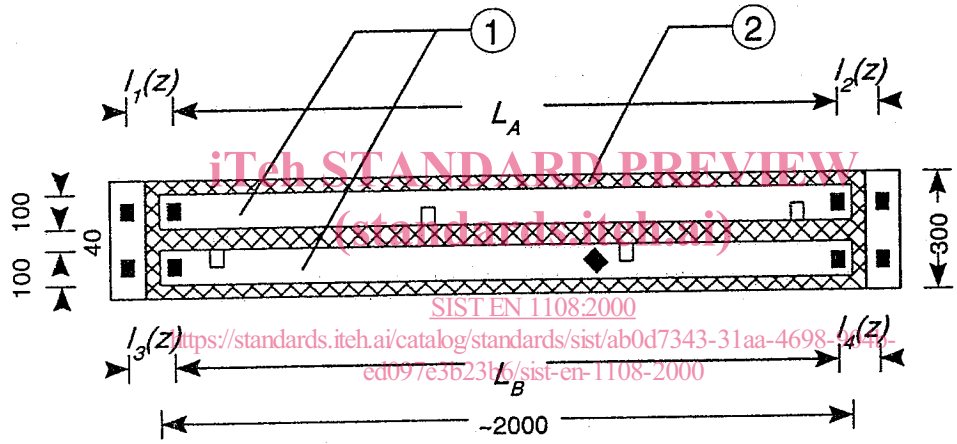
Dimensions in millimetres



1a) Side view



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1b) Top view

Legend:
- ■ measuring marks on the sample surface and cooling block
- □ 4 thermocouples
- ◆ 1 control thermocouple
- (1) test specimens (A and B)
- (2) thermal insulation (cellular glass)
- (3) infrared heater
- (4) metal block with water cooling

Figure 1: Apparatus and arrangement of test specimens

5 Apparatus

5.1 Length measuring device, measuring length of at least 2000 mm, with a scale division of at least 1 mm.

5.2 Metal cooling block (approximately 2200 mm x 300 mm x 100 mm) for supporting the thermal insulation and test specimens (see figure 1), with forced cold water circulating, with a uniform temperature no greater than 22 °C.

5.3 Insulation panels, made of cellular glass with a density of approximately 125 kg/m³ and approximately 40 mm thick.

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5.4 Four calibrated thermocouples, connected to an electronic thermometer with a recorder and capable of measuring to ± 1 °C in the working range for recording the temperature of the upper face of the sheet.

5.5 Matt black paint, for colouring the metal facings.

5.6 Four measuring marks of adjustable height (e.g. penetration pins) securely connected to the cooling block outside the test specimens (see figure 1).

5.7 Four measuring marks on the test specimen surface (e.g. razor blade bonded with solvent free adhesive, see figure 1).

5.8 Precision length measuring device (e.g. graduated magnifying glass) for measuring the distance between the two measuring marks to the nearest 0,1 mm.

5.9 Infrared radiation source, with thermostatic control for uniform heating of the bitumen sheet surface to 70 °C (for accuracy, see clause 8).

5.10 Bonding bitumen: oxidized bitumen with a softening point (ring and ball) between 80 °C and 100 °C and penetration between 20 /10 mm and 35 /10 mm.

5.11 Insulated screens, to protect the test specimen against draughts from the sides.

6 Sampling

Test samples shall be taken in accordance with the corresponding European Standard.

Two rectangular test specimens with dimensions of approximately 2000 mm x 100 mm are taken from the test sample with the larger dimension in the longitudinal direction and a distance of at least 300 mm shall be maintained from each edge of the sheet. The test specimens shall be numbered and the upper faces shall be marked.

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After taking the test specimens, they are conditioned for at least 24 h at (23 ± 2) °C on a flat support.

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7 Preparation of test specimens

7.1 General

Bond the cellular glass panels to the top of the cooling block with hot bitumen so that the top of the metallic block is covered up to the measuring marks at the edges (see figure 1). The cellular glass panels shall form a flat surface.

Fully bond the two test specimens approximately 40 mm apart to the cellular glass base as specified in 7.2 or 7.3 with the bottom facing downwards.

7.2 Bonding with hot bitumen

When bonding with hot bitumen, first place the two test specimens loosely on the cellular glass so that they are approximately 40 mm apart then roll back one test specimen half way and unroll it into a pool of molten bitumen at approximately 180 °C to 200 °C excluding any bubbles. Repeat the procedure for the second half of the test specimen. Bond the second test specimen in the same way approximately 40 mm from the first.

7.3 Bonding by torching

In the case of bonding by torching, a uniform layer of hot bitumen (approximately 1,5 kg/m²) is first applied to the cellular glass and is allowed to cool. The two test specimens are laid loosely on the prepared surface and arranged. Then, one test specimen is rolled back half way. The bonding mass on the lower face of the test specimen is heated with a gas flame so that when it is rolled back molten bitumen coating is always in front of the roll and a bubble free bond is obtained. The same procedure is used for the second half of the test specimen. The second test specimen is bonded in the same way approximately 40 mm from the first.

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7.4 Preparation of bonded test specimens

After the test specimens have cooled down, four thermocouples shall be attached to the upper face of the test specimens as shown in figure 1. The thermocouple for controlling the radiant heater shall be placed directly adjacent to one of the middle thermocouples.

Four measuring marks shall also be attached to the ends of the test specimens by means of a solvent free adhesive. The measuring marks on the test specimens shall be opposite and in line with the measuring marks on the cooling block (see figure 1).

The surfaces of the test specimens and the thermocouples are painted matt black.

This test assembly is conditioned at (23 ± 2) °C for at least 24 h prior to the test.

8 Procedure

Prior to commencing the test, the initial lengths of the two test specimens are measured:

- Measure the initial lengths of the two test specimens, L_A and L_B, to the nearest 1 mm with the ruler (see figure 1).
- Measure the distances $l_1(0)$ to $l_4(0)$ between the four measuring marks on the cooling block and the measuring marks on the test specimens with the optical instrument to the nearest 0,1 mm (see figure 1).

Then, using the radiant heater, the test specimens are subjected to ten heating cycles as follows:

- 4 h ± 5 min at (70 ± 2) °C (including heating-up time);
- 2 h ± 5 min with heating switched off;
- 4 h ± 5 min at (70 ± 2) °C (including heating-up time);
- 14 h ± 15 min cooling down to ambient temperature with heating switched off.

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The time- and position-dependent variation in the temperature at all four measuring points shall not exceed 8 °C. The mean value of all the measurements shall not deviate by more than ± 1 °C from 70 °C during the steady-state heating phase. The heating time taken to reach steady-state shall not exceed 30 min.

To ensure the required constant temperature, the radiant heat source shall be thermostatically controlled by means of control thermocouples. Where necessary, the open side areas between the radiant heater and the test specimen surface shall be covered with heat-insulated plates. The temperatures shall be recorded continuously during the test cycles. Throughout the tests, the cooling block shall be kept by forced cold water circulation at a uniform temperature no greater than 22 °C.

At the end of each cycle z (at the end of the 14-h cooling phase) the distances $l_1(z)$ to $l_4(z)$ are measured again to the nearest 0,1 mm. The test specimens shall also be examined for any visible changes.

9 Recording of results, evaluation and precision of test method

9.1 Recording of results and evaluation

The change in dimensions ΔL, in %, is calculated after each cycle z using equation (1) for test specimens A or equation (2) for test specimen B:

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$$\Delta L_A(z) = \frac{\Delta L_1(z) + \Delta L_2(z)}{L_A} x100 \quad (1)$$

$$\Delta L_B(z) = \frac{\Delta L_3(z) + \Delta L_4(z)}{L_B} x100 \quad (2)$$

Where: L_A; L_B is the initial length of test specimens A and B.

$\Delta l_1(z)$ to $\Delta l_4(z)$ is the change of l_1 to l_4 after cycle z compared to the relevant initial measurement $l_1(0)$ to $l_4(0)$, e.g. $\Delta l_1(z) = l_1(z) - l_1(0)$.

The values shall be determined to the nearest 0,01 %. They are plotted in a graph and evaluated as follows (see example in figure 2) with the first three temperature cycles for stabilizing the test specimens:

- determination of the value after the third cycle $\Delta L\ (3)$
- determination of the maximum value between the third and tenth cycle, ΔL_{max}
- determination of the difference $\Delta\Delta L = \Delta L_{max} - \Delta L(3)$

These values are determined for each test specimen and the mean value shall be reported to the nearest 0,01 %. The form stability is the difference $\Delta\Delta L$ reported to the nearest 0,01 %.

Specific incidences or occurrences such as the need to repeat the test or visible external changes to the test specimens during the test (e.g. delamination, creasing, blisters) shall be stated.

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9.2 Precision of test method

No information can be given at present on the precision of the measuring method; no results from inter-aboratory tests as specified in ISO 5725:1986 are yet available.

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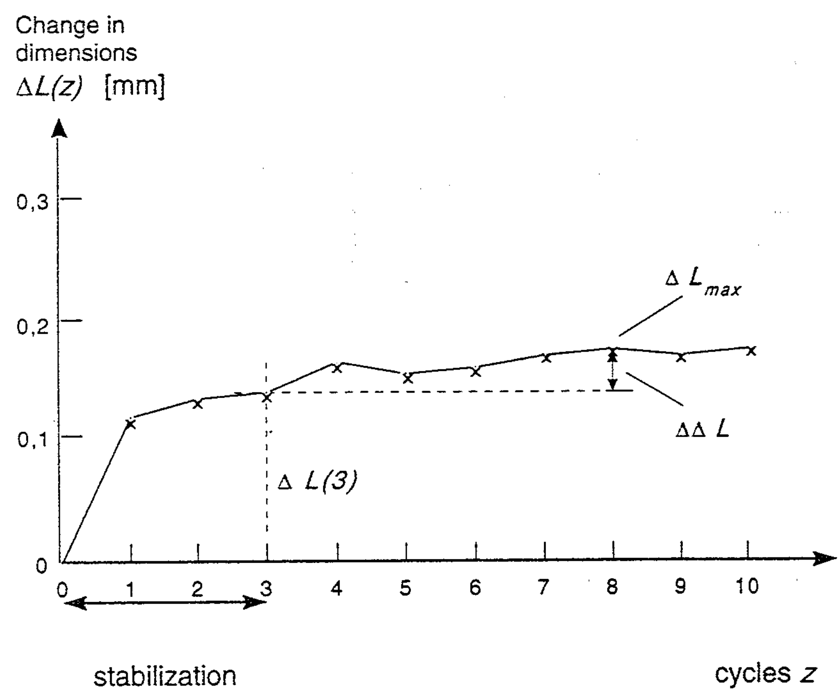

Figure 2: Evaluation for a test specimen (example)