BRITISH STANDARD

BS EN
1107-1:2000

Flexible sheets for waterproofing — Determination of dimensional stability —

Part 1: Bitumen sheets for roof waterproofing

The European Standard EN 1107-1:1999 has the status of a British Standard

ICS 91.100.50

National foreword

This British Standard is the official English language version of EN 1107-1:1999.

The UK participation in its preparation was entrusted to Technical Committee B/546, Flexible sheets for waterproofing, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 9 and a back cover.

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English version

Flexible sheets for waterproofing - Determination of dimensional stability - Part 1: Bitumen sheets for roof waterproofing

Feuilles souples d'étanchéité- Détermination de la stabilité dimensionnelle - Partie 1: Feuilles d'étanchéité de toiture bitumineuses

Abdichtungsbahnen - Bestimmung der Maßhaltigkeit - Teil 1: Bitumenbahnen für Dachabdichtungen

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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

Contents

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of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by September 2001.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 characterization 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 intended to be used in conjunction with European Standards on product specification for reinforced and unreinforced bitumen sheets for roofing.

This test is intended to determine the dimensional changes in bitumen sheets as a result of production-induced internal stresses released under the effect of heat. Excessive dimensional changes can result in detrimental stresses in service.

This test can be used to measure basic properties of the bitumen sheeting directly relevant to its fitness for purpose for waterproofing applications.

1 Scope

This European Standard specifies the determination of the dimensional stability of bitumen sheets.

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 dimensional change the change in length of unrestrained test specimens taken from the bitumen sheet in the longitudinal direction when subjected to a specific thermal load. It is given as a percentage (%) relative to the initial length

4 Principle

Test specimens taken from the test sample are subjected to a specified heat load to permit any internal stresses to be relaxed. The resulting dimensional change is measured using an optical or mechanical method (see clauses **5**, **7** and **9**).

5 Apparatus

5.1 General

Two alternative measuring methods can be used:

a) Optical method (method A):

This method is based on optical measurement of the distance between the marks before and after exposure to a heat load (see Figure 1).

b) Calliper method (method B):

This method is based on measuring the change in distance between two measuring marks using a calliper [= extensometer] (see Figure 2).

5.2 Apparatus for methods A and B

5.2.1 Oven with circulating air (without fresh air supply), adjustable to (80 ± 2) °C.

5.2.2 Thermocouple, connected to an external electronic thermometer capable of measuring to ± 1 °C in the temperature range.

5.2.3 Steel plate (approximately 280 mm x 80 mm x 6 mm) with cut outs. This is used as a template for local removal of the coating and for flattening the test specimen when locating the measuring marks and during the measurement itself (see Figure 1 and Figure 2).

5.2.4 Glass plate, coated with talcum powder.

5.3 Apparatus for method A (optical method)

5.3.1 General

In addition to 5.2 the apparatus indicated in **5.3.2** to **5.3.7** is required.

5.3.2 Beam compass, made of steel, with dimensions of approximately 25 mm x 10 mm x 250 mm with a fitted centring cone (diameter approximately 8 mm, height approximately 12 mm, cone angle approximately 60 °) and interchangeable scribing pin (tip diameter approximately 0,05 mm) a distance of L_A = (190 ± 5) mm from the cone axis (see Figure 1).

5.3.3 M5 nuts or similar measuring marks as the measuring base.

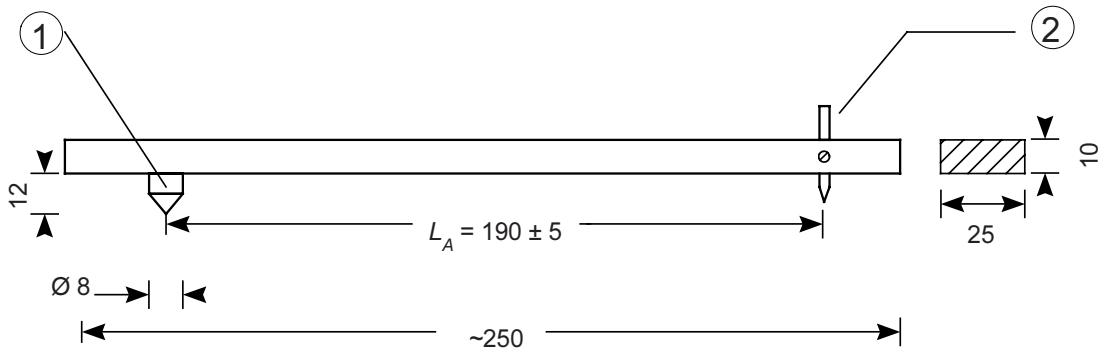
5.3.4 Aluminium tags (approximately 30 mm x 30 mm x 0,2 mm) to receive the measuring marks.

5.3.5 Office stapler, for fastening the aluminium tags.

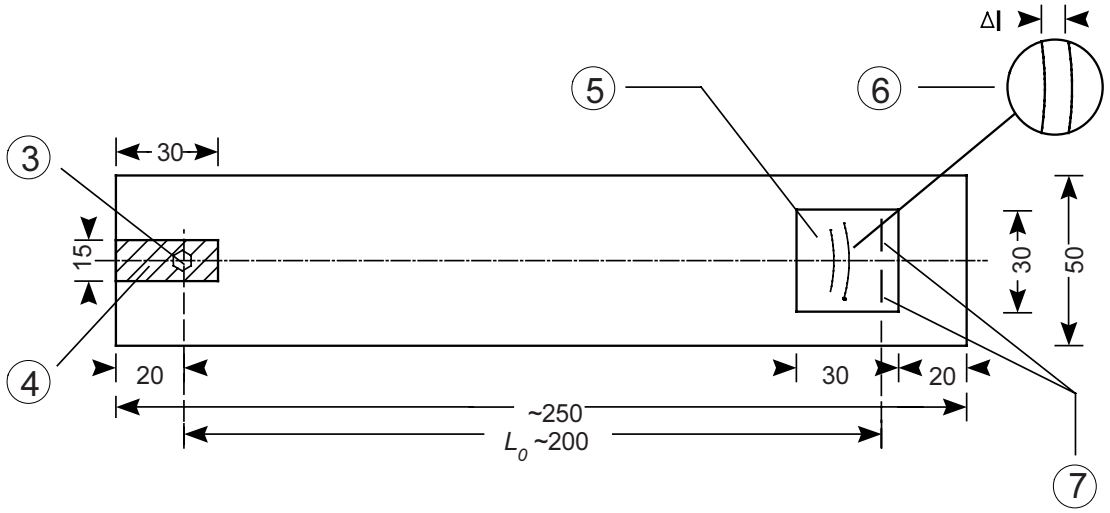
5.3.6 Length measuring device, measuring length at least 250 mm, with a scale division of at least 1 mm.

5.3.7 Precision length measuring device (e.g. graduated magnifying glass), with a scale division of at least 0,05 mm.

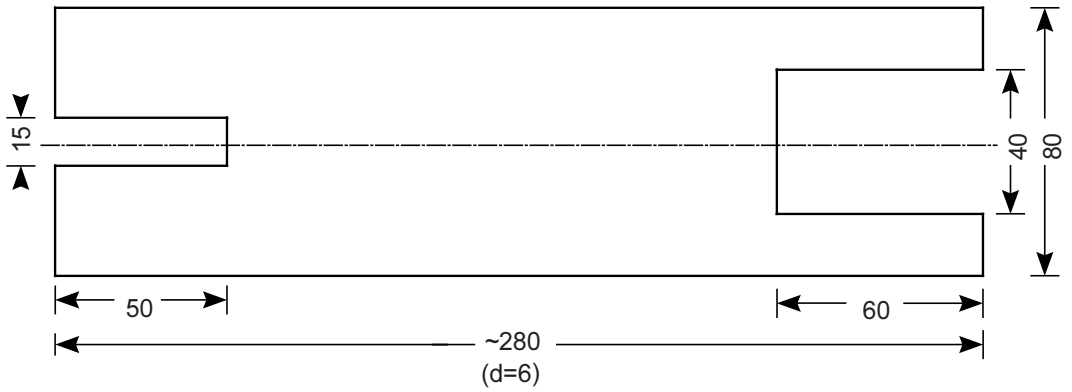
Dimensions in millimetres



1a) Beam compass



1b) Test specimen

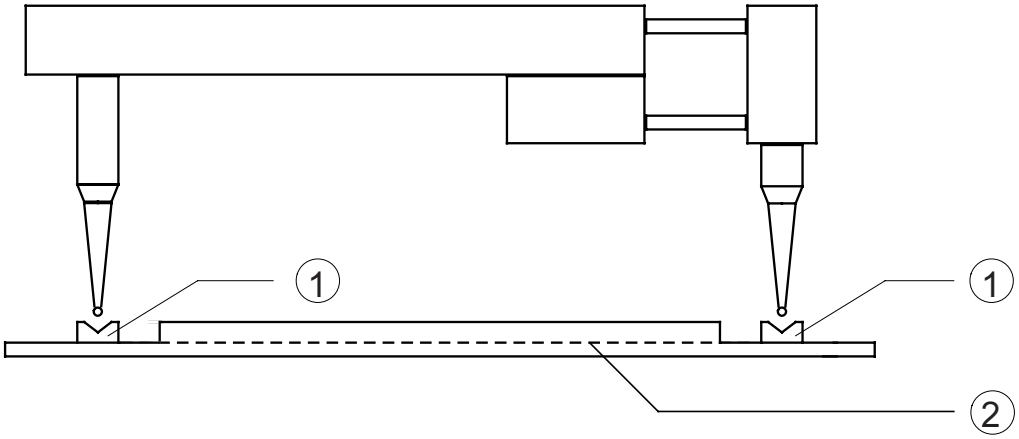


1c) Steel plate

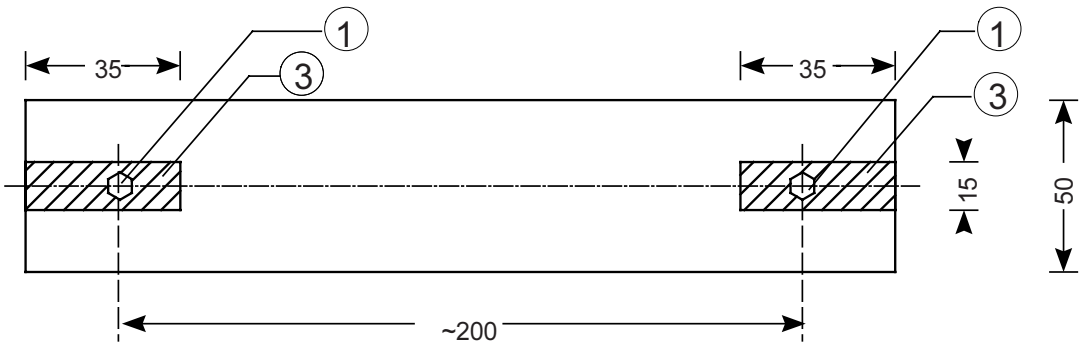
Legend:
(1) steel cone
(2) pin
(3) nut M5 (measuring base)
(4) coating removed
(5) aluminium tag
(6) measuring marks
(7) staples

Figure 1: Test specimens and apparatus for testing in accordance with method A

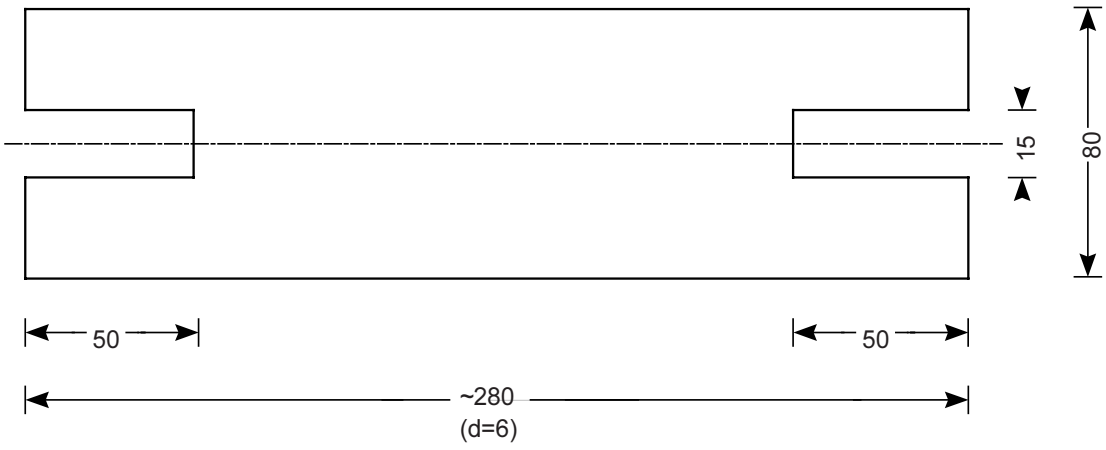
Dimensions in millimetres



2a) Calliper measuring device (extensometer)



2b) Test specimen



2c) Steel plate

Legend: (1) measuring base (2) reinforcement (3) coating removed

Figure 2: Test specimens and apparatus for testing in accordance with method B

5.4 Apparatus for method B (calliper method)

5.4.1 General

In addition to **5.2** the apparatus indicated in **5.4.2** and **5.4.3** is required:

5.4.2 Calliper (extensometer), measuring base 200 mm, with mechanical or electronic measuring system capable of measuring to 0,05 mm.

5.4.3 Measuring bases, especially suitable for the calliper.

6 Sampling

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

Five rectangular test specimens with dimensions of (250 ± 1) mm x (50 ± 1) mm are taken from the test sample uniformly over the width of the sheet and with the larger dimension in the longitudinal direction of the sheet. The test specimens shall not be taken within 150 mm of the edges of the sheet. In the case of sheets with more than one reinforcement 10 test specimens shall be taken. The test specimens shall be numbered consecutively, beginning from one edge of the sheet and the upper and lower faces of the sheet shall be marked.

7 Preparation of test specimens

Any protective film shall be removed, preferably by applying a strip of adhesive tape to it at ambient temperature, cooling the test specimen to approximately the presumed cold bending temperature and then pulling the adhesive tape from the test specimen. Alternatively, or additionally, the film can be removed by means of a compressed air jet (maximum pressure approximately 5 bar, nozzle diameter approximately 0,5 mm). If it is not possible to remove the film using these methods, a gas flame may be used but for the least time necessary to destroy the film but not otherwise to damage the test specimen.

The coating on the lower face of the test specimen shall be removed down to the reinforcement as shown in Figure 1 or Figure 2 using the metal template and a heated spatula or similar device. The reinforcement shall not be damaged.

The measuring bases as shown in Figure 1 and Figure 2 are bonded to the exposed reinforcement with a solvent-free adhesive. In the case of test specimens for the optical measuring method, the aluminium tag is fastened as shown in Figure 1 by means of two staples at right angles to the longitudinal edge of the test specimen through the reinforcement in such a way that the imaginary line through the staples is approximately 200 mm from the middle of the measuring base. In the case of sheets without reinforcement, the measuring bases are bonded directly to the surface of the test specimen. In the case of sheets with more than one reinforcement, both sides shall be tested.

The test specimens prepared in this way are then conditioned on a flat talced base for at least 24 h at (23 ± 2) °C. The compass and steel plate and, where appropriate, the calliper measuring device are also conditioned at the same temperature.

8 Procedure

8.1 Method A (optical method)

When using the optical method (see **5.3**) the reference measuring length L_0 on the test specimen (see Figure 1) is determined at (23 ± 2) °C to the nearest 1 mm using the length measuring device. Then the first measuring mark is applied to the test specimens. For this, the steel plate with the cut outs is placed over the measuring base and the aluminium tag. The centering cone of the compass is then positioned on the measuring base and a measuring mark in the form of a curved line is scribed into the aluminium tag with the pin. This is done without any additional pressure, just the dead weight of the compass. The first measuring mark shall be identified appropriate.

8.2 Method B (calliper method)

Using the test specimens to be tested in accordance with the calliper method (see **5.4**), the measuring device is placed on the measuring bases at a temperature of (23 ± 2) °C and the distance between the measuring bases is measured accurately to the nearest 0,05 mm and noted as the reference measuring length L_0.

8.3 General (methods A and B)

The oven is preheated to a temperature of (80 ± 2) °C. The temperature is controlled by the thermocouple positioned in the proximity of the test specimens in the test area.

Then, the test specimens with the measuring base uppermost are placed in the oven for 24 h ± 10 min at (80 ± 2) °C supported on a talcumed glass plate. The glass plate shall be coated with sufficient talcum to prevent the test specimens sticking to it. The temperature shall be maintained throughout the whole conditioning period in the charged part of the oven.

After the conditioning period, the glass plates with the test specimens are removed from the oven and allowed to cool for at least 4 h at (23 ± 2) °C.

9 Recording of results, evaluation and precision of test method

9.1 Method A (optical method)

The test specimens are then given a second measuring mark as described in **8.1**. The distance between the outside contours of the two marks is measured in the radial direction (see Figure 1) to the nearest 0,05 mm with a precision length measuring device on each test specimen.

The individual measured values are given as a percentage of L_0.

9.2 Method B (calliper method)

The distance between the measuring bases on the test specimen is measured again as described in **8.2** to the nearest 0,05 mm. The difference between this measurement and the reference length L_0 is calculated as a percentage of the reference length L_0 for each test specimen.

9.3 Evaluation

The individual results are given a sign (+ expansion; – contraction) in accordance with the direction of the dimensional change.

The test result is the arithmetic mean value of the five individual values and is given to the nearest 0,1 %. For sheets with more than one reinforcement the test results for each side shall be calculated separately.

9.4 Precision of test method

The precision values were determined by an initial international interlaboratory test following ISO 5725:1986; they relate to sheets with polyester reinforcement.

No data can be given at present for sheets with other reinforcement or sheets without reinforcement.

9.4.1 Repeatability

- range of the five individual values $d_{a,5}$ = 0,3 %
- repeatability standard deviation of results: σ_r = 0,06 %
- confidence interval (95 %) of the result: q_r = 0,1 %
- repeatability limit (difference between two results): r = 0,2 %

9.4.2 Reproducibility

- reproducibility standard deviation of results: σ_R = 0,12 %
- confidence interval (95 %) of a result: q_R = 0,2 %
- reproducibility limit (between two results): R = 0,3 %

10 Test report

The test report shall include at least the following information:

a) all details necessary to identify the product tested;

b) a reference to this standard (EN 1107-1), and any deviation from it;

c) information on sampling in accordance with clause **6**;

d) details of preparation of the test specimens in accordance with clause **7**;

e) the test results in accordance with **9.3**, indicating the method used (A or B);

f) the date of the test.

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