

BS EN 1110:2010



BSI Standards Publication

**Flexible sheets for
waterproofing — Bitumen
sheets for roof waterproofing
— Determination of flow
resistance at elevated
temperature**

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English Version

Flexible sheets for waterproofing - Bitumen sheets for roof waterproofing - Determination of flow resistance at elevated temperature

Feuilles souples d'étanchéité - Feuilles d'étanchéité de toitures bitumineuses - Détermination de la résistance au fluage à température élevée

Abdichtungsbahnen - Bitumenbahnen für Dachabdichtungen - Bestimmung der Wärmestandfestigkeit

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Foreword

This document (EN 1110:2010) has been prepared by Technical Committee CEN/TC 254 "Flexible sheets for waterproofing", the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by June 2011, and conflicting national standards shall be withdrawn at the latest by June 2011.

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Introduction

This European Standard is intended for characterisation and/or classification of bitumen sheets as manufactured or supplied for 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 method is intended to be used in conjunction with EN 13707.

This test is used to determine the flow resistance of the coating or to determine the flow resistance limit of a bitumen sheet. The test result depends on the type of coating, the sheet thickness, type and position of the reinforcement and type and mass of the granules on the surface. The use of test results to directly compare the performance of the coating in sheets of different composition is strictly limited because of the influence of other parameters which have not been quantified. Results from sheets with the same composition can be used to compare the performance of the coating directly.

The test primarily serves to characterize bitumen sheets. It can also be used to evaluate the change in flow resistance limit as a result of artificial ageing. It is not recommended to correlate the test results directly to the actual performance expected at elevated temperatures in service.

1 Scope

This European Standard specifies the determination of flow resistance of bitumen sheets at elevated temperature. The test is carried out at a specified temperature or consecutively at different temperatures in order to determine the flow resistance limit. Therefore, the test can be used to provide proof of the flow resistance required for a product or to determine the flow resistance limit specific to the product e.g. in order to establish the change in this behaviour as a result of artificial ageing.

The test is not applicable to bitumen sheets without reinforcement.

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 13416, *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Rules for sampling*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

flow resistance

ability of bitumen sheet test specimen to be suspended vertically under specified temperature conditions without the coating moving by more than 2 mm and no occurrence of falling droplets

3.2

flow resistance limit

F

highest temperature where less than 2 mm displacement of the coating of a vertically suspended bitumen sheet test specimen is measured and no falling droplets from the coating of the test specimen are observed

3.3

flow

maximum difference between the longitudinal dimension of the test specimen before and after heating within the oven

3.4

falling droplets

oily constituents emitted from the coating of the sheet, which are observed after heating, on a white piece of paper placed under the test specimen during the heating within the oven

NOTE Mineral particles (e.g. slate, sand, talcum) are not a part of the coating and should therefore not be assessed as falling droplets.

4 Principle

Test specimens taken from the test sample are suspended vertically in an oven at a specified temperature. The maximum longitudinal dimensions of the test specimen are measured before and after being heated in the oven. The displacement is calculated as the difference between the longitudinal dimension over the full width of the test specimen, before and after being heated within the oven. Failure is defined as a difference greater than 2,0 mm and/or the occurrence of droplets.

5 Apparatus

5.1 Oven with forced air circulating (without fresh air supply) and a maximum temperature deviation of ± 2 °C in the test area. After the door has been opened for 30 s, the recovery period to attain the working temperature again shall not exceed 5 min.

5.2 Thin metal wire, S-shaped

5.3 Siliconized paper

5.4 Caliper with an accuracy of 0,1 mm

5.5 White coloured paper able to resist the testing temperatures

6 Sampling

Test samples shall be taken in accordance with EN 13416.

Rectangular test specimens with the following dimensions:

— length X_0 (100 ± 1) mm,

— width 50 mm to 100 mm,

as required by the tests described in 8.2 or 8.3, are taken from the test sample uniformly over the width of the sheet and with the larger dimension in the transversal direction of the sheet. The test specimens shall not be taken within 150 mm of the edges of the sheet. The test specimens shall be numbered consecutively, beginning from one edge of the sheet.

NOTE For practical reasons the minimum width and maximum width are defined. This accommodates the common practise. Lower dimensions than 50 mm could possibly influence the test result and are impractical. Larger dimensions than 100 mm could result in bending of the test specimen during testing which could possibly influence the result.

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 e.g. 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 0,5 MPa, nozzle diameter approximately 0,5 mm).

The test specimens are then conditioned prior to the test for at least 2 h at (23 ± 2) °C on a flat surface so that they do not touch each other and not to stick to the surface. If necessary, a separating sheet of siliconized paper shall be used to prevent sticking.

8 Procedure

8.1 Preparation for test

The oven is preheated to the specified test temperature. For the duration of the test the temperature shall not vary by more than ± 2 °C inside the test area.

8.2 Determination of flow resistance at a specified temperature

The three test specimens are provided with a thin S-shaped metal wire fixed in the middle of the short side of the test specimen and at a distance of approximately 15 mm from the top edge. The length X_0 of each test specimen is measured.

The prepared test specimens are suspended vertically at the same height in the oven with at least 30 mm distance between them. A white coloured piece of paper is placed underneath the test specimens. The time for placing the test specimens and paper in the oven shall not exceed 30 s. The heating period is (120 ± 2) min after inserting the test specimens.

As soon as the heating period is completed, the test specimens shall be removed from the oven without contacting each other and allowed to cool for at least 2 h at (23 ± 2) °C in a horizontal position.

Measure after the heating and cooling period over the whole width of the three test specimens if the longitudinal dimension (from top to bottom) is less or equal to $(X_0 + 2)$ mm (see Figure 1).

Observe on the white coloured paper the occurrence of any droplet coming from the test specimen.

8.3 Determination of flow resistance limit

The flow resistance limit shall be determined by means of preliminary tests on individual test specimens at different temperatures at intervals of 5 °C.

The purpose of these preliminary tests is to find two temperature steps T and $(T + 5)$ °C within which the following conditions are reached: the displacement dimension $\Delta L \leq 2$ mm and no droplets at temperature T and the displacement dimension $\Delta L > 2$ mm and/or occurrence of droplets at temperature $(T + 5)$ °C.

A new test specimen shall be used for each temperature step.

After these two temperatures have been determined in the preliminary test the flow properties are determined in accordance with 8.2 on a series of three test specimen. The tests are carried out at the two temperatures T and $(T + 5)$ °C. A new series of test specimen shall be used for each temperature.

9 Calculation of results, evaluation and precision of test method

9.1 Flow resistance

The flow resistance at a specified temperature is regarded as having passed the test, if the longitudinal dimension of the three test specimens from the top to the bottom over the full width does not exceed $(X_0 + 2)$ mm and no falling droplets have been observed.

9.2 Flow resistance limit

The flow resistance limit (F) is determined and given to the lowest temperature (T).

9.3 Precision of test method

9.3.1 General

The precision of the test method was verified by an interlaboratory test on an APP modified polyester reinforced sheet and on a SBS modified polyester reinforced sheet. Based on the results of this inter laboratory test CEN/TC 254/SC 1 concluded that the precision of this test method is equal or better than the EN 1110:1999 test method. Therefore, the precision values of the EN 1110:1999, which were determined by

an initial international interlaboratory test following ISO 5725:1986, are maintained within this standard. These precision values relate to sheets with polyester reinforcement.

9.3.2 Repeatability

- Repeatability standard deviation of results: $\sigma_r = 0,7 \text{ }^\circ\text{C}$
- Confidence interval (95 %) of a result: $q_r = 1,3 \text{ }^\circ\text{C}$
- Repeatability limit (difference between two results): $r = 2 \text{ }^\circ\text{C}$

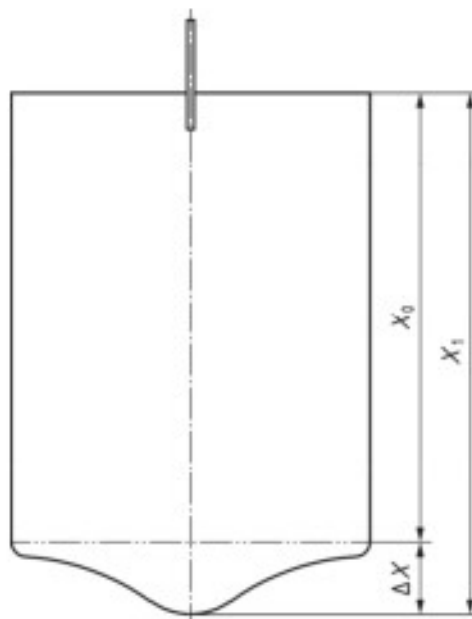
9.3.3 Reproducibility

- Reproducibility standard deviation of results: $\sigma_R = 3,5 \text{ }^\circ\text{C}$
- Confidence interval (95 %) of a result: $q_R = 6,7 \text{ }^\circ\text{C}$
- Reproducibility limit (difference between two results): $R = 10 \text{ }^\circ\text{C}$

10 Test report

The test report shall include at least the following information:

- a) all details necessary to identify the product tested;
- b) reference to this European Standard, 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) test results of the individual test specimen;
- f) test result in accordance with Clause 9;
- g) date of the test.



$$\Delta x = (x_1 - x_0) \leq 2 \text{ mm}$$

Figure 1 — Specimen before and after testing

Bibliography

- [1] ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests*
- [2] EN 13707, *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*
- [3] EN 1110:1999, *Flexible sheets for waterproofing — Bitumen sheets for roof waterproofing — Determination of flow resistance at elevated temperature*

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