BS EN 1110:2010

BSI Standards Publication

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

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 1110:2010. It supersedes BS EN 1110:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/546/1, Waterproofing Sheets - Reinforced bitumen membranes.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 71037 7

ICS 91.100.50

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2011.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1110

December 2010

ICS 91.100.50

Supersedes EN 1110:1999

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

This European Standard was approved by CEN on 28 November 2010.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1110:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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: $\sigma_r = 0{,}7$ °C

— Confidence interval (95 %) of a result: $q_r = 1{,}3$ °C

— Repeatability limit (difference between two results): $r = 2$ °C

9.3.3 Reproducibility

— Reproducibility standard deviation of results: $\sigma_R = 3{,}5$ °C

— Confidence interval (95 %) of a result: $q_R = 6{,}7$ °C

— Reproducibility limit (difference between two results): $R = 10$ °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;

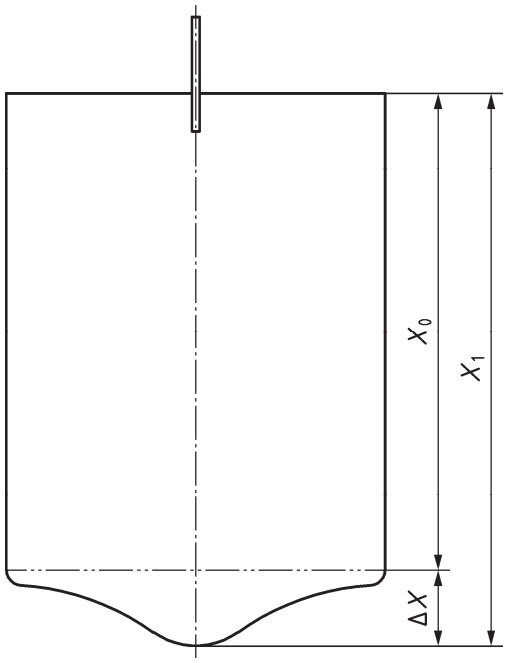
c) information on sampling in accordance with Clause 6;

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.



$\Delta x = (x_1 - x_0) \leq 2$ 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*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™