BRITISH STANDARD

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1548:2007

Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing — Method for exposure to bitumen

The European Standard EN 1548:2007 has the status of a British Standard

ICS 91.100.50

National foreword

This British Standard is the UK implementation of EN 1548:2007.

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

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Foreword

This document (EN 1548:2007) 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of an identical text or by endorsement, at the latest by March 2008, and conflicting national standards shall be withdrawn at the latest by March 2008.

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, 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.

Introduction

This European Standard is intended for characterisation of plastic and rubber sheets as manufactured or supplied before use. This 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.

1 Scope

This European Standard specifies a method of exposing test specimens of plastic and rubber sheets for roofing free from all external restraint, to contact with bitumen at an elevated temperature and methods for determining the changes in properties resulting from such exposure.

The methods for determination of changes in properties are specified as follows:

a) changes in mass directly after contact with bitumen;

b) changes in physical properties after contact with bitumen.

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 1849-2, *Flexible sheets for waterproofing – Determination of thickness and mass per unit area – Part 2: Plastic and rubber sheets for roof waterproofing*

EN 12311-2, *Flexible sheets for waterproofing – Determination of tensile properties – Part 2: Plastic and rubber sheets for roof waterproofing*

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

EN 13956:2005*, Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing – Definitions and characteristics*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13956:2005 apply.

4 General

The bitumen compatibility of sheets with an inner layer and EPDM sheets may be determined by a change in mass.

The bitumen compatibility of sheets without an inner layer may be determined by the change in Young's Modulus. Results obtained by this test method from homogeneous sheets can be applied to sheets manufactured with same chemical formulation, but having inner reinforcement layers (e.g. fabric or non-wovens of polyester or mineral fibres).

NOTE See also Annex A

Sheets with a non-woven backing of at least 150 g/m² or equivalent, which prevents any contact of the waterproofing membrane with bitumen when installed in accordance with the manufacturer's instructions are considered to be bitumen compatible and may be declared as such by the manufacturer. The compatibility with bitumen is determined for the underside of the sheet as installed in accordance with the manufacturer's

instructions. This European standard does not necessarily assess compatibility with bitumen on the upper face.

5 Principle

A test specimen is exposed, on one face only, to contact with bitumen at 50°C for 28 days. Determination of properties is made before and after contact with bitumen.

6 Apparatus

6.1 Metal plate

A rectangular metal plate measuring 400 mm x 350 mm x 2 mm.

6.2 Metal mask

A rectangular metal mask 3 mm thick with outside dimensions of 280 mm x 220 mm and three inside windows of 200 mm x 80 mm each (see Figure 1). The beam width of the frame shall be 10 mm.

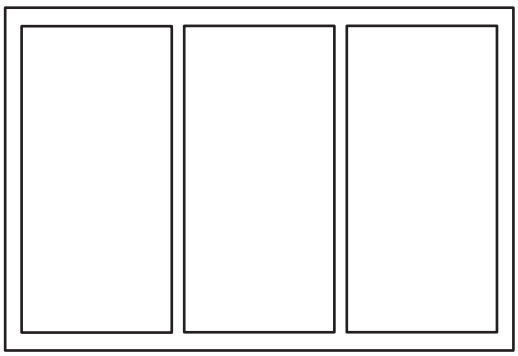

Figure 1 — Metal mask

6.3 Glass plate

A rectangular glass plate 3 mm to 8 mm thick measuring 400 mm x 350 mm.

6.4 Separation means

A means of separating sheets e.g. silicon paper, talc, aluminium foil, Teflon coated fabric.

6.5 Thermometer

A thermometer of suitable range and accuracy.

6.6 Balance

Balance capable of reading to 0,001 g.

6.7 Dial micrometer

Dial micrometer with flat anvils, accurate to 0,01 mm.

6.8 Calliper gauge

Calliper gauge, capable of measuring to an accuracy of 0,1 mm.

6.9 Ventilated oven

Ventilated air oven regulated in such a way that the test specimen can be maintained at a constant temperature of ≥ 50 °C during the full test duration.

NOTE The temperature calibration procedure is described in B.1 and details on the ventilation are given in B.2.

6.10 Bitumen

Standard type of bitumen used throughout Europe and commonly available. If in doubt use 85/25 grade.

7 Sampling

Samples shall be taken in accordance with EN 13416.

8 Preparation of test specimens

Six specimens of a size of 210 mm x 90 mm shall be prepared. Three specimens shall be used for exposure to contact with bitumen (for abbreviation purposes these will be called "exposed specimens"). Three specimens shall be used for reference purposes, i.e. for heat aging under the same conditions but without contact with bitumen (these will be called "reference specimens").

After exposure condition the test specimens, prior to testing, for at least 7 days in a standard atmosphere of (23 ± 2) °C and (50 ± 5) % relative humidity.

9 Procedure

9.1 Test bitumen

If information is required concerning the behaviour of the sheet in contact with a specific type of test bitumen, that bitumen shall, as a rule, be used.

9.2 Temperature

Unless otherwise stated the temperature for exposure to contact with bitumen is (50 ± 2) °C. If any other temperature is used it shall be noted in the test report (see 11)..

The temperature for the determination of changes in properties is (23 ± 2) °C.

9.3 Exposure duration

The exposure duration is at least 28 days. Exposure of greater than 28 days shall be noted in the test report (see 11).

9.4 Exposure to contact with bitumen

9.4.1 Test specimens

Place the metal base plate, covered by separation means (see 6.4) and the mask, in the oven until they have reached (70 ± 2) °C. Remove this assembly from the oven and place it on a level surface. Uniformly pour the hot bitumen, after homogenization, into the warm assembly to create a layer of at least 3 mm thickness.

A typical temperature for casting of the bitumen is 175 °C, however a bitumen temperature of 175 °C or greater shall be maintained for no longer than 4 min. Take care not to heat the bitumen over 200 °C. The heating time for the bitumen shall not exceed 1 h prior to casting.

Allow the assembly to cool to room temperature and then place three test specimens centrally on the bitumen surface in the mask windows avoiding any entrapped air. The face in contact with the bitumen shall be the same as will be exposed in the application.

Place the separation means (see 6.4) on the other side of the specimens and place the glass plate on them. Carefully turn over the whole assembly so the base plate is uppermost. Remove the base plate and separation means and place the rest of the assembly in an oven at (50 ± 2) °C for ≥ 28 days.

Remove the assembly from the oven and separate the specimen from the bitumen layer, for example by cooling it to – 20 °C or lower and delaminate by slightly bending it back and forth. In some cases it may be better to remove the bitumen by pulling it off while still warm. It might be necessary in some cases to clean the test specimen to remove remnants of bitumen.

9.4.2 Reference specimens

Three specimens shall be stored in a separate oven at (50 ± 2) °C for ≥ 28 days without contact with the bitumen.

9.5 Determination of changes in mass

9.5.1 Test specimen

Six specimens 210 mm x 90 mm shall be used, three as exposed specimens, three as reference specimens.

9.5.2 Initial value

Record the initial mass M_1 of each test specimen according to EN 1849-2.

9.5.3 Exposure

Expose three test specimens to contact with the test bitumen and three reference specimens following the procedure in Clause 9.4

9.5.4 Measurement of mass

After reconditioning in accordance with Clause 8 record the mass, M_r, of the three reference specimens and the mass, M_x, of the three exposed specimens in accordance with EN 1849-2.

9.6 Determination of changes in Young's Modulus

9.6.1 Test specimen

Six specimens 210 mm x 90 mm shall be used, three as exposed specimens, three as reference specimens.

NOTE The same test specimens as used for the determination of change in mass can be used.

9.6.2 Exposure

Expose the test specimens for exposure to contact with the test bitumen and the reference specimens following the procedure in Clause 9.4.

9.6.3 Determination of Young's Modulus

After determination of the change in mass, cut the specimens 170 mm x 15 mm from the 210 mm x 90 mm specimens. Cut five specimens each from the larger exposed and reference material. Determine the Young's Modulus E_r of the reference samples and the Young's Modulus E_x of the exposed samples in accordance with EN 12311-2, Method A. The secant modulus E_{sc} between 1 % and 2 % strain may be deduced from the stress-strain curve when a testing speed of (5 ± 1) mm/min has been used.

The measuring length shall be 100 mm measured between reference marks on an extensometer.

10 Expression of results

10.1 Changes in mass

10.1.1 Change in mass

Record, for each specimen, the masses in grams of:

a) reference specimen M_r;

b) exposed specimen after contact with bitumen M_x;

and record these values with the applicable signs.

Calculate and record the mean value M_{rm} of the three reference specimens and M_{xm} of the three exposed specimens.

10.1.2 Change in mass per unit area

For each specimen, calculate and record the mass per unit area, expressed in grams per square metre, by means of the following equation:

M_r/A_i in $g.m^{-2}$ or M_x/A_i in $g.m^{-2}$ (1)

where

M_r and M_x have the same meanings as in 10.1.1 and A_i is the total surfaces area, in square metres, of the respective specimens.

Calculate and record $M_{r,u,m}$, the mean mass per unit area for the reference specimens and $M_{x,u,m}$, the mean mass per unit area for the exposed specimens.

10.1.3 Percentage change in mass

Record for each specimen the mass in gram of:

a) reference specimen virgin M_{rv} and after ≥ 28d ≥ 50°C M_r;
b) exposed specimen virgin M_{xv} and after contact with bitumen M_x;

and record these values with the applicable signs.

Calculate and record the percentage change in mass for each specimen to two decimal places, using the following equation:

$DM_x=100 * (M_x - M_{xv}) / M_{xv}$ (2)

$DM_r=100 * (M_r - M_{rv}) / M_{rv}$ (3)

Calculate and record the mean values of DM_x and DM_r.

Determine the percentage loss in mass (ΔM) after exposure to contact with bitumen by the following equation:

$\Delta M = \text{mean } DM_x - \text{mean } DM_r$ (4)

10.2 Young's Modulus

State E_r, Young's Modulus of reference specimens after heat aging and reconditioning according to Clause 8, and E_x, Young's Modulus after contact with bitumen and reconditioning according to Clause 8.

The change in Young's Modulus is calculated by:

$E_r - E_x$ (5)

Express the change as percentage of the reference value, $\Delta E = 100*(E_x - E_r)/ E_r$.

11 Test report

The test report shall include at least the following information:

a) reference to this European Standard (EN 1548:2007) and any deviation from it;
b) all details necessary to identify the product tested;
c) information on sampling in accordance with Clause 7;
d) details of preparation of the test specimen in accordance with Clause 8;
e) test results in accordance with Clause 10;
f) any peculiarities in the method employed or encountered during the test;
g) date of the test(s);
h) grade (and source if known) of bitumen used.

Annex A
(informative)

Additional information

Under the action of contact with bitumen, a material may be subjected to several phenomena, which may occur simultaneously.

The behaviour of the material in the presence of bitumen can be determined only under arbitrarily fixed conditions aimed at making comparisons between different materials. The choice of the test conditions (nature of the bitumen, temperature and duration), as well as of the properties in which changes are to be measured, depends on the eventual application of the material under test.

However, it is not possible to establish any direct correlation between the experimental results and the behaviour of the material in service. These tests do, nevertheless, permit a comparison to be made of the behaviour of different material under specified conditions, thus allowing an initial evaluation of their behaviour in relation to certain types of bitumen.

It is emphasized that the comparison of different material by means of this test is valid only if the specimens used are of the same shape, the same dimensions (in particular the same thickness) and in as nearly as possible the same state (of internal stresses, surface, etc.).

Results obtained by this test method from homogeneous sheets can be applied to sheets manufactured with the same chemical formulation but having inner reinforcement layers (fabric or non-wovens of polyester or mineral fibres).

It is the responsibility of the manufacturer to declare bitumen compatibility for the intended use.

Annex B
(informative)

Calibration of apparatus

B.1 Temperature calibration

Thermocouples having a minimum precision of 0,1 °C in the range from 50 °C to 80 °C are used for checking the oven. The oven should be checked at least once a year at the working temperature of 50 °C at three points: a point in the horizontal plane of respectively the upper, lower and central test specimen supports, each point being selected randomly in the work area of the aforementioned horizontal plane. The measurement of the temperature at these points is carried out every ten minutes during half an hour. The temperature deviations observed at each of these points should not exceed the range of (50 ± 2) °C.

B.2 Ventilation calibration

The air change in the oven should at least be (5 ± 2) times per hour. The circulation of the air through the oven should be steady at approximately 0,5 to 1,5 m/s but need not be calibrated.

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