



BSI Standards Publication

**Flexible sheets for
waterproofing —
Determination of resistance
to ozone — Plastic and rubber
sheets for roof waterproofing**

National foreword

This British Standard is the UK implementation of EN 1844:2013. It supersedes BS EN 1844:2001 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/546, Flexible sheets for waterproofing and water vapour control.

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

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Flexible sheets for waterproofing - Determination of resistance to ozone - Plastic and rubber sheets for roof waterproofing

Feuilles souples d'étanchéité - Détermination de la résistance à l'ozone - Feuilles d'étanchéité de toiture plastiques et élastomères

Abdichtungsbahnen - Verhalten bei Ozonbeanspruchung - Kunststoff- und Elastomerbahnen für Dachabdichtungen

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Foreword

This document (EN 1844:2013) 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of an identical text or by endorsement, at the latest by November 2013, and conflicting national standards shall be withdrawn at the latest by November 2013.

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 1844:2001.

This document has been technically and editorially revised in order to correct the ozone concentration.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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

This test is intended to be used in conjunction with European Standards for plastic and rubber sheets for waterproofing.

1 Scope

This European Standard specifies a method for the determination of the resistance of plastic and rubber sheets for waterproofing to cracking when exposed, under static tensile strain, to air containing a definite concentration of ozone and at a definite temperature without the effects of direct light.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

3 Principle

Test specimens are exposed under elongation in a closed chamber, at a defined relative humidity and temperature, to an atmosphere containing ozone. After exposure, the presence or absence of cracks is determined.

4 Apparatus

The apparatus used shall be in accordance with ISO 1431-1.

The test chamber shall also be controlled for relative humidity.

5 Sampling

Samples shall be taken in accordance with EN 13416.

6 Test specimens

Test specimens shall have an undamaged test surface. Ozone resistance shall not be assessed on surfaces that have been cut or buffed. Comparisons of different materials are only valid if the cracking is assessed on surfaces of similar finish produced by the same method.

Test specimens shall consist of strips of not less than 10 mm width and length not less than 40 mm between the grips before stretching; the thickness is equal to the thickness of the sheets.

The ends of the test specimen held in the grips may be protected with an ozone resistant lacquer. Care shall be taken in selecting a lacquer to ensure that the solvent used does not appreciably swell the membrane. Silicone grease shall be used. Alternatively, the test specimen may be provided with modified ends, for example by the use of lugs, to enable it to be extended without causing excessive stress concentration and breakage at the grips during ozone exposure. At least three test specimens shall be used.

7 Conditioning

7.1 Conditioning in the unstrained state

For all test purposes, the minimum time between manufacturing of the finished product and straining the test specimens shall be 16 hours.

For non-product test, the maximum time between manufacturing of the finished product and straining the test specimens shall be 4 weeks.

For product tests, wherever possible, the time between manufacturing of the finished product and straining the test specimens shall not be more than 3 months. In other cases, tests shall be made within 2 months of the date of the receipt of the product by the customer.

Test specimens and samples shall not, between the time of manufacturing of finished product and insertion in the cabinet, be allowed to come into contact with membranes of a different composition. This is necessary to prevent additives, which may affect the development of ozone cracks from migrating by diffusion from one membrane to adjacent membranes.

It is recommended that aluminium foil is placed between test specimens and sheets of different compositions, but any other method, which prevents migration of additives, can be used.

Samples and test specimens shall be stored in the dark, in an essentially ozone-free atmosphere during the period between manufacturing of the finished product and stretching. The normal storage temperature in accordance to ISO 23529 should be the standard temperature of (23 ± 2) °C. These storage conditions should be used, as far as possible, for products. For evaluations intended to be comparable, the storage time and conditions shall be identical.

For thermoplastic rubbers, the storage period shall begin immediately after shaping.

7.2 Conditioning in the strained state

After stretching, the test specimens shall be conditioned for a period between 48 h and 96 h in an essentially ozone-free atmosphere in the dark. The temperature for this conditioning shall be the standard temperature of (23 ± 2) °C. The test specimens shall not be touched or otherwise disturbed in any way during the conditioning period. For tests to be comparable, the conditioning time shall be the same.

8 Test conditions

8.1 Ozone concentration

The test shall be carried out at an ozone concentration of (200 ± 20) pphm by volume.

NOTE It has been found that differences in atmospheric pressure can influence ozone cracking when test pieces are exposed to constant ozone concentrations expressed in parts per million. This effect can be taken into account by expressing the ozone content in the ozonised air in terms of the partial pressure of ozone, i.e. in millipascals, and making comparisons at constant ozone partial pressures. At standard conditions of atmospheric pressure and temperature (101 kPa, 273 K), a concentration of 1 pphm is equivalent to a partial pressure of about 1 mPa. Further guidance is given in ISO 1431-1.

8.2 Temperature

The test shall be carried out at a temperature of (40 ± 2) °C.

8.3 Relative humidity

The test shall be carried out at a relative humidity of (65 ± 5) %.

8.4 Exposure time

Place the strained test pieces, suitably conditioned, in the ozone chamber for (168 ± 2) h.

8.5 Elongation

The test shall be carried out with test specimens stretched to an elongation of (20 ± 2) %.

In the case of reinforced finished product, there may be difficulty in achieving the required/specified elongation due to deformation in the test specimen or restriction in reinforcement movement.

In the case of reinforced sheeting, the test specimens can be skived or cut, but not buffed, to remove the reinforcement, or moulded without the reinforcement.

One of the following methods is recommended to produce a suitable test specimen:

- a) When using a test specimen from the reinforced finished product, stretch the test specimen in an appropriate direction, maybe diagonally, in order to achieve the required/specified elongation.
- b) Carefully remove the reinforcement without damaging the elastomeric surface.

9 Procedure

Strain the test specimens at 20 % elongation and condition them in accordance with 7.2.

Adjust the rate of flow and temperature of the ionised gas and its ozone concentration to that required and place the strained test specimen in the test chamber. Maintain the test conditions at the required levels.

The lens may either be mounted in a window in the chamber wall, or the test specimens may be removed from the chamber for a short period, in their clamps. The test specimens shall not be handled or bumped when carrying out the examination.

Finally examine the test specimen after a (168 ± 2) h exposure period.

NOTE Cracks propagating from edges that originate from the preparation by the punching die are to be ignored.

10 Expression of results

Report the results as no cracking or cracking.

11 Precision of test method

No information is available at this time.

12 Test report

The test report shall contain at least the following information:

- a) reference to this European Standard (EN 1844);
- b) all details necessary to identify the product tested;
- c) number of test specimens tested;
- d) method of preparation of test pieces;
- e) whether a rotating carrier was used;
- f) air flow rate;
- g) whether cracking occurred; if required, the nature of the cracking may also be given;
- h) any non-standard procedures or any peculiarities encountered during testing;
- i) date(s) of testing.

Bibliography

- [1] ISO 1431-3, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 3: Reference and alternative methods for determining the ozone concentration in laboratory test chambers*
- [2] ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

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