



BSI Standards Publication

PUBLISHED DOCUMENT

Classification rules for the end-use application of test results arising from BS 476-3, "Classification and method of test for external fire exposure of roofs"

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Summary of pages

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Foreword

Publishing information

This Published Document is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2012. It was prepared by Panel FSH/22/-/8, *Fire resistance tests for external fire exposure for roofs*, under the authority of Technical Committee FSH/22, *Fire resistance tests*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

This Published Document is intended to be used as the basis for fire performance classification arising from fire tests conducted according to BS 476-3.

Use of this document

As a guide, this Published Document takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice.

Presentational conventions

The provisions in this Published Document are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

The word "should" is used to express recommendations of this document. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

Notes give references and additional information that are important but do not form part of the recommendations.

Contractual and legal considerations

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

Compliance with a Published Document cannot confer immunity from legal obligations.

0 Introduction

0.1 Background

Until recently, the fire classification for external fire exposure to roofs was based solely on the fire test data arising from BS 476-3:2004 or BS 476-3:1958.

However, as the variations and range of roof systems have broadened, industry has sought to minimize expensive retesting of every potential variation of a particular type of roof system and, where possible, develop end-use application rules to permit a wider range of roof classifications to be established without further testing.

As the data base increases, more classification rules might become viable. However, end-use application of the classification cannot be considered where no test data exist. New rules can only be developed according to the scope of test data available.

NOTE 1 The testing described in BS 476-3 is designed to give information about the hazard of fire spreading to the roof of a building from a nearby fire outside the building itself. The fire testing is not concerned with the behaviour of a roof when subjected to the effects of fire on its underside.

When subjected to the fire penetration test in BS 476-3, specimens are exposed to radiation of intensity 12 kW/m² measured on the surface of the specimen. This can be regarded as, for example, the intensity incident on a roof 7.6 m above ground level from a fire 13.7 m away in a building with a facade of (15.2 x 15.2) m and 50% window openings. Because wind tends to carry any surface flames through any fissures in the roof, provision is made in the test to simulate the effect of wind of 6.7 m/s (15 mph) by applying suction to the lower side of the roof specimen during the test.

However, in the spread of flame test, the intensity of variation varies over the exposed surface of the roof specimen. The distance to which the fire spreads downwards over the specimen thus gives a measure of the minimum intensity required to ignite the surface when a small ignition source such as a brand is present.

For these reasons, the BS 476-3 fire test is designed to provide information on fire penetration through the entire roofing system, as well as surface spread of flame over the specimen, to enable national regulators to set out informed requirements for fire safety in buildings.

Fire tests on roofing systems are carried out in accordance with BS 476-3:1958 or BS 476-3:2004. The results from these tests are then used for classifying the roofing systems in accordance with Clause 4 and BS 476-3:2004.

In order to derive end-use application classifications for similar roofing systems based on the data obtained from BS 476-3, end-use application rules are needed. Where end-use application rules are provided, they are based on current knowledge and experience.

NOTE 2 Normally, the fire classification report is issued as part of the fire test report.

Since the rules cannot anticipate every possible application, they are to be considered as general guidance, and might be subject to change as further test data become available.

Where such rules are not available, this Published Document provides a procedure for determining the classification for the end-use application of similar roofing systems so that the number of tests can be minimized to cover the maximum range of end-use applications. Additional end-use application rules can be developed for each fire condition as sufficient test data become available.

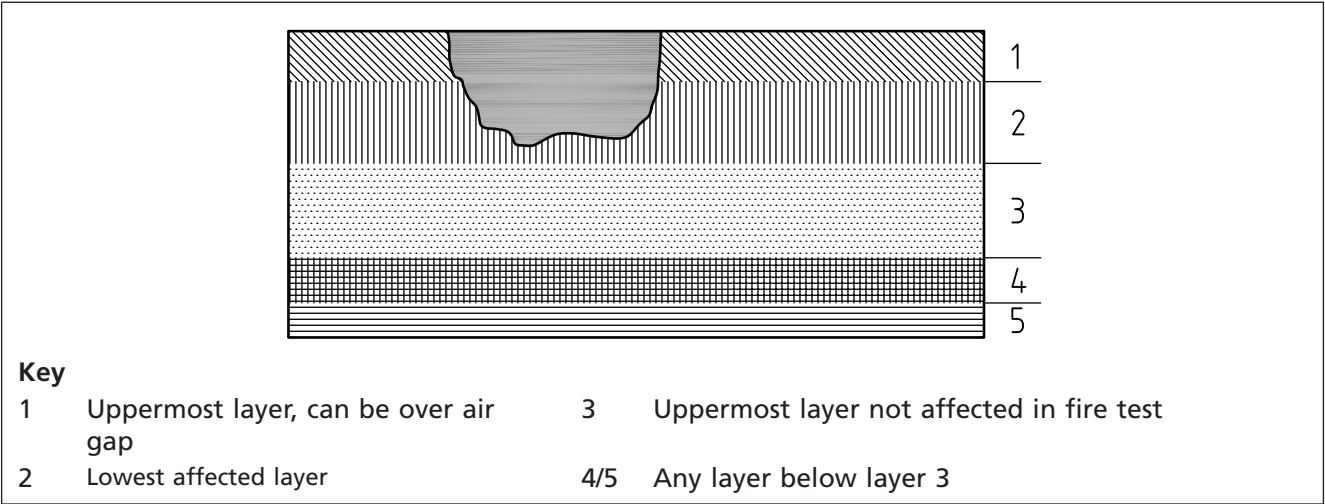
0.2 Variations in roofing systems

Roofing systems covered by this Published Document typically comprise a support deck, substrate, air and vapour control layer, insulation layer(s), membranes, and roof coverings. When other separating layers or intermediate layers are needed to satisfy other roof characteristics, these need to be included in the consideration of the roofing system to be classified.

This Published Document considers the possible effect(s) of single or multiple changes to the roofing system or end-use application parameters of the roof for external fire performance. Since varying several parameters at the same time can lead to unexpected results, the rules are only valid if they are applied to one parameter in the roofing system, and the others are kept unchanged, unless otherwise stated.

NOTE 1 The extent to which an individual component or layer is directly affected or damaged by the testing conditions is influenced by the layers and components used around the individual layer (see Figure 1).

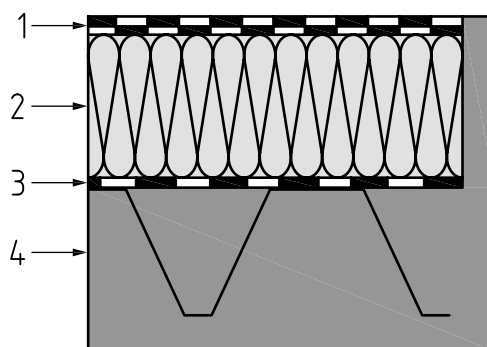
Figure 1 Layers affected in the fire test



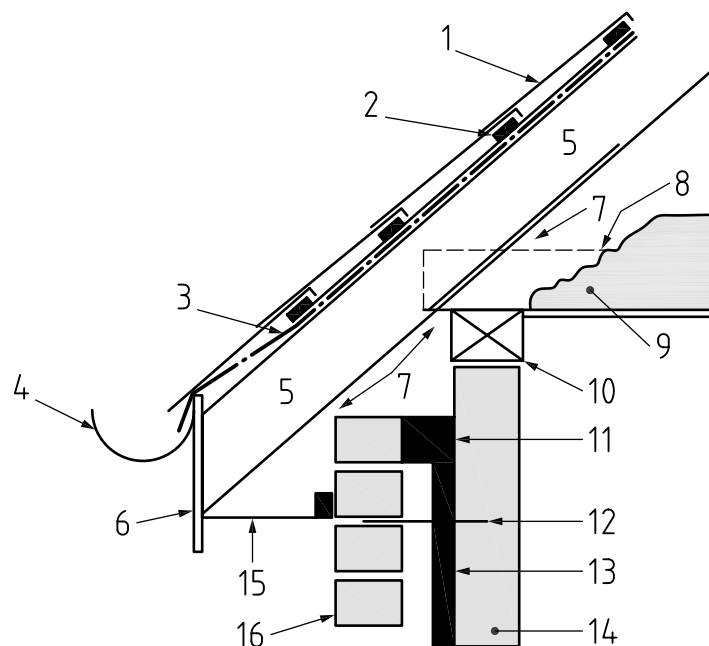
NOTE 2 The term “as tested” is used to indicate that specific end-use application rules do not yet exist, and additional fire testing is required to gain an appropriate classification.

NOTE 3 A number of variations are possible (see Figure 2). For example, insulation under a roof covering may be laid across profiled metal decking, as in Figure 2a) or the roofing system can include an insulation layer positioned between roof trusses, or it can be laid above the ceiling [as shown in Figure 2b)].

Figure 2 Example roof variations

**Key**

- | | |
|---|---|
| 1 Bituminous roof covering (one or more layers) | 3 Vapour barrier and/or one or more other layer, such as acoustic layer |
| 2 Insulation (one or more layers) | 4 Particular type of supporting deck |
- a) Typical roofing system without air gaps

**Key**

- | | |
|--------------------|--------------------------------|
| 1 Tiles | 9 Ceiling insulation |
| 2 Battens | 10 Wall plate |
| 3 Felt or membrane | 11 Cavity closer |
| 4 Gutter | 12 Wall tie |
| 5 Roof trusses | 13 Wall insulation |
| 6 Fascia board | 14 Blockwork |
| 7 Air gap | 15 Soffit board with air vents |
| 8 Ceiling joist | 16 Brickwork |

b) Alternative type of pitched roofing system with air gaps

1 Scope

This Published Document sets out a methodology for generating new classification rules for roof coverings tested in accordance with BS 476-3:1958 and BS 476-3:2004, which simplifies the specification of a roof covering in its end-use application as part of a roofing system. The document also considers the possible influences on the classification of single or multiple changes to the roof covering material and/or construction of the tested roofing system.

NOTE Applying the results of tests to an actual end-use application often requires specialist knowledge. This application is generally simplified if the tested roof covering/roofing system can be given a classification based upon the results of test(s) which is easily related to the end-use.

Where rules already exist, they are presented in Clause 4 and Clause 5.

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.

NOTE Product standards for roof coverings are listed in the Bibliography.

BS 476-3:1958, *Fire tests on building materials and structure – Part 3: Classification and method of test for external fire exposure to roofs* ¹⁾

BS 476-3:2004, *Fire tests on building materials and structure – Part 3: Classification and method of test for external fire exposure to roofs*

3 Terms and definitions

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

3.1 adhesive

organic or inorganic material (e.g. polyurethane-based, bitumen-based, dispersion adhesive) glue which is used to attach the surfaces of two or more products or components

NOTE Adhesives or glues can be applied separately to form a separate layer within the roofing system, while factory pre-applied adhesives or glues (3.7) are part of the specific product/component forming a layer.

3.2 binder content

amount of binder material (as percentage weight or percentage volume) within the product

NOTE 1 The binder can be inorganic or organic in nature. In the case of the latter, it adds a fire load to the product containing the binder, and is considered within the classification of products or product groups.

NOTE 2 This term does not apply to compound waterproofing sheets.

3.3 deemed-to-satisfy

solution established by an EC Decision (such as 2000/553/EC [1]) or by national regulation, which includes specific conditions for the materials (e.g. a minimum thickness) to be valid

¹⁾ Withdrawn.

**3.4 classification without further testing
CWFT**

products that have been proven to be stable in a given European class (on the basis of testing to the appropriate EN test methods), within the scope of their variability

NOTE See Table A.1.

3.5 end-use application parameter

aspect of the application of a product or a variation in product property (e.g. type of substrate, finish, colour, fixing or mounting method, type and position of joints), which might or might not affect the fire performance

3.6 end-use application rule

outcome of a process that predicts the classification result for a variation of a product property and/or its intended end-use application, based on the methodology in this document

3.7 factory (pre-)applied adhesive

layer of organic or inorganic material (e.g. polyurethane-based, bitumen-based) that is factory-applied to products such as to assist the installation (e.g. self-adhesion)

3.8 product parameter

aspect of a product (e.g. thickness, composition, density) which might vary, and which might or might not have an influence on the product's fire performance

3.9 roof covering

element(s) of a roofing system subject to classification

3.10 roof pitch

inclination of the roof surface to the horizontal

NOTE In the case of a roof comprising discontinuously laid overlapping elements, e.g. tiles or slates, the roof pitch is the rafter pitch, since the pitch of the roof might be a few degrees lower due to the overlaps.

3.11 roofing system

complete roofing assembly which includes the support, substrates, intermediate and external layers

3.12 separating layer

functional layer within a roof construction that is typically used to separate layers that do not match for reasons of chemical incompatibility, or is needed as underlay, where applicable

NOTE Separating layers can be products such as fire protective layers (e.g. glass fleece), underslating (e.g. polymeric sheet, polymeric sheet reinforced by polymeric fibres, bituminized reinforced sheets), and others such as bituminous kraft paper, aluminium sheet and covering (organic), and similar.

3.13 spread of flame

propagation of a flame front over the surface of a product under the influence of imposed irradiance

[BS 476-7:1997]