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# Fire tests on building materials and structures —

## Part 3: Classification and method of test for external fire exposure to roofs

ICS 13.220.50

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## British Standard

The preparation of this British Standard was entrusted by Technical Committee FSH/22, Fire resistance tests, to Subcommittee FSH/22/8, Test procedures for external fire exposure to roofs, upon which the following bodies were represented:

Association of British Roofing Felt Manufacturers  
BRE — Building Research Establishment  
BRE/LPC Laboratories  
British Rigid Urethane Foam Manufacturers' Association  
Concrete Tile Manufacturers Association  
Eurisol (UK Mineral Wool Association)  
Fibre Cement Manufacturers Association Ltd.  
Flat Glass Manufacturers' Association  
Flat Roofing Alliance  
Gypsum Products Development Association  
Home Office  
Mastic Asphalt Council Ltd.  
National Association of Rooflight Manufacturers  
National Federation of Roofing Contractors  
National GRP Construction and Engineering Federation  
OPDM — Building Division  
UK Steel Association  
Warrington Fire Research Centre

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 14 June 2004

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First published June 1958  
Second edition November 1975  
Third edition June 2004

### Amendments issued since publication

Amd. No.	Date	Comments
16169	18 January 2006	Amendment to <b>4.2.3</b>
16924	30 April 2007	See foreword

The following BSI references relate to the work on this British Standard:  
Committee reference FSH/22/8  
Draft for comment 03/109613

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This Part of BS 476-3 has been prepared by Subcommittee FSH/22/8. It is based on BS 476-3:1958 and it supersedes BS 476-3:1975 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags  $\overline{A_1}$   $\langle A_1 \rangle$ . Tags indicating changes to text carry the number of the amendment. For example, text altered by Amendment No. 1 is indicated by  $\overline{A_1}$   $\langle A_1 \rangle$ .

The tests described in this part of BS 476 are designed to give information concerning the hazard that exists of fires spreading to the roof of a building from a nearby fire outside the building itself. The tests are not concerned with the behaviour of a roof when subjected to the effects of fire on its underside.

A preliminary test is made in which a specimen section of the roof is subjected to the effects of flame in the absence of radiation. Unless the specimen is so affected by this test that it is obvious it would not pass the principal tests, i.e. the penetration and the spread of flame tests, these are then carried out using the radiated heat apparatus.

When subjected to the penetration test, specimens are exposed to radiation of intensity  $12 \text{ kW/m}^2$  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  $15.2 \text{ m} \times 15.2 \text{ m}$  and 50 % window openings. Because wind will tend to carry any surface flames through any fissures in a roof, provision is made in the test to simulate the effect of a wind of 6.7 m/s (15 miles per hour) by applying suction to the lower side of the roof specimen during the test.

In the spread of flame test, however, the intensity of radiation varies over the exposed surface of the 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.

NOTE This intensity can be interpreted as being equivalent to the distances given in Table B.1, between an exposed roof 7.6 m above ground level and a burning building with a facade  $15.2 \text{ m} \times 15.2 \text{ m}$  and 50 % window openings.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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

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

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 11 and a back cover.

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## 1 Scope

The tests given in this British Standard are designed to enable measurement of:

- a) capacity of a representative section of a roof to resist penetration by fire when the external surface is exposed to radiation and flame; and
- b) distance of the spread of flame on the outer surface of the roof covering under certain conditions.

Roofs are graded according to the angle at which they are tested, the time for which they resist penetration by fire, and the distance of superficial spread of flame on their external surface.

**A<sub>2</sub>** An additional test for rooflights is given in Annex C. **A<sub>2</sub>**

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the reference cited applies. For undated references, the latest edition of the referenced document (including any amendments).

BS EN 13238, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*.

BS EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*.

## 3 Terms and definitions

For the purpose of this British Standard, the following terms and definitions apply.

### 3.1

#### **penetration by fire**

appearance of glowing or flaming on the underside of the specimen other than that of the test flame

NOTE In the text, this term has been shortened to "penetration".

### 3.2

#### **non-combustible**

product which is reaction to fire Euroclass A1, as described in BS EN 13501-1

## 4 Classification

### 4.1 Roof system

Roof systems shall be designated by the letters EXT. F. or EXT. S. to indicate whether the test results apply to a flat (horizontal) or an inclined roof system, respectively.

**A<sub>2</sub>** NOTE For special roof pitch applications at other specified angles, the test results need no such designation. **A<sub>2</sub>**

### 4.2 Fire resistance of roof system

#### 4.2.1 Coding system

Roof systems subject to conditions of external fire shall be classified according to both the time of penetration and the distance of spread of flame along their external surface.

Each category designation shall consist of two letters, e.g. AA, AC, BB, these being determined as specified in 4.2.2 and 4.2.3.

#### 4.2.2 Fire penetration (first letter)

- A. Those specimens that have not been penetrated within one hour.
- B. Those specimens that are penetrated in not less than 30 min.
- C. Those specimens that are penetrated in less than 30 min.
- D. Those specimens that are penetrated in the preliminary flame test.