

# Fire tests on building materials and structures —

## Part 31: Methods for measuring smoke penetration through doorsets and shutter assemblies —

### Section 31.1 Method of measurement under ambient temperature conditions

ICS 13.220.50

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| C1       | March 2014    | Information added to Foreword         |
| C2       | December 2024 | Supersession updated in Foreword      |
|          |               |                                       |

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# Foreword

This part of BS 476 is published by BSI Standards Limited, under licence from The British Standards Institution.

This standard has been superseded by the current BS EN 1634-3, and will be withdrawn on 2 September 2029.

This Section of this British Standard has been prepared under the direction of the Fire Standards Committee. The committee responsible for this standard has undertaken the revision of existing methods and the preparation of new methods and these will be published as a new series which is described in BS 476-10.

The method described in this Section is one which has been prepared in cooperation with the International Organization for Standardization (ISO), to assess the performance of doorsets and shutter assemblies to the penetration of smoke and gaseous products from fires under ambient temperature conditions. When smoke and gases from a fire start to spread in a building, a pressure difference can develop between the two sides of a closed doorset or shutter assembly. Leakage of smoke can occur through the clearances between the door leaf and the frame and other openings. This method simulates the conditions which doorsets and shutter assemblies may be subjected to in practice during either the very early stages of fire development or at positions remote from the seat of the fire. Further methods are under consideration which describe procedures for evaluating the performance of doorsets and shutter assemblies at medium and high temperatures. It is intended that these will be published as Sections 31.2 and 31.3 respectively of this Part of this standard.

The apparatus described in this Section is equivalent to that described in ISO 5925/1. However, BSI is developing a common philosophy on where fire doors should be used and on their fire performance criteria. This Section reflects this philosophy and in particular the terminology used for fire doors differs slightly from that used in ISO 5925/1. Guidance information on how the results from this method are used in determining the performance of different types of fire doors is also under consideration.

In preparing the methods described in this Part of this standard, every effort has been made to design out possible situations which might cause hazard to the operator. However, situations can exist which are unforeseen and therefore attention is drawn to the Health and Safety at Work etc. Act 1974, and the need to ensure that the methods specified in this Part of this standard are carried out under suitable environmental conditions to provide adequate protection of personnel against the risk of fire, inhalation of smoke and/or toxic products of combustion.

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## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This Section of this British Standard describes a method for measuring smoke penetration, as represented by the measurement of air leakage rate, through doorsets and vertically oriented shutter assemblies under ambient temperature conditions.

This method is used to evaluate the performance of a fire door used for smoke control purposes but gives no information on the fire resistance of a fire door for which the methods described in BS 476-22 are applicable.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Definitions

For the purposes of this Section of this British Standard, the definitions given in BS 4422 apply together with the following.

### 2.1

#### doorset (shutter assembly)

an assembly consisting of a fixed part (the frame), one or more movable parts (the leaves), and their hardware, the function of which is to allow or prevent access

### 2.2

#### fire door (shutter)

a door (shutter) provided for the passage of persons, air or objects which together with its frame and furniture as installed in a building, is intended, when closed, to resist the passage of fire and/or gaseous products of combustion and is capable of meeting specified performance criteria

### 2.3

#### ambient temperature

a temperature of  $25 \pm 15$  °C, representative of that normally found in buildings

## 3 Apparatus

**3.1 General.** The apparatus shall consist essentially of an air leakage chamber with one vertical side open, and of sufficient size to allow the fitting of a doorset or shutter assembly including, if required, a surround (see Figure 1) and a means of providing a differential air pressure across the faces of the specimen.

**3.2 Air leakage chamber.** The chamber shall be constructed so that, with the surround fitted and its opening sealed, the rate of air leakage from the apparatus does not exceed  $7 \text{ m}^3/\text{h}$  or  $0.25 \text{ m}^3/\text{h}$  per metre of any perimeter sealing, whichever is the greater, at a pressure of 50 Pa above atmospheric pressure. It shall be provided with a means of ensuring that the airflow pattern in the chamber gives a uniform pressure over the face of the specimen (see clause 5).

NOTE The uniform airflow pattern may be achieved by either the use of baffle plates or by deflection of the airflow.

### 3.3 Surround

**3.3.1** The surround, if required, shall be capable of being fixed and sealed against the chamber opening and shall be so constructed as to allow the specimen to be installed in the apparatus in its test position and, if appropriate, to be tested from either direction.

**3.3.2** If the surround is also to be used to test the specimen for fire resistance it shall be treated as a supporting construction and be selected accordingly and shall meet the requirements of BS 476-22 for the appropriate duration.

### 3.4 Airflow system

**3.4.1** The chamber shall be equipped with a fan system capable of applying and maintaining an adjustable pressure differential of up to 100 Pa between the two faces of the specimen, together with connections to provide for the supply of air to and exhaustion of air from the chamber.

NOTE The specimen is required to be tested in two directions, and this may be achieved by either the use of a reversible airflow system (see Figure 2) or by reversing the surround containing the specimen (see 3.3.1).

**3.4.2** The chamber shall be provided with a means of measuring rate of air leakage, when the specimen is in place, with an accuracy of  $\pm 5$  %.

NOTE It may be necessary to use more than one instrument to achieve the specified accuracy. In general the rate of air leakage will depend upon the size of the door or shutter and the area of the leakage paths. It is not anticipated that for doors designed for smoke control purposes that the rate of air leakage will exceed  $16 \text{ m}^3/\text{h}$  per metre of the leakage path.

## 4 Ancillary equipment

**4.1 Barometer.** The barometer shall be capable of measuring atmospheric pressure with an accuracy of  $\pm 1$  %.

**4.2 Static pressure measuring head.** The measuring head shall be capable of measuring and recording the static pressure over the range from 5 Pa to 100 Pa with an accuracy of  $\pm 10$  % of the specified value, with a maximum of  $\pm 5$  Pa.

**4.3 Thermometer.** The thermometer shall be of the dry bulb type and shall be capable of measuring atmospheric temperature with an accuracy of 1 °C.