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Timber-based fire door assemblies – Code of practice

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Contents

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 34, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2016. It was prepared by Subcommittee B/538/1, *Windows and doors*, under the authority of Technical Committee B/538, *Doors, windows, shutters, hardware and curtain walling*. A list of organizations represented on these committees can be obtained on request to their secretary.

Supersession

This British Standard supersedes BS 8214:2008, which is withdrawn.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- limitation of the scope to timber-based door assemblies only;
- complete revision of recommendations for joints between timber-based door frames and walls;
- removal of colour codes from the normative text;
- general update to take into account the publication of new and revised standards since 2008.

Fire doors perform a vital function in the provision of an adequate means of escape from a building and, depending upon the intended use of the building, BS 9999, BS 9991 and other documents recommend both the performance rating and the position of the fire doors required to ensure safe egress. Similarly, guidance in support of national building regulations includes provision for the control of the spread of internal fire, by means of compartmentation or other techniques, and again adequately rated fire doors contribute to this containment. The rating of such doors is specified by the design team/designer, possibly in conjunction with fire safety professionals, using the recommendations given in these documents, or by the fire strategy that has been developed to meet the functional objectives. The fire resistance provisions of the structure, including the fire door assemblies, will have been determined, when designing to meet the functional requirements of the regulations, as those which are necessary to control the hazard from fire to acceptable levels of risk.

This British Standard identifies the important parameters in the specification, installation and maintenance of fire doors that contribute to the successful attainment and retention of the level of performance deemed appropriate to contain the risk.

References are given throughout this British Standard to information to be obtained from manufacturers. These are summarized in Annex A.

Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions in this standard 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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

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 British Standard cannot confer immunity from legal obligations.

Particular attention is drawn to Regulation 7 of the Building Regulations 2010 [1], Regulation 8 of the Building (Scotland) Regulations 2004 [2] and Regulations 23 and 24(2) of the Building Regulations (Northern Ireland) 2012 [3].

Attention is also drawn to the Regulatory Reform (Fire Safety) Order 2005 [4], the Fire (Scotland) Act 2005 [5] and the Fire Safety Regulations (Northern Ireland) 2010 [6] in respect of the requirement for all buildings to be subjected to ongoing fire risk assessment, subsequent to the acceptance by the regulatory controllers of the fire protection measures provided.

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0 Introduction

0.1 Role and use of fire doors

Fire doors are required to provide two main functions:

a) to maintain any compartmentation of buildings, which has been introduced to limit the size and spread of fire in order to control the perceived risk;

b) to allow access to protected escape routes, both vertically and horizontally, without any loss of fire resistance, and limit smoke movement in the structure forming these routes, e.g. protected corridors, lobbies, stairways and shafts.

The locations and ratings for fire doors for means of escape are given in relevant guidance under building regulations in the UK and applicable design standards such as BS 9991 and BS 9999 founded on risk-based design considerations. In more complex buildings, designs may be based on fire safety engineering approaches governed by procedures defined in BS 7974.

0.2 Fire door rating

The expression of fire resistance requirements in the UK in regulations and design standards is limited to either the integrity criterion alone or integrity with insulation. Performance is tested in accordance with either BS 476-22 or BS EN 1634-1, determined by the time in minutes when the standard failure criteria are reached for either integrity or insulation. Fire doors are typically designated by reference to their integrity performance, although insulation performance might also be a requirement, particularly under risk-based design approaches.

When tested in accordance with BS 476-22, such doors are identified by the prefix FD followed by the required integrity rating expressed in minutes, e.g. FD 30, a fire-resisting door able to resist integrity failure for 30 min. The following ratings fall within the scope of this British Standard: FD 20, FD 30, FD 60, FD 90 and FD 120.

When tested in accordance with BS EN 1634-1, and classified in accordance with BS EN 13501-2, the doors are identified by the prefix E followed by the required integrity rating expressed in minutes, e.g. E 30, a fire-resisting door able to resist integrity failure for 30 min. The following ratings fall within the scope of this British Standard: E 20, E 30, E 45, E 60, E 90 and E 120. Insulation performance is indicated by the shorthand designation "EI" followed by the test time category (e.g. 30 min).

NOTE National building regulations ([1] to [3] and [7]) only apply to life safety. Higher performance levels (such as insulation) might be necessary for certain applications if property protection is required.

In addition to the need to provide fire resistance, certain doors are also required to restrict the spread of ambient temperature ("cold") smoke. When tested in accordance with BS 476-31.1, these doors are identified by the suffix S, e.g. FD 30S. When tested in accordance with BS EN 1634-3 and classified in accordance with BS EN 13501-2, these doors are identified by the suffix S_a, e.g. E 30S_a.

1 Scope

This British Standard gives recommendations for the specification, installation and maintenance of timber-based fire doors. The recommendations are applicable to timber-based hinged or pivoted pedestrian door assemblies or door leaves, fitted into frames of any material.

This British Standard is applicable only to door assemblies that are designed to provide fire resistance ratings of up to and including 2 h when tested in accordance with BS 476-22 or BS EN 1634-1.

This British Standard is applicable to fire performance and smoke control. It does not cover security, ergonomic factors, functional performance other than with respect to fire resistance. It does not cover impact safety of glazing, for which recommendations are given in BS 6262-4.

This British Standard does not include doorsets, which are covered in BS EN 16034.

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.

BS 476-20, *Fire tests on building materials and structures – Part 20: Method for determination of the fire resistance of elements of construction (general principles)*

BS 476-22, *Fire tests on building materials and structures – Part 22: Method for determination of the fire resistance of non-loadbearing elements of construction*

BS 476-31.1, *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*

BS EN 179, *Building hardware – Emergency exit devices operated by a lever handle or push pad, for use on escape routes – Requirements and test methods*

BS EN 1125, *Building hardware – Panic exit devices operated by a horizontal bar, for use on escape routes – Requirements and test methods*

BS EN 1366-4, *Fire resistance tests for service installations – Part 4: Linear joint seals*

BS EN 1634-1, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows*

BS EN 1634-3, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 3: Smoke control test for door and shutter assemblies*

BS EN 13637, *Building hardware – Electrically controlled exit systems for use on escape routes – Requirements and test methods*

3 Terms and definitions

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

3.1 architrave
trim that serves to mask the joint between a door frame and the surrounding structure, which can be integral with the frame or a separate element

3.2 assessment
technical evaluation of the expected performance of a door assembly in lieu of testing, carried out by a competent authority, with reference to relevant test evidence, for changes to components or arrangements

3.3 competent person
person, suitably trained and qualified by knowledge and practical experience, and provided with the necessary instructions, to enable the required task(s) to be carried out correctly

3.4 door
building component for closing an opening in a wall that allows access and might or might not admit light when closed

NOTE The word "door" is used as a generic term for door leaves and door assemblies.

3.5 door assembly
complete assembly as specified and installed, including door frame and one or more leaves, together with door hardware, glazing, seals and other components, supplied from more than one source

NOTE A door assembly can also include associated over panels and side panels (which can be glazed) as part of a fire door screen.

3.6 door frame
fixed surround into which are fitted one or more door leaves

NOTE A door frame can also be designed to surround other panels, and can include sill, threshold, architraves or other cover moulds. A door frame can be a separate item to be fixed to the adjacent structure, or it can be an integral part of a wall or partition.

3.7 door hardware

3.7.1 door hardware
small components, usually metal, used mainly for the operation or support of doors

3.7.2 essential door hardware
items that are necessary to achieve the fire-resisting performance of a fire door assembly when incorporated into a building

NOTE Guidance on essential door hardware is given in Annex B.

3.7.3 non-essential door hardware
items that are not necessary to achieve the fire-resisting performance of a fire door assembly, but which if fitted might affect that performance

NOTE Guidance on non-essential door hardware is given in Annex B.

3.8 door leaf
hinged or pivoted part within a door frame

3.9 doorset
pedestrian doorset, industrial, commercial and/or garage doorset, rolling shutter and/or operable fabric curtains including any frame or guide, door leaf or leaves, rolling or folding curtain, etc., which is provided to give a fire resisting and/or smoke control capability when used for the closing of permanent openings in fire resisting separating elements, including any side panel(s), vision panel(s), flush over panel(s), transom panel(s) and/or glazing together with the door hardware and any seals (whether provided for the purpose of fire resistance or smoke control) which form the assembly and fulfilling the provisions of BS EN 16034

NOTE Doorsets are supplied from a single source as defined in BS EN 12519.

[SOURCE: BS EN 16034:2014, **3.1**, modified – note added]

3.10 fire door
door (**3.4**) which, together with its frame and hardware as installed in a building, is intended (when closed) to restrict the passage of fire and/or smoke, and is capable of meeting specified performance criteria to those ends

NOTE A fire door may have one or more leaves, and the term includes a cover or other form of protection to an opening in a fire-resisting wall or floor or in a structure surrounding a protected shaft.

3.11 fire door assembly
door assembly (**3.5**), intended, when closed, to restrict the passage of fire and/or smoke and to be capable of meeting specified performance criteria to those ends

3.12 fire resistance
ability of a component or construction of a building to meet for a stated period of time some or all of the appropriate criteria specified in BS 476-22 or BS EN 1634-1

3.13 intumescent fire seal
seal used to impede the flow of heat, flame or gases, which only becomes active when subjected to elevated temperature

NOTE Intumescent fire seals are components which expand, helping to fill gaps and voids, when subjected to heat in excess of ambient temperatures.

3.14 latch
self-engaging fastener which secures a moveable component (e.g. door) in a closed position and which can be released by hand

[SOURCE: BS EN 12209:2003, **3.1.14**]

3.15 lock
fastener which secures a moveable component in a closed position within an opening and which is operated by a key or other device

[SOURCE: BS EN 12209:2003, **3.1.17**]

3.16 seal
fitting provided to close a gap for the purpose of controlling the passage of air, smoke, water, fire, sound, etc.

3.17 smoke seal
seal fitted to the leaf edge or frame reveal for the purpose of restricting the flow of smoke or hot gases

3.18 third-party certification scheme
scheme undertaken by an independent third-party certification body that certifies conformity to the provisions of a recognized document which is appropriate to the purpose for which a product, material or process is to be used

NOTE Such schemes are designed to ensure consistency of product conformity and the standard of workmanship being provided.

4 Determination of fire resistance of doors

*COMMENTARY ON CLAUSE **4***

The fire resistance of a door assembly is determined by subjecting a full-size construction to test in accordance with the procedures laid down in the appropriate fire resistance test standard, i.e. BS 476-22 or BS EN 1634-1. The test standard requires the tested construction to be fully representative of the assembly to be used in practice in terms of materials and methods of construction, size, number of leaves and mode of operation, including all glazed openings and essential door hardware.

The fire resistance is expressed in terms of the number of minutes for which the assembly meets the relevant criteria. Depending upon the test standard used for the evaluation, the criteria would be either integrity or insulation.

For the purposes of classification, doors are classified to the last specific fire resistance period that has been passed during the test before failure occurs. Where more than one criterion is identified during the test, it is possible that for each of these criteria a different classification period might apply (see BS EN 13501-2).

Recommendations on the required classification period for a particular application are provided by either regulatory guidance or relevant design standards (such as BS 9991 and BS 9999), as well as individual designs carried out according to BS 7974.

The building designer should ensure that all fire doors to be used are of a design that has been tested or subjected to assessment for the required fire resistance period, and that documentary evidence exists to that effect.

Where the elements of a fire door are to be obtained from different sources, the building designer should ensure that the elements to be used are compatible and are able to provide the required fire resistance period, and that documentary evidence exists to that effect.

Before proceeding with contractual commitments it should be established that evidence of performance exists which meets with the approval of the enforcing authority.

NOTE 1 When it is impossible, due to size or other constraints, or is impractical, to evaluate the constructions by test then it is appropriate to have the potential fire resistance of the construction determined by way of agreed expert opinion based on existing test evidence. This course of action might be required when evidence of performance of a particular component has been established in connection with another form of construction. As a successful fire resistance performance is often the result of complex interactions between materials it can never be assumed that a result obtained under one set of circumstances will be conferred on a different combination of components or materials. It might be possible, however, for the proposed combination to be determined as suitable by a competent expert, on the basis of evidence generated in other tests.

NOTE 2 BS 9999:2017 recommends that door openings in compartment walls are limited to 25% of the wall length where the doors are uninsulated. There is no limit if the doors provide insulated performance at the appropriate level.

5 Marking

All fire doors should be clearly marked with their declared fire resistance period either immediately after manufacture or inspection, or before dispatch.

NOTE 1 Some marking systems are controlled within third-party certification schemes, whereas others are purely identification in their own right and do not imply such certification.

All fire-resisting glass should be identified on the glass itself with a permanent mark that provides, as a minimum, the glass manufacturer's name, product name and impact classification if required by the application. That mark should be permanent, visible and readable after glazing. It should be resilient to common cleaning methods such that the mark remains readable during the working life of the door.

Documentation or website information for the fire-resisting glazing should provide details of the specified glazing system, including, for example, potentially critical information such as edge cover, glazing sealants and setting blocks for expansion provisions within the glazing pocket. That information should also include the fire-resisting classification of the glazed system, with reference to the applicable fire test evidence and certification.

NOTE 2 The system referred to in the 2008 edition of this standard is now considered obsolete but might be encountered when inspecting existing fire doors. The marking system was intended to provide information on the door assembly and is not an indication of third-party certification. Table 1 is reproduced from the 2008 edition for information purposes.

NOTE 3 The GGF publication A guide to best practice in the specification and use of fire-resistant glazed systems *[8] gives further guidance on identification and documentation.*

Table 1 **Range of colour codes giving a method of performance identification for non-metallic doors and frames**

Core colour	Label colour or background colour	Integrity	Colour code interpretation
		min	
Red	White	20	Intumescent fire seals need to be added at time of original installation
	Yellow	30	
	Pink	45	
	Blue	60	
	Brown	90	
	Black	120	
Green	White	20	Intumescent fire seals will have been fitted at time of manufacture
	Yellow	30	
	Pink	45	
	Blue	60	
	Brown	90	
	Black	120	

6 Specifying fire doors

The specification of fire doors should be undertaken only by persons with appropriate expertise.

NOTE 1 Fire door manufacturers have considerable experience in the design, manufacture and testing of fire doors, and have many different proven designs available. Any deviation from designs that have been tested or subjected to assessment need careful evaluation.

When specifying a fire door assembly, a full description of the element should be provided in addition to the level of fire resistance required. The description should include the following, as any of these can affect the potential fire resistance of the assembly:

a) overall size;

b) size and number of leaves;

c) mode of operation (single or double swing);

d) size, location and number of any glazed openings;

e) details of the door hardware, including any additional intumescent protection required;

f) details of frames;

g) presence of any over panels, fanlights, side panels, etc.;

h) presence of any performance seals.

NOTE 2 Fire resistance is a property that can be possessed only by a complete construction, and not by the individual components or materials from which the construction is formed. In the case of a fire door, it is only the complete assembly as described in the relevant fire test report that can be deemed to provide the required performance when competently installed into the building. Therefore, a door leaf, door frame, door hardware or any other component part cannot be fire-resisting in isolation from other parts.

As the constituent parts of a fire door often interact in quite subtle ways, any changes from the original tested specification can significantly alter the performance of the assembly installed. Therefore in order to maintain the performance of fire door assemblies, the quality of materials and components used in manufacturing should be carefully monitored and controlled.

NOTE 3 General guidance on matters relating to fire doors can be found in BWF publication Fire doors – The burning issues – From specification to maintenance: the life cycle of a fire door explained *[9] and the ASDMA* Best practice guide to timber fire doors *[10]. Guidance on the specification of door hardware for fire doors is given in the DHF/GAI* Code of practice: hardware for fire and escape doors *[11].*

NOTE 4 Users of this British Standard are advised to consider the desirability of sourcing fire doors from a manufacturer that operates as a member of a third-party certification scheme, as such schemes are designed to ensure consistency of product conformity.

7 Doors and frames

7.1 General

Ideally, fire doors should be purchased as coordinated assemblies in accordance with the manufacturer's specification.

NOTE This is expected to ensure that all the correct components are fitted and that full assembly instructions are available.

If it is not possible or practicable to do so, the recommendations given in **7.2** to **7.**5 should be followed, subject to the manufacturer's guidance, test or assessment evidence.

7.2 Door leaves

*COMMENTARY ON **7.2***

There are various constructions used for the manufacture of fire doors. These can be used in a number of configurations, which vary from single-leaf single-swing through to double-leaf double-swing, with a possible option for storey-height door assemblies using transoms or flush over panels.

It should not be assumed that a door tested in one configuration will be suitable for another configuration.

7.3 Door frames

7.3.1 General

There are no generic recommendations for the dimensions of door frames for fire-resisting door assemblies. The minimum dimensions for frame cross-section, including any doorstop, should be obtained from the manufacturer or determined according to the fire test evidence and other relevant non-fire criteria.

The frame of a fire-resisting door assembly should provide not only support of the leaves in the cold state, but also adequate support of the leaves under fire exposure. The frame should be able to accept door hardware fixings to support the door leaf and fixings retaining the frame in the wall opening.

7.3.2 Solid timber door frames

The dimensions and density of solid timber door frames should be not less than those tested or approved.

NOTE 1 Guidance on timber types and classifications is given in BS EN 942.

NOTE 2 Some species might have specific restrictions in their scope of application, as identified by the manufacturer.

7.3.3 Engineered timber door frames

The dimensions and density of engineered timber door frames (e.g. MDF) should be not less than those tested or approved.

NOTE Guidance on types and classifications of composite materials is given in BS EN 14374.

7.3.4 Metal door frames

Timber-based door leaves should not be hung in metal frames unless substantiated by specific test evidence.

If a metal frame has formed part of a door assembly with a timber-based door leaf and achieved a satisfactory fire test result, it should not be assumed that the metal frame is suitable for use with any other timber-based door leaf.

7.3.5 Composite door frames

The design of composite door frames (e.g. PVC-U or glass-reinforced plastic) should be identical to those tested or approved.

7.4 Intumescent fire and smoke seals

*NOTE 1 Installation of intumescent fire and smoke seals is covered in Clause **12**.*

There are various types of intumescent fire seal, each of which can react differently. Such seals should meet the period of fire resistance and configuration relevant to the specific door design when tested in accordance with BS 476-22 or BS EN 1634-1. The seal formulation, dimensions and configuration should be the same as those originally specified for the door design.

There are a number of different types of smoke seal available, and the most appropriate type for each specific door type and configuration should be identified from the manufacturer's test report. Smoke seals should meet the required performance relevant to the specific door design when tested in accordance with BS 476-31.1 or BS EN 1634-3, and should not compromise the fire performance of the door when fitted.

If the door edges have to be planed to improve fit within the door frame, the seals should be first removed and then replaced when the work is completed.

*NOTE 2 There is a limit on the amount of adjustment that can be made to door edges (see **9.5.1**). The performance of the door can be affected, and if too much of the edge is removed, refitting the seal without further modification would leave the seal standing proud.*

NOTE 3 General guidance on the role of intumescent fire seals can be found in IFSA technical information sheet 1 [12]. Guidance on the role of smoke seals can be found in IFSA technical information sheet 3 [13].

7.5 Apertures

Apertures should not be cut on site unless this is carried out by a competent person in accordance with the test evidence and the manufacturer's recommendations.

Apertures should only be cut into doors that are designed (i.e. tested and/or assessed) to receive apertures, and should therefore only be fitted into a fire door under the control of the fire door manufacturer. The position of the cut-out within the door should be the same as, and the aperture size should not exceed, the area and aspect ratio of that previously tested and/or assessed.

Glazed apertures should be in accordance with Clause **10**. Apertures for hardware should be in accordance with Clause **11**. Any other apertures should be discussed with the fire door manufacturer.

8 Handling and storage of doors on site

Delivery should be planned so as to reduce the storage time on site to the practical minimum. Where door assemblies have to be stored, they should be protected at all times from moisture and extremes of temperature, preferably in a ventilated building.

NOTE Guidance on moisture content can be found in the ASDMA Best practice guide to timber fire doors *[10].*

The manufacturer's specific handling and storage instructions should be followed.

9 Installation of fire doors

NOTE Users of this British Standard are advised to consider the desirability of employing installers that operate as a member of a third-party certification scheme for fire door installation, as such schemes are designed to ensure that the installation process maintains product conformity.

9.1 General

The fixing of door assemblies should be left as late in the building programme as possible to avoid damage arising from other operations. The manufacturer's specific installation instructions should be followed.

9.2 Installation of door frames

The frame should be plumb and square, and securely fixed into the opening, with suitable solid packing to ensure that the gap between the frame and surround is equal on both sides.

NOTE The need to provide solid fixings for normal day-to-day use is likely to override any special fixing considerations for fire.

Door assemblies should be installed plumb and square within the opening, without twist, racking or distortion of any member, in accordance with the manufacturer's recommended tolerances, to operate correctly after installation.

Correct methods of installation should be adopted to ensure that, when fixed into the wall, the designated fire rating for the door opening will be achieved.

Metal and composite frames, if used, should be fixed in accordance with the manufacturer's specific instructions.

9.3 Compatibility of door frames with surrounding structure

The main supporting structure for the door assembly, including any part of the reveal left unprotected by the frame, should be subject to a fire resistance test and should be shown to be capable of:

a) effectively supporting the proposed door assembly construction for the required fire resistance period; and

b) mechanically supporting the door assembly in the cold state.

The method of fixing and the location of fixings should be suitable for the particular structure into which the door assembly is to be installed.

NOTE The type of surrounding structure or wall/partition can exert an influence upon the fire performance of the assembly, e.g. for timber doors in steel frames or glazed screens.

9.4 Sealing between door assembly and surrounding structure

9.4.1 General

In order to maintain the fire resistance of a fire-resisting wall or partition when fitted with a door assembly, the sealing between timber-based door frames and the supporting construction should be in accordance with Table 2 to Table 5 as appropriate for the fire performance required. The manufacturer's advice should be obtained for any door frame materials, types of construction or periods of fire resistance that are not covered in these tables.

To ensure easy installation, the structural opening for the door assembly should be prepared to a size, including permissible clearance, defined by the door supplier.

Table 2 **Supporting construction unlikely to exhibit significant distortion during fire exposure, with 30 min fire resistance** *(1 of 2)*

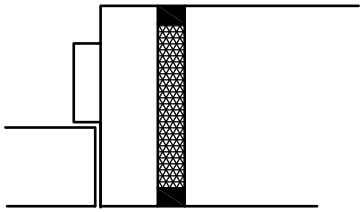
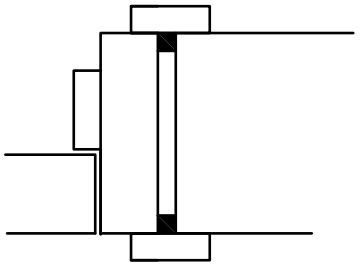
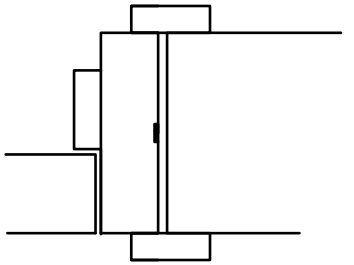
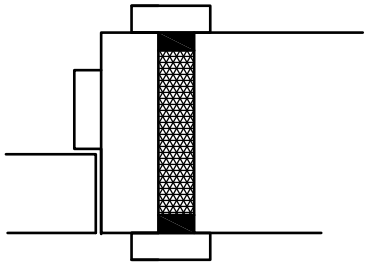
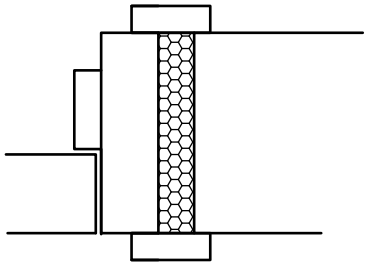
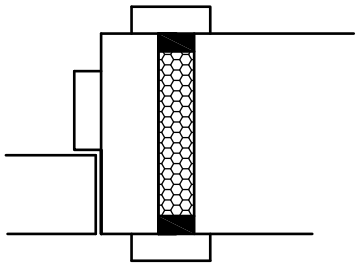
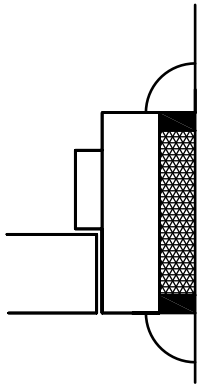
	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
1	No architraves fitted	Mineral rock fibre tightly packed to a depth of the frame making allowance for a 10 mm capping, to both faces, of mastic	Up to 15 mm	Yes	See **9.4.2**	
2	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Mastic applied to fill the gap between the wall and the frame to a minimum depth of 10 mm	Up to 10 mm	Yes	See **9.4.2**	
3	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Minimum 10 mm × 2 mm pressure-forming intumescent fire seal centrally fitted the rear of the door frame	Up to 5 mm	No	None	
4	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Mineral rock fibre tightly packed for the full depth of the frame	Up to 20 mm	Yes	Rock fibre to be capped with mastic (see **9.4.2**) on both sides of the frame with no gaps	
				No	None	

Table 2 **Supporting construction unlikely to exhibit significant distortion during fire exposure, with 30 min fire resistance** *(2 of 2)*

	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
5	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Expanding foam for the full depth of the frame	Up to 20 mm	No	See **9.4.2**	
6	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Expanding foam for the full depth of the frame capped with mastic	Up to 20 mm	Yes	See **9.4.2**	
7	Minimum 10 mm hardwood quadrant beads tightly fitted between wall and frame	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 20 mm	Yes	Quadrant bead should be sized appropriate for the wall to frame gap. See **9.4.2**	

NOTE Examples are:
- *non-load bearing timber stud partition;*
- *masonry wall.*

Table 3 **Supporting construction likely to exhibit significant distortion during fire exposure, with 30 min fire resistance** *(1 of 2)*

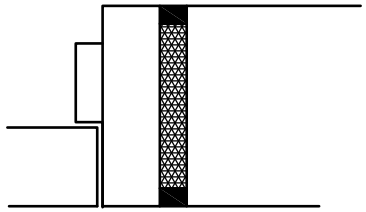
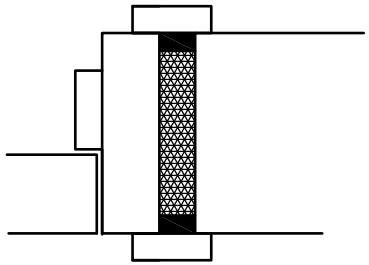
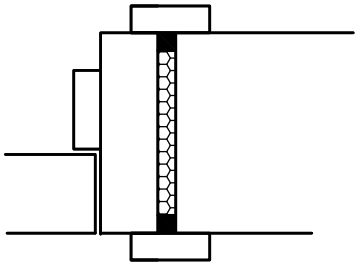
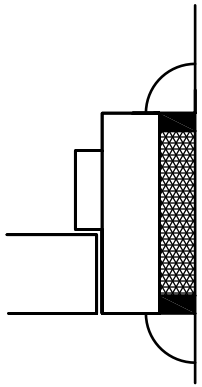
	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
1	No architraves fitted	Mineral rock fibre tightly packed to a depth of the frame making allowance for a 10 mm capping, to both faces, of mastic	Up to 15 mm	Yes	See **9.4.2**	
2	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 20 mm	Yes	See **9.4.2**	
3	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Expanding fire rated polyurethane foam for the full depth making allowance for a 10 mm capping, to both faces, of mastic	Up to 10 mm	Yes	See **9.4.2**	

Table 3 **Supporting construction likely to exhibit significant distortion during fire exposure, with 30 min fire resistance** *(2 of 2)*

	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
4	Minimum 10 mm hardwood quadrant beads tightly fitted between wall and frame	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 20 mm	Yes	Quadrant bead should be sized appropriate for the wall to frame gap. See **9.4.2**	

NOTE Examples are:
- *steel stud partition;*
- *load-bearing timber stud partition.*

Table 4 **Supporting construction unlikely to exhibit significant distortion during fire exposure, with 60 min fire resistance** *(1 of 2)*

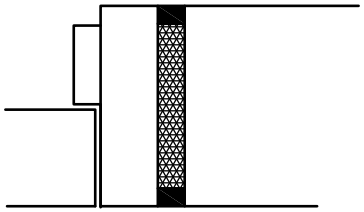
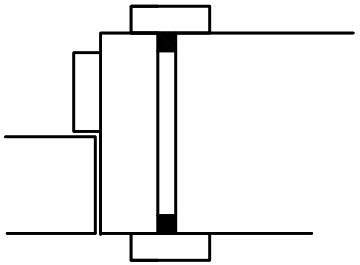
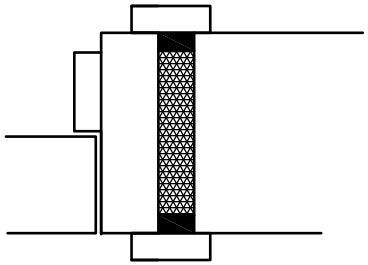
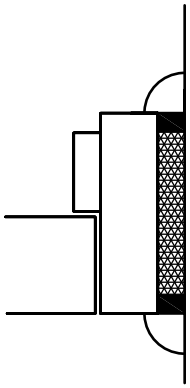
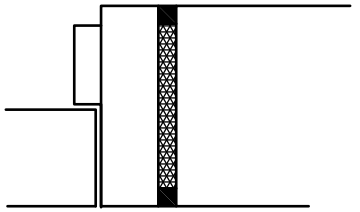
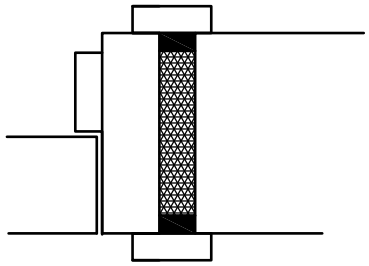
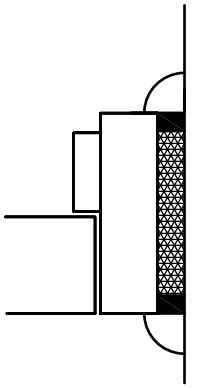
	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
1	No architraves fitted	Mineral rock fibre tightly packed to a depth of the frame making allowance for a 10 mm capping, to both faces, of mastic	Up to 15 mm	Yes	See **9.4.2**	
2	Architraves to be minimum 15 mm thick constructed from hardwood or MDF with 15 mm overlap on frame and wall	Mastic applied to fill the gap between the wall and the frame to a minimum depth of 10 mm	Up to 10 mm	Yes	See **9.4.2**	
3	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Mineral rock fibre tightly packed for the full depth of the frame	Up to 20 mm	Yes	Rock fibre to be capped with mastic (see **9.4.2**) on both sides of the frame with no gaps	
				No	None	

Table 4 **Supporting construction unlikely to exhibit significant distortion during fire exposure, with 60 min fire resistance** *(2 of 2)*

Architrave condition		Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
4	Minimum 10 mm hardwood quadrant beads tightly fitted between wall and frame	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 15 mm	Yes	Quadrant bead should be sized appropriate for the wall to frame gap. See **9.4.2**	

NOTE Examples are:
- *non-load bearing timber stud partition;*
- *masonry wall.*

Table 5 **Supporting construction likely to exhibit significant distortion during fire exposure, with 60 min fire resistance**

	Architrave condition	Additional Protection	Maximum frame to supporting construction gap width	Suitable for smoke control assemblies	Specific recommendations	Schematic
1	No architraves fitted	Mineral rock fibre tightly packed to a depth of the frame making allowance for a 10 mm capping, to both faces, of mastic	Up to 10 mm	Yes	See **9.4.2**	
2	Architraves to be minimum 15 mm thick constructed from softwood, hardwood or MDF with 15 mm overlap on frame and wall	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 20 mm	Yes	See **9.4.2**	
3	Minimum 10 mm hardwood quadrant beads tightly fitted between wall and frame	Mineral rock fibre tightly packed for the full depth of the frame capped with mastic	Up to 15 mm	Yes	Quadrant bead should be sized appropriate for the wall to frame gap. See **9.4.2**	

NOTE Examples are:
- *steel stud partition;*
- *load-bearing timber stud partition.*

9.4.2 Sealant

Mastic should be an approved linear gap joint seal, successfully tested in accordance with BS 476-20 or BS EN 1366-4 for the required period of fire resistance.

NOTE 1 Any substrate materials tested either side of the approved mastic are acceptable as supporting evidence, e.g. timber to concrete, concrete to concrete, flexible partition to timber or flexible partition to concrete. Provided that the mastic has been tested within these parameters, it can be used for the applications described in Table 2 to Table 5.

Expanding foam should be an approved linear gap joint seal, successfully tested in accordance with BS 476-20 or BS EN 1366-4 for a minimum of 30 min fire resistance.

NOTE 2 Provided that the expanding foam has been tested uncapped on both faces (e.g. without architraves) in accordance with BS 476-20 or BS EN 1366-4, with a minimum gap width of 20 mm and a maximum full fill depth of 100 mm, the expanding foam is approved for frame to supporting construction gap widths up to 20 mm and for all frame depths. Any substrate materials tested either side of the approved expanding foam linear joint seal are acceptable as supporting evidence, e.g. timber to concrete, concrete to concrete, flexible partition to timber or flexible partition to concrete. Provided that the expanding foam has been tested within these parameters, it can be used for the applications described in Table 2 to Table 5.

NOTE 3 For expanding foams that have been tested in accordance with BS 476-20 or BS EN 1366-4, outside these parameters, the maximum width and required depth of foam is dictated by the manufacturer's tested approval and instructions. This could include restrictions on the type of surrounding structure that is approved for use with the expanding foam.

NOTE 4 Mastic and expanding foam seals may be used for the applications described in Table 2 to Table 5, provided that they have been included within a fire test, between the door frame and surrounding structure, on a timber-based door assembly that has demonstrated a minimum of 30 min fire resistance in accordance with BS 476-22 or BS EN 1634-1.

The manufacturer's instructions should be followed.

NOTE 5 The pressure-forming intumescent fire seals identified within Table 2, item 3 are defined as door edge intumescent fire seals that have been successfully tested in accordance with BS 476-22 or BS EN 1634-1 for the required period of fire resistance.

9.4.3 Architrave

Architraves should be mechanically fixed, e.g. pneumatically fired pins, screws.

9.5 Hanging of a door leaf

9.5.1 General

Any adjustment to the door size necessary on site to achieve an equal gap around the sides and top of the door leaf should only be performed in accordance with any limitations given in the manufacturer's installation instructions applicable to the particular door type.

If, in the process of installation, any fire and/or smoke seals are damaged, they should be replaced by identical products.

Intumescent fire seals usually incorporate a protective coating and care should be taken to ensure that the exposed surfaces are not damaged in the adjustment process.

NOTE 1 In certain environments this could lead to a loss of effectiveness in the longer term. In some cases the intumescent fire seal is concealed within the door construction and is not immediately obvious.

*NOTE 2 Specific recommendations for the installation of intumescent fire and smoke seals are given in Clause **12**.*

It should be established before alteration on site whether the door assembly incorporates a concealed intumescent fire seal and, if so, adjustment (e.g. planing) should be limited accordingly.

9.5.2 Operating gaps

Doors should be hung to give an equal gap across the head, down both jambs and at meeting edges.

NOTE Failure of fire-resisting door assemblies under test is very often due to burn-through at the operating gap between the door leaf edge and the door frame. A typical gap to achieve good fire performance is between 2 mm and 4 mm.

All fire doors, including those of 20 min fire integrity, should be fitted with intumescent fire seals, or intumescent fire and smoke seals (combined or separate). Certain smoke seals, e.g. those fitted in the frame reveal or edge of the door, might require a larger gap in order to operate without causing significant frictional increases, but the gap should remain within tolerances approved for the fire resistance performance. The correct doorstop to frame gap should be allowed for where doorstop-mounted smoke seals are fitted.

9.5.3 Under-door (threshold) gaps for fire resistance

Under-door (threshold) gaps should be in accordance with the fire door manufacturer's installation instructions for the particular design.

NOTE 1 Gaps larger than those approved are likely to compromise the fire resistance performance of the door assembly.

The door should be able to open freely over its entire opening angle without damaging the seal or catching on the floor.

NOTE 2 Further guidance on threshold gaps is given in the ASDMA publication Guidance and recommendations for the coordination of bespoke doorsets *[14].*

Threshold gaps for smoke performance should be in accordance with **12.3**.

10 Glazing

*COMMENTARY ON CLAUSE **10***

Glazing is important for fire doors because of the need under UK regulations for safe access, requiring clear vision from one side of the door to the other. This typically includes one or more glazed panels in doors of an appropriate area and at a suitable height and position for all possible users, in some cases with associated side glazed screens and fanlight glazing. The conditions that apply to glazing in doors are also applicable to associated glazed screen assemblies. A fire door with an associated fire-resisting screen needs to be tested or assessed for use as a complete installed door-screen glazed assembly.

Applicable guidance under UK building regulations imposes limits on the use of uninsulated (i.e. integrity-only) fire-resisting glazing in fire doors along escape routes because of heat transfer considerations in fire. The use of fire-resisting glazed elements which satisfy the relevant insulation criteria is not so limited.

Regulatory guidance provided in the UK for compliance with building regulations is primarily for life safety. There are other situations where insulation fire-resisting glazing is specified rather than integrity-only. For example, risk-based design approaches can require the enhanced levels of protection provided by fire-resisting

insulation glazing for higher risk occupancies; also for applications in more complex and multiple occupancy buildings where escape might not be straightforward. Insurers might also set additional limitations on the use of integrity-only fire-resisting glazing that do not apply to insulation fire-resisting glazing, covering specific risks for property protection purposes (see FPA/RISCA publication Approved Document B: Incorporating insurers' requirements for property protection *[15]).*

*NOTE 1 For the preparation of apertures, see **7.5**. For glass replacement, see **13.4**.*

Glazing should preferably be carried out in the door factory, and glazing on site should be avoided if at all possible because of the need for close supervision and attention to important detail to minimize the risks of fire penetration into the body of the door. If glazing on site into factory-prepared apertures is unavoidable then the glazed system should be installed exactly as specified by the door manufacturer, indicating the named components and any particular glazing conditions or arrangements that apply as determined from the applicable test evidence.

Cutting into the body of door leaves that are not designed to accommodate glazing apertures can critically weaken the door and undermine designed fire performance because of the area of glazing that is required and the position of vision panels in the door. Glazing apertures should therefore be prepared in the factory, under the control of the door manufacturer.

NOTE 2 Any cut-outs to take glazing that are not covered by the applicable test evidence (or are outside the scope of applicable certification) will invalidate approval of the door for use as a fire door.

NOTE 3 The cutting on site of apertures at installation to take glass (or at a later date, for example, after fire risk assessment) is strongly deprecated. Any unauthorized glazing cut-outs made to a door are likely to invalidate its certification.

NOTE 4 Where glazing on site cannot be avoided, users of this British Standard are advised to consider the desirability of employing glaziers that operate as a member of a third-party certification scheme for fire rated glass installation, as such schemes are designed to ensure that the glazing process maintains product conformity.

Fire-resisting glass used by the door manufacturer should be permanently marked as a minimum with the glass name, glass supplier's name and the applicable glass performance classification. That marking should be permanent and clear, able to be seen and read after installation in the door or glazed screen. Glass should not be marked on site at the installation, or later.

Fire doors are used along transit routes where glazing needs to be rated for impact safety according to applicable requirements in building regulations governing accidental human impact. Fire-resisting glass used in fire doors and screens in critical locations where accidental impact is a risk should be rated for impact safety as appropriate, and permanently marked accordingly.

The glazing system should be installed as specified in each individual case. Only complete specified glazed systems with appropriate test evidence and available installation guidance should be used. Specified components and glazing arrangements should not be changed without endorsement by the door manufacturer, based on applicable test evidence.

In all cases, the glazing system specification should include the glass by name and its thickness, together with other associated components including the glazing sealant, and any liner that is required in the glazing pocket. The door manufacturer's recommendations on glazing beads, bead fixings, use of setting blocks, edge cover requirements for the glass, and expansion allowances within the glazing aperture should be followed.

The edge cover limits provided by the glass manufacturer in each individual case should be followed, using the glazing sealant/gasket as specified, since changes to the sealant/gasket can critically affect performance.

NOTE 5 In all cases the individual elements of the glazing system are important to keep the glass in place under fire conditions, including:

- *bead cross-section, profile, thickness and height;*
- *timber type, moisture content and density;*
- *type and length of fixings (e.g. pins or screws);*
- *separation between the fixings, and their angle of insertion through the bead into the body of the door;*
- *combination with glazing sealants, which are available in a number of different forms (e.g. strips, tapes, preformed channels, compressible fibre gaskets), using different chemical formulations, providing a range of behaviours from inert to intumescence, in various degrees.*

NOTE 6 Each component in a fire-resisting glazed system cannot be tested in isolation, and therefore the compatibility of components is essential when fitting fire-resisting glass, as demonstrated by standard fire resistance test evidence for the complete glazed system.

Each specified glazing system is designed to function with the glass as an integrated unit. No aspect should be changed without specific test evidence to support the change (including components, main dimensions and design features), and what applies to one particular glazed system should not be assumed as automatically applying to another glazed system using a different glass. In all cases, the sealant/gasket should be fitted accurately into the corners of the glazing aperture to minimize the risks of fire penetration.

A description of the glass and glazing system, as installed, should be provided by the manufacturer (if installed in the factory) or the installer (if installed on site) for retention by the person responsible for the fire safety measures in the building where the door or door screen is located.

*NOTE 7 This information is important for reference in fire risk assessments, or if replacement and refurbishment is needed at some stage during the working life of the building (see **13.4**).*

NOTE 8 Further guidance on fire-resistant glass and glazing is given the GGF publication A guide to best practice in the specification and use of fire-resistant glazed systems *[8].*

11 Door hardware

NOTE Users of this British Standard are advised to consider the desirability of sourcing door hardware from a manufacturer that operates as a member of a third-party certification scheme, as such schemes are designed to ensure consistency of product conformity.

11.1 General

The intumescent materials that have been used to achieve a particular performance in test conditions, with the door hardware and/or the door, should be present in the finished assembly to maintain the stated performance. This should include any additional intumescent protection used in conjunction with the element of door hardware.

NOTE 1 When intumescent protection is specified, then unless such protection is as tested and approved for the item of hardware, the fire performance of the door is likely to be compromised.

Door hardware falls into two categories: essential and non-essential. All door hardware, including that which is electrically operated, should be specified according to its intended function, and should be fitted in accordance with the hardware manufacturer's instructions, supported by the test or assessment evidence for the door assembly.

NOTE 2 Guidance on essential and non-essential door hardware is given in Annex B.

Panic bolts and other emergency exit devices might constitute essential door hardware on internal compartmentation doors in multi-occupancy buildings. In all circumstances they should conform to BS EN 179, BS EN 1125 or BS EN 13637 as appropriate.

11.2 Fitting of door hardware

All door hardware should be fitted in such a way as to ensure that the fire-resisting properties of the door assembly are not compromised, including any tested or approved intumescent protection.

Interruption of intumescent fire seals at the positions of door hardware should be avoided (see also **7.4** and **12.1**), unless supported by test evidence or assessment.

Where mortices are cut to take hardware, they should be cut as accurately as possible to avoid gaps around the fitted hardware.

11.3 Letter plates

Where a letter plate is fitted into a door it should be fitted together with an intumescent liner, as the use of intumescent liners significantly inhibits the spread of fire through the letter plate aperture of the door leaf. Only letter plates that have achieved the appropriate fire resistance period when tested in situ in a fire door should be used.

Since it is not possible to predetermine in which position a letter plate will be fitted, all letter plates for use in fire doors are usually tested in both the top and bottom of a door. Letter plates should be fitted in accordance with the manufacturer's information provided with the door, identifying the acceptable locations for fitting.

Letter plates with larger apertures should not be used unless they have been tested and have achieved the appropriate classification with respect to fire resistance and smoke leakage.

11.4 Door closing devices

Fire doors can only operate correctly if they are fully closed at the time of fire. As a result, all fire doors, except those normally kept locked shut and fitted with appropriate signage (e.g. doors leading to a cupboard or service duct), should be fitted with a self-closing device.

NOTE 1 More detailed recommendations for door closing devices are given in BS 9991 and BS 9999.

Door closing devices fitted on fire-resisting doors should be able to:

a) close the door leaf reliably from any angle to which it has been opened;

b) overcome the resistance of a latch or any seals when fitted.

Door closing devices fitted to fire-resisting doors should be able to perform one of two functions, dependent on whether or not a latch is fitted to the door:

1) latched door: to close the door in a controlled manner into a position where the latch engages. In this case, once the latch is engaged, such closers have no further essential role to play;

2) unlatched door: to close the door in a controlled manner into its frame or, in the case of double-swing doors, to its dead centre closed position, and maintain this condition for a period during fire exposure until the heat-activated sealing system takes over the role of maintaining the door in the closed position.

NOTE 2 These functions are considered "essential" in terms of the ability of the doors to achieve their intended fire resistance rating.

11.5 Hinges and pivots

When used in a fire-resisting door assembly, the door leaf should be hung on hinges or mounted on pivots.

These should be able to achieve the intended fire rating.

Hinges and pivots should be able to allow the door closing device, when fitted to a fire-resisting door assembly, to close the door leaf reliably from any angle to which it has been open.

11.6 Air transfer grilles

11.6.1 General

An air transfer grille to be fitted in a fire door assembly should be fitted only if it has been provided with the grille manufacturer's information confirming that the grille has been tested in a similar construction to determine fire integrity at the pressure differentials appropriate to the height of its intended application.

The required application of the door should be determined, in terms of fire resistance only (fire containment air transfer grille) or fire resistance and cold smoke control (fire and cold smoke containment air transfer grille), as described below.

a) Fire containment air transfer grille. Air transfer grilles that are designed for fire containment only allow the passage of air during normal operation that, when activated by a rise in temperature of the air stream, provides containment of fire. Fire containment only air transfer grilles are typically activated by a thermal release mechanism usually pre-set to operate between 70 °C and 74 °C, or by activation of a suitably tested intumescent matrix within the grille, and are not designed to control smoke at ambient temperature. Fire containment air transfer grilles are therefore only suitable for fitting to doors that are intended to provide fire resistance only (e.g. FD 30).

b) Fire and cold smoke containment air transfer grille. Air transfer grilles that are designed for fire and cold smoke containment allow the passage of air during normal operation, but include an electro-mechanical system that interacts with smoke detectors (either directly or via a fire alarm panel), which seals the grille in order to maintain the smoke leakage rate for the door assembly, as defined in the relevant smoke leakage test standard. Fire and cold smoke containment air transfer grilles also include mechanisms that are activated by a rise in temperature (either mechanical or intumescent-based) that can seal the grille to provide fire containment. Fire and cold smoke containment air transfer grilles are therefore suitable for fitting to doors that are intended to provide fire resistance and ambient temperature smoke control (e.g. FD 30S).

The installation of air transfer grilles should be undertaken only when full fitting instructions and relevant wiring diagrams are available, and should be undertaken only by competent persons.

In the case of electrically interactive air transfer grilles, the installer should liaise with the person(s) responsible for the fire alarm panel or building management system.

All air transfer grilles should be installed in accordance with the manufacturer's installation and commissioning instructions, including any additional protection required for wire ways, conduits and receiver loops, as appropriate.

11.6.2 Over panels and side panels

An air transfer grille to be fitted in an over panel or side panel should be fitted only if it has been provided with the grille manufacturer's information confirming that the grille has been tested in a similar construction to determine fire integrity at the pressure differentials appropriate to the height of its intended application.

Fire and/or smoke containment requirements should be determined as recommended in **11.6.1**.

NOTE General guidance on the appropriate use of air transfer grilles in fire- and smoke-resisting doors can be found in IFSA technical information sheet 7 [16].

12 Installation of intumescent fire or smoke seals

*COMMENTARY ON CLAUSE **12***

Generally the optimum performance from single strip intumescent fire seals is achieved when they are fitted into the leaf or frame of a conventionally sized, latched, single-leaf single-swing door at the mid position of the leaf thickness. Interrupting intumescent fire seals at door hardware positions can have a detrimental effect on the door performance.

NOTE 1 Users of this British Standard are advised to consider the desirability of sourcing intumescent fire and smoke seals from a manufacturer that operates as a member of a third-party certification scheme, as such schemes are designed to ensure consistency of product conformity.

NOTE 2 General guidance on the role and performance of intumescent fire seals, including concealed intumescent fire seals can be found in IFSA technical information sheet 1 [12]. Guidance on selecting smoke seals can be found in IFSA technical information sheet 5 [17].

12.1 General

The intumescent materials that have been used to achieve a particular performance in test conditions should be present in the finished assembly to maintain the stated performance. This should include any additional intumescent protection used in conjunction with the element of door hardware.

The door manufacturer's specified materials and configurations should be used unless there are approved alternatives supported by the test or assessment evidence.

When it is necessary to fit seals on site, either in the frame or the door edge, the manufacturer's recommendations should be followed precisely for the type and mode of operation of the door concerned.

Intumescent fire seals are normally fitted into a groove and can be a friction fit, self-adhesive, glued or mechanically fixed. Care should be taken when fitting self-adhesive seals to ensure that the groove is dry and free from dust or sawdust to ensure a good bond.

NOTE The self-adhesive action deteriorates at lower temperatures, and additional mechanical fixing might be necessary if the seals are fitted at temperatures below 10 °C. Seals may be surface-mounted if they are sufficiently thin, but such seals are more prone to detachment than those fitted into grooves.

If intumescent fire or smoke seals have to be replaced, this should be done in accordance with **13.2.3**.

12.2 Concealed intumescent fire seals

*COMMENTARY ON **12.2***

Some manufacturers offer door assemblies in which pressure-forming intumescent material is concealed behind the timber lipping of the door leaf. The methods of achieving concealed intumescent details are all proprietary. Doors fitted with concealed intumescents are expected to be marked accordingly by the manufacturer.

If it is decided to specify or offer a concealed intumescent fire seal then relevant supporting fire test evidence or assessment should be obtained and the following factors should be taken into account:

a) the proprietary nature of existing solutions;

b) the fine balance of intumescent fire seal specification, operating gaps, lipping dimensions and adhesives required to achieve such a system;

c) the robustness required for the lipping to withstand normal wear and tear;

d) the potential requirement for a separate smoke sealing system;

e) ongoing maintenance concerns.

12.3 Smoke seals

*COMMENTARY ON **12.3***

The test standards for determining smoke leakage are BS 476-31.1 and BS EN 1634-3. Smoke leakage is essentially the transfer of airborne particles of the products of combustion, and sealing systems are used to restrict this air flow. Seals are used to fill the gaps between the door leaf and the frame. As such, they can have an adverse effect on the operating forces required to use the door if not carefully fitted (see BS 8300). Removal of seals to accommodate door hardware increases the leakage rate.

Seals that fit in the centre thickness of the door are generally subjected to friction effects detrimental to the durability of the seal and the easy use of the door. Seals applied to the face of the doorstop are unlikely to have a noticeably adverse effect on the forces required to open the door. Doorstop-mounted seals might prevent the door from latching or closing if incorrectly fitted, or when incorporated within a door rebate that has not been designed to accommodate such seals.

Fire doors that are required by the appropriate building regulations ([1] to [3] and [7]) to restrict the flow of ambient temperature smoke, identified by the suffix S, e.g. FD 30S (BS 476-31) or the suffix S_a, e.g. E 30S_a (BS EN 1634-3), should be fitted with smoke seals.

When installed, the threshold gap should, where practicable, be sealed by a flexible edge or automatic drop seal, either with a leakage rate not exceeding 3 m^3/h per metre at 25 Pa when tested to BS 476-31.1 or BS 1634-3, or just contacting the floor, giving an even contact with the floor but not exhibiting significant increased frictional forces that could interfere with the closing action of the door. Where this is impracticable, the threshold gap should not exceed 3 mm at any point.

NOTE 1 In practice, when the door is fitted the threshold gap can be significantly influenced by the type of floor/floor finish provided and the degree of flatness of the floor across the opening arc for the door. Neither of these are determined by the door manufacturer, and if a particular gap is required then it is expected that this will be identified accordingly in the original door specification. In practice the actual clearance achievable might not be known until the point of installation.

*NOTE 2 Recommendations for threshold gaps for fire resistance are given in **9.5.3**.*

The seal manufacturer's recommended installation instructions should be followed whether the intumescent fire and smoke seals are separate or combined.

Painting of smoke seals or combined intumescent fire and smoke seals should be avoided as such coatings can inhibit the door from closing completely, and the seal could be damaged as a consequence of adhesion to the adjacent element.

*NOTE 3 See also Clause **14** regarding painting of intumescent fire seals.*

13 Maintenance

*COMMENTARY ON CLAUSE **13***

Fire doors are tested and evaluated for fire resistance pass/failure criteria under the same stringent processes as apply to other elements of the building, such as walls, floors and partitions. However, doors do deteriorate, and this is most likely to occur during the occupation of the building, since they are used in locations along pedestrian transit routes where they might be subject to significant damage or normal wear and tear due to repeated operation and abuse.

This deterioration can take two main forms:

a) damage to the leaf or the components making up the assembly;

b) wear in the door hardware, or a reduction in the effectiveness of fixings, causing the door to fail to self-close, thereby resulting in a breach of the fire barrier.

It is important, therefore, for inspection, maintenance and repair of any damage to be undertaken on a regular basis if the required fire resistance is to be maintained. The markings of individual components can be an aid to the correct replacement of those components when necessary.

Attention is drawn to Article 17 of the Regulatory Reform (Fire Safety) Order 2005 [4] in respect of the requirement for maintenance of fire safety provisions. Specific recommendations are given in BS 9999:2017, Annex I.

Further guidance on maintenance is given in ASDMA publication Risk assessment considerations – Timber fire doors *[18].*

13.1 General

Door leaves, door frames, hardware, glass and seals should be examined at regular intervals for superficial damage, structural damage and excessive bowing or deformation. These intervals should be modified over time as necessary to suit observations and experience related to the particular building.

NOTE The frequency of inspection can be determined according to the risk assessment and relative to the frequency of use of the doorway. Generally, doors used infrequently might be programmed for (say) monthly inspection. Duct doors are normally kept closed and might not be fitted with closers, so can be omitted from the inspection programme. High usage doors could be programmed for (say) weekly inspections.

Inspection and maintenance should be undertaken by a competent person.

13.2 Door leaves and door frames

13.2.1 General

It is not easy to repair doors and maintain the interactive behaviour of the various component parts, except for minor repairs, which should only be undertaken with the approval of the door manufacturer. When any other damage is detected, the complete door leaf or door frame should be replaced.

The replacement door should be able to provide the same level of fire resistance as the damaged door and, if intumescent fire seals are fitted in the frame, the new door should be compatible with the fitted seals.

Doors that are normally kept locked should be inspected with the doors open, by an authorized person.

13.2.2 Double-leaf doors

In the event of damage that necessitates the replacement of one leaf of a double door, both leaves should be replaced with a new matching pair, since it would be virtually impossible to ensure that a replacement single leaf would be of identical construction to that being removed.

NOTE Any difference in construction is likely to cause different movement when exposed to fire, severely reducing the likelihood of the doors maintaining their integrity.

13.2.3 Replacement of intumescent fire seals, smoke seals, combined intumescent fire and smoke seals

*COMMENTARY ON **13.2.3***

There are three types of door seal available for fire and smoke containment:

a) intumescent fire seals designed to maintain the integrity of the door assembly;

b) smoke seals to restrict the flow of smoke before intumescent fire seals become effective;

c) combined intumescent fire and smoke seals where both intumescent fire and smoke seals are incorporated in one assembly.

Damage or degradation of these seals can have a significant adverse impact on the ability of the door assembly to perform its designed function.

If a seal is missing in part or in total, the entire length should be replaced immediately. To maintain the potential (or design) integrity performance, the replacement seal should be of the same formulation, dimensions and configuration as that of the seal being replaced, and fitted in accordance with the manufacturer's instructions.

13.3 Replacement of door hardware

Where it is necessary to replace essential door hardware as a result of natural wear or damage, the fire door manufacturer's technical information should be followed.

13.4 Replacement of glass

*NOTE 1 For fitting of glass on site, see Clause **10**.*

The door manufacturer should be consulted to determine whether or not replacement of the glass can be carried out on site, to establish what conditions apply and what guidance should be followed. Replacement work should be carried out by a competent person.

Any changes should be made according to the original glazing system specification for the door. The glazing aperture should be cleaned of debris and any projections removed before re-glazing. New beads, bead fixings and glazing sealant/gaskets should be used.

NOTE 2 Where glass and/or associated retaining systems need to be replaced on site, users of this British Standard are advised to consider the desirability of employing glaziers that operate as a member of a third-party certification scheme for fire rated glass installation, as such schemes are designed to ensure that the glazing process maintains product conformity.

14 On-site decoration

NOTE Fire door leaves are generally not required to provide a specific surface spread-of-flame barrier, and may therefore be painted or lacquered as desired, in accordance with the manufacturer's recommendations where available.

Smoke-only seals should never be overpainted.

For combined intumescent fire and smoke seals, the smoke element should never be overpainted.

For intumescent fire-only seals, there is no evidence to suggest that overpainting of intumescent fire seals has any detrimental effect on the ability of the seals to perform efficiently; however, overpainting should be avoided wherever possible, or if unavoidable should be limited to a maximum of five coats of conventional paint or lacquer or a maximum of 0.5 mm, whichever is the greater.

When preparing a frame for redecorating, the use of heat or chemical strippers should be avoided if seals are incorporated. If seals are damaged by either of these processes, they should be replaced in accordance with **13.2.3**.

Where glazing beads are identified as having been painted with intumescent paint, specialist advice should be obtained before repainting.

Annex A (informative) Information to be obtained from manufacturers

References are given throughout this British Standard to information to be obtained from manufacturers. These are summarized below:

a) minimum dimensions for frame cross-sections, where applicable (**7.3.1**);

b) restrictions on the scope of application of timber species (**7.3.2**);

c) cutting of apertures (**7.5** and Clause **10**);

d) handling and storage instructions (Clause **8**);

e) fixing of door assemblies (**9.1**);

f) general instructions for installation of door frames (**9.2**);

g) specific instructions for installation of metal and composite frames (**9.2**);

h) joints for any door frame materials, types of construction or periods of fire resistance that are not covered in Table 2 to Table 5 (**9.4.1**);

i) suitability of the test evidence for the sealant (**9.4.2**);

j) limitations on door size adjustment (**9.5.1**);

k) under-door (threshold) gaps (**9.5.3**);

l) instructions for installation of glazing (Clause **10**);

m) specification of glass or associated retaining system (Clause **10** and **13.4**);

n) instructions for installation of door hardware (**11.1**);

o) instructions for fitting of letter plates (**11.3**);

p) instructions for installation of air transfer grilles (**11.6.1** and **11.6.2**);

q) instructions for installation of intumescent fire or smoke seals (**12.1**, **12.2**, **12.3**);

r) materials and configurations for intumescent fire seals (**12.1**);

s) details of whether repairs are permissible (**13.2.1**);

t) specification of intumescent fire or smoke seals for replacement purposes (**13.2.3**);

u) technical information for door hardware for replacement purposes (**13.3**).

NOTE This list encompasses information to be provided by different manufacturers involved in the process, e.g. fire door manufacturers, hardware manufacturers, glazing and seal manufacturers. It is a checklist for references to manufacturers' instructions/recommendations within this British Standard and is not necessarily an exhaustive list of all information that might need to be provided.

Annex B (informative) Guidance on essential and non-essential door hardware

NOTE Further guidance on door hardware is given in the DHF/GAI Code of practice: hardware for fire and escape doors *[11].*

B.1 Essential door hardware

The following are examples of items of hardware that are necessary for fire resistance:

- hanging devices:
- single axis hinges conforming to BS EN 1935;
- pivots as part of closing device assembly conforming to BS EN 1154;

- closing devices:
- controlled closing devices conforming to BS EN 1154;
- electro-magnetic hold-open or free-swing devices conforming to BS EN 1155;
- door co-ordinators conforming to BS EN 1158;
- locking devices:
- lock cases conforming to BS EN 12209 or BS EN 179 when supplied as an assembly for emergency escape locksets;
- electro-mechanical locks conforming to BS EN 14846;
- cylinders conforming to BS EN 1303;
- bolts for inactive or slave leaves conforming to BS EN 12051;
- panic bolts and other emergency exit devices to normally locked internal fire doors on escape routes, conforming to BS EN 1125 or BS EN 179;
- intumescent fire seals.

The continuing correct performance of these items is critical to the achievement of the potential fire resistance of the assemblies.

B.2 Non-essential door hardware

The following are examples of items of hardware that are not necessary for fire performance, but which might be necessary for means of escape or the function of the door:

- lever furniture;
- pull handles;

  NOTE 1 BS 8300 prefers single-side fixing.
- electro-magnetic hold-open devices;
- panic bolts and other emergency exit devices, conforming to BS EN 1125, BS EN 179 or BS EN 13637;
- push plates;
- kick plates;
- number or name plates;
- signs, accessories, etc.

  NOTE 2 Attention is drawn to the legal requirement for signage to identify fire doors.

  NOTE 3 Safety signs are covered in the BS 5499 series.

Such items can affect the fire performance of the door.

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BS 5499 (all parts), *Safety signs, including fire safety signs.*

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BS 8300, *Design of buildings and their approaches to meet the needs of disabled people – Code of practice*

BS 9991, *Fire safety in the design, management and use of residential buildings – Code of practice*

BS 9999:2017, *Fire safety in the design, management and use of buildings – Code of practice*

BS EN 942, *Timber in joinery – General requirements*

BS EN 1154, *Building hardware – Controlled door closing devices – Requirements and test methods*

BS EN 1155, *Building hardware – Electrically powered hold-open devices for swing doors – Requirements and test methods*

BS EN 1158, *Building hardware – Door coordinator devices – Requirements and test methods*

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BS EN 16034:2014, *Pedestrian doorsets, industrial, commercial, garage doors and openable windows – Product standard, performance characteristics – Fire resisting and/or smoke control characteristics*

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