Code of practice for

Fire door assemblies with non-metallic leaves

Portes coupe-feu à vantaux non métalliques — Code de bonne pratique

Feuerschutztüren mit Türblättern aus nicht-metallischen Werkstoffen

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Committees responsible for this British Standard

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Association of Builders' Hardware Manufacturers
British Furniture Manufacturers' Federation
British Lock Manufacturers' Association
British Standards Society
British Woodworking Federation
Department of Health
Department of the Environment (Building Research Establishment)
Department of the Environment (Construction Industries Directorate)
Department of the Environment (Property Services Agency)
Fibre Building Board Organization (FIDOR)
Fibre Cement Manufacturers' Association Limited
Flat Glass Manufacturers' Association
Guild of Architectural Ironmongers
Gypsum Products Development Association
Institute of Carpenters
Institution of Fire Engineers
Intumescent Fire Seals Association
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London Housing Consortium
Royal Institute of British Architects
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Foreword

This British Standard has been prepared under the direction of the Timber Standards Policy Committee.

In recent years there has been an increase in performance based regulations and codes and a corresponding decrease in the use of specified constructions for particular functional applications. Fire doors are now almost exclusively specified by the level of performance that they can attain when subjected to the standard method of test for the determination of the fire resistance of elements of construction. The current method of test is given in BS 476 : Part 22 which, with BS 476 : Parts 20, 21 and 23, replaced BS 476 : Part 8 in 1987. Whilst most of the advice given in this code is based on testing performed in accordance with BS 476 : Part 8, it is considered that the guidance will be applicable to tests performed in accordance with BS 476 : Part 22.

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, the appropriate Part of BS 5588 and other guidance documents recommend both the rating and the position of the fire doors required to ensure safe egress. Similarly, national building regulations include provision for the control of the spread of internal fire, either by means of compartmentation or other techniques, and again adequately rated fire doors contribute to this containment. The rating of these doors will be specified by the controlling authorities in terms of the performance that they are to provide when evaluated with respect to the current fire resistance testing procedure.

This code of practice identifies the important parameters that contribute to the successful attainment and maintenance of the required level of performance in the design, construction and use of fire doors where the door leaf component is of a non-metallic construction.

The information is of value to the designer of such fire doors as it should reduce the product development time and costs. It is also of use to the specifier of such doors as it identifies the key parameters to be specified and advises on any constraints that may apply to the design to be specified. Controlling authorities will find that the information will assist them in evaluating whether the test evidence submitted is relevant to the component under examination, and whether further evidence of performance is required.

Assistance is provided to the builder by identifying the permissible site operations and by the provision of guidance relating to the installation of such assemblies. Finally, advice on how to maintain fire doors in an operating condition is provided for use by property management.

Further information on the technology and the current methods of specifying fire doors is to be found in PD 6512 : Part 1. Examples of how to construct two designs of timber based FD30 rated, single leaf, single swing, latched fire doors of limited size, for internal use which are in compliance with the recommendations of this code, are to be found in PD 6512 : Part 2[1].

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Section 1. General

0 Introduction

0.1 Role and use of fire doors

Fire doors are required to provide two main functions.

(a) To maintain the compartmentation of buildings, which is aimed at containing the fire to the area of origin and yet still allow the passage of people or goods between one compartment and another.

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

NOTE 1. The position and fire performance of door assemblies required to fulfil the objectives given in (a) above are specified in the appropriate regulations and guidance.

For means of escape purposes the positions and ratings of the fire doors are given in the relevant codes of practice, i.e. BS 5588 : Part 1, Part 2 and Part 3.

NOTE 2. The specification of fire doors for the protection of the means of escape may also be found in other documents such as the Guides to the Fire Precautions Act.

A more detailed explanation of the role and use of fire doors is given in PD 6512 : Part 1 : 1985.

0.2 Fire door rating

Recent changes in the methods of expressing the results of fire resistance tests, both at international and national levels, have lead to the dropping of the stability term and in future non-loadbearing elements will be adjudged by the criteria of integrity and insulation only. The performance of a fire door when tested in accordance with BS 476 : Part 22 is judged by its time to failure (in minutes) for both integrity and insulation (see clause **3**); however for the purposes of BS 5588 fire doors are designated by reference to their required performance for integrity only and 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 standard; FD 20, 30, 45, 60, 90 and 120.

In addition to the need to provide fire resistance, certain doors are also required to restrict the spread of ambient temperature or 'cold' smoke. These doors are identified by the suffix S, e.g. FD 30S and when tested in accordance with BS 476 : Section 31.1 should comply with the recommendations for performance given in the relevant Part of BS 5588.

1 Scope

This British Standard gives recommendations for the specification, design, construction, installation and maintenance of fire doors constructed with non-metallic door leaves. The guidance given is applicable to assemblies where the door leaves are manufactured from wood, ligno-cellulosic materials and compatible mineral based or inorganic products and where the door frames are constructed from any of the above materials in addition to metal.

The recommendations given are restricted to doors, manufactured as described above, designed to provide fire resistance ratings of up to, and including 2 h. These ratings are in respect of tests conducted in accordance with the conditions specified in BS 476 : Part 8 and Part 22. Design guidance in particular is limited where proprietary materials may be involved, e.g. mineral cored doors.

The code does not provide recommendations relevant to industrial or architectural steel fire doors, lift doors, roller shutters or other forms of closure.

An example of a typical fire door specification is given in appendix A. Guidance on essential and non-essential ironmongery is given in appendix B and additional recommendations for timber used in fire doors are given in appendix C.

NOTE. The titles of the publications referred to in this standard are listed on page 36.

2 Definitions

For the purposes of this standard the definitions given in BS 6100 : Sections 4.1, 4.3, and 4.4 apply together with the following.

2.1 fire door

A door or shutter provided for the passage of persons, air or things which, together with its frame and furniture as installed in a building, is intended, when closed, to restrict the passage of fire and/or gaseous products of combustion and is capable of meeting specified performance criteria to those ends.

2.2 door

A term used for convenience where the context applies equally to door leaves, door frames, doorsets, door assemblies and door kits.

2.3 door leaf

A hinged or pivoted construction, the function of which is to allow or prevent access.

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2.4 door kit

A set of fully machined and fitted frame components together with a door leaf or leaves fully prepared for site assembly and fixing. Door kits may or may not include all the items of ironmongery required for the finished door assembly.

2.5 door frame

The fixed surround into which are fitted one or more door leaves. The door frame may also be designed to surround other panels, and may include sill, threshold, architraves or other cover moulds. The door frame may be a separate item to be fixed to the adjacent structure, or it may be an integral part of a wall or partition.

2.6 door assembly

A complete assembly as installed, comprising door frame and one or more door leaves and any other panels, together with their ironmongery and any seals.

2.7 fire door assembly

A door assembly, intended, when closed, to restrict the passage of fire and/or gaseous products of combustion and be capable of meeting specified performance criteria to those ends.

NOTE. For the purposes of this standard the term 'fire door assembly' is synonymous with 'fire door'.

2.8 doorset

A door frame with its door leaf or leaves pre-hung on hinges or pivots, supplied as an assembled unit from a single source.

2.9 seal

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

2.10 ironmongery

Small components, usually metal, used mainly for the operation or support of doors, windows and joinery fittings.

2.10.1 essential ironmongery

Items vital to achieve the fire resistance performance of a fire door assembly.

2.10.2 non-essential ironmongery

Items which are not required to achieve the fire resistance performance of a fire door assembly but which if fitted may affect the performance.

2.11 lock

A mechanism combining, in one case, a spring bolt and a dead bolt operated respectively by handle and a removable key.

2.12 latch

A device, operable from both sides and generally self engaging, for holding closed a door, gate or the like, consisting of a moveable part operated by a handle, falling by gravity or sliding or moving by means of a spring into a retaining member.

2.13 heat activated sealing system

A material, or combination of materials, normally intumescent in nature, which, when heated, forms a seal which is able to restrict the egress of hot gases between two adjacent surfaces, thus contributing to the integrity of the assembly.

2.14 fire resistance

The ability of a component or construction of a building to satisfy for a stated period of time the appropriate criteria specified in the relevant Part of BS 476.

3 Determination of fire resistance of doors

The fire resistance of a door assembly is determined by subjecting a full sized construction to test in accordance with the procedures laid down in the fire resistance testing standard specified in the relevant legislative document, e.g. BS 476 : Part 8 or Part 22. The test standard requires the tested construction to be fully representative of the assembly to be used in practice in terms of both the materials and methods of construction, the size, number of leaves and mode of operation including all glazed openings and essential ironmongery. Essential ironmongery includes, on a latched door the hinges or pivots and the latch, and on an unlatched door the hinges or pivots and the self-closing device.

The fire resistance is expressed in terms of the number of minutes for which the assembly satisfies the relevant criteria. Depending upon the test standard used for the evaluation, the criteria would be one or all of the following: stability, integrity, insulation.

In addition to the above criteria, for door leaves that incorporate significant quantities of glazing, the heat flux, or the radiation level and the

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position at which it was measured may also be recorded to enable the safe storage distance for combustible materials to be calculated. The fire resistance of a doorset may typically be expressed as follows:

stability:	37 min[1)]
integrity:	35 min
insulation:	35 min[2)]

NOTE. The relevant criteria are specified by the controlling authority.

The building designer should ensure that all fire doors (in all sizes and configurations) to be used have satisfied the requirements of appropriate fire tests, and that certificates exist 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.

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 fire resistance of the construction assessed by a competent assessor based on existing test evidence. This course of action may 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 should never be assumed that a result obtained under one set of circumstances will be conferred on a different combination of components or materials. It may be possible, however, for the proposed combination to be assessed as suitable by an assessor, on the basis of evidence generated in other tests.

1 The assessment should include details of the original tests on which the assessment is made, and the justification for the basis of the assessment.

NOTE. It is important that assessments are carried out by suitably qualified fire safety engineers or laboratories accredited by the National Measurement Accreditation Service (NAMAS) for conducting the relevant test. In either case the assessor should be familiar with the standards and procedures for the testing of fire doors and have current experience of such testing. In the case of assessments which take the form of either an extrapolation or an interpolation of test evidence the assessor should have specific knowledge, normally accumulated over a period of time, of the behaviour of the products when subjected to fire tests. Only this degree of knowledge can equip the assessor to provide assessments in respect of variations from the tested details. Test data and information in support of the assessment should be provided by the client who should either own or have permission to use the data.

4 Methods of specifying fire doors

4.1 Fire performance

Prior to 1983 the most commonly used method for specifying the performance of fire doors was by reference to the stability and integrity ratings. For example a half-hour fire door was required to resist stability and integrity failure for a period of 30 min. For certain applications it was permissible to reduce the integrity to less than that of the stability, known as 'firecheck' performance, and these doors were designated 30/20. Since then the reference to stability has been dropped and fire doors designated by the prefix FD should be specified only by their integrity rating, i.e. FD 30. This system is in accordance with the guidance given in PD 6512 : Part 1.

4.2 Description of the assembly

It is important when specifying a fire door assembly to provide a full description of the element in addition to the level of fire resistance required. This description should include the overall size, the size and number of leaves, details of frames and any overpanels, fanlights, sidepanels, etc., the mode of operation, the size and number of any glazed openings, and details of the ironmongery, as all of these can affect the potential fire resistance of the assembly.

The size of leaf is critical as a supplier will need to establish whether the certification of his product covers the size of the leaf required. The fire resistance of a doorset which has been determined by test applies only to assemblies up to the size tested unless it has been subsequently assessed as being able to be used at a larger size by an appropriate authority (see clause **3**). It should be stated carefully whether the assembly is:

(a) single leaf;

(b) double leaf, including unequal pairs of leaves.

A door leaf tested as a single leaf assembly is not suitable for use as a leaf in a double leaf assembly unless it has also been tested as part of a double leaf doorset, or has been assessed as suitable by an appropriate authority on the basis of supportive test evidence (see clause **3**).

Integral overpanels, i.e. those fitted without a transom, play an important role in the fire resistance of a doorset and if these are to be used they should be clearly identified. Any door leaf used in conjunction with an overpanel should have

[1)] In BS 476 : Part 22, non-loadbearing elements are no longer evaluated with respect to stability and this term will not be found in test reports for door assemblies. Doors will be required only to satisfy the integrity criterion, hence the current method of referring to fire door performance purely by reference to the integrity rating, e.g. FD 30, as described in PD 6512 : Part 1.

[2)] When glass, which does not satisfy the insulation criterion, is incorporated in the construction, then the door cannot claim to satisfy the full insulation rating.

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demonstrated its ability to provide the required integrity when used in this manner under test conditions. Fanlights and sidepanels are normally separated from the leaves by transoms or mullions and as such they have less influence on the performance than integral overpanels. However, the method of construction of these panels should be such that they do not have a lesser fire resistance than the door leaves with which they are associated.

It should be clearly stated whether the doors are to be hung as:

(1) single swing, i.e. opening in one direction only;

(2) double swing, i.e. opening in either direction.

Glazed openings can have a twofold influence on the ability of a door assembly to achieve the required level of fire resistance. The glass and the glass retaining system should in themselves be capable of providing an equal level of fire resistance as the door leaf into which they are to be installed. The core material of certain forms of door construction may require to be modified, e.g. by the incorporation of solid timber framing to the intended aperture, and it is important therefore to establish the size and position of such openings before commencing manufacture. Secondly, the inclusion of an aperture may interfere with structural components within the leaf and as a result reduce the stability of the door under fire test conditions. It is necessary, therefore, to establish whether the door has been tested or assessed as being capable of providing the desired level of fire resistance when glazed in the manner proposed.

The size, number and position of any glazed openings (by reference to a drawing if necessary) should be clearly identified at the time of specifying the assembly.

The presence, or absence of any ironmongery which will retain the door leaf in the closed position during fire exposure has an important influence on the ability of a door to provide the required fire resistance. A door leaf, or leaves which are retained closed by means of a mortise latch, mortise lock or bolts will usually perform better in fire test conditions than a similar assembly that is only held in the closed condition by means of a self-closing device. It is important therefore to state in a specification whether the doors are positively retained shut as doors tested with the benefit of positive closing will not necessarily provide a similar level of performance when such devices are omitted. The absence of positive latching will influence the selection of both the edge sealing system and the associated ironmongery. (See appendix A.)

5 Marking

All fire doors should be clearly and permanently marked with their fire resistance rating, as established by test or assessment, either immediately after manufacture or inspection, or before dispatch. The marking should indicate clearly the integrity and, if applicable, the stability and insulation performance, together with the standard to which these figures relate, e.g. BS 476 : Part 8 or Part 22. The marking should also indicate whether heat activated seals need to be incorporated at the time of installation in order to achieve the claimed rating. A convenient way of providing this information is by means of a colour coded permanent label or plug.

The recommended colour code for non-metallic door assemblies is indicated by a combination of two colours. The background colour identifies the integrity rating of 20, 30, 45, 60 min, etc., and the inner core, either red or green, indicates the requirements for the heat activated (intumescent) seals. The red core indicates that the door should be hung only with the necessary heat activated seals fitted at the time of installation. The green core advises that the door has been supplied with any neccessary seals already incorporated, therefore the door should be hung only as received in an appropriate door frame and will provide the claimed performance without any additional work. Alternatively a blue/white coded plug may be used. In order to qualify for a blue/white code, doorsets should have been tested with and without additional seals and should achieve FD 30 and FD 20 integrity ratings respectively. Table 1 shows the complete range of colour codes for door assemblies of up to 120 min integrity. It is essential to check that the applied intumescent seal is suitable.

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

Core colour	Background colour	Integrity	Colour code interpretation
		min	
Red	White Yellow Pink Blue Brown Black	20 30 45 60 90 120[1)]	Intumescent seals require to be fitted at time of original installation (see clause 13)
Green	White Yellow Pink Blue Brown Black	20 30 45 60 90 120[2)]	No additional intumescent seal need be fitted at time of installation
Blue[3)]	White	20	With no intumescent seal fitted
	White	30	With intumescent seal fitted in either door edge or frame

[1)] FD 120 rating is unlikely to be achieved with conventional timber frames.

[2)] FD 120 rating is not achievable with conventional timber frames.

[3)] Only door constructions with a fire resistance rating of 30 min that satisfy both FD 20 without an additional intumescent seal fitted and FD 30 with an intumescent seal fitted are marked with a blue/white plug.

NOTE 1. Existence of a colour code does not necessarily mean that the product is available.

NOTE 2. Attention is drawn to the fact that 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.

Where the door identification includes a red core, identifying the need for intumescent seals to be fitted at the time of installation, it is important that the installer is supplied with the necessary information giving the type, size, quantity and the position of the intumescent seals to be fitted. This information should be appended to the door leaf in such a manner that it does not easily become detached in transit. Whilst it is imperative that this information is supplied for these doors, it is strongly recommended that all fire resisting doors are supplied to site with a data sheet advising the recipient of all limitations that apply to that particular door, e.g. its ability to be sized on site, selection of essential ironmongery, compatibility with items of non-essential ironmongery, suitability and approved techniques to be used for glazing and any limitations on finishes, etc.

It should be noted that the use of factory pre-finished, pre-hung doorsets/door kits precludes the need for this information being transmitted to site as it is not intended that site work would be performed on these assemblies. It is recommended that essential ironmongery is factory fitted, or that morticing for these items is carried out by the door manufacturer.

6 Other considerations

6.1 General

Whilst the achievement of the required fire resistance rating of a fire resisting door assembly is of paramount importance the door should also comply with the recommendations given in **6.2** to **6.5**.

6.2 Safety

Where door assemblies incorporate areas of glass, the glass should satisfy the recommendations of BS 6262. BS 6262 gives a classification system and recommends the minimum rating for the glass to be used, depending upon the location and the size of the pane.

6.3 Ergonomic factors

Fire doors are usually heavier than similarly sized non-fire doors. In addition they are often required to be fitted with a self-closing device. This means that some users, particularly elderly and disabled people and children, may have difficulty in opening the door. Difficulties may be aggrevated by badly fitted door seals or pressure on the door due to a fire or air movement in the building.

The force required to open a fire door depends on the above factors, and on the size and mass of the door leaf, the strength and efficiency of the door closer and the type and position of those items of ironmongery that have to be used to open the door.

Recommendations relating to maximum resistance to opening forces that can be tolerated by various user groups are given in DD 171 and the appropriate pressures should generally not be exceeded.

Where forces are excessive, the use of automatic door release devices complying with BS 5839 : Part 3 should be considered, but prior agreement of the enforcing authority should be sought.

NOTE. Further guidance on ergonomic factors is given in the Building Research Establishment Information Paper IP 2/82 'Ergonomic requirements for windows and doors.'

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6.4 Security

Security considerations can impose contradictory requirements on the design and installation of fire doors, particularly with respect to the ironmongery specification. When such conflicts are encountered it is important to consult the enforcing authorities in order to resolve any incompatability between the two requirements. BS 8220 gives guidance on the security aspects of buildings.

6.5 Fire safety signs

After installation the fire door should be labelled with the appropriate signs complying with BS 5499 : Part 1.

7 Functional performance

The most important aspect of the design and specification of a fire door is that it should meet the normal functional requirements. It is important that the door assembly is correctly specified in terms of its strength, robustness and other properties that may influence its ability to satisfy the normal functional requirements. DD 171 gives guidance on the relevant criteria and describes the appropriate test procedures for establishing the properties to be specified.

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Section 2. Design and manufacturing considerations

8 Introduction

8.1 Quality control and quality assurance

All of the individual components and materials forming a fire resisting door assembly which has successfully satisfied the fire resistance test for a given period will have contributed in some way to the fire performance of the assembly. In order to maintain the performance of doors manufactured subsequently, the quality of materials and components used should be carefully monitored and controlled.

It should not be necessary to check that a fire door conforms to that reported in the original fire test report with respect to the quality of construction. The use of a quality control scheme ensures consistency of product quality and is strongly recommended (see BS 5750).

8.2 The role of the constituent parts of the assembly

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, which can claim to provide the required performance. Therefore, a door leaf, door frame, ironmongery or any other component part cannot be fire resisting in isolation from other parts.

Because the individual component parts comprising a door assembly might previously have been included in successful fire resistance tests it does not necessarily follow that a composite construction formed from such items will perform similarly.

As the constituent parts of a fire door often interact in quite subtle ways any changes from the original tested specification may significantly alter the performance of the assembly installed.

The wide range of door leaf constructions and types of ironmongery, the behavioural differences between timber and metal frames, the very different nature of certain intumescent seals, and the varying compatibility of glazing systems with leaf cores, are all factors that contribute to the probability of the fire performance of a composite door assembly not being equal to that of its individual components.

Components from two or more fire doorset designs should not automatically be brought together to form a hybrid construction.

In some cases it may be possible to assess the fire resistance of a previously untested combination of components but test evidence relating to the various components should be available to the assessor. Indicative tests using parts of full sized elements can be used to aid such an assessment, particularly the aspects of such combinations that are not directly affected by the size of the specimen. Where it is not possible to make such an assessment the assembly should be re-evaluated by test.

Clauses **9** to **19** will assist the door designer to appreciate some of the aspects of the materials and how they may influence the design and the subsequent manufacture of fire door assemblies.

9 Door configuration

9.1 General

Depending upon the door assembly configuration, the door leaves are supported by different forms of ironmongery which vary in respect of their ability to control the various modes of distortion that may be exhibited by particular door leaf constructions. It is important to note that doors originally fire tested as single leaf or single swing assemblies should not then be used as double leaf or double swing doorsets without evidence of performance relating to that mode of operation. Door leaves tested as double swing assemblies may be favourably assessed for use as a single swing door, but this may require a modification to the amount of intumescent material required.

9.2 Single leaf, single swing, hinged doors

Leaves of single swing doors are generally hung on hinges and thus one side of the leaf is firmly restrained at one vertical edge. Even when fitted with a latch, which helps to restrain the other vertical edge of the door leaf, there is little to prevent door leaf distortion, under fire exposure, in the form of bowing on plan.

Single swing doors have doorstops, and it is widely recognized that door assemblies are often able to offer greater fire resistance when opening away from the direction of fire exposure. This has led to the erroneous belief that doorstops make an important contribution to fire resistance performance. Timber door leaves generally exhibit distortion due to shrinkage of the face towards the fire and the result is often seen as the edges and corners of the leaf tending to move towards the fire. Thus, if a door leaf opens in towards the fire the doorstop becomes irrelevant as the leaf distorts away from it. With a door leaf opening away from a fire the doorstop is on the exposed face and movement of the leaf edges or corners towards the fire is checked. This checking effect can be only temporary as eventually doorstops of any dimension will be charred away.

When heat activated sealing systems are used, the doorstop makes no significant contribution to fire resistance. The size, type and fixing of the stop is, therefore, unimportant.

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9.3 Single leaf, pivot hung, unlatched doors

The special type of ironmongery required for pivot hung doorsets restrains the door leaves in a different manner from single swing doors in the event of fire exposure. Such ironmongery consists of two pivot points, one in the head of the leaf and one at the foot of the leaf. Double swing leaves are not fitted with latches and when compared with single swing leaves the ironmongery for double swing leaves offers less restraint to leaf distortion when exposed to fire.

The absence of a doorstop and the different basic door frame cross section means that any leaf distortion will not necessarily move the leaf out of the frame. Without the resistance to door leaf distortion that the doorstop provides initially to an inward opening door the distortion will probably occur about the original plane of the leaf putting less stress on the heat activated sealing system.

9.4 Single and double swing, double leaf doors

A major problem is to maintain an effective seal between the meeting edges. Should one leaf move or distort differentially with respect to the other as a result of fire exposure, the meeting edges can separate, leading to a premature loss of integrity.

The selection of a suitable heat activated sealing system for this junction is vital. Excessive pressure resulting from the activation of an intumescent seal can cause the differential movement to increase whilst insufficient pressure may not be able to restrain any such deformations which occur in the leaves. Rebated meeting edges are a deprecated form of construction (see **12.13**). As the rebates separate, due to differential bowing, the gap between the leaves becomes increasingly difficult to seal, the width of the gap to be sealed being equal to the depth of the rebate (see figure 1). If a rebated joint is unavoidable then the rebate should be as small as practical. Unequal rebates are more likely to be successful than equal rebates. Test evidence should be furnished to support rebated meeting stiles.

Double swing, double leaf assemblies are preferred to double leaf, single swing doors where leaves open in opposite directions.

Even when plain meeting stiles are utilized it is difficult to achieve a seal at the junction with the meeting stiles and the head of the door frame. If a unidirectional intumescent seal is used then a better seal is likely to be achieved if the sealing strip is fitted continuously across the head of the frame rather than in the leaf heads, particularly for periods of fire resistance in excess of 30 min. When a multidirectional intumescent seal is used this will be more tolerant and an adequate seal may be achieved without the need for it to be frame mounted.

10 Door frames

10.1 General

The frame of a fire resisting doorset should provide:

(a) support of the leaves in the cold state;

(b) adequate support of the leaves under fire exposure.

10.2 Workmanship

Fire exposure will exploit any void or badly formed joint. Any void in any joint should be plugged with solid timber or filled with intumescent compound or suitable filler at the time of manufacture.

10.3 Manufacture of door frames by third party

Frequently door frames for fire resisting door assemblies are not made by door manufacturers.

In this case guidance should be sought from the leaf manufacturer who will be able to advise on the dimensions and specification of the door frame used in the original fire test validating the assembly. The original frame specification can be seen as a minimum and any increase in frame width, depth or additional mouldings is acceptable.

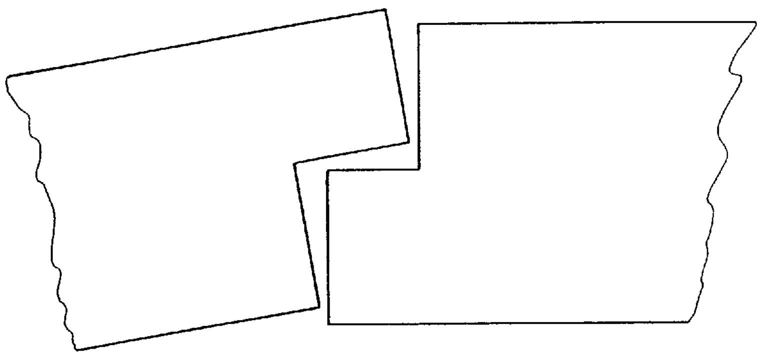

Figure 1. Example of separation of rebates on swing doors

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10.4 Timber door frames

The risk of premature failure of fire doors due to the distortion of their timber frames can be ignored if the frame has been formed from straight-grained material and is adequately fixed to the surrounding structure. The rate of charring of timber frames is of much greater significance. Charring rate is generally closely related to timber density. Commercially available softwoods with densities of at least 420 kg/m^3 have been shown by test to be suitable for door frames for assemblies with fire resistance ratings of FD 20 and FD 30.

Certain 54 mm thick door leaves with a fire resistance rating of FD 60 have been successfully tested using frames of selected softwood. It is more usual however, for timber with a slower charring rate to be used for this application, normally hardwoods with densities of 650 kg/m^3 or greater. FD 60 assemblies incorporating leaves of 44 mm thickness will be less tolerant of lower density frames and the timber density for thinner leaves becomes much more critical.

Tests on door frame members incorporating finger joints have not shown to be the cause of any failure to achieve the required fire resistance.

Timber based door frames for assemblies that are designed to provide fire resistance periods in excess of 60 min will either be manufactured from very high density timbers or incorporate proprietary protective materials in the construction. The impregnation of softwood with flame retardant salts has not been shown to make a significant contribution to the fire resistance of timber framed fire doors.

Door frame material should, therefore, be free from wild grain, and have the density and cross section of at least that used in the validating test or in any other approved specification.

A change in door frame specification from the original which involves the use of a timber of a greater density or cross section is acceptable without the need for further test evidence or assessment.

10.5 Steel door frames

Steel expands when heated, and temperatures in excess of 800 °C and 900 °C are experienced during 30 min and 60 min exposures respectively in the fire resistance test given in BS 476. Steel door frames will have one cooler edge on the unexposed face of a doorset under test whilst the other edge will be exposed to the fire. The heated edge of the frame will expand with such force that the frame members will endeavour to bow in towards the furnace. The very different thermal behaviour of timber will produce different and often opposite, modes of distortion or bowing in the timber door leaf. The result is that the edge of the door leaf will tend to separate from the frame, thus contributing to loss of integrity of the door assembly.

For periods of fire resistance of up to 30 min some composite metal frames incorporating steel liners, often forming part of a partitioning system, have successfully incorporated timber based door leaves. Frames for doors with a fire resistance rating of 60 min invariably require a method of controlling their distortion. Most commonly the steel frame sections are infilled with cementitious material or are securely fixed to a masonry surround with masonry passing into the rear of the frame section. As well as providing a mechanical restraint, intimate contact with masonry produces a heat sink effect, further assisting in reducing distortion of the steel door frames. When so fixed, the notes on fixing given in appendix D of BS 1245 : 1986 should be followed for test assemblies. Steel door frames should be of the type tested and fixed in accordance with the tested condition.

The relatively high thermal conductivity of steel will mean that there may be a possibilility of the unexposed face of the steel frame reaching temperatures sufficient to ignite timber, e.g. the unexposed face of the door leaf. The other main problem associated with a steel frame having reached several hundred degrees Celsius by conduction is the effect upon the intumescent or heat activated seal used to protect the leaf to frame clearance gap. Intumescent seals work satisfactorily when bearing against timber surfaces. The insulating properties of timber will mean that even during fire exposure the expanding seal will be acting against the uncharred timber surfaces of door leaf edge and door frame towards the unexposed face of the doorset. However, in the case of a steel frame the seal will be acting against a steel surface heated by thermal conduction. This may degrade the seal more rapidly, thus reducing the period for which the seal remains effective.

Thermal expansion of a steel frame will lead to an increase in its internal dimensions, i.e. the opening size for the door leaf. This will lead to an increase in the leaf to frame clearance gap, thereby placing a greater performance requirement on any seal used to protect this junction. Intumescent seals do not expand indefinitely, and the specification for such seals in this application is normally greater than would be used with timber frames.

Because a steel frame has formed part of a door assembly with a timber based door leaf and achieved a satisfactory fire test result it does not follow that the steel frame is suitable for combining with any other timber based door leaf.

Timber based door leaves should not be hung in steel frames unless substantiated by specific test evidence. Such door assemblies do not easily lend themselves to assessments.

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10.6 Aluminium alloy door frames

Frames manufactured from aluminium alloys often feature in demountable partition systems. As aluminium has a melting point of around 650 °C, substantially below the temperatures that are experienced by a door assembly exposed to the fire test conditions for 20 min, it can be seen that special provisions have to be made if door frames constructed substantially from aluminium are to be used as part of a fire resisting door assembly. Aluminium alloy frames are unlikely to be used successfully in fire resisting door assemblies which are designed to provide fire resisting periods in excess of 30 min.

Test evidence relating to the exact design of the frame, any special linings, the method of installation, the heat activated sealing system and the specific leaf construction should be provided to substantiate the claimed performance.

10.7 Door frame dimensions

There are no particular recommendations for the dimensions of door frames for fire resisting doorsets. The minimum dimensions of frame cross section is dictated by cold state requirements. The frame should be able to accept ironmongery fixings to support the door leaf and fixings retaining the frame in the wall opening.

Timber frames of basic cross section as small as 70 mm × 30 mm have proven successful, indeed, some split frame designs consist of several even smaller sections joined together.

The size of frame should be not less than that tested or approved unless a smaller section has been assessed as being suitable by an appropriate authority when used in combination with a specific form of leaf construction.

10.8 Doorstops

One area of contention regarding door frame dimensions has often been the depth of the rebate. With current design of fire doors incorporating heat activated or intumescent door leaf/frame edge seals the doorstop dimension is irrelevant. The availability of double swing door assemblies able to offer periods of fire resistance up to 120 min can be seen to support this.

As with basic frame cross section, the doorstop dimensions are influenced by cold state requirements. Provided doorstop sections can be securely fixed to resist normal usage there is no need for the stop to be worked from solid, i.e. be integral with the basic door frame section.

Doorstops can only ever offer any significant contribution to fire resistance if there are no intumescent or heat activated fire seals present and then only if the door leaf remains free of distortion during fire exposure enabling the face of the door leaf to remain in continuous intimate contact with the doorstop. Fire resisting door leaves will invariably exhibit some degree of distortion or movement under fire exposure thus breaking contact with any doorstop, potentially allowing the passage of flames or hot gases. In such cases a 12 mm deep doorstop would be just as effective as a 25 mm deep doorstop but in all cases gaps should be kept to a minimum.

10.9 Over-rebated door leaves and frames (see figure 2)

Door frames designed for use with over-rebated leaves do not cover the full thickness of the leaf. It is therefore more difficult to maintain a seal between the leaf and the frame as such an assembly is less able to withstand leaf distortion. Over-rebated door leaf/frame assemblies should not be used for fire resisting door assemblies unless supported by test evidence.

11 Junction between door assemblies and surrounding structure

11.1 Sealing between door assembly and surrounding structure

In order to maintain the fire resistance of a fire resisting wall or partition when fitted with a door assembly the junction between the two elements should be adequately sealed (see tables 2 and 3).

Modular coordination of door sizes and openings into which they are to be fitted may produce a clearance gap. Ideally a wall or partition should be built up to the rear of the door frame without gaps. This is not always possible and to ensure easy installation of the door assembly the opening should be made within the permissible tolerance.

The gap between door frame and wall opening can vary greatly and is usually masked with an architrave.

Fire resisting doors are built into a wide range of wall constructions and the recommendations for timber frames in table 2 and table 3 should be adopted to ensure that overall fire resistance for periods of 30 min and 60 min respectively is maintained. Recommendations for steel and aluminium alloy door frames are included in **10.5** and **10.6** respectively.

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11.2 Compatibility of door frames with surrounding structure

The surrounding structure or wall into which a fire door is built will exert an influence upon the fire performance of the assembly only if excessive distortion is likely as a result of fire exposure. This is a significant consideration where metal frames are used.

Masonry walls and non-loadbearing timber stud walls are reliably stable and generally present few problems. Some partitions may be prone to distortion. In some instances a timber door frame can limit the distortion of a steel stud partition.

The most problematic combination can be a timber door leaf in a steel frame, within a steel stud partition. The steel door frame or steel stud partition will undergo both a certain degree of expansion and/or distortion during fire exposure and this cumulative movement may not be tolerated by a timber door leaf.

Unless differential distortion between the wall and the door assembly is unlikely, the compatibility of a door assembly with an adjacent wall should be established by test.

12 Door leaves

12.1 General

The two important functions of any fire door leaf are:

(a) the ability to resist burn-through;

(b) the ability to remain free from critical levels of distortion under fire exposure.

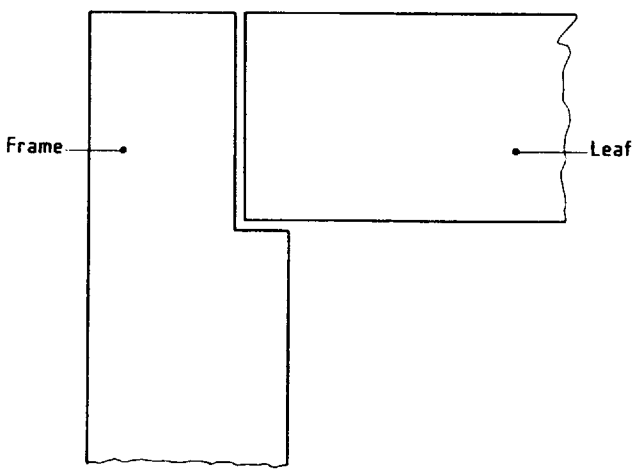
There two functions are easily influenced by changes in raw materials and adhesives (see **12.5**, **12.7** and **12.8**). Moisture content of door leaf components at the time of manufacture can also influence the fire performance, e.g. if a leaf core is relatively wet or dry compared with the facings then stresses will develop as the leaf reaches equilibrium.

12.2 Workmanship gaps

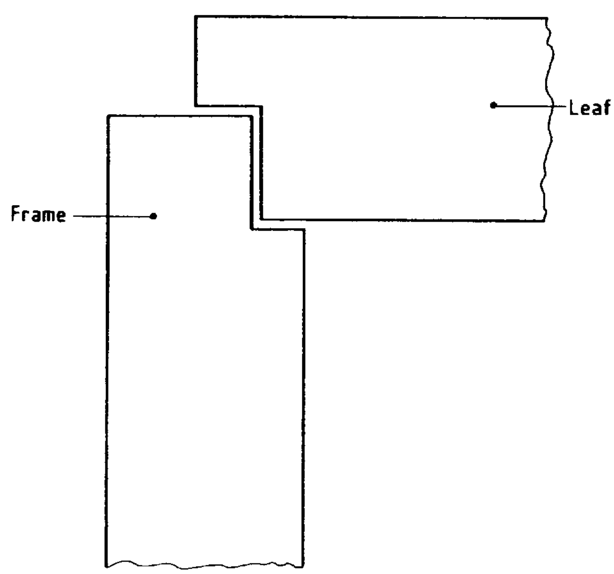
If the material remains unchanged from that used in the original tested construction, the quality of workmanship may affect the fire performance.

The most deleterious features are probably voids formed within leaf constructions due to inaccurate dimensions or hasty assembly. Such voids become more critical as the required period of fire resistance increases. After the exposed facing has been consumed revealing a void within the leaf core there will be only the unexposed facing material left to prevent burn through of the leaf. Gaps of up to 4 mm between core components appear to have little effect so long as the adjacent materials are not prone to excessive shrinkage. Larger gaps or voids will allow turbulence of hot gases and flames within them leading to rapid burn-through of the leaf.

At certain locations, e.g. adjoining door edge lippings, or glazing apertures, any void, including those 4 mm wide or less, may be a potential weakness and should be filled with an insert of core material or intumescent compound.



(a) Normal door leaf and frame



(b) Over-rebated door leaf and frame

Figure 2. Over-rebated door leaf and frame

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Table 2. Recommendations for the joint between timber door frames and walls to provide 30 min fire resistance

<table>
<tr><th>Wall construction</th><th>Maximum frame to wall gap width</th><th>Architrave condition</th><th>Additional protection (see 19.6)</th></tr>
<tr><td></td><td>mm</td><td></td><td></td></tr>
<tr><td rowspan="3">Non-loadbearing walls, unlikely to exhibit significant distortion during fire exposure, e.g. timber stud walls and masonry walls built without fair face</td><td rowspan="2">Up to 10</td><td>Intimately fitted softwood or hardwood architraves at least 15 mm thick with a 15 mm overlap onto wall and door frame</td><td>Nil</td></tr>
<tr><td>Imperfectly fitting architraves</td><td rowspan="3">2 mm × 10 mm of intumescent material as a pre-formed strip or seal
or
Mineral or glass wool packed to a depth of at least 10 mm
or
A bead of intumescent paste or intumescent mastic</td></tr>
<tr><td>More than 10</td><td>All architrave conditions</td></tr>
<tr><td>Loadbearing walls, likely to exhibit distortion during fire exposure, e.g. steel stud walls</td><td>All gap sizes</td><td>Fit of architrave cannot be guaranteed due to likely distortion of wall</td></tr>
<tr><td rowspan="2">Loadbearing or non-loadbearing walls
Fair faced masonry walls</td><td>Up to 10</td><td>Intimately fitted 19 mm hardwood quadrant bead</td><td>Nil</td></tr>
<tr><td>More than 10</td><td>All architrave conditions</td><td>2 mm × 10 mm of intumescent material as a pre-formed strip seal
or
Mineral or glass wool packed to a depth of at least 10 mm.
or
A bead of intumescent paste or instumescent mastic</td></tr>
<tr><td colspan="4">NOTE. There is a risk that wall finishes with a surface spread of flame rating of Class 3, as defined in BS 476 : Part 7, may contribute to ignition and flaming of the architrave on the unexposed face due to leakage of hot gases. For smoke control doorsets frame to wall gaps should always be packed with mineral or glass wool or sealed with a bead of intumescent paste or mastic.</td></tr>
</table>

12.3 Consistency of construction with original design

Gross constuctional and dimensional discrepancies are unacceptable, e.g. the omission or addition of internal core components which conflict with the specification of the original test specimen. A framed-up leaf construction with infill panels may be sensitive to changes in the number of joints in the panels, some designs require one piece infill panels whilst others require infill areas to comprise a certain number of smaller panels. Each method of infilling has advantages and disadvantages and cannot be seen as interchangeable.

The number of joints and the size and number of components used in the basic construction should not be changed without either reference to an appropriate authority or a re-evaluation with respect to the fire resistance test.

12.4 Door leaf cores: general

For periods of fire resistance of up to 60 min it is possible to manufacture door leaves entirely of cellulosic materials. The traditional thickness for door leaves with a fire resistance rating of 60 min has been 54 mm. In recent years doors have been developed, which are able to provide 60 min performance with all cellulosic leaves at 44 mm or 45 mm thickness, the traditional thickness of leaves designed to provide 30 min fire resistance. This has been made possible by careful choice of materials for the construction of the door leaf, particularly the leaf core. The charring rate of timber and timber based materials is the limiting factor regarding the thickness of fire resisting door leaves. For this reason door assemblies designed to provide periods of fire resistance in excess of 60 min generally rely on the increasing use of non-combustible materials as the required periods of performance extend.

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Table 3. Recommendations for the joint between timber door frames and walls to provide 60 min fire resistance

Wall construction	Maximum frame to wall gap width	Architrave condition	Additional protection (see **19.6**)
	mm		
Non-loadbearing walls unlikely to exhibit significant distortion during fire exposure, e.g. timber stud walls and masonry walls built without fair face	Up to 10	Intimately fitted hardwood architraves at least 15 mm thick with a 15 mm overlap onto wall and door frame	2 mm × 10 mm of intumescent material as a pre-formed strip or seal or Mineral or glass wool packed to a depth of at least 10 mm or A bead of intumescent paste or intumescent mastic
		Imperfectly fitting architraves	2 mm × 20 mm of intumescent material as a pre-formed strip or seal or Mineral or glass wool packed to a depth of at least 20 mm or A bead of intumescent paste or mastic
	More than 10	All architrave conditions	
Loadbearing walls likely to exhibit significant distortion during fire exposure, e.g. steel stud walls	All gap sizes	Fit of architrave cannot be guaranteed due to likely distortion of wall	
Loadbearing on non-loadbearing walls Fair faced masonry walls	All gap sizes	All architrave conditions	

NOTE. There is a risk that wall finishes with a surface spread of flame rating of Class 3, as defined in BS 476 : Part 7, may contribute to ignition and flaming of the architrave on the unexposed face due to leakage of hot gases. For smoke control doorsets frame to wall gaps should always be packed with mineral or glass wool or sealed with a bead of intumescent paste or mastic.

Some fire doors with a fire resistance in excess of 60 min may have the appearance of being made from timber but may consist of a completely non-combustible core with only the facings and lippings being of timber. Such constructions are proprietary in nature and the guidance related to the design and construction of the core component is not covered by this code, although all other aspects of the assembly should comply where relevant.

Door leaf core constructions are of two general types, they are either:

(a) continuous, or

(b) framed up.

The specific considerations relating to these types of construction are as given below.

12.5 Continuous cellulosic core constructions

In this type of construction the door leaf consists of a timber based core slab finished with lippings and facings constructed so that the core provides mechanical and structural functions as well as resisting burn-through in the event of a fire. The core of this type of leaf typically consists of continuously butt jointed timber laminations. The performance of such forms of constructions is dependent upon the species of timber used, the density, straightness of grain, the presence or absence of voids, the use and selection of adhesives between laminations and the choice of such adhesives. Many of these slabs may look similar in terms of a specification but will behave differently when exposed to fire.

The use of these door leaf constructions should be supported by test evidence relating to the specific materials and methods of construction employed by the manufacturer of the product to be used. This evidence should have been generated on a door assembly with a similar mode of operation, i.e. single leaf, double acting, unlatched, etc. in order to determine the ability of the construction to satisfy the requirements in the actual mode of use.

12.6 Framed up core constructions

This type of construction relies on a perimeter frame of timber members which act as internal door stiles and rails. Some designs also incorporate mid-rails. These members provide a frame for infill panels of various materials, both frame and infill being subsequently covered by facings (see **12.10**). Infill panels for door leaves designed to provide up to 30 min fire resistance are invariably of cellulosic materials, e.g. flaxboard, cork, fibreboard, particleboard. For door leaves designed to provide longer periods of fire resistance the infill panel is likely to consist of a mineral based board.

The use of any form of framed up core construction should be supported by a test or assessment evidence (see clause **3**).

12.7 General performance of core materials

Regardless of the performance level there are several basic characteristics required for all door core materials as follows.

(a) The ability to resist burn-through for the required period of fire resistance. This is achieved by a combination of density and thickness. However, a very dense core will produce a very heavy door leaf which will lead to problems in installation, increased wear of supporting ironmongery, loosening of fixings, etc. A lighter weight, mineral-based core may reduce these problems. A mineral-cored door generally requires special fixing considerations.

(b) The ability to remain flat during fire exposure. This is influenced by the stiffness of the facings, the straightness of grain of any timber components and the choice of adhesives.

(c) Lack of shrinkage. Excessive shrinkage of either infill panels or individual core laminations will allow the development of fissures in the core which may produce premature burn-through of the door leaf resulting in loss of integrity. Excessive shrinkage of a continuous door leaf as a whole can lead to gaps between leaf edge and frame also leading to loss of integrity.

(d) Compatibility with the overall design. The manufacture of timber based doors is essentially a joinery operation and core materials should lend themselves to joinery processes. Special adhesives and jointing techniques may cause problems.

12.8 Adhesives

Fire door leaves tend not to rely on profiled joints, e.g. tongued and grooved, morticed and tenoned, etc. Any joint formed in timber may become ineffective during fire exposure due to charring.

As a result door leaves rely very heavily on the quality of adhesives to an extent where butt joints between door leaf components are normal rather than the exception.

The most important glueline in a flush faced door leaf is between the core and the facing. Early on during fire exposure the door leaf facing will be consumed. The glueline between the core components and the unexposed facing becomes responsible for retaining the core, the major proportion of a leaf construction, in position. The glueline between internal core components is often a low grade adhesive which simply keeps the core together for ease of fabrication, and may be polyvinyl acetate (PVA) adhesive complying with BS 4071 or elastomeric type. Other gluelines, e.g. leaf core to facing and lipping to core are usually aminoplastic resin adhesives complying with BS 1204 : Part 2 for doors to provide periods of fire resistance up to 30 min. For longer periods the choice of adhesive becomes far more critical, generally speaking type WBP, weatherproof and boilproof adhesives seem to be more suitable.

Adhesives should not be changed without establishing the effect that this might have on the fire resistance.

12.9 Importance of balanced construction of timber door leaves

Fire exposure will tend to exaggerate any potential distortions due to moisture movements which may become manifest in the cold state as a result of normal service. Dissimilar door facings may create an uneven gradient of moisture content through the door leaf thickness which may induce cold state distortion, therefore increasing the potential for distortion under fire exposure. If the potential fire resistance is to be realized it is important for any design to be balanced.

12.10 Facing materials: general

Facings for flush doors will normally be of fibreboard, particleboard, or plywood.

These materials are required to provide a suitable surface for decoration, e.g. paint, polish, etc., as well as providing adequate strength as a stressed skin in the cold state.

Fire exposure will quickly consume the exposed facing. The internal members of a framed up leaf construction are usually butt jointed and may only be bonded with adhesives that are unable to withstand heating. The unexposed facing is therefore responsible, in many cases, for supporting the core components after the loss of the unexposed face. Towards the end of the required period of fire resistance the unexposed facing will be:

(a) subject to increased temperature;

(b) subject to increased moisture content;

(c) supporting the weight of the core components;

(d) resisting distortion.

Facing materials differ in their ability to cope with the conditions described above. It is for this reason that the commonly used facing materials, i.e. fibreboard, particleboard and plywood should not be seen as interchangeable, unless supported by test, or assessment evidence, specific to the particular leaf construction.

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12.11 Metallic membranes

The introduction of a metallic membrane can significantly unbalance a door leaf construction. Compared with timber, metals are often thought to be relatively 'fire safe'. Fire doors may sometimes be required to provide X-ray protection, added levels of security, or be faced with a decorative metal facing. Temperatures sufficient to melt lead and aluminium will be achieved within 10 min from the start of a fire resistance test in accordance with BS 476. Steels will not melt but will expand significantly. Any bond between metallic and timber based components will therefore be broken down at a fairly early stage with very unpredictable consequences.

Metal membranes are also impermeable and will interfere with the movement of moisture through the thickness of a door leaf.

Consequently, metallic membranes should not be incorporated either in, or on door leaves forming part of a fire resisting door without their use being supported by test evidence, or an assessment based on test evidence that is specific to the particular leaf construction.

12.12 Plain door lippings

Timber will char at a steady rate. However, in the case of an arris, e.g. at the leaf edge, heat energy will be supplied in two directions simultaneously, resulting in rounding of the arris due to charring at a rate apparently greater than that of charring on a flat surface. This phenomenon is recognized in BS 5268 : Section 4.1. Hardwood is the normal material for door lippings because of its toughness and ability to resist wear and tear. Hardwoods are generally denser than softwoods and therefore have a lower charring rate which is of additional value when considering fire exposure.

Intumescent or heat activated fire seals and smoke seals may be fitted into door lippings. The thickness of the lipping will have to be sufficient to accommodate grooves that will accept the fire and smoke seals. Lippings of 8 mm minimum thickness are generally found adequate and these are normally butt jointed to the door core edge.

Test evidence substantiating the use of a particular form of construction where the tested assembly incorporates lippings should not be considered to substantiate a similar form of construction where no lipping is incorporated.

12.13 Door lippings with rebated leaf edges

Rebated leaf edges generally result in a lower fire or smoke control performance than that achieved by the use of plain leaf edges. The required fire performance is achieved by the use of adequate intumescent seals, and smoke control is achieved by the use of a flexible edge seal as referred to in BS 5588 : Parts 1, 2, 3 and 5 and PD 6512 : Part 1. Plain edge meeting stiles are more able to accommodate intumescent and flexible edge seals.

Rebated leaf edges require the use of forms of ironmongery generally unsuitable for use on fire doors, i.e. forend conversion sets and door leaf selectors, both of which can reduce the integrity of the assembly.

A rebate can be seen as reducing by half the leaf edge thickness of the leaf edge. Therefore, much less differential distortion between the leaves will cause separation of meeting rebates compared with the plain edges which maintain the full door leaf thickness.

Double leaf assemblies should not be provided with rebated meeting stiles unless supported by test or assessment evidence. Where test evidence has been generated on a double leaf assembly with rebated meeting stiles it is permissible to use these doors with plain edges subject to an approved and proven sealing system being incorporated in the meeting stile junction.

If chamfered edges are necessary, gaps should be kept to a minimum to allow normal opening.

13 Intumescent and smoke seals

13.1 Typical performances of intumescent seals

For door assemblies designed to achieve 20 min or 30 min integrity, test experience shows that a 10 mm wide strip of intumescent material which has satisfied the test described in BS 476 : Part 23 for the relevant period, fitted centrally into the leaf or frame rebate of a conventional sized, latched, single leaf, single swing assembly will normally be adequate. The seal or strip may be interrupted at ironmongery positions (see **13.7**).

For similar doors designed to provide periods of 60 min fire resistance or greater the intumescent seal specification will be at least twice that required for 30 min applications and with at least part of the seal by-passing all ironmongery fixings. For double leaf assemblies the quantity of intumescent seal will be that established by test and will be dependent upon the behaviour of the door leaves.

13.2 Use and mode of operation of intumescent seals

The various types of intumescent seal all possess properties peculiar to themselves and should not be interchanged. The main reason for the use of intumescent seals is to combat the onerous effect of positive pressure conditions and therefore the correct function of these seals is vital. It is of the utmost importance to maintain the intumescent seal specification as indicated in the original fire test report. Test reports will also give details of the location of the seals, in the door leaf edge or in the door frame rebate. As the required period of fire resistance increases and as the doorset configuration becomes more complex the location and specification of intumescent seals is of particular importance.

Intumescent seals for doors are of the following two main types.

(a) Those which expand forcibly thus exerting a clamping effect. This type of seal can play an important function in restricting door leaf distortion.

(b) Those which expand more voluminously but are not pressure forming. This type is generally better at protecting larger or irregular gaps.

With pressure forming intumescent seals, which tend to expand only in thickness, it is advisable for doors that are required to provide extended periods of fire resistance to fit the seals into the frame rebate rather than the door leaf edge. This ensures maximum protection at corners. This is rarely a problem for doorsets with a fire resistance rating of 30 min where seals can be fitted in either the frame or the leaf.

Double leaf door assemblies require careful consideration, and over-specification of pressure forming intumescent materials at the meeting edges or jambs can spring the door leaves open. Double leaf door assemblies also will benefit if the seal at the head is fitted into the frame.

Having determined the correct technical specification aesthetic aspects can be considered. Intumescent seals are available in a wide range of finishes and colours.

Any change in specification should be supported by assessment or test evidence.

For single leaf, single swing, latched door assemblies with timber frames, not exceeding 900 mm × 2100 mm, it is possible to interchange intumescent seals by reference to the test described in clause **6** of BS 476 : Part 23 : 1986. Any intumescent seal that has satisfied the integrity criterion described in the test for the required period can be used for sealing such door assemblies, assuming that the door has satisfied the criteria described in either BS 476 : Part 8, or Part 22 for the appropriate period.

13.3 Concealed intumescent systems

Several manufacturers now 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. Should it be decided to specify or offer a concealed intumescent seal then relevant supporting fire test evidence is necessary. This is due to the following:

(a) the proprietary nature of existing solutions;

(b) the fine balance of intumesent seal specification, lipping dimensions and adhesives required to achieve such a system;

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

13.4 Fit of door leaf

Failure of fire resisting door assemblies under test is very often due to burn-through at the clearance gap between door leaf edge and door frame. The fit of the leaves within the frame when installed should be no worse than the fit of the original test specimen. The majority of timber fire doors incorporate intumescent seals which are capable of sealing gaps of 5 mm. Most fire test specimens are invariably fitted with smaller gaps and most site installers of doorsets would certainly achieve a level of fit with gaps of less than 4 mm.

There is a danger that the presence of an intumescent seal will suggest that unusually large clearance gaps can be tolerated due to the gap filling properties of the seals. Should a door achieve a fire resistance performance under test of exactly 60 min any safety margin offered by intumescent seals can be seen to have been fully utilized.

There are several door designs capable of providing 20 min integrity which do not require intumescent seals. If cannot be stressed enough that with such designs the control of the door leaf to door frame clearance gap is vital, and gaps in installed assemblies should not exceed those recorded in the original test report.

13.5 Smoke seals

In all cases doorsets which are required to control smoke will also be fire resisting. Fire doors that are required to restrict the flow of ambient temperature smoke, identified by the suffix S, e.g. FD 30S, should be fitted with flexible edge seals.

Smoke and fire seals in the same leaf edge or frame rebate will often prove impractical. Whilst combined intumescent fire and smoke seals are available a separate smoke seal may be preferred, in which case the smoke seal may be fitted into the frame rebate with the fire seal in the leaf edge or vice versa.

Brush or blade seals which are able to tolerate movement of the door leaf have proven satisfactory in reducing air leakage rates in tests performed in accordance with BS 476 : Section 31.1.

Some types of seal, e.g. a compression type seal that is fitted to a doorstop may be suitable for latched doors but where no latch is fitted they may become ineffective at an early stage due to the greater risk of door movement.

13.6 Threshold sealing

Fire test experience has shown that intumescent seals do not have to be fitted across the bottom of door leaves. The pressure conditions evolved during a fully developed fire are the main reason for this.

The test given in BS 476 : Section 31.1 is designed to measure ambient temperature air or smoke leakage, and test conditions are such that the entire face of a doorset under test will be under positive pressure. However, for test purposes, the threshold gap is taped and some form of effective

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threshold seal should be used if complete smoke control is to be achieved, unless the threshold gap does not exceed 3 mm at any point.

13.7 The influence of ironmongery on intumescent sealing

On doorsets with a fire resistance rating of FD 30, ironmongery may interrupt intumescent seals as long as the ironmongery does not extend to within 12 mm of one of the faces. On doorsets with a fire resistance rating of FD 60, the intumescent sealing should be continuous with an adequate quantity of seal by-passing all ironmongery positions. This may be achieved by using wider seals, by bedding ironmongery in intumescent paste or mastic, by letting in additional lengths of seal adjacent to such ironmongery, by the use of intumescent plugs, or by any other method proven by test to be successful.

14 Glazing and other apertures

14.1 General

Fire doors are fitted with glazed apertures for a variety of reasons including a simple requirement for borrowed light or the need for a vision panel in cross-corridor doors for safety. Glazing systems are often sensitive to the substrate onto which they are fitted and different door leaf constructions will vary in their ability to accept areas of glazing.

14.2 Installation of glazed apertures

When forming glazed apertures the following factors should be considered.

(a) Substrate. Proprietary glazing systems may have been validated by test only when installed in a frame of solid timber. These systems will not necessarily offer the same performance when fitted into door leaves of different construction and materials.

(b) Fixing. Some leaf core materials are of low density or have poor screw or pin holding properties. In these cases small apertures will be more successful and the aperture may require to be lined out with solid timber at the time of manufacture.

(c) Position. Careful regard to the position of a glazed aperture is vital. Cutting of the aperture should not remove any part of any structural member of the door leaf. In framed up door leaf core constructions the internal stiles and rails constitute structural members. In door leaves of a continuous core construction glazed apertures should leave a sufficient margin of door leaf between the leaf edge and the edge of the aperture such that the door leaf suffers no significant loss of mechanical strength.

(d) Leaf distortion. If the door leaf of a particular door is prone to distortion when exposed to fire this may indicate its inability to accept any glazing detail. While certain glazing systems may be able to tolerate some distortion of the door leaf into which they are fitted, excessive distortion will disturb the glass edge retaining detail by either separating the rear face of the glazing system from the aperture reveal, or by contributing to a failure of the glazing system to maintain edge cover of the glass pane. In either case integrity failure will occur.

(e) Leaf/glass interface. There is often a problem of maintaining a seal between the interface of a glazing system and the aperture reveal onto which the system is fixed. During fire exposure charring or degradation of the leaf core material will undermine the glazing system resulting in premature loss of integrity.

Some glazing systems incorporate intumescent materials at their rear face to prevent this mode of failure, particularly for periods of 60 min fire resistance and greater. In order to achieve even 30 min performances many framed up door leaf constructions require glazing apertures to be lined with a framing of solid timber in lieu of the normal core.

Glazed apertures should be incorporated in fire resisting door leaves only if there is test evidence to substantiate the use of the glass, the retaining system and the size and position of the aperture in combination with the type of construction to be glazed.

NOTE. Guidance on the fire performance of glass is given in PD 6512 : Part 3.

14.3 Apertures other than glazing: general

Apertures other than glazing include those for letterplates and air transfer grilles. Letterplates are simply plain apertures protected only by metal flaps. Fire resisting air transfer grilles are formed from a matrix of intumescent materials which will react under fire exposure to expand and effectively close off the aperture. Where smoke control is a consideration the use of these air transfer grilles should be avoided unless they can be closed off by detection devices.

Preparation of apertures is best performed in the factory where machine cutting can achieve a greater degree of precision. Cutting of an aperture should not remove any part of a structural member of a door leaf if as a result there is a significant loss of strength or stiffness.

14.4 Letterplates

Letterplates can allow the through-flow of air or gases. Under the simulated conditions of the fire test performed in accordance with BS 476 : Part 8 the upper part of a doorset will be subject to positive pressure while the lower part of the doorset is subject to negative pressure. A letterplate above the neutral pressure axis, more than 900 mm up from the foot of the doorset, will generally be unable to prevent flames and gases egressing from the furnace under positive pressure without the assistance of a second (internal) flap.

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A letterplate installed towards the lower part of the doorset will be exposed to negative pressure and air will be drawn into the furnace through the letterplate aperture. Whilst this is less likely to lead to a conventional integrity failure, the ingress of oxygen rich air is likely to cause a more rapid erosion of the adjacent door core and a large aperture may develop which could cause ignition of the unexposed face.

Therefore a letterplate should be installed in the neutral pressure zone, i.e. between 800 mm and 1000 mm above the threshold. Letterplates with a maximum aperture size of 250 mm × 38 mm, complying with BS 2911, having well fitting sprung or gravity internal and external flaps manufactured from materials such as steel, stainless steel and some brasses, have proven successful for periods of up to 30 min fire resistance when evaluated in accordance with BS 476 : Part 8 and only these should be fitted. Letterplates with larger apertures should not be used.

14.5 Air transfer grilles

Air transfer grilles are often required for purposes of maintaining a heated or air controlled environment. As with glazed apertures, the fitting of these can reduce the fire resistance of an assembly.

Only air transfer grilles which are supported by relevant test evidence relating to a similar construction should be fitted into fire doors. These grilles should be fitted only at a height above floor level related to the pressure experienced during the fire test.

Where smoke control is a consideration, the implications of fitting an air transfer grille should be taken into account.

15 Overpanels and sidepanels

15.1 General

In order to extend the appearance of the finish of fire door leaves beyond the leaves themselves, the use of overpanels or sidepanels of door leaf construction may be utilized.

15.2 Overpanels

Overpanels which are securely fixed at their lower edges to transoms or framing members of the same depth as the basic door frame cross section can be freely specified, provided the maximum height and width of the overpanel do not exceed the maximum tested height and width of the door leaf of an identical construction to that of which the overpanel is manufactured.

Double leaf door assemblies incorporating flush overpanels have difficulty in satisfying the fire resistance test. Therefore, if the only evidence of performance is related to solid frames, it is not possible to assess the fire resistance of an assembly without a transom or other framing member. This is because of possible differential movements between the two leaves and overpanel. The overpanel extends across the entire width of the two door leaves and should remain opposite the heads of the two separate and unfixed door leaves. The internal components of the overpanel may also be orientated differently from those in the door leaves thus further adding to the risk of differential movements due to distortion under fire exposure.

Specific test evidence should therefore be used to support the use of flush overpanels.

15.3 Sidepanels

Sidepanels normally consist of solid panels or glazing in frames of similar dimension to the door frame.

Provided sidepanels are securely fixed within a frame of the same basic cross section as the door frame and are of the same construction as the door leafs they can be freely specified. The maximum height and width of the sidepanel should not exceed the maximum tested height and width of the door leaf.

15.4 Glazed and other apertures in overpanels and sidepanels

For advice on installing glazed areas or the cutting of other apertures in overpanels and sidepanels see clause **14**.

16 Ironmongery

16.1 General

Ironmongery falls into two categories, i.e. essential and non-essential (see **2.10.1** and **2.10.2** and appendix B).

The general rule for the fitting of ironmongery is that items which are surface fixed should always be fitted in preference to morticed components, i.e. those requiring removal of door leaf or door frame material. Where removal of material is necessary, e.g. for a latch, the minimum thickness of leaf material should be removed.

Any mass of metal will eventually become heated during fire exposure. Heat is conducted into frame sections and door leaves via metal components more quickly than would occur by charring of timber alone. Heated metal can cause localized charring of adjacent timber and can easily cause a premature burn-through of the door leaf.

The selection of ironmongery is vital to the performance of fire resisting doors and it should be selected and fitted with care in accordance with the manufacturer's instructions.

NOTE. Performance requirements for locks and latches for doors in buildings are specified in BS 5872. Performance recommendations for door closers are given in **16.3**. The performance requirements for hinges are specified in BS 7352. Information on ironmongery is also given in the DHSS Health Technical Memorandum No. 59 and the ABHM and Guild of Architectural Ironmongers Codes of practice.

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It is important, especially with the specification of self-closing devices, to establish whether they are essential or non-essential and to select closers that are able to perform the required function. This may require evidence of test to be obtained from the supplier (see the ABHM Code of practice). The fixings for ironmongery should be compatible with the fitting and the materials of the door assembly.

Any voids, due to overmorticing, as a result of fitting ironmongery should be made good at the time of manufacture by filling with either door leaf or door frame material, as removed, intumescent or other suitable fire stopping material.

Should it be required to deviate from the ironmongery specification as shown in a fire test report, it may be possible to use another item of ironmongery that is supported by fire test data generated in a similar form of construction. This can be determined either by reference to the ABHM Code of practice or by having the influence of the proposed change retested or assessed by an appropriate authority.

16.2 Hanging devices

16.2.1 *Non-rising hinges*

Hinges fitted to fire doors should be non-combustible and should be selected to perform in accordance with BS 7352.

NOTE. Some regulations also have a minimum melting point of 800 °C requirement.

The hinges selected should be adequate in numbers and performance for the use category, size and weight of door to be supplied and be compatible with the fire resistance of door and frame and with any self-closing device that may be fitted.

16.2.2 *Rising hinges*

Hinges with rising cams or quick action rising spindles should not be fitted to fire doors. The need to provide a chamfered head detail to accommodate the movement of the door as it rises in the frame enlarges the gap at the head of the door. This gap is difficult to seal by the provision of heat activated or intumescent seals in time to prevent loss of integrity. In order to cope with a gap of this size even fire doors with a fire resistance rating of FD 20 will require an intumescent strip to be fitted.

16.2.3 *Pivots*

Top and bottom pivots can be used in lieu of hinges where it has been proven by test that the door construction is suitable. Assessment in these circumstances is difficult. Such pivots should be used in conjunction with either a latch or self-closing device.

16.2.4 *Gravity pivots*

Gravity pivots may be provided for use on double action doors where the action is free moving and where the door is retained positively in the closed position by the use of a locating device other than a bolt or other permanent fastening. These should be used only when fitted strictly in accordance with the test conditions.

16.3 Closing devices

All fire doors should be fitted with closing devices. On a latched door the closers will be responsible for closing the leaf, overcoming any latch mechanism, and seals if present, and contributing to keeping the leaf closed during the developing phase of fire exposure.

In the absence of a latch, a door closer becomes part of the essential hardware and will be required to retain the leaf in the closed position during fire. The correct choice of closer is vital and any closer specified should have demonstrated its ability to perform in this manner. When the doorset incorporates forcibly expanding intumescent seals, the closer may have to remain effective only until the seals are activated, wedging or gripping the door leaf(ves) in position.

Overhead door closers should comply with the performance requirements of BS 6459 : Part 1. Only closers that are supported by test evidence should be used. Concealed (morticed) door closers should not be fitted unless supported by test evidence for the door construction specified.

16.4 Securing devices

If a door is fitted with a latch or lock for its validating fire tests, a latch should always be fitted in practice. If a latch is solely responsible for retaining a door leaf in the closed position during fire exposure then the closer needs to be effective only in the cold state and to be able to overcome the latch action at all times.

All latches and locks, regardless of their contribution to the fire resistance of a doorset, should be carefully fitted. Latch bodies should be as slim as possible, removing no more than 18 mm from the thickness of a 54 mm FD 30 or FD 60 door leaf. Even slimmer latch bodies are necessary for 45 mm thick FD 30 or FD 60 door leaves. It is important to avoid any over-morticing and any voids around the latch body should be filled with intumescent paste or mastic, or other suitable fire stopping medium. It is unlikely that any latch in any timber based 45 mm thick FD 60 leaf will be successful without additional intumescent protection.

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Bored lock and latch sets (knobsets) are not recommended. These should be fitted only where there is test evidence available of their satisfactory fire resistance performance in the proposed door assembly.

The lock or latch selected should, in terms of its strength and durability, be suitable for the purpose, weight and usage of the door in question and should comply with BS 5872.

16.5 Door bolts

Where bolts were fitted to secure one leaf of a double leaf or a leaf and a half assembly in conjunction with any latch or lock for its validating fire test, these should always be fitted in practice. Face mounted, recessed (flush) bolts should be as slim as possible, removing the minimum amount of material in both width and depth and not more than the thickness allowed for morticed components. Oversizing of the recess should be avoided. Any void should be filled with intumescent paste or other suitable fire stopping material. Recessed (flush) bolts should be fitted to the opening or closing face of the door, not in the door edge.

Surface fixed bolts should be secured with screws of brass or steel in an adequate size to support the bolt, with a minimum length of 30 mm.

In all cases special attention should be paid to the provision of adequate fixings for the retaining plate or staple on the frame.

16.6 Additional ironmongery

The installation of any additional ironmongery requiring the removal of door leaf or door frame material during installation should be supported by test evidence.

16.7 Ironmongery and edge sealing

Advice on the relationship between ironmongery and intumescent and smoke seals is given in **13.7**.

17 Design modifications

In order to accommodate design modifications of fire doors while maintaining design performance, deviations from the original specification should be tested, assessed or otherwise approved (see clause **3**).

For relatively small design modifications, obtaining an assessment should present no great difficulty. Larger changes may not be possible to assess as there may be no relevant test evidence on which to base an opinion to support an assessment. In these cases a fire test is required.

The influence of any change in the design of a door assembly, whether decorative or structural, should be considered and, when significant, either an assessment or further test evidence should be obtained.

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Section 3. On-site care and installation

18 Site handling and storage

Fire doors are internal joinery components and, as such, should be adequately protected from exposure to excessive moisture and splashing by corrosive or staining materials.

The fixing of door assemblies should be left as late in the building programme as possible to avoid damage arising from other operations. Delivery should be planned so as to reduce the storage time on site to the practical minimum. Where doors, doorsets and door kits have to be stored, they should be protected at all times from rain and sun, preferably in a ventilated building. When no such facility is available they can be stored temporarily under covers held clear of the timber to permit air to circulate freely. The covers should be secured all round to prevent the wind blowing the protection off and the doors should be transferred to a suitable covered area as soon as possible. Manufacturer's instructions should be followed.

Door assembly timber components that are to receive a clear finish should be stored to ensure that they are not unevenly exposed to daylight. Door leaves should be stored flat on bearers to keep them away from floor or ground contact. Any protective wrappings should be retained as long as possible.

Further recommendations on the subject of site handling and storage are to be found in BS 8000 : Part 5 and, where applicable, the recommendations of this code should be followed.

Additional recommendations are to be found in CP 151 : Part 1 and in the British Woodworking Federation's Doors Information Sheets No. 2 'Recommendations for site handling of timber doors', and No. 3 'Fire resisting doors/doorsets. Use and fitting on site'.

Heat activated seals and smoke seals can easily be damaged. When these are supplied separately for fixing after installation of the door assembly they should be kept wrapped in a dry, ventilated environment and clearly identified.

19 Work on assemblies

19.1 General

It is strongly recommended that pre-hung, pre-finished, fire doors are specified whenever possible as this reduces the amount of site work necessary and allows normal factory quality control procedures to be applied to the finishing operations, including the fitting of approved ironmongery and glazing.

19.2 Hanging of door leaf

Doors should be hung to give an equal gap across the head and down both jambs. The size of this gap should not exceed 4 mm. Certain smoke seals may require a larger gap in order to operate without causing significant frictional increases, but the gap should remain within tested tolerances.

Any adjustment to the door size necessary on site to achieve the equal gap should be performed with care. If the heat activated seals, or smoke seals, are fitted in the frame then the door can be adjusted on any edge, although with lipped doors the adjustment should be made equally on both sides. If, however, the seals are fitted to the door leaf then size adjustments are limited to the edges which have no seals, e.g. the bottom of the door. When a door has exposed seals in the edges and still has to be adjusted then it is imperative that the seals are removed before sizing, and refitted after the adjustment has been made. If, in the process of removal, the seals are damaged, they should be replaced by identical products. Intumescent seals usually incorporate a protective coating and it is important that the exposed surfaces are not damaged in the adjustment process. In certain environments this could lead to a loss of effectiveness in the longer term. In some cases the intumescent seal is concealed behind the lipping and is not immediately obvious. It should be established before planing any lipping whether it incorporates a concealed system and, if so, planing should be limited accordingly. In extreme cases this may require the door to be re-lipped and this should be done by the manufacturer.

19.3 Installation of fire or smoke seals

When it is necessary to fit seals on site, either in the frame or the door edge, it is important to follow the manufacturer's recommendations.

The type, number and position of the seals should be as approved for that door in the mode of operation in which it is hung. For seals that are glued in position, rather than mechanically fixed, no special adhesive specification is required for the fire performance and the adhesive has to be adequate only for the normal cold use condition. When the seals are fitted in grooves, polyvinyl acetate (PVA) adhesives have been found suitable.

Smoke seals are often subjected to dynamic or frictional forces and should be securely fitted using the manufacturer's recommendations. For smoke seals to be effective they should run continuously past all ironmongery. Where there is a conflict of position the heat activated seal should be fitted in

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accordance with the door manufacturer's recommendations, normally on the centreline of the construction, and the smoke seal should be positioned in the nearest position. Combined fire and smoke seals should be fitted in accordance with the manufacturer's recommendations.

19.4 Fitting and operation of ironmongery

When site fixing morticed items into fire doors, it is important to avoid any over-morticing, both in the depth or in the width of the void. The width of any mortice should not exceed the dimensions given in **16.4** unless the specific item has been approved for use in that assembly. When over-morticing occurs then the over-morticed areas should be suitably fire stopped by using intumescent compounds or mineral fibre packing.

Face fixed items, such as overhead closers and hinges, should be fixed with screws not less than 38 mm long of the gauge compatible with the component. The fixing of hinges, latch forends and any other edge fixed ironmongery to doors where a concealed intumescent seal is incorporated should be in accordance with the door manufacturer's recommendations. Whenever possible, bolts should be fixed to the face of the door, rather than the door edge. Any recesses cut into the door to accommodate these should not exceed the thickness allowed for morticed components. Liaison with the door manufacturer is strongly recommended when the fitting of recessed bolts is contemplated. Pivots, shoes or straps, as used on double swing assemblies, may require additional intumescent protection depending upon the nature and thickness of the door. The recommendations of the supplier of both the door and ironmongery should be followed when fitting such items.

After fitting, it is important to check that all moving items operate as intended, e.g. latches and closers. It is particularly important to ensure that any closer fitted overcomes the latch resistance.

19.5 Fitting of glass on site

Glazed apertures can be potentially the weakest part of any fire door. It is important, therefore, for such apertures to be glazed in a manner that does not reduce the fire resistance, safety or security aspects of the door. Georgian wired glass is able to provide fire resistance ratings of stability and integrity periods of 30 min and 60 min when correctly glazed.

Recently developed unwired glasses can be used to achieve fire resistance ratings of up to 60 min. These fall into two categories, those that do not provide insulation, e.g. borosilicate glasses and specially toughened glasses, and those that are able to satisfy the insulation requirements of the fire resistance test by incorporating interlayers or gels of intumescent material.

Non-insulating glasses are sensitive with respect to the method of glazing and these should be installed only in accordance with the manufacturer's instructions. The insulating glasses are more tolerant of glazing technique and adequately retained timber beads have been shown to be suitable for periods of up to 60 min but the bead fixings are critical and the advice of the manufacturers should be sought and implemented.

The cutting, on site, of apertures for glass is strongly deprecated.

Timber beads are able to provide a 30 min fire resistance, subject to the size being adequate, when used in conjunction with proprietary bedding mediums, e.g. intumescent strips, mastics, etc. and when retained by screws or pins of adequate length. It is not possible to provide minimum specifications for these components but they should comply with the validating test evidence for the glass and the bedding medium used.

Wired glass should be cut to allow a clearance on all edges of approximately 5 mm. The use of setting blocks of suitable material is recommended in order to equalize the gaps. The unwired glasses are generally unable to be site cut and these should be ordered to the correct size. It is important, therefore, that apertures for these glasses are cut accurately with clearance as recommended by the manufacturer.

Fire doors designed to provide fire resistance periods of 60 min or more should not be site glazed.

19.6 Installation of the door assembly

The assembly should be securely fixed into the opening. Timber frames should be screw fixed back to the surround, with packing if necessary, to ensure that the gap between the frame and surround is equal on both sides. The need to provide solid fixings for normal day-to-day use will probably override any special fixing considerations for fire.

Metal frames, if used, should be built in and fixed in accordance with the tested method. This may require back filling the frame with cementitious materials (see **10.5**).

Any gaps between the back of the door frame and the surround should be fire stopped by means of suitable cementitious materials, intumescent strips, intumescent paste, intumescent mastic, or mineral fibres as indicated in tables 2 and 3. When the assemblies are also required to perform a smoke control function, the architraves should be tightly fitted to the wall. In this case any fire stopping material used should be air impermeable.

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19.7 Threshold conditions

There is no need for heat activated seals to be fitted in the threshold. There is only limited test evidence to support threshold gaps in excess of 8 mm and where gaps are required to be greater than this, possibly for ventilation or air conditioning purposes, they should be permitted only if there is test evidence available to substantiate their use. Large gaps are a potential route for the spread of cold smoke which has lost its buoyancy and therefore, when hanging door leaves, the gap at the bottom should be as small as is compatible with the use and position of the door unless otherwise specified. Except when escape routes are pressurized to restrict the spread of smoke, a threshold smoke seal will be required if smoke leakage is to be reduced effectively. When fitted, smoke seals should give an even contact with the floor but should not exhibit significant increased frictional forces that could interfere with the closing action of the door. Where a threshold seal is not fitted and effective smoke sealing is required the threshold gap should not exceed 3 mm at any point.

19.8 Assembly

It is imperative that control is exercised on site to ensure that the correct leaf is hung in the correct frame. When double leaf assemblies are involved, it is important to check both leaves to ensure that there is no mismatch of components and door leaves and door frames should be marked permanently to avoid this risk.

19.9 Decoration

When painting the door edges there is no evidence to suggest that over-painting of the intumescent seals by conventional paints or varnishes, in normal thicknesses, has any particularly harmful effect. Indeed, such painting can provide added protection to the seals.

19.10 Signs

Signs, when fitted, should comply with the appropriate statutory provisions.

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Section 4. Maintenance

20 Introduction

Fire doors have to provide a similar level of fire resistance as the fixed elements of a building, e.g. walls and floors, and are evaluated by the same stringent procedures and criteria. However, since such doors are often opened and closed many times a day, this mobility is likely to cause a more rapid deterioration in the fire resistance performance of a door compared with that of a fixed element. This deterioration can take two main forms:

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

(b) wear in the ironmongery, 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, that periodic inspection, maintenance and repair of any damage should be undertaken on a regular basis if the required fire resistance is to be maintained.

21 Fire seals

Fire seals can be of two different types; heat activated seals designed to maintain the integrity of the assembly and smoke seals to reduce the flow of smoke in the period before heat activated seals become effective. Damage or degradation of either of these will have serious implications on the ability of the assembly to perform its design function.

The condition of the visible heat activated seals should be examined at six-monthly intervals. If the seal is missing, in part or in total, it should be replaced immediately. It is necessary to replace like with like and the use of any seal, other than that originally installed, may jeopardize the performance of the door except that in the case of single swing, latched, single leaf assemblies of up to 60 min fire resistance it is permissible to use any seal that has provided an equal level of integrity to that originally fitted. Seals should be fitted in accordance with the manufacturer's instructions. New seals may be butt jointed to existing seals but any cut edge should be sealed, if appropriate, with a suitable water resistant sealant, e.g. mastic or epoxy resin. Flexible edge seals, provided for smoke control purposes, should be replaced if they are missing, damaged or are not making adequate contact with adjacent components. Such seals should be replaced only as continuous lengths, as joints are a further source of potential leakage. For complete effectiveness, both the profile and the material used for the replacement seal should be of the type originally fitted.

22 Door gaps

The gap between the perimeter of the door and the adjacent frame can change in two ways. The gap can get smaller, until it is eventually binding on the frame, as a result of either swelling of the door or the frame by the uptake of moisture, loosening of fixings causing the door leaf to drop or a loss of squareness in the frame caused by movement or settlement in the adjacent structure. Alternatively, the gap can get larger and this is mainly as a result of the timber drying out following occupation of the building. Timber exhibits quite large shrinkage transverse to the grain for relatively small losses of moisture. If both the door and the frame were supplied with a high moisture content then large gaps are likely to develop between the two components.

Small gaps present little problem but in the extreme they may overcompress any flexible edge seal, should one be fitted for smoke control purposes, which will increase the resistance to opening and closing or the door may start to bind directly on the frame. This will cause the door to close only partially, or not close at all, both of which are likely to cause a premature loss of integrity in the event of a fire.

Doors fitted with heat activated seals based upon the expansion of intumescent materials are capable of tolerating larger gaps than doors without such seals (see clause **13**). When a gap exceeds 5 mm it should be ascertained, by reference to the seal or door manufacturer if necessary, whether the type of seal fitted is capable of providing the level of fire resistance required. Oversize gaps are likely to cause the intumescent material to be subjected to excessive heating which may cause the early erosion or consumption of the expanded foam.

Door gaps should be examined at not less than six-monthly intervals, although in the early stages of occupation of a new building more frequent periodic examination is recommended. If a door is binding the cause of this should be determined and if associated with any of the leaf fixings, e.g. hinge screws coming loose, the cause should be rectified. If the binding is a result of swelling, or a loss of squareness which is likely to be permanent, then the edge of the door should be relieved to give the recommended clearance of 4 mm. If heat activated seals are fitted to these edges they will need to be removed prior to sizing and the reduced door edge or lipping may require to be regrooved to allow the seal to be refitted. Care should be taken to check whether the lipping conceals a heat activated seal which may be exposed if too much material is removed. The amount of material to be removed

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may be reduced by taking equal amounts off opposing edges. If the concealed seal is exposed the door will require to be relipped and this should be performed by the original door manufacturer or by using techniques approved by them.

Excessive gaps can be reduced by applying solid timber of an equivalent density to either the face of the frame or the door edges. This timber should be glued in position using adhesive which will not thermally soften and, if possible, be reinforced with suitable mechanical fixings. The use of thin veneers of timber is not recommended for this purpose as they burn away more rapidly than larger sections of timber when exposed to fire. To avoid this risk the minimum thickness of timber to be applied should be 6 mm and in order to achieve this it may initially be necessary to reduce the size of the leaf even further before building up either the frame or the door edge. Applied timber should never cover over existing seals unless similar seals are incorporated in the exposed face of the new timber.

23 Replacement and repair of door leaves

The fire resistance of a door assembly is primarily provided by the performance of the door leaf which is itself dependent upon the fire behaviour of its component parts. Damage to any of these components, facings, sub-facings, core or framing can cause the leaf to behave very differently when exposed to fire. Damaged facings may allow the door to deflect more than is desirable whilst damage to any sub-facings, or the core, may cause the door to be penetrated by fire more easily. Damaged lippings may seriously impair the ability of the door to provide a seal between the leaf and the frame. Where resistance to opening is high this may cause local damage to the leaf framing at its interface with any closers, pivots or hinges. Any weakness in these areas is likely to cause a loss of integrity when exposed to fire.

Door leaves should be examined at six-monthly intervals for superficial damage, structural damage and excessive bowing or deformation. It is not easy to repair doors and maintain the interactive behaviour of the various component parts, except for minor repairs such as the replacement of lippings. For these reasons, when significant damage is detected, the door leaf should be replaced in total. It is important to ensure that the replacement door is able to provide a similar level of fire resistance to the damaged door and, if the heat activated seals are fitted in the frame, that the new door is compatible with the fitted seals. When replacing one leaf of a double leaf door assembly it is vital to ensure that the replacement door is of an identical construction to the remaining leaf. Any difference in construction will cause differential movement when exposed to fire, severely reducing the likelihood of the doors maintaining their integrity.

Localized repair, such as the replacement of damaged framing members or door facings, should be undertaken only in conjunction with the original door supplier. The selection of materials and adhesives is important and guidance on these aspects may be found in section 2. Doors designed to provide fire resistance periods of 120 min or more should be replaced, not repaired.

24 Replacement of glazing

Glazed apertures are likely to be one of the most frequently damaged components in a fire door due to the fragile nature of glass.

The most common form of glass for use in doors of up to 60 min fire resistance is 6 mm thick Georgian wired glass. Under heating this glass will crack very quickly but the wires maintain the integrity of the glass throughout the heating period. For this reason cracked Georgian wired glass does not constitute a fire risk, although it may well require replacement for other reasons. If, however, the crack is accompanied by spalling, causing a small hole to develop, then the glass should be replaced immediately.

Other types of glass, clear, unwired borosilicate or laminated insulating fire resisting clear glasses should be replaced immediately after failure. For periods of fire resistance of 30 min and above, the glazing system for both wired glass and clear borosilicate glasses will incorporate specialist, proprietary materials either in place of the beads, between the beads and the glass, and/or as a protection to the beads. In the event of the aperture being reglazed it is important that these materials are reinstated. Any of these materials that are damaged during reglazing, such as intumescent mastics, pastes or plasters, should be replaced by new materials of a similar type. The choice of these new materials should be undertaken in consultation with the original door manufacturer.

Glasses which are able to satisfy the insulation requirements of the fire resistance test can be site glazed but they should be glazed in accordance with the manufacturer's instructions. Screws or other fixings play an important role in retaining the glass during fire exposure and when installing new glass, the screws should be of the same material, length, gauge and fixing centres as those used previously.

Many of the special glasses cannot be site cut and have to be ordered in the required size. This can cause a delay of several weeks. During this period the aperture should be glazed temporarily using wired glass, glazed in a manner that will allow it to provide a similar level of integrity, or the aperture should be filled with a suitable fire protection board product until the replacement glass is available.

On no account should a glazing aperture in a fire door designed to provide 60 min or more fire resistance be replaced without consultation with the manufacturer. The choice of glass and glazing system is critical to the performance of such apertures.

25 Ironmongery

25.1 General

Ironmongery on fire doors consists of two main categories: the ironmongery that is essential to the fire resistance performance of a door and other non-essential items of hardware that do not contribute to the fire resistance but are incorporated to allow the door to fulfil its intended purpose (see appendix B).

All essential ironmongery, as listed in appendix B, should be inspected at intervals of 6 months. After the installation of new door assemblies in an existing or new building it is recommended that these items be inspected at more frequent intervals during the first 6 months. The key points of such inspections and the recommended maintenance and replacement procedures are given below for the individual components.

25.2 Hinges

Hinges should be inspected for signs of wear. Worn hinges that exhibit play in the knuckle which could cause the leaf to drop or bind should be replaced immediately. The hinge pin should be fully located in the knuckle as loose or displaced pins will cause wear and reduce the efficiency of closing, ultimately inhibiting the free movement of the door. Replacement hinges should be selected to perform in accordance with BS 7352. At the time of fitting they should be lightly oiled with a light machine oil and this lubrication should be repeated every 6 months. The wear tolerance should not exceed that permissible in BS 7352.

When the environmental conditions are abnormal, e.g. high temperature, or low humidity, or both, or where the door is subjected to exceptionally heavy usage, subsequent lubrication periods should be reduced to three-monthly intervals.

Screws should be compatible with the hinges and should be of the gauge recommended by the manufacturer, and not less than 38 mm long. All hinges should be recessed. For door assemblies designed to provide up to, and including, 30 min fire resistance it is common for the heat activated seals to be interrupted at hinge positions. For door assemblies that are required to provide fire resistance in excess of this it is normal practice to maintain a continuous seal past all hinges. Any seals which are disturbed should be replaced.

Some proprietary fire doors, especially those designed to provide the longer fire resistance periods, may incorporate friable materials that require either special screws or careful fitting. Hinge screws should be screwed from the beginning of the thread. The practice of partly hammering the screw into position is deprecated. Similarly many door leaves are constructed of multi-layered material. In this case the screw positions are critical and should not be varied. Any attempt to hammer screws into these doors may cause internal delamination which could seriously affect the performance of the doors when exposed to fire.

25.3 Latches

Most door assemblies fitted with mortice latches rely upon the latch bolt to make an important contribution to the performance of the door in the event of fire. It is imperative, therefore, that latches are inspected at six-monthly intervals to ensure that the latch bolt moves freely and projects fully at all times, especially when engaged.

The striking plate should be checked for correct alignment.

NOTE. Damaged, worn or sticking latch bolts and badly fitted striking plates are a major reason for preventing effective closing where the door relies upon a door closer to close the door fully in its frame.

At the time of inspection any failure of the latch to operate as intended should be rectified. Adjustments to striking plate or latch bolt may improve the free movement of the latch. Badly fitted latch or lock furniture can cause interference with the effective operation and therefore correct fitting of the furniture is essential. Damaged or badly worn latch bolts should be replaced immediately. In general terms, locks and latches require little maintenance. Lubrication, when required in the context of free latching of a door, should be confined to the latch bolt. The sides and striking face of the latch bolt should be lubricated by a smear of light oil every 6 months. Pin tumbler and disc tumbler cylinders should also be lubricated at six-monthly intervals with either flake graphite or one of the liquid lubricants now available containing PTFE (polytetrafluoroethylene) particles in suspension.

A mortice latch or lock should be replaced with an identical model. Where the mortice latch or lock has to be changed due to changing security or means of escape requirements, the latch or lock should comply with **16.4** and be installed in accordance with **19.4**.

When replacing latch or lock assemblies, any intumescent protection should be reinstated.

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25.4 Bolts

Bolts used to secure one leaf of a double leaf, or a leaf and a half assembly should be inspected at six-monthly intervals to ensure that they engage fully. Any failure to do so should be rectified. Sockets at floor level frequently get filled with debris and should be cleaned out at regular intervals to ensure that there is no blockage restricting the entry of the bolts. The bolted door leaf should be inspected for damage as impact loads on the door put undue stress on the screw fixings which may cause splitting of the timber or delamination of the facings, or sub-facings. This could cause the door to fail prematurely when exposed to fire. Some local repairs may be undertaken by means of suitable adhesives and/or improved mechanical fixings. The original door manufacturer should be consulted for advice on the repair if the damage is significant and in extreme case replacement of the door may be necessary (see clause **23**). If the bolt requires to be replaced it should be replaced by a similar item. Guidance on the fitting of bolts is given in **19.4**.

All bolts should be lubricated with light machine oil at six-monthly intervals.

25.5 Self-closing devices

Self-closing devices can be both essential and non-essential ironmongery. In both cases it is important that they function as intended. Self-closing devices should be examined at six-monthly intervals to ensure that the door is closing properly and any necessary adjustments should be made to the closing and latching speeds.

There is little routine maintenance to be carried out on self-closing devices. Any self-closing device which has failed should be replaced immediately using a closer that has been validated by test for use on a door assembly of similar size, weight, mode, construction and fire resistance rating and should be selected to perform in accordance with BS 6459 : Part 1.

Concealed overhead closers should not be fitted unless validated by test or assessment evidence.

25.6 Automatic release mechanisms

Automatic release mechanisms should be inspected and tested in accordance with BS 5839 : Part 3. The door leaf should be examined at six-monthly intervals to ensure that the action of holding the door open is not inducing permanent deflections in the leaf which might cause deformation, bowing or misalignment with the frame or an adjacent leaf when the door is closed (see clause **23**).

NOTE. These mechanisms do not include mechanical hold-open mechanisms incorporated in door closer assemblies.

25.7 Pull handles and other furniture

Although not essential for fire resistance, pull handles and other furniture should be inspected at six-monthly intervals to ensure that they can be used to open the door easily. Any obvious loosening or damage that may cause these items to fail in service should be rectified by repair or replacement so that they do not cause a door to become inoperative when it is required as a means of escape.

25.8 Face fixed plates

Face fixed plates do not require any regular maintenance. However, a six-monthly examination is recommended to ensure that loosening of the screws has not caused the plates to become partially detached impairing the door's operation or damaging its facings or sub-facings.

25.9 Letterplates

Letterplates that comply with the integrity requirements of BS 476 : Part 8 or Part 22, when fitted in a door leaf, do so by the combined action of an external and internal plate, the latter invariably being made of high melting point brass or steel. If either of these plates becomes detached, the likelihood of the integrity being maintained is severely impaired. The letterplates should be examined at six-monthly intervals to ensure that they are intact and closing efficiently. If the letterplate requires replacement, it should be replaced only by a tested unit (see **14.4**).

26 Decoration

Unglazed areas of any fire door leaves are generally not required to provide a specific surface spread of flame requirement and may therefore be decorated as desired.

There is no evidence to suggest that overpainting of heat activated seals has any detrimental effect on the ability of the seals to perform efficiently. There are some benefits in overpainting the seals as they are less likely to absorb atmospheric moisture. However, there are limits on how much paint can be applied without there being a risk of the seal being rendered inoperative. It is recommended that overpainting be limited to a maximum of five coats of conventional oil bound paint or varnish.

When preparing a frame for redecoration, the use of heat or chemical strippers should be avoided if intumescent seals are incorporated. If seals are damaged by either of these processes, they should be replaced in accordance with clause **21**.

If glazing beads have been painted with intumescent paint, it is essential that they should be repainted with a similar paint.

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Appendices

Appendix A. Example of a typical fire door specification

An example of a typical specification for a double leaf, single swing fire door is as follows.

> A double leaf, single swing assembly, 2100 mm × 1900 mm overall with 2 no. leaves of equal size, 2050 mm × 826 mm × 44 mm thick: plain edge meeting stiles, one leaf bolted closed, the other self-closing and incorporating a mortice latch. Each leaf to incorporate 1 no. glazed vision panel, 900 mm × 250 mm, positioned as shown on drawing no. XXXX. The complete assembly is to provide an FD 30 rating, i.e. to satisfy the integrity criterion of BS 476 : Part 22 : 1987 for 30 min.

This specification should be followed by a detailed ironmongery schedule. If the door assembly is to be supplied under a specified quality assured scheme, this should be clearly stated.

Ironmongery specification:

> 6 no. 100 mm × 75 mm plain knuckle butt hinges[1)]
>
> 1 no. face fixed single action overhead door closer
>
> 2 no. 200 mm × 25 mm lever action flush bolts (face mounted)
>
> 1 no. floor socket
>
> 1 no. 75 mm mortice latch complying with BS 5872
>
> 1 set lever handle mortice latch furniture complying with BS 4951

Appendix B. Guidance on essential and non-essential ironmongery

B.1 Essential ironmongery

Essential ironmongery for the various types of fire door assemblies is as follows.

(a) Single swing, single leaf latched door assemblies

hanging devices:	hinges or pivots
securing devices:	mortice latch or lock

(b) Single swing, double leaf, latched door assemblies with plain meeting stiles

hanging devices:	hinges or pivots
securing devices:	mortice latch or lock bolts (one leaf only)

(c) Single swing, single and double leaf unlatched door assemblies with plain meeting stiles

hanging devices:	hinges or pivots
self-closing devices:	surface mounted overhead door closers or floor mounted spring units

(d) Double swing, single and double leaf, unlatched door assemblies

hanging devices:	floor springs with their essential accessories

The continuing correct performance of these items is critical to the achievement of the potential fire resistance of the assemblies. Bored lock and latch sets (knobsets) should not be used unless tested in the relative fire door.

B.2 Non-essential ironmongery

This is all encompassing. Examples of items that are not vital to the fire resistance but which may be vital to the means of escape requirement or general fire performance are given below:

latch and lock furniture
pull handles
automatic release mechanisms
self closing devices fitted to latched doors
panic bolts and other emergency exit devices

NOTE. Panic bolts and other emergency exit devices may constitute essential ironmongery on internal compartmentation doors in multi-occupancy buildings. In all circumstances they should comply with BS 5725 : Part 1 or BS 5872 as appropriate.

Non-essential items of ironmongery should fulfil their intended function at all times.

Non-essential items are also provided for aesthetic or protective reasons but do not contribute to either the fire resistance or the escape function. These items include:

push plates
kick plates
number or name plates
signs, accessories, etc.

Such items may affect the fire performance only as a result of the fixings used.

[1)] General guidance on fire door applications is given in appendix C of BS 7352 : 1990.

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Appendix C. Additional recommendations for timber used in fire doors

Additional recommendations for timber used in fire doors are as follows.

(a) Knot characteristics. Whereas BS 1186 : Part 1 permits unsound or dead knots to be present on concealed surfaces these can cause a burn through of a component due to the void that they may leave. For firedoors all unsound knots should be plugged, or filled with inorganic fillers, even on concealed timbers. Plugging, or filling with inorganic fillers should be undertaken to make good any defects.

NOTE. Unsound knots should be avoided even on concealed timbers if possible.

(b) Splits, shakes and checks. As for unsound knots, the timber should be free of such defects even on concealed timbers.

(c) Sapwood. The timber should be as uniform as possible and marked changes between heartwood and sapwood should be avoided.

(d) Wane. Wane should be avoided.

NOTE. Wane, even on a concealed edge, will leave a void in the construction that may cause a premature burn-through.

(e) Rate of growth. BS 1186 : Part 1 permits up to four growth rings per 25 mm for internal joinery and limits the rate of growth to six rings per 25 mm for external joinery. The recommendations for external joinery should be used for the construction of fire doors.

(f) Straightness of grain. It is important that the timber used for the frame of the flush door leaf or for the stiles and rails of a fully glazed door is as straight grained as practical and the timber should be selected accordingly. The timber used for these components should have a slope of grain better than 1 in 15.

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Publications referred to

BS 476	Fire tests on building materials and structures Part 7 Method for classification of the surface spread of flame of products Part 8 Test methods and criteria for the fire resistance of elements of building construction Part 20 Method for determination of the fire resistance of elements of construction (general principles) Part 21 Methods for determination of the fire resistance of loadbearing elements of construction Part 22 Methods for determination of the fire resistance of non-loadbearing elements of construction Part 23 Methods for determination of the contribution of components to the fire resistance of a structure Part 31 Methods for measuring smoke penetration through doorsets and shutter assemblies Section 31.1 Method of measurement under ambient temperature conditions
BS 1186	Timber for and workmanship in joinery Part 1 Specification for timber
BS 1204	Synthetic resin adhesives (phenolic and aminoplastic) for wood Part 2 Specification for close-contact adhesives
BS 1245	Specification for metal door frames (steel)
BS 2911	Specification for letter plates
BS 4071	Specification for polyvinyl acetate (PVA) emulsion adhesives for wood
BS 4951	Specification for builders' hardware: lock and latch furniture (doors)
BS 5268	Structural use of timber Part 4 Fire resistance of timber structures Section 4.1 Method of calculating fire resistance of timber members
BS 5499	Fire safety signs, notices and graphic symbols Part 1 Specification for fire safety signs
BS 5588	Fire precautions in the design, construction and use of buildings Part 1 Code of practice for residential buildings Part 2 Code of practice for shops Part 3 Code of practice for office buildings
BS 5725	Emergency exit devices Part 1 Specification for panic bolts and panic latches mechanically operated by a horizontal push-bar
BS 5750	Quality systems
BS 5839	Fire detection and alarm systems for buildings Part 3 Specification for automatic release mechanisms for certain fire protection equipment
BS 5872	Specification for locks and latches for doors in buildings
BS 6100	Glossary of building and civil engineering terms Part 4 Forest products Section 4.1 Characteristics and properties of timber and wood based panel products Section 4.3 Wood based panel products Section 4.4 Carpentry and joinery
BS 6262	Code of practice for glazing for buildings
BS 6459	Door closers Part 1 Specification for mechanical performance of crank and rack and pinion overhead closers
BS 7352[1]	Specification for strength and durability performance of metal hinges for side hanging applications and dimensional requirements for template drilled hinges

NOS. 33, 34, 35
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BS 8000	Workmanship on building sites Part 5 Code of practice for carpentry, joinery and general fixings
BS 8220	Guide for security of buildings against crime
CP 151	Doors and windows including frames and linings Part 1 Wooden doors
PD 6512	Use of elements of structural fire protection with particular reference to the recommendations given in BS 5588 'Fire precautions in the design and construction of buildings' Part 1 Guide to fire doors [1] [2]Part 2 Examples of fire doors Part 3 Guide to the fire performance of glass
DD 171	Guide to specifying performance requirements for hinged or pivoted doors (including test methods)

Guides to the Fire Precautions Act 1971, HMSO

Information Paper IP 2/82 Ergonomic requirements for windows and doors, Building Research Establishment[3]

Code of practice for hardware essential to the optimum performance of fire-resisting timber doorsets, Association of Builders' Hardware Manufacturers[4]

Health Technical Memorandum No. 59 Ironmongery, Department of Health and Social Security[5]

Code of practice. Architectural ironmongery suitable for use on fire resisting self-closing timber and emergency exit doors, Guild of Architectural Ironmongers[6]

Doors Information Sheets No. 2 Recommendations for site handling of timber doors; No. 3 Fire resisting doors/doorsets. Use and fitting on site, British Woodworking Federation[7]

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[1] In preparation.

[2] Referred to in the foreword only.

[3] Available from Building Research Establishment, Garston, Watford, WD2 7JR.

[4] Available from Association of Builders' Hardware Manufacturers, Heath Street, Tamworth, Staffordshire B77 7JH.

[5] Available from DHSS, Room 305, Euston Tower, 286 Euston Road, London NW1 3DN.

[6] Available from Guild of Architectural Ironmongers, 8 Stepney Green, London E1 3JU.

[7] Available from British Woodworking Federation, 82 New Cavendish Street, London W1M 8AD.

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AMD 7438

Amendment No. 1
published and effective from 15 November 1992
to BS 8214 : 1990

Code of practice for fire door assemblies with non-metallic leaves

Revised text

Clause 3 Determination of fire resistance of doors

Delete the note at the end of the clause and substitute the following.

'NOTE. It is important that assessments are carried out by suitably qualified fire safety engineers or laboratories accredited by the National Measurement Accreditation Service (NAMAS) for conducting the relevant test. In either case the assessor should be familiar with the standards and procedures for the testing of fire doors and have current experience of such testing. In the case of assessments which take the form of either an extrapolation or an interpolation of test evidence the assessor should have specific knowledge, normally accumulated over a period of time, of the behaviour of the products when subjected to fire tests. Only this degree of knowledge can equip the assessor to provide assessments in respect of variations from the tested details. Test data and information in support of the assessment should be provided by the client who should either own or have permission to use the data.'

AMD 7438/November 1992

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