

Fire Doors Explained

Introduction

Buildings are compartmented to delay the spread of fire from one area to another. The compartments are usually linked by doors to allow for passage of traffic around the building. Door sets have two important functions in a fire, when closed they form a barrier to fire spread and when open they provide a means of escape.

A well designed timber fire door will delay the spread of fire and smoke without causing too much hindrance to the movement of people and goods. Different parts of a building may be separated from each other, into compartments of a fire-resisting construction. Any openings leading from them will have fire doors to maintain an effective fire barrier and should prevent excessive transmission of products of combustion which can interfere with the safe use of escape routes.

Every fire door is therefore required to act as a barrier to the passage of smoke and/or fire to varying degrees dependent upon its location in a building and the fire hazard associated with the building.

- A fire door is to provide resistance to the passage of a well developed fire and consequently requires intumescent strips to be installed.
- Secondly to prevent excessive quantities of cold smoke to pass in the early stages of a fire and then to provide a barrier to a well-developed fire. They need to be fitted with intumescent strips and cold smoke seals to achieve this aim.

Some fire doors may be required to fulfil only the first function as they may not be required to prevent the passage of smoke because of their location. Others as indicated by the second function may have to resist the the passage of smoke and the spread of fire. Fire doors are specified as FD when required to fulfil the first function and and FDs doors to fulfil the second.

Specifications of timber fire doors

The performance of timber doors is judged by subjecting them to the standard test procedure specified in BS 476 : Part 22: 1987 or BS EN 1634-1: 2000. Tests are made on complete door assemblies, the door and frame with all the necessary hardware. It is then fixed in a wall representing its use in practice. By testing a door in one type of frame and using it in another, no guarantee can be given of its behaviour under fire conditions. The test procedure is fully described in the Standard and consists of exposing one face of the door to heat condition expected in a fire whilst observing the door for stability and integrity. The Standard requires the tests to be carried out with the upper part of the door under a small positive pressure, to simulate the conditions likely to occur in a fire. It also provides an objective method of establishing the loss of integrity of a door by the use of a combustible fibrous pad on the un exposed side of the door and see when it ignites. A door should be tested from each side to establish its performance with either face exposed to fire conditions, consequently requires two specimens. It is reasonable assumed all fire doors and frames manufactured to the same specification as the

two specimen doors and frames will achieve the same fire resisting properties. A technique has been developed for minimising the susceptibility of door edges to early penetration by fire. It consists of applying intumescent strip to the edges so that a rise in temperature will cause the material to swell and close the gaps. Intumescent paints have been used but the most successful and reliable technique is the intumescent strip, about 4 mm thick by 10 mm wide, cut into a groove in the door or the frame edge. As soon as the temperature in the vicinity of the strips exceeds 200 degrees C, usually about 10-15 minutes after the start of a fire, the strip swells and seals the gaps. One strip is adequate for a half hour fire door and for the increased protection needed with one-hour doors, two of these strips will be necessary. The intumescent material is soft and cellular in structure and will not prevent deformation of the door. There are fire resisting doors that are able to resist the passage of fire for more than 30/60 minutes but these are more likely to be used for the protection of property than for means of escape from fire.

Fire resisting doors - Door type for means of escape purposes.	Integrity [1] Minutes	Stability [2] Minutes
Half-hour fire-resisting	30	30
One-hour fire-resisting	60	60

[1] Integrity Failure is deemed to occur when cracks or other openings exist through which flames or hot gases can pass or when flaming occurs on the unexposed face.

[2] Stability Failure is deemed to occur when collapse of the specimen takes place.

Identifying Fire Doors

Certified Fire Doors

Manufacturers can certify fire door sets so they are easily identified and with a guarantee to behave in a fire as they should. The first step for the manufacturer is to construct a fire door set designed to a specification that in the opinion of the manufacturer will resist a fire for a specified time. This door set is then tested by an approved fire testing centre and if it passes the test any door sets constructed to that specification can be considered for certification. Once the certification is approved all similar constructed door sets are identified by labels. This will identify the manufacturer, the date of manufacture and the design fire rating of the door type. They may fit a colour coded plug instead of or in addition to the label. Identification labels are usually fitted on the top edge of the door and plugs inserted in the jamb of the door. For Hospitals, fire doors display a disc at the top of each face of the door showing the design fire performance see HTM58. Identification marks can sometimes be removed during installation or adjustment of the assembly or may have been painted over but if the door set has been installed by a competent joiner this should not happen. There are two associations that have certifiable fire door systems they are,

TRADA Q-Mark fire door scheme

The woodworking association BM TRADA use a system called Q-Mark it uses coloured plugs inserted in the jamb of the door which indicates the the type of fire door.

Q-Mark fire doors are clearly marked as such by small plastic plugs in the door leaf and/or frame, these include member details and scope of certification for verification purposes during specification, installation or at a later stage in their service life. They are only available to full members of the BM TRADA Q-Mark schemes.



The plugs follow a simple colour coding system and for more details go to their website BMTRADA or for colour code information download [BM TRADA Door Plug Card](#) This information is summarised on a laminated plastic card, available free of charge from BM TRADA, contact enquires@bmtrada.com).

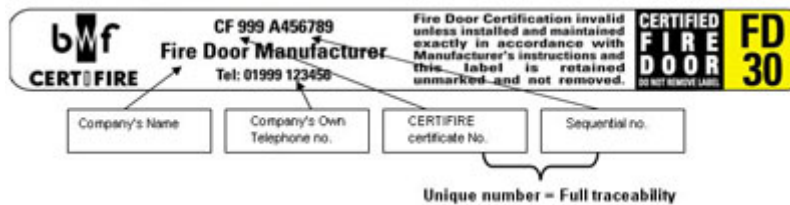
British Woodworking Federation Certifire fire door scheme

British Woodworking Federation is another organisation that provides fire door ratings and the following is their system. Fire ratings for fire door assemblies are given in minutes and prefixed by the letters 'FD' i.e. FD 30 equates to a 30 minute fire door or doorset. The most commonly specified integrity levels are:

- FD30 - 30 minutes (Half Hour)
- FD60 - 60 minutes (One Hour)
- FD90 - 90 minutes (Ninety Minutes)
- FD120 - 120 minutes (Hundred and Twenty Minutes)

As part of the steps being taken by the BWF to simplify fire door identification and eliminate confusion in specification, the existing FD20 rating is no longer available.

Every BWF-Certifire Fire Door Assembly carries a permanent and tamper evident label and/or plastic plug. For more information go to their web site. [The British Woodworking Federation](#) for more fuller details go to [FDS Directory 2009](#).



The former system used by BWF utilising plastic plugs is no longer used but may be found in older buildings. BWF provided cards with the all the necessary details and were available from the federation if you wish to view the information displayed on these obsolete BWF identification scheme [click here BWF obsolete card](#).

Nominal Fire Doors

Nominal fire doors are doors that are not certified but in the opinion of an assessor will hold back a fire for a specified period of time. Identifying nominal fire doors is very difficult but there are a number of clues that may indicate the door is a nominal fire door.

All dedicated fire doors providing a half hour or greater performance are usually fitted with intumescent seals. These may be encased in a PVC sheath, of any colour, which may also hold a blade or brush seal for smoke sealing purposes. These seals are fitted in the door leaf edges or the frame to seal the head and long edges of the assembly. A door may be fitted with a concealed intumescent system where the long edge sealing is housed under lippings. Intumescent seals will be visible at the head of the door. Doors 44mm thick fitted with 10-15mm wide intumescent seals are likely to be FD30 and doors 54mm thick using at least 20mm width of intumescent seal, fitted as one or two strips are likely to be FD60.

Fire doors with a rating in excess of FD60 are rarely used on escape routes or to protect people but may be found where property protection is important e.g. data storage areas where documents cannot be removed in the event of fire. Some of these doors have the appearance of timber, but may be constructed with a mineral core. Expert assistance may be required to identify such doorsets.

Before intumescent seals were introduced the frames of fire doors were fitted with 25mm rebates and can still be found in premises today.

Panel doors, especially if less than 44mm thick, are unlikely to be FD30 however they could have been upgraded or modified to achieve a fire resisting standard.

Hollow flush doors using egg box or similar construction will not be FD30. This can be detected by the weight of the door because fire doors are much heavier than a

hollow door. To check the weight of a door, instead of removing it, you can detach the self closer and swing the door between you thumb and index finger this gives a good indication of the weight of the door. Hollow doors are reasonable easy to detect using this method.

Fire doors should have self closer's fitted and rising butt hinges are not considered to be a self closer.

Because of the weight of a fire door and to prevent it warping fire doors are usually fitted with three steel hinges. However the current BS EN standard does allow two hinges in certain circumstances.

There may be documentation that was supplied with a fire door giving you all the necessary information. Unfortunately there is no standard method of identifying fire doors other than the Q-Mark or the Certifire fire door schemes therefore insisting on written proof that a fire door meets all the necessary standards, for example a test certificate is a possible solution.

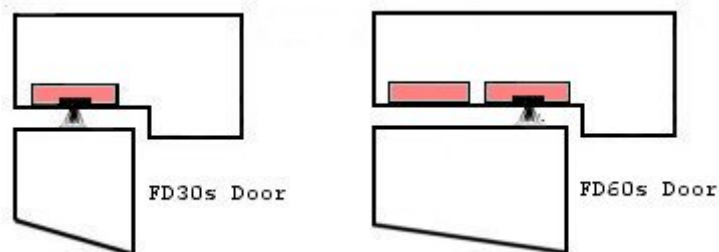
Intumescent Fire Seals and Cold Smoke Seals

Intumescent fire seals and cold smoke seals should be fitted to the back edge, stile and head of the fire resisting door sets. The following is information on the type or size of intumescent strip that should be used.

Not all intumescent materials act in the same way. Low pressure seals expand in all directions but provide little help to the door in resisting distortion under fire. Some high pressure seals exert pressure mainly in one direction and provide some resistance to distortion of the door leaf under fire. A further type of intumescent material, available in different grades, acts in all directions and generates some pressure. Fire seals activate at temperatures that are above human survival levels.

Type of fire door	Without cold smoke seals	With cold smoke seals
30/30 Single action door 30/30 Double action door	10mm x 4mm (Both sides and top)	10mm x 4mm (Both sides and top)
30/30 Double pairs of doors	10mm x 4mm on one centre stile 10mm x 4mm on other stile, heads and back edges	
60/60 Single action door 60/60 Double action door	20mm x 4mm (Both sides and top)	20mm x 4mm (Both sides and top)
60/60 Double pair of doors	20mm x 4mm on one centre stile 20mm x 4mm on other stile, heads and back edges	

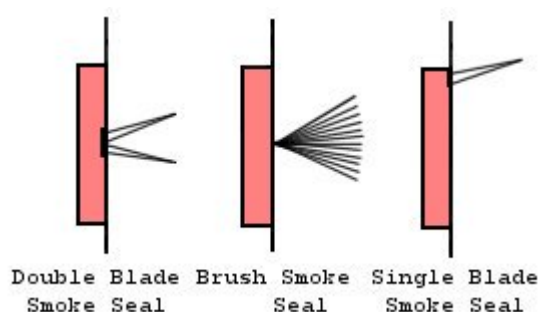
In most circumstances, retention or control of smoke is required, where this is so, fire door sets can be fitted with appropriate smoke seals. These prevent the leakage of air and therefore smoke, through the most vulnerable places i.e. gaps between door and frame, glazed openings and where appropriate, letter plates. Installations fitted with such seals are designated by the suffix 's' after the Integrity rating i.e. FD 30s. To achieve this, such classifications are given tests on the seals in accordance with BS 476 Part 31.1 or Certified approved smoke seals to TS21.



All hinges, locks and door closer's should be fitted with Intumescent material. Grooves should be made slightly wider than the seals to allow of pre painting and shrinkage of timber. Please refer to fixing and installation instructions.

Note: - It is always best to ask door manufacturers what type of seal to use.

Fore more detailed information go to [Intumescent Fire Seals Association](#)



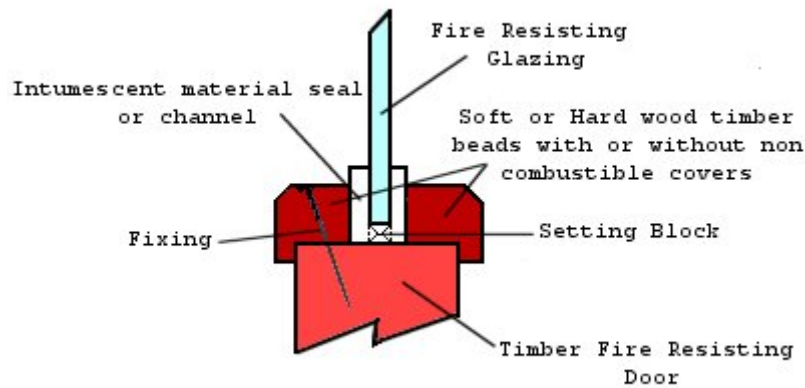
Fire Resisting Glazing

Glazing may range from a small vision panel in a door to a glazed screen for maximum light transmission and safety. Ordinary glass cracks when exposed to heat and is liable to fall out fairly early in a fire. Fire resisting glass can withstand exposure to the heating condition in a fire test for at least 60 minutes before it reaches a temperature high enough to soften it. The main reason for this is that in clear FR glazing nearly 50 per cent of the incident heat is transmitted through the glass by radiation.

The size of the glass and the method of its retention are important factors which influence its integrity. As the temperature approaches the softening point a large sheet will tend to collapse earlier than a smaller one. On the unexposed face, beading retaining the glass is subjected to radiant and conducted heat through the glass and to convection currents at the top of the pane. This can raise the temperature sufficiently to ignite timber beading after about 20 minutes. To delay the ignition of beading to 30 minutes it is necessary to provide protection by impregnation of a surface coating or a surface covering of non-combustible material or fit a fire resistant glass secured using a fire resistant glazing systems which hold the glass firmly in place during normal use, but in the event of fire the intumescent material expands securing and insulating the glass and protecting the surrounding timber.

For longer periods of fire protection, an improved retention system for the glazing is needed, The glass panel should be small and the method of fixing it should ensure that no direct path can be created for the transference of hot gases.

Fore more detailed information go to [Glass and Glazing Federation](#) and download Fire Resistant Guide.



Fire Door Furniture and Ironmongery

An important aspect of ensuring fire doors meet the required standard, is the fitting of certified door furniture.

Maintenance of Fire Doors

Fire doors are engineered products that provide life and property saving functions in the event of fire. It is important that they are regularly inspected and maintained to permit them to perform at their best on the one and only occasion when they are called upon so to do.

Doorsets fitted with hold open devices or swing free type closer should be closed daily, particularly overnight when there is likely to be low building occupancy. For busy 24/7 buildings (e.g. hospitals) fire doors should be closed at least weekly. All fire doors should close effectively from any angle of opening using only the door closer.

There are a number of reasons why doors may fail to close :-

- Check that there are no foreign bodies or other objects obstructing the door.
- Check that any smoke seals are correctly fitted and are undamaged.
- Check the latch, if fitted to ensure correct operation and that it is suitably lubricated.
- Only as a last resort should the closing device be adjusted, but this must be carried out carefully to ensure that the doors can be opened without undue force.

Intumescent seals should be checked regularly, at intervals not greater than 6 months, and damaged or missing seals replaced. To maintain the design performance potential, replacement seals should be of the same brand, size and type as the original. However, any intumescent seal of the same size as the original is better than none.

Mechanical items such as hinges, locks, latches, closer, floor springs etc are likely to wear over time. Maintenance provisions should comply with the hardware suppliers recommendations where these are known. Otherwise, locks and latches may require occasional light lubrication. Some hinges use self lubricating bearings that will not need additional lubrication.

Where it is necessary to replace worn hardware on a fire door, the essential items should be replaced with products to the same specification as the original where possible. Otherwise hinges, latches, locks, flush bolts, closer and other items of load bearing or securing hardware should be of the same type and size as the original items and should have been proven for use in timber fire rated doorsets of the required performance. Hardware that has been successfully tested in metal doorsets may not be suitable for use with timber doorsets.

Redundant hardware should be carefully removed. Intumescent gaskets may have been used under hinge blades, lock/latch for end plates, strike plates, with some closer fittings and in flush bolt recesses. These gaskets should be replaced if possible with gaskets of the same material. Otherwise they should be retained and reused with the new fittings if they are undamaged. Intumescent gaskets or mastics used for these applications are usually the low pressure type. Check out my page on [Fire Door Fittings and Ironmongery](#).

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 over painting of heat activated seals has any detrimental effect on the ability of the seals to perform efficiently. There are some benefits in over painting 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 over painting 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. If glazing beads have been painted with intumescent paint, it is essential that they should be repainted with a similar paint.

British Standards

The following is a list of documents relevant to timber fire doors

BS 476: - 20: 1987 Fire tests on building materials and structures. Methods for determination of the

fire resistance of elements of construction (general principles)

BS 476 - 22: 1987 Fire tests on building materials and structures. Methods for determination of the

fire resistance of non-loadbearing elements of construction

BS 476: - 23: 1987 Fire tests on building materials and structures. Methods for the determination of the contribution of components to the fire resistance of a structure

BS 476: - 31.1: 1983 Fire tests on building materials and structures. Method of measuring smoke penetration through doorset and shutter assemblies – method of measurement under ambient temperature conditions.

BS 8214:2008 Code of practice for fire door assemblies

BS EN 1634-1:2008 Fire resistance and smoke control tests for door, shutter and, openable window assemblies and elements of building hardware. Fire resistance tests for doors, shutters and openable windows which is an alternative for BS 476 - 22: 1987