

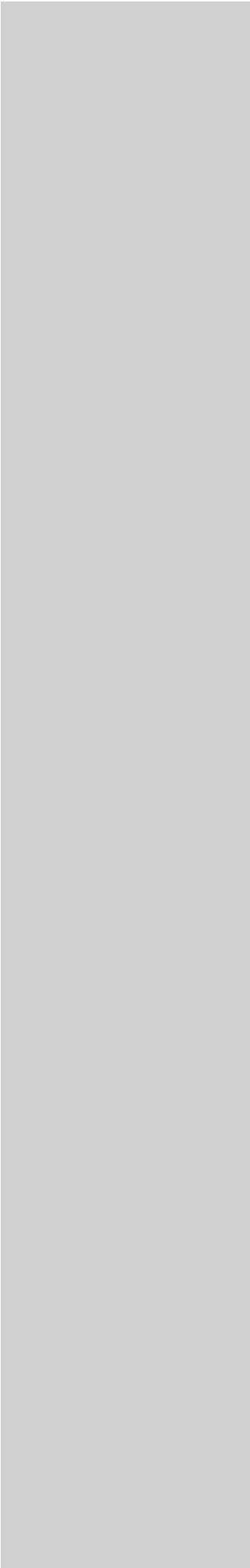
# Code of Practice:

## Hardware for Fire and Escape Doors



Issue No.3  
July 2009





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This Code has been compiled by members of the Door and Hardware Federation (DHF) and Guild of Architectural Ironmongers (GAI), to provide advice on best practice in the selection of building hardware for use on fire-resisting doors and doorsets, and escape doors. The Code is aimed at architects, building control officers, fire officers, responsible persons (as designated under the Regulatory Reform Order (RRO)) together with specifiers and suppliers of building hardware.

The Code is advisory, and compliance does not imply immunity from any legal requirement nor does it necessarily satisfy any special conditions which might be required by insurance companies or regulatory authorities.

The Code addresses the requirements of the latest legislation in the field, including CE Marking, the Construction Products Regulations 1991, Building Regulations (England & Wales), Building (Scotland) Regulations 2004, Building Regulations (Northern Ireland) 2000, requirements under the Regulatory Reform (Fire Safety) Order 2005, and the Disability Discrimination Act. Also considered are certification schemes and declarations of conformity with standards.

## Previous issues withdrawn

This issue, no. 3, replaces the previous edition of the Code, issue 2, published in June 2006 and the previous codes of practice published by both the Association of Building Hardware Manufacturers and the Guild of Architectural Ironmongers, all of which have been withdrawn:

- ABHM Code of Practice, January 1983 **WITHDRAWN**  
Hardware essential to the optimum performance of fire resisting timber doorsets
- GAI Code of Practice, March 1986 **WITHDRAWN**  
Architectural ironmongery suitable for use on fire resisting self-closing timber and emergency exit doors
- ABHM Code of Practice, issue 2, July 1993 **WITHDRAWN**  
Hardware essential to the optimum performance of fire resisting timber doorsets
- GAI Code of Practice, issue 2, September 1993 **WITHDRAWN**  
Architectural ironmongery suitable for use on fire resisting self-closing timber and emergency exit doors
- ABHM/GAI (BHIF) Code of Practice, November 2000 **WITHDRAWN**  
Hardware for timber fire and escape doors
- DHF/GAI Code of Practice, June 2006, **WITHDRAWN**  
Hardware for fire and escape doors

**Door and Hardware Federation**

The DHF was formed in 2003 by the amalgamation of the Association of Building Hardware Manufacturers (ABHM) founded in 1897, with the Door and Shutter Manufacturers' Association (DSMA) founded in 1940. Paramount in its activities is its contribution to the writing of Technical Performance Standards and Codes of Practice, whether they be for use in the United Kingdom or Europe.

**Guild of Architectural Ironmongers**

The GAI, founded in 1961, represents the majority of architectural ironmongers in the United Kingdom as well as a significant number of manufacturers. It is also heavily involved in the writing of Technical Performance Standards, as well as managing an industry-wide technical and management Education Programme relating to building hardware.

A combined team from the DHF and the GAI has been responsible for this document. Technical enquiries should be directed to the GAI or DHF at the addresses given below:

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Incorporating DSMA & ABHM



## 1.0 General

### 1.1 Scope

This Code applies to building hardware for fire-resisting doors and doorsets, and escape doors. The following are taken into account:

- timber fire doors of up to two hours resistance
- steel fire doors of up to four hours resistance.

The building hardware items covered are all either:

- essential to the successful operation of the doorset, or
- optional (non-essential) items which could cause a failure of the doorset.

Fire-resisting doors manufactured from materials other than timber or steel are excluded from the scope of this document.

### 1.2 Terminology

Terminology used in this Code of Practice reflects common usage as far as possible. Where appropriate, terminology has been taken from the current BS EN standards for building hardware.

## 1.3 Commentary

### 1.3.1 Purpose of Fire-resisting Doors

Fire-resisting doors serve three main purposes in a building:

- To restrict the initial development of a fire - a correctly fitted and functioning fire-resisting door can help to suppress a fire by restricting the amount of oxygen available to it.
- To restrict the spread of fire - a closed fire-resisting door is designed to endure direct attack by fire for a specified period of time. This should restrict the spread of fire through the building, gaining time for evacuation of the premises and for active fire protection resources such as sprinklers and fire fighters to perform their functions.
- To protect escape routes - the provision of protected escape routes is a requirement of Building Regulations. Any door opening on to an escape route or operating across an escape route is likely to be designated as a fire-resisting door, to ensure that persons using the route have protection from fire while they escape.

After evacuation, fire-resisting doors should continue to provide some protection for fire fighters entering the building to extinguish the fire.



## Section 1: Introduction



*Fire-resisting doors*

### 1.3.2 Testing of Fire Doors

The testing and certification of fire-resisting doors is carried out under the requirements stated in:

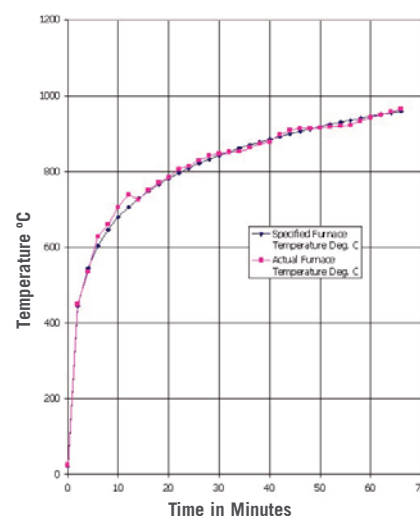
- BS 476:22, or
- BS EN 1634-1.

A doorset is built into masonry, partitioning or other walling system and then the whole assembly is offered up onto the front of a test furnace. Gas or oil burners provide the source of heat. The temperature in the furnace is controlled in accordance with the time/temperature curve specified in the Standard.

The pressure in the furnace is also controlled as specified in the Standard so that the threshold and lower part of the doorset are exposed to negative pressure (tending to draw cool air into the furnace from outside) while the upper part of the door is subject to positive pressure (tending to force hot gases from the furnace through any apertures in the test specimen).



*Glazed steel door and screen  
under fire test*



*Time/temperature curve  
BS EN 1634-1*

BS 476:22 sets the neutral pressure axis at 1 m from ffl, whereas BS EN 1634-1 sets the neutral pressure axis at 0.5 m above the floor.



Doors are often tested with the minimum of building hardware fitted: typically

- three hinges
- a door closer
- a lock or latch.

However the deadbolt is not thrown and the spring bolt may be wired back so that they play no part in holding the door closed. The door manufacturer is then able to test two points simultaneously:

- the door can perform its fire-resisting function without a latch or bolt (for unlatched applications relying on a door closer)
- locks of similar dimensions and materials can be fitted without compromising the door's fire resistance.

Under both BS 476:22 and BS EN 1634-1 test regimes, a door withstands fire attack for a period of time, for example 36 minutes or 67 minutes, and for the purposes of regulations is then described as FD30, FD60, etc. (BS 476:22 ) or E30, E60, etc. (BS EN 1634-1). Withstanding fire attack means not allowing flame or hot gases to pass. In other words, the doorset maintains its fire integrity.

Fire resistance classification using test data from BS EN 1634-1 is covered in BS EN 13501-2.

"Integrity" does not include passage of smoke, and during the early stages of a timber door fire test, copious amounts of smoke are pushed through the gaps between the door and frame, and between the meeting stiles on pairs of doors, in the upper area. This is due to the positive pressure in this area of the door. Where doors have intumescent seals fitted, and these have activated and expanded in the gaps around the door(s) and frame, the smoke penetration is reduced to almost zero, until the door assembly reaches the end of its ability to withstand fire attack, and new gaps open, due to warping of the door, or burn-through.

BS EN 1634-1 is significantly different from BS 476:22 in its test regime, so results from one test are not directly applicable to the other. Where an item of door hardware has been included in tests to BS 476:22, and it is intended for use on a door tested to BS EN 1634-1, new relevant test data will be needed.

More recently, hardware might have been subjected to a test in accordance with:

- BS EN 1634-2:2008 Fire resistance characterisation test for elements of building hardware

The results of this small-scale test regime may be used for hardware to be use on doors of similar construction, which were tested to BS EN 1634-1.



## Section 1: Introduction



*Without smoke seals, smoke passes around fire doors in the early stages of a fire - see unsealed right hand door*

### 1.3.3 Testing of Smoke Doors

Smoke doors in the UK are currently identified by the suffix 'S', for example FD30S, as in Approved Document B to the Building Regulations. It is usually a fire-resisting door of designated duration, with a smoke seal added to the frame or door edge, (normally sides and top only). The assembly is tested to BS 476:31.1, to determine its leakage rate. This is not part of the fire test, and is conducted at ambient temperature, with no heating of the smoke or doorset.

The report generated after testing will indicate the total length of interruptions in the perimeter smoke seal due to building hardware such as hinges and lock strikes. Therefore the specifier of building hardware for a smoke door must ensure that the fittings selected will not create a greater total length of interruptions in the seal.

**Example: if the tested doorset's frame-fixed smoke seal was interrupted by:**

3 x hinges @ 100 mm height	=	300 mm
1 x strike plate @ 220 mm height	=	220 mm
Total length of interruptions	=	520 mm



*Smoke seals interrupted by lock strike*

The specifier must find out if the seal is to be fitted to the frame or the door, and then ensure that building hardware, fitted on the same surface, does not exceed the allowance for interruptions indicated in the test report. Some seals incorporate fins which bypass the hardware, thus removing the problem.

BS EN 1634-3:2004 will eventually replace BS 476:31.1. It covers both cold smoke (similar to BS 476:31.1) and medium temperature (200°C) smoke.

### 1.3.4 The role of building hardware in fire-resisting and emergency escape doors

Some items of building hardware are essential to ensure that the fire-resisting door stays closed in its frame in a fire emergency. Products fitted as "Essential" items include:

- pivots or hinges - these attach the door onto the frame, and hinges might also help to stop it bowing
- a door closing device - an overhead door closer or floor spring ensures that the door closes reliably and stays shut
- and/or a latch/lock - in some cases, a latch or lock takes on the role of holding the door shut (in lieu of the door closing device).

These items must be carefully selected to ensure that they will perform their role satisfactorily. Most other items of building hardware on the door perform a function not directly associated with its fire performance ("non-essential"), but they must in no way impede or reduce the door's ability to withstand fire attack for the specified time. This also requires careful selection. Too often, holes are drilled through timber fire doors, and large metal components are attached, with no thought as to the consequences.

For steel doors, care must be taken to ensure that non-metallic materials, such as plastics, on the unexposed face of the door will not support combustion, due to the relatively high temperatures reached on this type of door. Many ancillary items might not have been included in fire tests, and there might be no evidence to show whether or not they affect fire-resisting door performance. Also, it cannot be assumed that building hardware tested on timber fire-resisting doors will necessarily perform successfully on steel doors, and vice-versa.

Door hardware that has been included in successful fire tests has reached one goal, but there is an additional goal - durability. When fire tested, the door, the seals and hardware are brand new, and no significant cycling (opening and closing movements) takes place before the test.



## Section 1: Introduction

Those items performing a role essential to the successful operation of the fire-resisting doorset, hinges, closing devices, latches or locks - should be chosen for their ability to cope with the type of use to which the door will be put. If hinges collapse, a door closer weakens, or a latch wears badly, it is unlikely that the door will maintain its essential self-closing function. This, of course, will defeat the main purpose of the fire door, and the safety of people and property is put at risk.

Door hardware is available to meet a variety of performance and durability levels, and selection of appropriate products will save on maintenance costs and, when put to the ultimate test, will save lives. BS EN 14600:2005 requires a minimum cycling (durability) of 200,000 cycles prior to the fire-resistance test. Although not obligatory, it seeks to establish the efficiency and safety of installation of fire-resisting door assemblies.

Similarly, door hardware on escape route doors has to permit the occupants of a building to make their escape safely to a place outside the building. The exact functional requirements will vary according to the circumstances and must be decided on the basis of a risk assessment. However, the building hardware, particularly the hinges and the emergency/panic exit devices, must always have sufficient strength and durability to remain effective for an economically reasonable working life under the prevailing conditions. Failure of the building hardware to perform properly when required could result in occupants being injured while attempting to escape, or even trapped, with potentially fatal consequences.

### 1.4 Relevant Legislation

**1.4.1 The Building Regulations - Approved Document B - (Fire safety) Volume 1: Dwellinghouses (2006 edition) and Volume 2: Buildings other than dwellinghouses (2006 edition)**

**1.4.2 Building (Scotland) Regulations 2004 (as amended) – Domestic Handbook Section 2 - Fire (2008) and Non-domestic Handbook Section 2 - Fire (2008)**

**1.4.3 Building Regulations (Northern Ireland) 2000 - DFP Technical Booklets E: 2005 - Fire Safety**

**1.4.4 Building Standards - Technical Guidance Document Part B (2006) - Republic of Ireland**



These national regulations and their associated technical documents set out the requirements for the design and construction of buildings so as to secure reasonable standards of health and safety for persons in and around the building. The specific documents listed above contain the detail relating to fire safety, including provisions relating to fire-resisting doors and escape routes. Fire resistance requirements for doors are currently specified by reference to BS 476:22 or to BS EN 1634-1.

Approved Document B (**1.4.1**) now contains a reference to:

- independent product certification schemes
- schemes for installers

as a means of certifying that materials comply with relevant Standards and of ensuring that materials are properly installed.

Approved Document B (Page 5) also states that one way of demonstrating that proper materials have been used is to use products bearing CE marking in accordance with the Construction Products Directive (89/106/EEC).

Approved Document M 2004 includes provisions for many fire-resisting doors to be "accessible" and therefore places limits on the maximum opening forces for mechanically operated doors. The provisions of this Approved Document, as they affect the specifications for and the operations of fire-resisting doors, are considered in detail in **Section 11**.

Approved Documents B (Fire safety) and M (Access to and use of buildings) are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. There is no obligation to adopt any particular solution contained in an Approved Document if you prefer to meet the relevant requirement in some other way. The guidance relates only to the particular requirements of the Regulations which that document addresses. The building work will also have to comply with the Requirements of any other relevant paragraphs in Schedule 1 to the Regulations.

## 1.4.5 The Construction Products Regulations 1991 (as amended)

These regulations implemented Council Directive 89/106/EEC in UK law. They made it illegal to supply any construction products that would not enable a properly constructed building in which they were incorporated to satisfy the essential health and safety requirements of the Directive.



## Section 1: Introduction

The relevant essential requirements as far as fire-resisting doors and emergency exit doors are concerned are:

- Safety in case of Fire
- Safety in Use.

This provision is in force for all products, and prosecutions have been brought in the UK for the offence of supplying products which do not comply.

The 1991 Regulations also made it possible to apply the CE Mark to construction products that comply with relevant "harmonised" technical specifications. The following products can presently be CE Marked.

Product Type	EN Number	CE Marking, possible from	Locations
Emergency Exit Hardware	BS EN 179	1 April 2002	<ul style="list-style-type: none"> <li>• Locked doors on escape routes</li> <li>• Fire / smoke doors</li> </ul>
Panic Exit Hardware	BS EN 1125	1 April 2002	<ul style="list-style-type: none"> <li>• Locked doors on escape routes</li> <li>• Fire / smoke doors</li> </ul>
Single Axis Hinges	BS EN 1935	1 Dec. 2002	<ul style="list-style-type: none"> <li>• Locked doors on escape routes</li> <li>• Fire / smoke doors</li> </ul>
Controlled Door Closing Devices	BS EN 1154	1 Oct. 2003	<ul style="list-style-type: none"> <li>• Fire / smoke doors</li> </ul>
Electrically powered Hold Open Devices	BS EN 1155	1 Oct. 2003	<ul style="list-style-type: none"> <li>• Fire / smoke doors</li> </ul>
Door Co-ordinators	BS EN 1158	1 Oct. 2003	<ul style="list-style-type: none"> <li>• Fire / smoke doors</li> </ul>
Locks and Latches	BS EN 12209	1 Dec. 2004	<ul style="list-style-type: none"> <li>• Fire / smoke doors</li> </ul>
Electro Mechanically Operated Locks	BS EN 14846	1 Oct 2009	<ul style="list-style-type: none"> <li>• Fire / smoke doors</li> </ul>

Products bearing the CE Mark are assumed to satisfy the essential requirements and their use will provide a defence in certain proceedings against the user under the Health and Safety at Work Act 1974 and similar legislation. Improper application of the mark is an offence.

There remain several building hardware products for which no harmonised specification exists and which cannot bear the CE mark. The manufacturer must still be able to demonstrate that such products can satisfy the essential requirements. Generally, the best method of demonstrating this will be compliance with a "non- harmonised" European Standard. The user will also find such compliance a useful guide to selection of the correct products and it will help to demonstrate that health and safety legislation has been complied with.

The Construction Products Directive is likely to be replaced by 2012 with a new Construction Products Regulation. This will be directly enforceable in the law of the UK and other EU member states without any national legislation being necessary. The national differences in interpretation should therefore disappear. In particular, CE marking will become a legal requirement in all member states for any product which is covered by a harmonised standard and for which there are performance requirements in national regulations.



## 1.4.6 The General Product Safety Regulations 2005

These regulations govern any aspect of the safety of a consumer product not already covered by specific legislation such as **1.4.5**. It is an offence to supply an unsafe product unless it can be shown that the supplier had in fact taken all reasonable steps to ensure its safety. The regulations also place obligations on producers and distributors in relation to keeping records of safety-related complaints and notifying the authorities if unsafe products have been supplied.

## 1.4.7 Regulatory Reform (Fire Safety) Order 2005

In brief, these regulations require building owners and operators to conduct risk assessments on the buildings under their supervision to ensure the following:

- hazards which could cause a fire are minimised or removed
- material which could fuel a fire is carefully and appropriately stored to minimise risk
- appropriate fire-fighting equipment is provided
- building occupants are trained in fire emergency procedures
- suitable and sufficient fire escape routes and doors are provided
- the building is maintained to continue or improve its original fire-resisting construction
- the fire safety of the building is maintained through regular checks
- fire escape routes are maintained to provide a continuously high level of operational availability

This list is not comprehensive, but gives an insight into the wide-ranging responsibilities which have been transferred from other agencies, such as the Fire Service, to building owners and operators. Users of this Code of Practice will find its guidance on suitable products, the standards to which they should conform, and the recommendations on their maintenance, of great help in fulfilling responsibilities they might have in connection with this legislation. (See also **Section 13:**

**Maintenance: Fire and Escape Door Hardware.**)

## 1.4.8 The Workplace (Health Safety and Welfare) Regulations 1992

These regulations require employers to provide safe workplaces including doors, which are safe in use (regulation 18). There is also a requirement to maintain the workplace and its equipment in a safe condition (regulation 5). The safety of the doors in the workplace is to be determined by risk assessments.





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### 1.4.9 The Construction (Design and Management) Regulations 2007

These regulations are aimed at securing minimum health and safety requirements at construction sites. The client, developer, CDM co-ordinator and contractors are all required to undertake their duties in a way which avoids foreseeable risks to persons engaged in construction work or cleaning work at any time, including after the building has been handed over to the client. The CDM co-ordinator is required to prepare (regulation 20) a health and safety file containing information relating to the project which is likely to be needed during any subsequent construction work to ensure the health and safety of any person. This file is to be handed over to the client who must ensure (regulation 17) that it is kept available for the use of any person who might need the information and that it is passed on to subsequent purchasers of the premises. Among the information contained in the file should be details of fire compartmentation and fire exits.

### 1.4.10 The Disability Discrimination Act 2005

This requires service providers to take reasonable steps to tackle physical features of premises, like steps or narrow doorways, that prevent, or make it unreasonably difficult for, disabled people to access their services.

## 1.5 Documentation

The following documents are considered acceptable as evidence of suitability of building hardware for incorporation into a fire-resisting doorset or door assembly:

- third party certification of the building hardware
- fire-resisting doorsets' third party certification data sheet, field of application summary or
- fire test reports or
- assessment by competent authority.

Durability of building hardware, whether for use on a fire-resisting door or an emergency exit door, may be evidenced (in order of preference) by:

- CE marking in accordance with relevant harmonised product standard (where available), or
- third party BS EN test report, or
- third party BS test report, or
- manufacturer's declaration.



The above documentation has been usefully summarised by several manufacturers through use of the ARGE Code of Compliance documents. (See **1.5.8**).

Further information is contained in a pocket guide for fire test reports and assessments published by the Fire Test Study Group Ltd. Additional sources of information are product labelling (fire performance/durability) and the instructions for fixing, commissioning and use.

## 1.5.1 Building Hardware Certification

CERTIFIRE offers third party certification schemes for passive fire protection products. The door hardware scheme covers performance under fire test; durability (against relevant BS ENs or BSs) and quality assured manufacture under the ISO 9000 regime. The certificate issued for each product will give details on the scope of the product's certificated use on various fire-resisting door types. Other similar schemes have been proposed.

## 1.5.2 Fire-resisting Door Certification

There are several fire-resisting door certification schemes. These include CERTIFIRE, BRE Certification and BM TRADA, each of which includes schemes for both timber and steel doorsets. The CERTIFIRE timber door scheme is operated jointly with BWF under the name BWF/ CERTIFIRE. Such doors are supplied with information covering their installation.

Door hardware is also addressed in these documents, and descriptions are given of the type, material, dimensions and fixings of building hardware which may be used on the door without invalidating the certification. If the selected fittings fall outside the scope of the data sheets, it will invalidate the door's certification, and possibly its fire resistance.

## 1.5.3 Fire Test Reports

These should:

- be relevant to the particular installation being considered
- name the product clearly and unambiguously
- relate to doors and frames which are generically the same as the ones proposed in the project
- be current (maximum 10 years, otherwise check the document for a date limiting its validity).

Fire test reports are complex technical documents and should only be used by those who are competent to interpret what is reported in the document.

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It is easy for the uninitiated to overlook a vital aspect of the test which limits the field of application of the result. For example, a closer tested on a door which was latched closed is not proven as suitable for the same door in unlatched condition.

### 1.5.4 Field of Application Summary

This document is a digest of relevant information extracted from a fire-resisting door's test report. It is intended for use by regulatory authorities, and gives similar information to that found in door certification data sheets.

### 1.5.5 Assessments

These are usually written in much more user-friendly language than fire test reports. They are based on test evidence, and the assessor's experience.

### 1.5.6 Overseas Test Evidence

Any fire test evidence from overseas, especially from outside the EU, unless provided by a "NOTIFIED BODY" should be treated with caution as the test methods and fire door construction can vary from country to country, and are therefore unlikely to have directly transferable relevance.

Fire tests in other countries are conducted in the context of local building regulations, national practices, and locally available materials, and might not provide data applicable to UK situations.

Test evidence generated under BS EN 1634-1 is useful, but if the test was conducted outside the UK, certain differences in national practice may still be evident. For instance, most other EU countries do not allow unlatched fire doors. In the UK, most tests are on unlatched doors. This is much more onerous on the door closing device.

### 1.5.7 Performance Standards

By using these BS EN Standards, the performance of building hardware for fire-resisting doors and emergency escape doors can be quantified in any or all the following areas:

- Category of use
- Durability
- Door size/mass
- Fire resistance
- Safety
- Corrosion resistance
- Security



# Section 1: Introduction

All new European building hardware Standards use a classification system in which the first seven digits are common. Each digit relates to a feature of the product measured against the requirements of the relevant standard. They are as follows:

An example of their use taken from EN 1935 - Single axis hinges; (other building hardware standards are generally similar):

Digit 1	Digit 2	Digit 3	Digit 4	Digit 5	Digit 6	Digit 7
Category of use	Durability	Door size/mass	Fire resistance	Safety in use	Corrosion resistance	Security

## 1 - Category of use

Grade 1 - Light duty

Grade 2 - Medium duty

Grade 3 - Heavy duty

Grade 4 - Severe duty

## 2 - Durability

(Out of possible grades 1-8, only 3,4 & 7 are used in this standard)

Grade 3 - 10,000 test cycles

Grade 4 - 25,000 test cycles

Grade 7 - 200,000 test cycles

## 3 - Door size/mass

Grade 1 - 20 kg

Grade 2 - 40 kg

Grade 3 - 60 kg

Grade 4 - 80 kg

Grade 5 - 100 kg

Grade 6 - 120 kg

Grade 7 - 60 kg

## 4 - Fire resistance

Grade 0 - not approved for use on fire / smoke door assemblies

Grade A - suitable for smoke door assemblies - subject to test evidence

Grade B - suitable for fire and smoke door assemblies - based on a test in accordance with BS EN 1634-1

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### 5 - Safety in use

Grade 1 - safe (only acceptable grade)

### 6 - Corrosion resistance

Based on the grades given in BS EN 1670

Grade 0 - none

Grade 1 - mild

Grade 2 - moderate

Grade 3 - high

Grade 4 - very high

### 7 - Security

Grade 0 - not suitable for burglar-resistant doors

Grade 1 - suitable for burglar-resistant doors, subject to test evidence

Certain products may carry additional classification digits for parameters specific to those devices.

British Standards for products outside the scope of the BS ENs might not cover all of these categories. Reference must be made to each standard with which a product claims compliance.

In the product section of this Code of Practice, relevant standards for each product are listed.

### 1.5.8 ARGE manufacturer's declaration of compliance with EN standards

ARGE is The European Federation of Associations of Lock and Builders' Hardware Manufacturers. A standard form for manufacturers' declarations of compliance has been developed by ARGE. On a single sheet of A4, this gives full details of the product and its testing, including the multi-digit code box relevant to the product. This provides a quick reference to all the essential information needed to assess the product's status in relation to Standards. Where appropriate, additional information on fire performance is included.

These documents should make the selection and comparison of tested products a straightforward exercise.



# Section 1: Introduction

Page 17

Code of Practice: Hardware for Fire and Escape Doors

## Manufacturer's declaration of compliance with The Construction Products Regulations

We declare that the following product:

**XYZ - 5-lever mortice sashlock**

Has been successfully tested to: **EN 12209:2003**

With the following classification:

**2 H 4 1\* 0 F 7 K D 2 B**

Box		
1	Category of use	For use by people with some incentive to exercise care; some chance of misuse
2	Number of test cycles	200,000 test cycles; 10 N load on latch bolt
3	Test door mass/size	100 kg door mass; 25N maximum closing force
4	Fire behaviour	*Suitable: see optional requirements below (WF Assessment Report no. 148484/A)
5	Safety	No safety requirement
6	Corrosion resistance	High corrosion resistance
7	Security and drill resistance	**Very high security with drill resistance
8	Field of door application	Mortice: hinged door; locked from inside
9	Type of key operation and locking	Lever lock; manually locking
10	Type of spindle operation	Latch for unsprung lever handle operation
11	Key identification requirement	Minimum five detaining elements

And the following optional requirements:

\*included in fire test to BS EN 1634-1, assessed for timber doors up to FD 60

\*\*Kitemarked to BS 3621: 2004

### Evidence of standards compliance:

<input checked="" type="checkbox"/>	Type testing by Manufacturer	SPUK Ltd TEST LABORATORY, UKAS ref: 2526
	Type testing by Manufacturer to EN 45001	
	Type testing by Independent recognised laboratory	
	Regular audit testing by Manufacturer	
	Regular audit testing by Manufacturer to EN 45001	
	Regular audit testing by independent recognised laboratory	
	Other (specify)	

### Evidence of quality compliance:

	Manufacturer's own quality system	
	Manufacturer's quality system to EN 9002	
	Manufacturer's quality system to EN 9001	
	Manufacturer's quality system to EN 9002 with Independent quality assessment	
<input checked="" type="checkbox"/>	Manufacturer's quality system to EN 9001 with Independent quality assessment	BSi Certificate no. 02256
	Other (specify)	

### Evidence of marking compliance:

	None	
	CE Marking	Applied for
<input checked="" type="checkbox"/>	Quality label (e.g. Kitemark, RAL NF etc.)	Kitemark to BS 3621
	Other (specify)	

Signature:

Position:

Date:

*ARGE-style manufacturer's Declaration of compliance*

**DHF**  
Door & Hardware  
Federation

**gai** guild of  
architectural  
ironmongers  
advancing architectural ironmongery



# Section 1: Introduction

## **Manufacturer's declaration of compliance for standards and quality**

We declare that the following product:

***pqr - overhead door closer***

Has been successfully tested to: **EN 1154:1997**

With the following classification:

4	8	3/4	1*	1	3
---	---	-----	----	---	---

Box		
1	Category of use	For closing doors from 180° open
2	Number of test cycles	500,000
3	Test door mass/size	Size 3 & 4 (950 – 1100 mm wide; 60 – 80 kg)
4	Fire behaviour	*Suitable: see optional requirements below (WFRC Test no. 142118)
5	Safety	Grade 1
6	Corrosion resistance	High resistance

And the following optional requirements:

**CERTIFIRE approved ITT 120 (Cert. No. 391)**

\*included in fire test to BS EN 1634-1, assessed for timber doors up to FD 120

### **Evidence of standards compliance:**

	Type testing by Manufacturer	
	Type testing by Manufacturer to EN 45001	
X	Type testing by Independent recognised laboratory	ASSA AB ATL SWEDAC ref. 1600
	Regular audit testing by Manufacturer	
	Regular audit testing by Manufacturer to EN 45001	
X	Regular audit testing by independent recognised laboratory	ASSA AB ATL SWEDAC ref. 1600
	Other (specify)	

### **Evidence of quality compliance:**

	Manufacturer's own quality system	
	Manufacturer's quality system to EN 9002	
	Manufacturer's quality system to EN 9001	
	Manufacturer's quality system to EN 9002 with Independent quality assessment	
X	Manufacturer's quality system to EN 9001 with Independent quality assessment	TUV Certificate no. 04100 11037
	Other (specify)	

### **Evidence of marking compliance:**

	None	
X	CE Marking	DNV Certificate number 1162-CPD-0132
	Quality label (e.g. Kitemark, RAL NF etc.)	
	Other (specify)	

Signature:

Position:

Date:

*ARGE-style Manufacturer's Declaration of compliance  
for CE marked product*



### 2.1 Introduction

When used in a fire-resisting door assembly, the door leaf should be hung on single-axis hinges in accordance with local and national regulations. Hinges fitted to fire-resisting doors should be able to achieve the intended fire rating, also the hinge should be able to allow the door closing device, when fitted to a fire-resisting door assembly, to close the door leaf reliably from any angle to which it has been opened, overcoming the resistance of a latch or any seals when fitted.

Experience relating to escape from buildings and general safety has shown the importance of fitting doors on escape routes with suitable hinges to enable the occupants of the building to escape quickly and easily from a building in the case of fire or other emergency. Generally all doors on escape routes should open in the direction of emergency travel.

At the same time, where escape route doors are part of the final exit from a building, there will be some additional requirements for security of the door against intrusion and burglary. In this case the hinges should be of a design so that they cannot be removed or parted whilst the door is closed, ensuring that the building and its contents are secured against unauthorised entry.

Where escape route doors are part of the fire compartmentation of the building, there will be additional requirements to ensure that the hinges fitted do not compromise the fire-resisting performance of the doorset.

### 2.2 Critical Recommendations

Except where otherwise noted the recommendations apply both to hinges for fire-resisting door assemblies and to those fitted to doors on escape routes.

#### 2.2.1

The chosen hinge should be:

- CE Marked to BS EN 1935, including its Annex B
- preferably, provided with certification by an approved third party certification body.

(For further information on certification schemes see **1.5 Documentation**).

## Section 2: Hinges

### 2.2.2

When used on fire-resisting doorsets the product should have demonstrated its ability to be suitable for the intended purpose, by inclusion in satisfactory fire test to BS EN 1634-1 or BS EN 1634-2, on a type of door assembly and configuration in which it is proposed to be used. An approved third party certification or testing body should provide this evidence.

### 2.2.3

The strength and features must be correct for the size of door and mass to which it is to be fitted, bearing in mind:

- the application of the door (main entrance, toilet lobby, duct door),
- position of door stop if being used (position on floor or wall in relation to width of door)
- whether subject to factors such as heavy traffic use, abusive treatment
- whether or not a door closer is being used (with or without backcheck)
- size (height and width) and mass (weight) of the door number and position of hinges
- whether the door is on an accessible route and therefore needs to satisfy Part M of the Building Regulations (see **Section 11** for details).

### 2.2.4

A regular program of maintenance should be undertaken to ensure that the correct operational performance of the hinge is maintained for the life of the building. (see **Section 13**).



*Hinges on high traffic areas which have become badly worn*

### 2.2.5

Rising butt hinges are NOT recommended for use on fire-resisting doorsets (see **2.3.6**).

### 2.2.6

Spring hinges are NOT recommended for use on fire-resisting doorsets (see **2.3.8**).

## Section 2: Hinges

### 2.2.7

For timber doors and frames, fixing screws should be not less than size No.8 (3.8 mm) and not less than 30 mm in length. (See also **2.3.9.**) For steel doors the dimensions may vary according to the method of fixing in accordance with their individual test report.

### 2.2.8

Hinges for use on final exit escape doors should have a corrosion resistance of not less than Grade 3 of BS EN 1670.

### 2.2.9

CE Marked hinges should be marked according to clause ZA.3 of BS EN 1935.

## 2.3 Commentary

### 2.3.1 Melting Point

The Building Regulations 1991 Approved Document B Volumes 1 & 2, Appendix B 2000/2006 Edition states:

"Unless shown to be satisfactory when tested as part of a fire door assembly, the essential components of any hinge on which a fire door is hung should be made entirely from materials having a melting point of at least 800°C."

### 2.3.2 Sizes

Hinges are available in a range of sizes, which relate to the mass and size of the door. These are set out in Table 1 of BS EN 1935, which is shown below:

Digit 1			Digit 2		Digit 3		Digit 4	Digit 5	Digit 6	Digit 7	Digit 8
Category of Use			Endurance Test Cycles		Test Door Mass		Fire	Safety Resistance	Corrosion	Security Resistance	Hinge Grade
Duty	Grade	Use on	Grade	Number of test cycles	Grade	Mass Kg	Grades	Grade	Grade	Grade	Grade
Light	1	Window	3	10 000	0	10	0 or 1	1	0,1,2,3,4	0 or 1	1
Light	1	Window	3	10 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	2
Light	1	Door/Window	4	25 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	3
Medium	2	Door	7	200 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	4
Light	1	Window	3	10 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	5
Light	1	Door/Window	4	25 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	6
Medium	2	Door	7	200 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	7
Light	1	Window	3	10 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	8
Light	1	Door/Window	4	25 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	9
Medium	2	Door	7	200 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	10
Heavy	3	Door	7	200 000	4	80	0 or 1	1	0,1,2,3,4	0 or 1	11
Severe	4	Door	7	200 000	5	100	0 or 1	1	0,1,2,3,4	0 or 1	12
Severe	4	Door	7	200 000	6	120	0 or 1	1	0,1,2,3,4	0 or 1	13
Severe	4	Door	7	200 000	7	160	0 or 1	1	0,1,2,3,4	0 or 1	14

Table 1: BS EN 1935 Classification Summary

Clearly, an important factor is the size of the hinge with respect to the door mass.

## Section 2: Hinges

Due to tooling costs and similar considerations, variations of hinge sizes and fixing methods are not easily accommodated on a steel door. Steel door manufacturers generally provide their own steel hinges, which otherwise comply with these requirements, as part of the fire-resisting steel doorset and these are covered by evidence of performance.

### 2.3.3 Torque

The torque between the two hinge leaves is important. Limits of this torque are set down in BS EN 1935; the low torque requirement of the hinge is necessary to allow the door closing device to overcome the resistance of the latch bolt and/or seal pressure. The requirements range between 2 Nm and 4 Nm dependent on the grade of hinge from 7 to 14. Hinges fitted on fire-resisting doors that are on accessible routes should have the lowest possible torque. (For more details see **Section 11**).

### 2.3.4 Number and Position of Hinges

In all cases reference should be made to the fire test evidence, and the tested condition should be followed. The necessary information should be on the fire door's data sheet.

It is usual for at least 3 hinges to be fitted on fire and escape route doors. With fire-resisting doors becoming heavier, there is a practice to fit two hinges at the top of the door with the third hinge at the bottom of the door. It is unsafe to alter the "as tested" position of a hinge on a fire door, without assessment from a suitably qualified authority.

For doors heavier than 160 kg or exceeding 2000 mm in height and 1000 mm in width, a recommendation from the hinge and/or door manufacturer should be obtained. Annex D of BS EN 1935 gives additional advice regarding the use of hinges on doors of excessive width. (A wide door is one where the width is more than half the height.)

### 2.3.5 Influence of Door Closing devices

Door closers put extra stress on hinges, which has significance for fire-resisting and escape doorsets. This has been addressed in BS EN 1935, annex E, as follows:

"For a standard door closing device it is recommended that the door mass should be notionally increased by 20%. The effect of a backcheck door closing device is greater and it is recommended that the door mass should be notionally increased by 75%."

### 2.3.6 Rising Butts

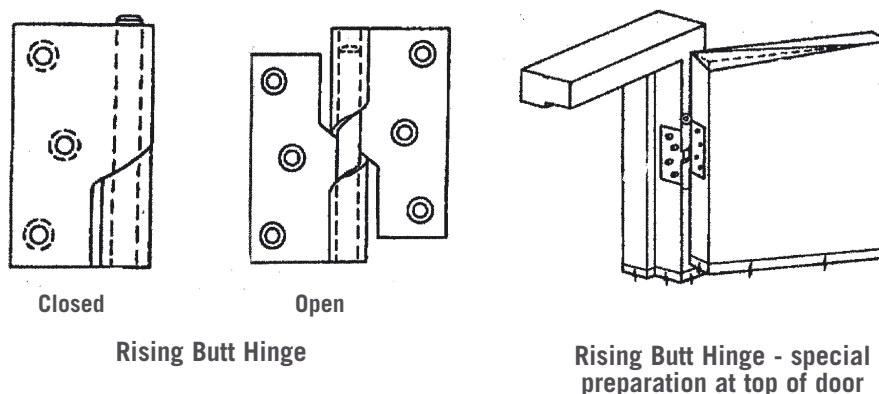
The Building Regulations 1991 Approved Document B 2000/2002 Edition stated that rising butt hinges, which do not meet the criteria of a self-closing device, were acceptable where the door was:

- i) to (or within) a dwelling,
- ii) between a dwelling house and its garage, or
- iii) in a cavity barrier.

The 2006 edition of Approved Document B no longer accepts rising butt hinges as a door closing device for fire doors.

In this Code of Practice the use of rising butt hinges is discouraged from the fire resistance viewpoint for the following reasons:

- a) To enable the door to function properly, it is necessary to ease the top edge of the door sufficiently to allow for the rise of the butt. When the door is returned to its closed position, this means that a gap in excess of 9 mm will exist at the head of the door. This will be in addition to the 3 mm gap, which is the recommended maximum for fire doors, making a total of 12 mm where the thickness of the door stop is only 12 mm. The head of the door is the most vulnerable point of the door if a fire breaks out. It is at this point that the pressure of smoke and hot gases, searching for cracks and fissures through which to escape, is highest.



*Rising butt hinge and door detail*

- b) The closing force exerted by rising butt hinges is extremely low and will not overcome air pressure differences or resistance from latches, seals or carpets that might be fitted, and therefore they cannot be considered as reliable door closing devices. (See **3.3.9**).

## Section 2: Hinges

### 2.3.7 Lift-off, Loose Pin and Journal Supported Hinges

Only hinges which require a special tool to separate the hinge leaves when the door is in the closed position may be used (this prevents the fire-resisting door from being removed by unauthorised persons).



*Lift-off hinge*

### 2.3.8 Spring Hinges – Single and double action

Such hinges come in many forms. The common factor with hinges of this type is the large amount of metal incorporated in their construction. This is likely to lead to early integrity failure in a timber door. In addition, the spring tension which acts as an integral self-closing device has an inherently low resistance to pressure in the closed, or near closed, position, making it difficult for such hinges to hold the door in the closed position without the assistance of a latch (see **3.3.8**).



*Double action spring hinge*

### 2.3.9 Fixing Screws

Although it is possible to use very short screws when fixing hinges to timber doors it is obvious that this must stress the construction - even in the "cold" state. When fire develops, a short screw will lose its holding ability more quickly than a long one, due to charring of timber around the hole. It is recommended that the screws used for fixing the hinges should be no less than 30 mm long.

Increasingly, fire doors are being manufactured with Graduated Density Core materials. These require a longer fixing screw of at least 50mm. If there is any doubt, advice should be sought from the door manufacturer regarding the material of the door core.

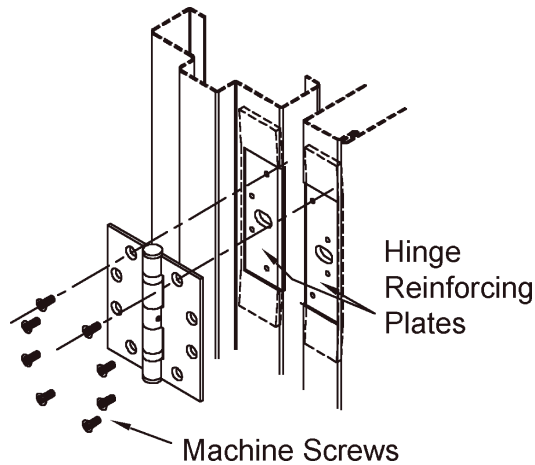


## Section 2: Hinges

The diameter of the screw will also play a significant role in supporting the door particularly in fire. It is recommended that no screw in a timber door should have a diameter of less than 3.8 mm (No.8).

It is recommended that the torque applied to the fixing screws should be not greater than 6 Nm per screw to prevent stripping the timber and that full thread type of screws be used. Care should be taken to ensure that the fixings do not penetrate the brickwork unless the brickwork is prepared to receive the screw otherwise the screw thread might be stripped.

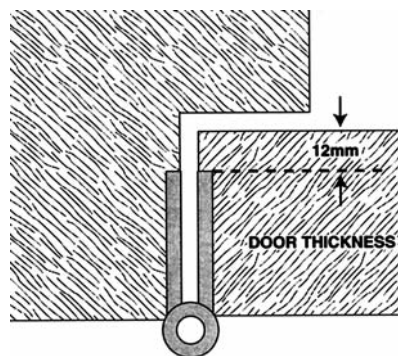
For steel doors, hinges should be fixed with machine screws which are screwed into steel reinforcing plates provided in the door and the frame.



*Hinge re-inforcing plates for steel doors and frames.*

### 2.3.10 Thermal Bridging

Except where there is satisfactory fire test evidence to prove performance, it is recommended that for timber door leaves of 44 mm thickness no part of the hinge should extend across the door thickness to a position closer than 12 mm from the non-pivoting face.



*Limiting thermal bridging*

For timber door leaves of 54 mm thickness no part of the hinge should extend across the thickness to a position closer than 18 mm from the non-pivoting face. (See also 2.3.13).



### 2.3.11 Door Stops and Hold Open Devices

These can put extra stress on the hinge and the hinge fixings, especially when the door is pulled to over-ride the hold open, or pushed against a door stop fitted near the middle of the door, or even closer to the hinges.

It is recommended that the hold open device should be positioned in the same horizontal plane as the door closing device, and as near to the edge of the locking stile as possible if it is not incorporated in a door closer. Door stops should also be positioned as near to the locking stile edge as possible, whilst taking care not to create a tripping hazard.

### 2.3.12 Door Preparation

To ensure the accuracy and position of the hinge rebates in the door leaf and door frame it is recommended that they be machined in position at the door manufacturing stage.

### 2.3.13 Intumescent Protection

If intumescent material was used when the hinge was fire tested, it is essential that the same material be used in order for the test evidence to be valid and maintain the integrity of the door set. Advice should be obtained from the door, hinge or intumescent supplier as to the type, position and fixing method to be used (see also **Section 9: Fire and Smoke Seals**).

### 2.3.14 Conductor Hinges

For further information see **4.3.5.2, Electrically Powered Hold-open Devices**.

For further information see also the Best Practice Guides

- **Single Axis Hinges to BS EN 1935**

published by the DHF and included on the DHF website. A link is available from the GAI website:

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)



### 3.1 Introduction

Fire-resisting doors (other than those to locked cupboards, service ducts, and internal doors in flats and dwellinghouses) are usually required to be self-closing, in accordance with building regulations.\*

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

- close the door leaf reliably from any angle to which it has been opened
- overcome the resistance of a latch or any seals when fitted.

Door closing devices fitted to fire-resisting doors are required to perform one of two functions, dependent on whether or not a latch is fitted to the door. These functions are considered "essential" in terms of the ability of the doorset to achieve its intended fire resistance rating.

- **Latched door:** To close the door in a controlled manner into a position where the latch engages. In this case, once the latch is engaged, such closers will have no further essential role to play.
- **Unlatched door:** To close the door in a controlled manner into its frame or, in the case of double swing doors, to its dead centre closed position, and maintain this condition for a period during fire exposure until the heat activated sealing system takes over the role of maintaining the door in the closed position.

For the purpose of this Code of Practice door closing mechanisms are divided into the following categories:

- Face-fixed closers - overhead mounted
- Face-fixed closers - jamb mounted
- Concealed closers - overhead mounted
- Concealed closers - jamb mounted
- Floor springs - floor mounted
- Spring hinges
- Rising butt hinges

**Note:** This list does not imply suitability of any device for fire door use - see **3.2** and **3.3** for further information.

*\*Dwellinghouses and flats granted planning permission before April 2007 fall under the recommendations of Approved Document B 2000 edition, which required any internal fire doors to be self-closing. This requirement will continue for such buildings, and self-closing devices should still be provided on such internal domestic fire doors in any refurbishment. In these circumstances, uncontrolled closers are permitted, including rising butt hinges. Dwellinghouses and flats granted planning permission after 5 April 2007 fall under the recommendations of Approved Document B 2006 edition. In this case, any dwellinghouses and flats fitted with hard-wired smoke sensors may have internal fire doors without self-closing devices. However, the front door to a flat, and the door to any integral garage must be fitted with a self-closing device which complies with BS EN 1154 or BS EN 1155.*



## Section 3: Door Closing Devices

### 3.2 Critical Recommendations

#### 3.2.1

The door closing device and its accessories should be:

- CE Marked to BS EN 1154 - Building hardware - Controlled door closing devices, including annex A,
- preferably, provided with additional product certification by an approved third party certification body.

(For further information on certification schemes see **1.5 Documentation**).

#### 3.2.2

The product and any accessories should have demonstrated their suitability for the intended purpose, by inclusion in satisfactory fire tests to BS EN 1634-1 or BS EN 1634-2, on a type of doorset and configuration in which will be used. This evidence should be provided by an approved third party certification or testing body. (See **1.5 Documentation**).

#### 3.2.3

The strength and features of the control must be correct for the size of door to which it is fitted, bearing in mind:

- Door size and mass,
- the application to the door (see **3.3.3**),
- whether subject to other factors such as differential air pressure, draughts, heavy traffic use, abusive treatment,
- whether door is to be latched or unlatched,
- whether smoke or other seals are fitted to the doorset,
- whether the door is on accessible route and therefore needs to satisfy Part M of the Building Regulations (see **Section 11** for details).

For further information see **3.3.1**.

### 3.2.4

Face fixed overhead controls should NOT be used on unlatched doors where the arm assemblies or components are made of material with a melting point of less than 800°C unless proven by specific tests (see **3.3.4**).

### 3.2.5

Concealed overhead controls should NOT be used unless they are provided with any specially designed and proven intumescent protection (see **3.3.7**) which might be stipulated in the fire test report of field of application.

### 3.2.6

For floor springs, strap accessories are preferred (see **3.3.10**).

### 3.2.7

Spring hinges, which are purely spring urged and do not control the closing speed, are unable to comply with BS EN 1154 and therefore should NOT be used for fire doors (see section **3.3.8**).

### 3.2.8

Rising butt hinges are NOT recommended for use on fire doors. (See **2.3.6** and **3.3.9**).

### 3.2.9

Manually operated mechanical hold-open devices (i.e. mechanisms which must be released manually) **SHOULD NOT BE USED ON FIRE DOORS**. (See **3.3.2**).

### 3.2.10

The automation of fire-resisting doors must not detract from their essential primary function as a fire door. The device should meet all critical criteria applicable to self-closing devices.

### 3.2.11

A regular programme of maintenance should be undertaken to ensure that the correct operational performance is maintained for the life of the building. (See **Section 13**).

## Section 3: Door Closing Devices

### 3.3 Commentary

#### 3.3.1 General

The Building Regulations 1991 Approved Document B 2000 Edition requires that all fire-resisting doors (with the exception of locked cupboard/duct doors and internal domestic doors) be fitted with an appropriate self-closing device.

Within the framework of the Construction Products Directive (89/106/EEC), these devices have been identified as playing an essential role in the safety of buildings in the case of fire. Compliance with BS EN 1154 (and EN1634-1) is deemed to satisfy the requirements of the Directive in this regard, and it is therefore strongly recommended that proof of compliance be obtained for any controlled door closing device before it is specified or used.

Closing controls are available in a range of strengths (commonly referred to as sizes) that relate to the available power to close the door. The minimum performance requirements are laid down in BS EN 1154 - Building hardware - Controlled door closing devices - and include levels of mechanical efficiency, suitable door width and mass.

The following extract from BS EN 1154 shows the range of door closer power sizes and related parameters:

Table 1								
1	2	3	4	5	6	7	8	9
Door closer power size	Recommended door leaf width mm max.	Test door mass kg	Closing moment			any other angle of	Opening moment between 0° and 60° Nm Max.	Door closer efficiency between 0° and 4° % min.
			between 0° and 4°		between 88° and 92°			
			Nm min.	Nm. max.	Nm min.	Nm min.		
1	<750	20	9	<13	3	2	26	50
2	850	40	13	<18	4	3	36	50
3	950	60	18	<26	6	4	47	55
4	1100	80	26	<37	9	6	62	60
5	1250	100	37	<54	12	8	83	65
6	1400	120	54	<87	18	11	134	65
7	1600	160	87	<140	29	18	215	65

NOTE 1 : The door widths given are for standard installations. In the case of unusually high or heavy doors, windy or draughty conditions, or special installations, a larger power size of door closer may be used.

NOTE 2 : The test door masses shown are only related to door closer power sizes for the purpose of the test procedure. They are not intended to indicate maximum values for actual use.

An important factor is the closing moment: a fire-resisting door must be closed to be effective, and situations might arise which dictate that a stronger closer should be specified (e.g. air pressure, hinge friction or fitted smoke seal considerations). Whilst this deals with the demand of the fire-resisting door, it will inevitably cause problems for the user in terms of the greater effort required to open.

A door must be easy for occupants of the building to open, particularly where there are large numbers of old, young, or infirm people and where the door is on an accessible route. (See also **Section 11**). When used in conjunction with a latched door assembly, there is no need for the closer to exert any greater force than that required to overcome the latch, friction and any seals. If however, the force is only marginally in excess of that required to overcome the latch resistance, friction and any seals, then reasonably high levels of maintenance will be required to ensure that the latch/seal resistance does not overcome the closer force. When considering the spring pressure, the anticipated degree of maintenance should also be taken into account.

Door closing devices which incorporate spring pressure adjustment provide a very useful way of adjusting the closing force on installation to suit the particular site conditions encountered. The adjustment should, be used with care, bearing in mind the needs of adequate closing force and the effects on the user. Smoke seals can sometimes prevent the door closer from fully closing the door, considerable force being required to deflect or compress the seal, particularly if they are not correctly installed and maintained. Very careful consideration should be given to these issues when specifying closing controls to ensure that extra spring strength is not applied just to overcome poor seal efficiency.

BS EN 1154 states that door closers of less than power size 3 are not considered suitable for fire doors due to their low closing moments, especially beyond 90°. It also requires that power adjustable closers should be capable of adjustment to at least power size 3, and that for such closers the installation instructions shall include precise instructions to the installer to ensure that the door closer is adjusted on site to size 3 or more. (Care should be taken to differentiate between variable power adjustable closers and template adjustable, where the closer remains dependent on the template fixing position).

BS EN 1154 permits delayed action closers to be used on fire-resisting door assemblies but it is important that any delay set is no more than that required for its use (e.g. for the easy passage of elderly or disabled persons), and is not more than 25 seconds.

## Section 3: Door Closing Devices

### 3.3.2 Hold Open and Free-Swing Devices

Manually operated mechanical hold-open devices (i.e. mechanisms which must be released manually) **SHOULD NOT BE USED ON FIRE-RESISTING DOORS**, as they would inhibit the closing action of the door, even in the event of a fire. They are not permitted by the Building Regulations, Approved Document B, England & Wales.

In situations where the fire-resisting door is required to be held open on busy traffic routes, or free swinging for the benefit of the elderly, infirm or disabled, specialist holding devices should be used which, being linked into the fire/smoke alarm/detection system, will release and close the door on receipt of a signal in the event of emergency or power failure. They can also be manually released when required. To ensure that these devices have the correct mechanical and electrical performance, they should comply fully with BS EN 1155 - *Electrically powered hold-open devices for swing doors*. **Section 4** of this Code of Practice contains detailed recommendations for these devices.

### 3.3.3 Closer Installation

Some rack and pinion closers designed for use on the pull side of the door can lose power significantly when installed on the push side or if used with single arms and slide channels. BS EN 1154 requires that the manufacturer must state clearly the door closer power size for the fitting position of each installation that he recommends. If it is intended to install a closer in other than its standard installation, the manufacturers' instructions must be consulted to ensure that size 3 is still achievable.

### 3.3.4 Door Closing Devices on Steel Doors

While the notes in paragraphs 3.3.5 to 3.3.12 below apply generally to all types of fire-resisting doors, it should be noted that door closing devices fitted to uninsulated steel doors can be susceptible to ignition of leaking fluid on the unexposed face of the door, causing integrity failure of the doorset. Therefore any closing device intended for use on such doors must be accompanied by evidence of performance for the required period when fitted to the unexposed face of steel doors.

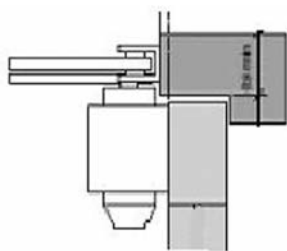


### 3.3.5 Face Fixed Overhead Closers

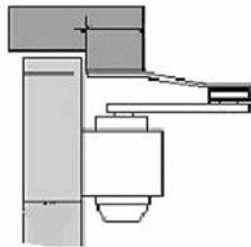
These are the most common form of door control and can be applied to the door in one of four ways:

- on the pull face
- on the push face
- mounted on the transom on the push side of the door
- mounted on the transom on the on the pull side of the door.

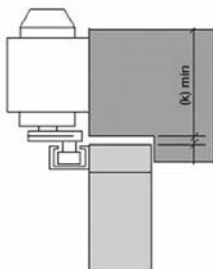
The connection between the door leaf and frame is created by a pair of folding arms or a single arm guided in a channel.



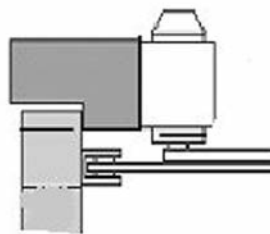
Pull face



Push face



Transom pull side



Transom push side

#### *Mounting options*

A wide variety of models has been proven by inclusion in fire door tests and the results have largely shown that mechanisms assembled in aluminium bodies do not adversely affect the fire resistance of the door assembly. The use of low melting point material in the arm linkage has been shown to be of risk in some applications. It is particularly important to check that the fire test evidence covers such an arm assembly in the fixing application that is intended.

## Section 3: Door Closing Devices

When considering which door face is most likely to be exposed to fire, it is advisable to assume that either face could be exposed and that suitable hardware be specified to achieve ultimate performance and safety. These characteristics can only really be established by subjecting the closing device to a test as part of a complete timber doorset. The flammability of the damping fluid is normally of little consequence on timber doorsets; if the closer is on the unexposed face of a timber door assembly then the temperature is unlikely to get high enough to cause fluid leakage, although this might become important where a significant area of the door leaf is glazed and escaping fluid might be ignited by contact with the glazing. If the closer is on the exposed face then the additional fuel that the damping fluid contributes will be negligible.

### 3.3.6 Face-fixed Jamb Closers



*Face-fixed jamb closer*

These uncontrolled closers do not meet the requirements in Approved Document B 2006 edition for self-closing devices (see **3.1 Introduction** for details). These closers are totally exposed to the fire conditions and are normally of low power and low mass. For this reason they are unlikely to remain operative for a period of time long enough for an unlatched door to satisfy the test requirement whether the doorset incorporates a thermally-activated sealing system or not.

They are generally unsuitable for use on a latched door assembly unless they comply fully with the requirements of BS EN 1154 to ensure that they apply enough force, from any angle, to overcome the frictional resistance of the latch. There are various types of face-fixed jamb closers, some of which can have the spring pressure relaxed very easily. In the absence of specific performance test evidence, this type of closer should NOT be considered for fire doorset use.

### 3.3.7 Concealed Closers

Concealed closers are installed into the door leaf and/or its frame. On timber doors, they are mortised into the fabric of the assembly causing a significant amount of the fire-resisting doorset material to be removed and intumescent protection of some kind will usually be required to protect the door from early integrity failure. This intumescent protection should be supplied by the manufacturer with every concealed closer intended for use on a timber fire-resisting doorset. It is particularly important with these closing devices to check that the fire test evidence is relevant to the intended door application and material. Some concealed closers have been successfully tested in steel doors without the need for intumescent protection.

#### 3.3.7.1 Concealed 'In Door'

These devices are mounted into the top rail of the door and are virtually concealed from view with the possible exception of the arm linkage.



*Concealed overhead closer*

In view of the large amount of timber removed from the door to accommodate these types they must be installed using specially designed intumescent protection jackets to delay integrity failure during fire conditions. It is therefore particularly important to check that the fire test evidence is relevant to the intended door application and material. To ensure sufficient durability and closing strength, it is also important that such closers comply fully with BS EN 1154.

## Section 3: Door Closing Devices

### 3.3.7.2 Transom Closers

These devices involve the removal of a considerable amount of material from both the head frame and top rail of the door and also from the bottom rail of the door leaf, where the associated bottom pivot has to be fitted.



*Transom closer in metal frame*

Although some devices have been satisfactorily tested and approved, their use requires specific intumescent protection and precise preparation of the door leaf and frame prior to fitting of the device. In the absence of such provisions, and documented evidence of satisfactory testing for the specific doorset intended, they should not be considered for fire doorset use.

### 3.3.7.3 Concealed Jamb Closers - controlled closing

These closers are normally inserted in the hanging edge of the door leaf and are anchored to the frame edge by means of a linkage. It is important to check that the selected concealed jamb mounted closer complies fully with BS EN 1154 for both power size and controlled closing, whether intended for use on latched or unlatched doorsets (See 3.1).



*Concealed jamb closer with controlled closing*

Because these closers are mortised into the leaf, it is also important to check that doors are suitable to accommodate the closers and that the installation of the closers will not be a possible cause of burn-through and integrity failure.

### 3.3.7.4 Concealed Jamb Closers - uncontrolled closing



*Concealed jamb closer with uncontrolled closing*

These uncontrolled closers do not meet the requirements in Approved Document B 2006 edition for self-closing devices (see **3.1 Introduction** for details). As described for concealed jamb closers with controlled closing, concealed jamb closers which have uncontrolled closing have their lowest closing power at, or near, the closed position. Test evidence has shown that the majority of these uncontrolled devices are unable to achieve power size 3 to BS EN 1154. Therefore they should not be considered for fire doors which require a self-closing device according to Approved Document B 2006.

### 3.3.8 Spring Hinges

These uncontrolled closers do not meet the requirements in Approved Document B 2006 edition for self-closing devices (see **3.1 Introduction** for details). Spring hinges, whether single or double action, embody a spring for the storage of energy but do not have a system for controlling and regulating the closing function. They provide their lowest closing power at, or near, the door closed position and, therefore, on latched doors, are unlikely to overcome latch resistance. On unlatched doors they are unlikely to hold the door leaf closed against the pressures known to exist in fire situations until any heat activated sealing system has operated.



*Double action spring hinge*

They do not contain a damped, or controlled closing mechanism and they are unlikely to achieve the minimum power size 3 for use on fire-resisting doors or to comply with the performance requirements of BS EN 1154. They are NOT recommended for fire doors which require a self-closing device according to Approved Document B 2006. (See also **2.3.8**).



## Section 3: Door Closing Devices

### 3.3.9 Rising Butt Hinges



*Rising butt hinge*

These hinges do not meet the requirements in Approved Document B 2006 edition for self-closing devices (see **3.1** for details). Rising butt hinges contain a ramped profile between the two hinge blades which causes the door leaf to rise as it is being opened. The mass of the door leaf will then tend to close the door when it is released. To enable the door to function properly, it is necessary to ease the top edge of the door sufficiently to allow for the rise of the butt. When the door is returned to its closed position, this means that a gap will exist at the vulnerable head of the door, which could compromise the fire integrity of the door assembly.

In order to achieve any form of self-closing, the butt hinges must be accurately aligned. Additionally, to meet the requirements of BS 4787, there is a requirement for 3 hinges per leaf whereas rising butt hinges are traditionally fitted as 2 hinges per leaf, while fire tests are also carried out with 3 hinges per leaf. Correct alignment is extremely difficult to achieve with 3 hinges.

The closing force exerted by such a device is extremely low and will not overcome air pressure differences or resistance from latches, seals or carpets that might be fitted, and therefore they cannot be considered as reliable door closing devices. Whilst such devices are still permitted in dwellings and flats covered by the previous Approved Document B for certain domestic applications only, they are NOT recommended for any fire door application by this Code of Practice. (See also **2.3.6**).



### 3.3.10 Floor Spring Accessories



*Double action floor spring with accessories*

As the floor spring and its associated pivots are responsible for holding the door in position, high melting point metals for the structural components will usually be required. Although the box containing the closer mechanism is one of the largest items of hardware, it is set into the threshold of the doorset and so, with the exception of the cover plate, is protected by the floor screed. The performance of the closer is aided during fire attack by the slight negative pressure at floor level, which is drawing cold air from the unexposed side of the construction, across the cover plate, so helping to keep this cool.

#### 3.3.10.1 Double Action Strap

A steel lever incorporating a socket of tapered form which fits onto the projecting drive spindle of the floor spring. The tapered form is designed to control the clearance between the threshold and underside of the door leaf and forms a firm drive link between door and closing control.

This fitting is installed centrally within the thickness of the bottom rail and is concealed. This fitting has shown itself to be most successful as an item of fire door hardware for, like the closing control, its position within the doorset is the least onerous in terms of exposure. Some designs require the addition of intumescent protection against the effects of heat reflection from the cover plate and this should be stated in the fire test evidence.

## Section 3: Door Closing Devices

### 3.3.10.2 Double Action Shoe

Whilst this performs the same function as the strap, it is constructed with side and heel walls which wrap around the heel profile of the door and is commonly made in brass. One sidewall is, therefore, exposed to flame, and conduction of heat via the walls to the unexposed face is likely to cause failure of integrity in timber doors under fire conditions. Some manufacturers are able to solve these problems by careful design and/or the addition of intumescent protection, and thus achieve satisfactory fire test evidence.

### 3.3.10.3 Double Action Top Centre

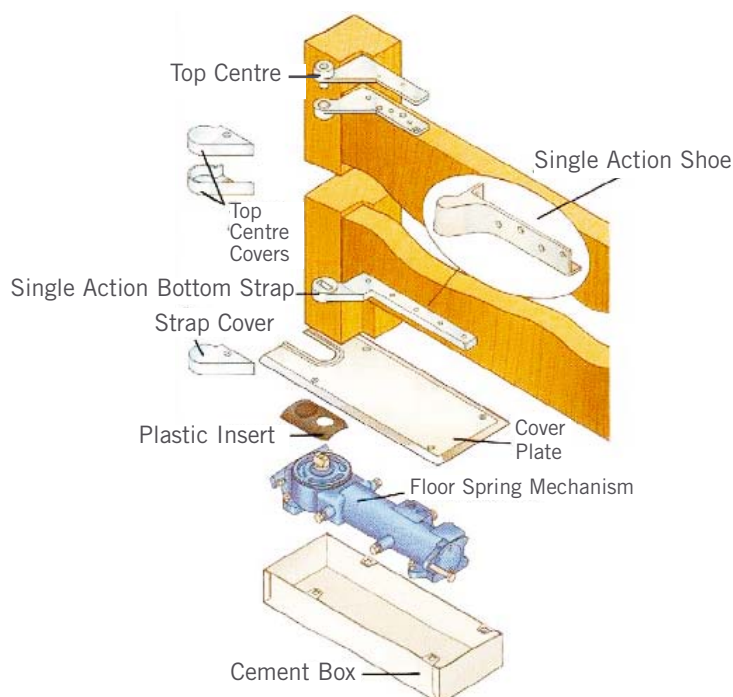
This fitting is complementary to both strap and shoe, forming the upper pivotal member of the doorset. It comprises two assemblies:

- the upper part housing the pivot pin, which is retractable to assist installation, mortised into the underside of the head frame,
- the lower part containing a bearing or bush for the pivot pin, morticed centrally into the thickness of the door top rail.

In view of the extreme conditions to which these fittings are subjected during fire, it is essential that they are manufactured from materials with a melting point in excess of 1000°C unless otherwise proven by test. They should be fitted carefully and accurately. The fire test evidence should record the details of the additional intumescent protection which was used.

### 3.3.10.4 Single Action Offset Strap

Of the same principle as for double action but the housing incorporating the tapered drive socket is offset and therefore projects from the face of the door, thus dictating opening in one direction only.



This projecting mass, if exposed to fire, is more likely to absorb and conduct heat to the fixings, leading to integrity failure of a timber door, but not normally of steel doors. Where fire test evidence dictates protection, it is provided by incorporating intumescent gaskets.

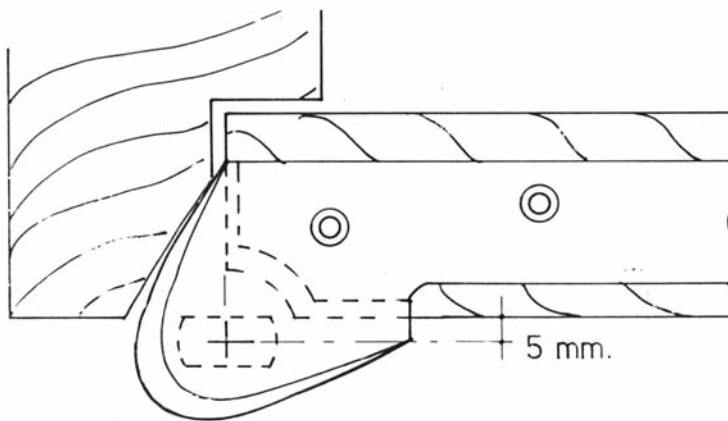
### 3.3.10.5 Single Action Offset Shoe

Of the same principle as the strap but with vertical side and heel walls let into the door face. The combination of walls and the projecting housing mass is an area of concern and the fitting might require insulation with intumescent gaskets. See test evidence for details.

### 3.3.10.6 Single Action Offset Top Centre

Complementary to single action strap and shoe, these fittings usually incorporate a removable pivot pin. As with the double action top centre, this component is sited in the most onerous position on the door and the projecting mass of metal housing the pivot pin and its bush accentuates the absorption of heat, requiring careful attention to insulation. The fire test evidence should record the details of the additional intumescent protection which was used.

Note: with these last three items, where they have a limited offset, it is necessary to notch away the door and frame locally, to provide clearance for the housing. This practice could lead to integrity failure in timber doors, and it is therefore important to check that the fire test evidence is relevant to the intended door application.



*5mm offset strap showing notch required in the frame and door heel*

## Section 3: Door Closing Devices

### 3.3.11 Automatic Swing Door Operators



*Automatic swing door operator*

#### 3.3.11.1

Automatic swing door operators generally look like a larger version of a manual door closing device and are fitted in a similar way. However, there are safety considerations that are detailed in BS 7036. (see also **3.2.2**)

#### 3.3.11.2

The automatic mechanism should be capable of being interfaced with the fire alarm system, thereby causing the doors to cease automatic opening in the event of an emergency triggering the alarm system.

#### 3.3.11.3

Automatic mechanisms normally power open, and close under spring pressure. Consideration should be given to external forces such as wind pressure in the same way as for manual devices.

#### 3.3.11.4

Any powered doorset is regarded as "machinery" as defined in the Supply of Machinery (Safety) Regulations 1992 and these regulations require that the complete assembly be covered by a declaration of conformity issued under this legislation; the assembled doorset must also bear the CE marking specified in the regulations. The person issuing the declaration is also required to keep a technical construction file for inspection by the authorities.

For further information see also the Best Practice Guides:

- **Controlled Door Closing Devices to BS EN 1154**
- **Electrically powered hold-open devices to BS EN 1155**

published by the DHF and included on the DHF website. A link is available from the GAI website:

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)

### 4.1 Introduction

Mechanically operated door closing devices fitted on fire-resisting doors can pose significant obstacles to the young, elderly, infirm or disabled. This self-closing function can also be an inconvenience in high traffic areas and cause difficulties where large numbers of users have to pass through the doors. (See **Section 11**).

To overcome these problems, electrically powered hold open devices can be used to hold a self-closing fire-resisting door in the open position. These devices are linked either into a building fire/smoke alarm system or controlled from locally positioned smoke detectors.

Depending upon the intended use of the door, there are two basic functions available:

- **Hold open:** This function holds the door leaf in an open position for as long as the device is energised, thus permitting free passage through the door. When triggered by the fire/smoke alarm system, local detector control, local pushbutton or by power failure, the device releases the door leaf and allows it to close under the control of a door closing device. With power subsequently restored, the leaf will again be held, once it has been returned to the hold open position. These devices are usually used on cross-corridor doors and circulation routes.
- **Free-swing:** After priming, by moving the door leaf to the fully open position, this function prevents the door closing mechanism from re-closing the leaf, but enables the leaf itself to be moved freely without the need for the user to overcome any force from the closer. In effect, the door leaf will then behave as though there were no closing mechanism fitted. When triggered by the fire/smoke alarm system, local detector control, local pushbutton or by power failure, the device releases the closer mechanism, allowing it to close the door leaf in a controlled manner from whatever position it was in at the time. With power subsequently restored, the leaf will again achieve this free-swing function once it has been returned to the fully open position. These devices are usually used on doors opening into individual rooms and are not recommended for cross-corridor doors or circulation routes.

## Section 4: Electrically Powered Hold Open Devices

It can be seen that the use of these devices will make access around a building much easier, particularly for the young, elderly, disabled or those manipulating trolleys etc, without compromising the fire compartmentation function of the fire-resisting doorset to which they are fitted.

For the purpose of this Code of Practice, electrically powered hold open devices are divided into the following three categories:

- Separate hold open devices,
- Hold open or Free-swing devices incorporated into an overhead closer (with or without an integral smoke detector),
- Hold open or Free-swing devices incorporated into a floor spring mechanism.

### 4.2 Critical Recommendations

#### 4.2.1

Manually operated mechanical hold open devices (i.e. mechanisms which must be released manually) **SHOULD NOT BE USED ON FIRE DOORS UNDER ANY CIRCUMSTANCES.**

#### 4.2.2

Electrically-powered hold open devices and their accessories should be:

- CE Marked to BS EN 1155 - Building Hardware - Electrically powered hold open devices for swing doors,
- preferably should be provided with additional product certification by an approved third party certification body.

(For further information on certification schemes see **1.5 Documentation**).

#### 4.2.3

The product and any accessories should have demonstrated their suitability for the intended purpose, by inclusion in satisfactory fire tests to BS EN 1634-1 or BS EN 1634-2, on a type of door assembly and configuration with which it is proposed to be used. This evidence should be provided by an approved third party certification or testing body. (See **1.5**).



### 4.2.4

When used on fire-resisting doors, electrically powered hold open devices must always be connected either to a building fire/smoke alarm system or a local smoke detector control. (See **4.3.1**).

### 4.2.5

For separate hold open devices, the holding power and manual release force must be correct for the size of door and power size to which they are to be fitted, bearing in mind:

- The power of the door closer that is fitted to the door,
- The position of the hold open device relative to the door width and its distance from hinges or pivots,
- Whether subject to other factors such as air pressure, draughts, heavy traffic use, abusive treatment, use by elderly, infirm or disabled.

(For further information see **4.3.1** and **4.3.2**).

### 4.2.6

Separate hold open devices should be installed such that they are in the same horizontal plane as the closing device to minimise any twisting or distortion of the door leaf. (See also **4.3.2**).



*Magnet with overhead closer*

### 4.2.7

Holes and apertures for the cables that provide electrical power to door- or frame-mounted devices must be protected to maintain the fire integrity of the doorset. This might require specially designed and proven intumescent protection (see **4.3.5**).

### 4.2.8

A regular programme of maintenance should be undertaken to ensure that the correct operational performance is maintained for the life of the building. (See **Section 13**).

## Section 4: Electrically Powered Hold Open Devices

### 4.3 Commentary

#### 4.3.1 General

The Building Regulations 1991 Approved Document B 2006 Edition allows self-closing fire-resisting doors to be held open by electrically powered hold open devices actuated by an automatic fire detection and alarm system, in those situations where a normal self-closing device would be considered a hindrance to the normal approved use of the building.

Within the framework of the Construction Products Directive (98/106/EEC), these devices have been identified as playing an essential role in the safety of buildings in the case of fire. Compliance with BS EN 1155 and fire test evidence to BS EN 1634-1 or BS EN 1634-2 will be deemed to satisfy the requirements of the Directive in this regard, and it is therefore strongly recommended that proof of compliance be obtained for any electrically powered hold open device before it is specified or used.

Electrically powered hold open devices are available in a range of strengths (commonly referred to as sizes) which relate to the available closing power of the door closer fitted, whether the closer is separately mounted or integral with the hold open device.

The minimum performance requirements are laid down in BS EN 1155 and include levels of electrical performance, holding power, suitable door width and mass.

The following extract from BS EN 1155 shows the range of hold open power sizes and related maximum recommended door leaf widths, together with some of the relevant test parameters:

Hold open power size	Max. door leaf width	Test door mass (kg)	Overload test drop weight	Max. test door friction (Nm)
3	950	60	15	0.3
4	1100	80	18	0.4
5	1250	100	21	0.5
6	1400	120	27	0.6
7	1600	160	36	0.8

Table 1 BS EN 1155

These devices are designed to release a door held open by them in the event of each or any one of the following:

- detection of smoke by either separate or integral smoke detectors,
- manual operation (pulling the door off hold open)
- operation of a manually operated switch fitted in a suitable position
- failure of the electrical supply to the device
- operation of the building fire alarm system, where installed.

It is important that the holding force of any separate hold open device is higher than the closing force exerted by the door closing mechanism. If the holding force is not strong enough, the closer will tend to pull the door leaf from the held position and hence close the door. Whilst this does not in itself compromise the fire performance of the doorset, it will be an annoyance to the building users, who might respond by wedging the door open to overcome this "nuisance closing".

If the holding force is too strong, the users might have difficulty in mechanically pulling the door leaf from the hold open position.

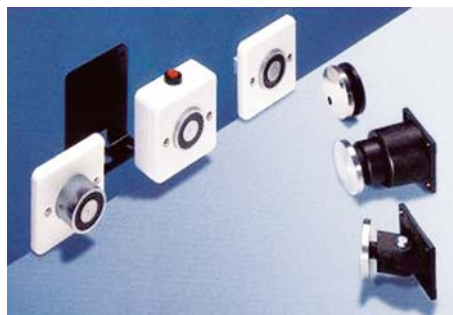
BS EN 1155 sets limits on the forces that are required to manually pull the door leaf from hold open, although it does also permit manual release by means of a local accessible pushbutton to disconnect the electrical power to the device.

It is vital that these hold open devices are able to release reliably in the case of fire. BS EN 1155 contains durability requirements and other performance tests to ensure that release will always occur, even when subject to variations of voltage supply.

### 4.3.2 Separate Hold Open Devices

These devices are mounted independently of the door-closing device and usually consist of an electro-magnet mounted on the floor or an adjacent wall, and an armature and mounting plate fixed in a corresponding position on the door leaf. The armature is generally quite small and is unlikely to adversely affect the fire integrity of the doorset. If the armature is fitted flush with the door face, or through-bolts are used to fix it, there is an increased chance of the fire integrity being affected in a timber door, so in these circumstances it is important to check the detail of the fire test evidence.

## Section 4: Electrically Powered Hold Open Devices



*Magnets and armatures*

The effective holding force available will depend upon the mounting position of the armature relative to its distance from the hinges and the power size of the door closer fitted. It is therefore important that the installation instructions are closely followed to avoid "nuisance closing".

Magnets used with timber fire-resisting doors should be mounted in the same horizontal plane as the door-closing device, i.e:

- level with the top of the door when used with an overhead door closer,
- at floor level when used with a floor spring.

This is to minimise the forces transmitted through the door caused by the opposing hold of the magnet and closing force of the door closer. These forces can cause twist in a timber door if the forces are applied at diagonally opposite corners, ultimately leading to permanent distortion of the door leaf.

### 4.3.3 Hold Open or Free-swing Devices Incorporated in an Overhead Closer Mechanism

For this type of device, BS EN 1155 requires that the overhead closer mechanism itself conforms fully with BS EN 1154. (See **Section 3** for further information on door closer requirements).

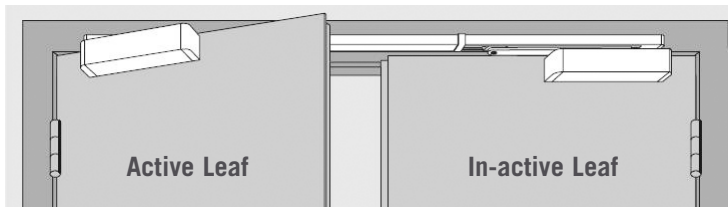


*Electro-hydraulic hold open door closer*

Some types of device use an electrically operated valve to control the oil flow in the closer mechanism, and these might, over a period of time, start to creep towards the closed position.

## Section 4: Electrically Powered Hold Open Devices

Other types operate directly on the closer arms and do not suffer from "creep". BS EN 1155 permits a maximum "creep" of only 2° over a period of 48 hours. Irrespective of the type of device used, it is important that the manufacturer's recommendations for routine checks and maintenance are followed, and it is often a requirement to ensure that all door holding devices are released at the end of each working day.



*Single track running full width of transom*

Some types are used for pairs of doors where the two door closing devices are linked by arms to a common track, which runs across the transom for the full width of both door leaves. In these circumstances this additional mass of metal can act as a heat sink and cause local charring of the frame or leaf in this vulnerable area, unless additional protection such as an intumescent gasket is fitted. It is important with all such devices to ensure that any protection recommended or supplied by the manufacturer is fitted during installation. The fire test evidence should be examined to make sure that it is relevant to the intended application.

### 4.3.4 Devices Incorporated into an Overhead Closing Mechanism with Integral Smoke Detector

Where devices incorporate their own smoke detection elements, it is particularly important to follow the installation instructions to ensure the operation of the detector is not impaired by incorrect mounting.



*Closer with integral smoke detector*

With these devices, smoke passing through the open doorway is sensed by the detector, which in turn sends a signal to release the hold open device and thus allow the closing mechanism to close the door. It is therefore essential to have a regular maintenance programme to ensure that the detectors are kept clean and all parts are in good operational order.

## Section 4: Electrically Powered Hold Open Devices

### 4.3.5 Power Transfer to the Door Leaf

Where the electrical parts of a hold open device are mounted on the door leaf, it is necessary to bring the electrical supply on to the door leaf. This can be done in several ways, each with its own implications for the fire integrity of the doorset-

#### 4.3.5.1 Exposed Flexible Cable

This type of connection is by far the most common, and has a negligible effect on the integrity of the doorset as the components are generally small and surface mounted. The flexible cable is fully exposed, and no evidence has been found that this type of connection ever caused a fire integrity failure.



*Exposed flexible cable*

#### 4.3.5.2 Concealed Conductor Hinge

This method requires a special hinge (sometimes non-load-bearing) containing small flexible conductors which can be connected at one end to the device on the door leaf, and at the other end to a connector block leading to the control unit or fire alarm system. It requires holes to be drilled in both the door leaf and frame, which might require the addition of intumescent protection to maintain fire integrity. It is important to check that the fire test evidence covers installation with conductor hinges.



*Conductor hinges*

#### 4.3.5.3 Concealed Flexible Cable

This method involves mortising steel housing containing an armoured flexible cable into the hanging stile of the doorset; the other end of the cable being fixed to the hanging edge of the door. Holes are drilled to carry wires to the hold open device and to connect to the fire alarm system.



These might need intumescent protection to maintain fire integrity



*Concealed cable loop*

Mortising the steel housing removes a significant amount of timber from the door frame. It is essential to check that the fire test evidence covers this type of installation, and that any recommended intumescent protection is fitted.

### 4.3.4 Devices Incorporated into a Floor Spring Mechanism

Electrical hold open and release devices incorporated in a floor spring are contained within the floor spring cement box and generally will have no effect on the fire integrity of the doorset. The power supply is under the floor. (See 3.3.9 for further information on floor springs).

### 4.3.5

For further information see also the Best Practice Guides:

- **Controlled Door Closing Devices to BS EN 1154**
- **Electrically powered hold open devices to BS EN 1155**

published by the DHF and included on the DHF website. A link is available from the GAI website:

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[www.gai.org.uk](http://www.gai.org.uk)

## Section 5: Door Co-ordinator Devices

### 5.1 Introduction

When pairs of doors are used for fire-resisting purposes, the door closing device fitted on each individual leaf should be able to:

- close the door leaf reliably from any angle to which it has been opened
- overcome the resistance of a latch or any seals when fitted.

When these pairs of doors have rebated meeting edges it is essential that the individual leaves close in the correct sequence, to maintain the fire integrity of the complete doorset assembly.

In these circumstances there is a need for a door co-ordinator device (also known as a door selector) to ensure that after opening, the first opening leaf of a pair of doors is held back from closing fully, until the second opening leaf has closed back fully into the frame.

For the purpose of this Code of Practice door co-ordinator devices are divided into the following categories:

- Gravity arm co-ordinators
- Swing arm co-ordinators
- Double arm swing co-ordinators
- Co-ordinators incorporated into door closing devices

**Note:** This list does not imply suitability of any particular device for fire door use - see **5.2** and **5.3** for further information.

### 5.2 Critical Recommendations

#### 5.2.1

The door co-ordinator device and its accessories should be:

- CE Marked to BS EN 1158 - Building hardware - Door co-ordinator devices, including its Annex A,
- preferably, provided with additional product certification by an approved third party certification body.

(For further information on certification schemes see **1.5 Documentation**).

### 5.2.2

The product and any accessories should have demonstrated their ability to be suitable for the intended purpose, by inclusion in satisfactory fire tests to BS EN 1634-1 or BS EN 1634-2, on a type of doorset and configuration in which it is proposed to be used. This evidence should be provided by an approved third party certification or testing body. (See **1.5 Documentation**).

### 5.2.3

The strength and features of the co-ordinator must be correct for the size of door to which it is to be fitted, bearing in mind:

- the application to the door,
- whether subject to other factors such as air pressure, draughts, heavy traffic use,
- abusive treatment, use by elderly, infirm or disabled,
- whether smoke or other seals are fitted to the doorset.

(For further information see **5.3.1**).

### 5.2.4

Concealed overhead co-ordinators should NOT be used on timber doorsets unless they are provided with specially designed and proven intumescent protection (see **5.3.1**).

### 5.2.5

Door or frame preparation in timber doorsets for mortised components must be protected to maintain the fire integrity of the doorset. This might require specially designed and proven intumescent protection. (see **5.3.5**).

### 5.2.6

Co-ordinators incorporated with electrical hold-open devices should comply additionally with the recommendations of **4.2** of this Code of Practice.

### 5.2.7

A regular programme of maintenance should be undertaken to ensure that correct operational performance is maintained for the life of the building. (See **Section 13**).

## Section 5: Door Co-ordinator Devices

### 5.3 Commentary

#### 5.3.1 General

The Building Regulations 1991 Approved Document B 2006 Edition require that all fire doors (with the exception of locked cupboard/duct doors and internal domestic doors) be fitted with an appropriate self-closing device. This applies equally to pairs of doors (double doorsets) with rebated meeting edges and therefore requires the use of a door co-ordinating device for these doorsets.

Within the framework of the Construction Products Directive (98/106/EEC), door co-ordinator devices have been identified as playing an essential role in the safety of buildings in the case of fire. Compliance with BS EN 1158 is deemed to satisfy the requirements of the Directive in this regard, and it is therefore strongly recommended that proof of compliance be obtained for any door co-ordinator device before it is specified or used.

Door co-ordinator devices are available in a range of sizes which relate to the available closing power of the door closers fitted and/or the rebate depth, whether the co-ordinator is separately mounted or integral with the closing device. The minimum performance requirements are laid down in BS EN 1158, and include manipulation, durability and abuse resistance tests.

The following extract from BS EN 1158 shows the range of co-ordinator sizes and related maximum recommended door leaf widths, together with some of the relevant test parameters:

**Table 1.**

Door coordinator size	Maximum recommended door leaf width	Test door leaf mass	Maximum distance between hinge centrelines	Maximum test door friction
	mm	kg	mm	Nm
3	950	60	1900	0.3
4	1100	80	2200	0.4
5	1250	100	2500	0.5
6	1400	120	2800	0.6
7	1600	160	3200	0.8

NOTE: This table relates to doors with equal leaves only.

*Table 1 BS EN 1158*

From the above table it can be seen that co-ordinator sizes are related to the door leaf width and the mass of the door to be controlled, in exactly the same manner as door closing devices (see Section **3.3.1, Table from BS EN 1154**). This is important not only to ensure that the co-ordinator size is matched with the power size of the door closers that are to be fitted, but also to make sure that the co-ordinator is able to withstand the normal forces and mechanical stresses experienced in daily use.

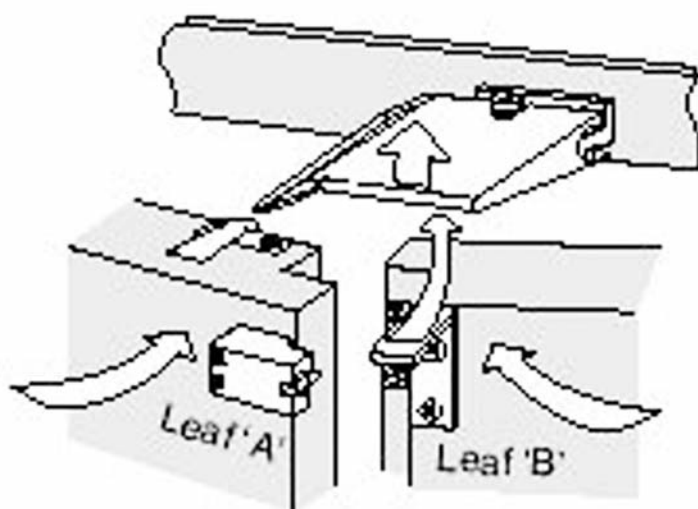
## Section 5: Door Co-ordinator Devices

Smoke seals can sometimes prevent the door closer from fully closing the door, considerable force being required to deflect or compress the seal, particularly if they are not correctly installed and maintained. Very careful consideration should be given to these issues when specifying door co-ordinators that incorporate closing controls to ensure that extra spring strength is not applied just to overcome poor seal installation or performance.

As a general rule, wherever components have to be mortised into the door leaves or frame of a timber doorset, there is an increased chance of an adverse affect on the fire resistance of the doorset, and there might be a need for additional intumescent protection. The fire test evidence should always be examined.

### 5.3.2 Gravity Arm Co-ordinators

These devices consist of simple gravity components such as flaps or roller arms, which are attached to the transom on the opening side of the doorset. They control the door leaves by blocking the last few degrees of return of the active leaf (the first opening and last closing leaf) until the inactive leaf (the last opening and first closing leaf) has closed into the frame. Generally they are surface mounted and, being of small mass in themselves, are unlikely to reduce the fire-resisting properties of the doorset. However, for correct operation they also require a "carry bar" device to enable the active leaf to be opened to its holding position, in instances when the inactive leaf is opened first. The carry bar and associated striking plate are generally mortised into the rebate of the door leaves and could be a source of failure in a fire situation.



*Gravity arm co-ordinator*

It is therefore essential to check that appropriate fire test evidence exists for these components and that it is suitable for the rebate dimensions of the doors for which it is intended.

## Section 5: Door Co-ordinator Devices

### 5.3.3 Swing Arm Co-ordinators

These devices consist of a simple spring-controlled arm which is attached to the transom on the opening side of the doorset, and controls the door leaves in a similar manner to the gravity type of co-ordinator. They require some form of plate/carry bar fixed to each door leaf, but generally all components are surface mounted and relatively small, and therefore unlikely to adversely affect the fire-resisting properties of the doorset assembly. In operation the spring loaded arm swings out to hold the active leaf open until the inactive leaf has closed, and as a result this type of design can be vulnerable to misuse or vandalism. It is especially important that such devices are subjected to regular checks to ensure they continue to work correctly.



*Swing arm co-ordinators*

### 5.3.4 Double Arm Swing Co-ordinators

To minimise the vulnerability to abuse of single swing arm co-ordinators, versions are available which contain very short operating arms and which hold the active leaf from a position nearer to the hanging edge of the door leaf. The co-ordinating mechanism is contained in a long tube which is mounted under the transom.

In this position the mass of metal could be a source of integrity failure in a timber doorset under fire conditions and it will almost certainly require the use of intumescent material to protect the transom and adjacent door leaves in this area.

The test report should be checked to determine what additional protection is required.

### 5.3.5 Co-ordinators Incorporated into Door Closing Devices

These devices offer the most effective way of providing both the closing function and the co-ordinating function in one device.

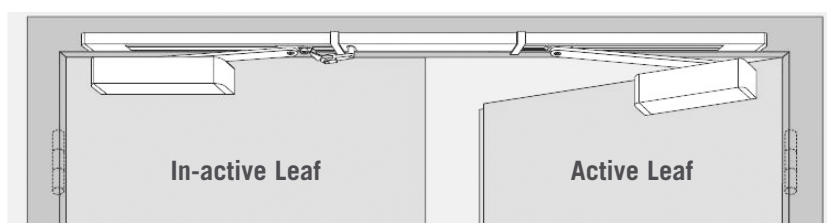
They consist of two door closing devices (one for each door leaf) and a common track assembly or concealed cable which connects the two closers and provides the co-ordinating action.



## Section 5: Door Co-ordinator Devices

For overhead, surface fixed co-ordinators, the track assembly is usually fixed to the underside of the transom, so the mass of metal could be a source of integrity failure in a timber doorset under fire conditions and it will almost certainly require the use of intumescent material to protect the transom and adjacent door leaves in this area. Some versions also provide smoke detectors built into the co-ordinator assembly and with these devices it is essential to have a regular maintenance programme to ensure that the detectors are kept clean and all parts remain in good operational order.

Other versions use closers concealed in the door leaves, with the track assembly concealed in the transom. As so much timber is removed when installing these devices, it is absolutely imperative to ensure that all intumescent protection recommended or supplied by the manufacturer is fitted during installation. The fire test report should be examined closely to ensure that it covers the particular application envisaged.



*Overhead closer with integral co-ordinator*

Several manufacturers provide floor springs with a co-ordinator function, achieved by means of a cable running under the finished floor level that connects the two floor spring mechanisms together. From a fire door control point of view, these are very satisfactory devices as all elements are concealed and away from the worst effects of a fire or misuse. Such an arrangement is most unlikely to have any adverse effect on the fire integrity of the doorset.

With all of these devices it is most important to check that the fire test evidence is appropriate to the particular application for which it is intended to be used, and that any intumescent protection recommended is actually fitted during installation. A thorough inspection of the installation is also recommended.



*Floor springs with integral co-ordinator*

## Section 5: Door Co-ordinator Devices

Further relevant information on door closers and electrically powered hold-open devices can be found in **Sections 3** and **4** of this guide.

For further information see also the Best Practice Guides:

- **Controlled door closing devices to BS EN 1154**
- **Electrically powered hold open devices to BS EN 1155**
- **Door coordinator devices to BS EN 1158**

published by the DHF and included on the DHF website. A link is available from the GAI website:

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)



### 6.1 Introduction

In order to provide an effective barrier to a fully developed fire, a door has to remain closed within the frame.

In the case of single action doorsets, this role might be undertaken by a latch. (Where the latch does not perform this role see **3.1**).

In certain cases there is a need for a lock to be fitted to a fire-resisting door. This might be on a duct door which is normally kept locked with only occasional access to service equipment, or other fire-resisting doors which for security reasons are locked for periods of time.

Where security is in conflict with easy egress, consultation with the regulatory authority or fire officer should be made in order to reach a satisfactory solution. Sometimes a turn operated lock might suffice whilst in other cases specialist devices are available that can reduce this conflict to a minimum, such as panic escape devices to BS EN 1125 or emergency exit devices to BS EN 179 (see **Section 12**).

In fitting locks or latches to fire-resisting doorsets, the potential fire performance of a doorset can be reduced due to:

- removal of a section of the door leaf, door frame or seal,
- leaving voids within the structure of a timber door,
- adding materials which could cause heat transfer problems in a timber door,
- through fixings creating thermal bridges in a timber door,
- using materials of low melting point (less than 800°C, or 900°C for steel doors over 90 minutes resistance) in components which, if they should melt, could cause a failure of functionality of the device,
- locks containing materials which might flame.

(Further information on the potential fire performance of a doorset see **6.3.1**).

For the purpose of this Code of Practice locks and latches are divided into the following categories:

- Roller catches
- Rim latches
- Mortice latches
- Mortice locks, rim locks and deadlocks
- Bored-in knobsets



## Section 6: Lock & Latches

**Note:** This list does not imply suitability of any device for fire door use - see **6.3.2** to **6.3.6** for further information.

### 6.2 Critical Recommendations

#### 6.2.1

The lock or latch should be:

- CE marked to BS EN 12209,
- preferably should be provided with additional product certification by an approved third party certification body.

(For further information on certification schemes see **1.5 Documentation**).

#### 6.2.2

The lock or latch should have demonstrated its suitability for the intended purpose by inclusion in satisfactory fire tests to BS EN 1634-1 or BS EN 1634-2, on a type of doorset and configuration in which it is proposed to be used. This evidence should be provided by an approved third party certification or testing body (see **1.5 Documentation**).

#### 6.2.3

Locks and latches with low melting point (less than 800°C, or 900°C for steel doors over 90 minutes resistance) components, which are critical to the retention of the door in the closed position, should NOT be used unless proven by specific tests.

#### 6.2.4

Where the fitting of a lock to a fire-resisting door is in conflict with easy egress, a risk assessment and/or consultation with the local fire prevention officer should be undertaken.

#### 6.2.5

A regular programme of maintenance should be undertaken to ensure that the correct operational performance is maintained for the life of the building (see **Section 13**).

#### 6.2.6

To reduce the removal of timber from doorsets, the locks and latches should be as small as is practicable.

### 6.3 Commentary

#### 6.3.1 General

The addition of a lock or latch to a fire-resisting doorset can reduce the fire performance of the doorset.

Locks and latches come in a range of sizes, methods of fixing (rim/mortise) and are manufactured using a range of materials, all of which can affect the fire performance of the door set.

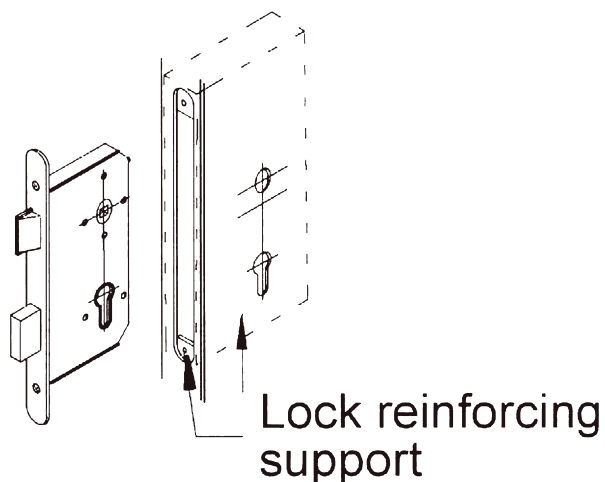
##### 6.3.1.1

Removal of significant sections of the door. The fitting of a lock or a latch (particularly a mortice device) entails removing wood from the fire-resisting timber door so reducing the material which provides fire protection and insulation.

The reduction in the amount of wood in the stile or rail can also impair the stability of the door, leaving it less able to resist distortion caused by the heat of a fully developed fire.

##### 6.3.1.2 Voids in the Structure of the Door

All mortising in fire-resisting timber doors should be performed as accurately as possible to avoid creating unnecessary voids. Clearance holes for keys, cylinders and spindles should be no larger than the sizes specified on the manufacturer's fitting instructions. If the latch or lock calls for the fitting of some form of intumescent protection and/or use of covered escutcheons, these must be used to ensure that the fire resistance of the door is no less than when tested. (BS 8214:2008 Section 11 Building hardware, confirms these requirements.)



Steel doors are normally of hollow construction and voids for mortice locks do not generally create a risk of integrity failure. However hollow steel doors should be constructed with a lock reinforcing support to ensure that the lock case:

## Section 6: Lock & Latches

- is rigidly and securely fixed,
- cannot move laterally,
- is provided with an adequate thickness of metal for hardware fixing screws.

### 6.3.1.3 The Size of the Lock or Latch

Timber is a naturally insulating material. In the presence of high temperatures and flaming it will burn, but at a predictable rate.

Wherever timber is removed and replaced by a metal, the charring characteristics of the doorset will be affected at this point. If the majority of the timber is removed, leaving only very small sections, integrity failure is likely to be accelerated. The degree to which this happens is proportional to the amount of metal introduced into the door.

Therefore, in timber fire-resisting doors it is desirable to incorporate the smallest lock or latch as practicable.

Where a larger lock or latch has to be used, intumescent protection of some kind will usually be required to protect the door from early integrity failure. This intumescent protection should be supplied by the manufacturer of the lock or latch, when the device is intended for use on a fire-resisting doorset.

On larger locks or latches where intumescent or smoke seals have to be removed in the locality of the device, a joggle in the striker will allow further seals to be fitted.

On steel fire-resisting doors, the door preparation method should not be changed from that tested. Where the scope of performance of a doorset is dependent on the engagement of a latch bolt or a dead bolt, the throw of the bolt should not be less than that covered by the evidence of performance.

### 6.3.1.4 Through fixings

Any fixing which passes through a fire-resisting timber door construction is a potential heat transfer hazard. The larger the fixing, the greater the hazard.

Where high melting point metals are used, and where these remain in position for the duration of the fire exposure, it is particularly important to keep through fixings as small as possible. By the use of clearance holes, items such as spindles and cylinders should not come directly into contact with the door's combustible facings. As stated earlier, these clearances must not be so large as to become an integrity risk in themselves.



Fixings and clearance holes must be as per the manufacturer's fitting instructions, to ensure that the fire resistance of the door is no less than when tested.

### 6.3.1.5 Incorporation of Low Melting Point (less than 800°C, or 900°C for steel doors over 90 minutes resistance) Components

Any door-retaining device incorporates components critical to the retention of the door in its closed position, such as the bolt of a latch. Should these components melt during a fire, there is a danger of the door becoming free and unable to withstand the pressure in the fire room or to resist any tendency to distort at high temperatures. Similarly, where the body of the component is face fixed, as in the case of rim locks or face mounted bolts, certain restrictions might be necessary on the choice of material used in the construction to ensure that no part of the component or its fixings melt and lose their retaining function.

### 6.3.2 Roller Bolt Catches

This form of latch cannot be relied upon to provide a retaining action and indeed can actually prevent a door from fully closing into the frame. Their use on fire-resisting doors is therefore NOT recommended.



*Roller bolt catch*

It should be noted that some latches, where withdrawal of the latch is via a handle/turn, use a roller rather than a bevelled bolt. Such devices can provide a positive retention of the door leaf but it is important to ensure that the rollers of such devices are made of a material of high enough melting point (greater than 800°C, or 900°C for steel doors over 90 minutes resistance) to meet the fire test requirements.

### 6.3.3 Rim Latches

A rim latch on a fire door assembly is vulnerable when exposed to the full effect of fire. This is in contrast to mortised products, which, in a timber door, gain protection from the component parts of the door into which they are fitted.

Where the latch case and keeps are fixed to the protected side of a timber door, zinc cases and keeps fitted with brass or steel bolts have been shown to perform satisfactorily. Cast iron lock cases and keeps fitted with a steel bolt have also been shown to maintain their retaining action when fitted on either side of a fire-resisting door.

## Section 6: Lock & Latches

The cylinder type latch poses an additional problem in timber doors as the mass of metal forms a thermal bridge and some form of intumescent protection might be required.

In all cases documented evidence of satisfactory testing for the specific doorset intended should be obtained before being considered for use on fire-resisting doors.



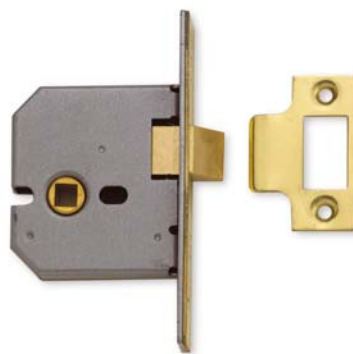
*Cylinder rim nightlatch*

### 6.3.4 Mortise Latches

Mortise latches are normally mortised into the door edge and depending upon the backset, are in either a vertical or horizontal latch case. A variant of these is the tubular type designed to be installed into a hole drilled in the edge of the door leaf.

The other major considerations with reference to the choice of mortise latches are:

- the thickness of the latch case in timber doors
- the material from which the latch bolt is constructed
- the length of the forend in timber doors
- the projection of the latch bolt.



*Mortise latch*

All of these factors could affect the fire integrity of the door and in some cases might require the use of intumescent protection supplied by the lock manufacturer.

To ensure the fire performance is maintained, it is recommended that documentary evidence of satisfactory testing for the specific doorset intended be checked before specifying the building hardware.

Where latches are incorporated in double leaf doorsets consisting of two leaves with rebated meeting stiles, the latch is often used in conjunction with a forend conversion unit. An analysis of typical conversion units shows that they are likely to create a thermal bridge in timber doors due to the mass of metal used as well as the amount of timber removed.

Doors with rebated meeting stiles and forend conversion units also require the use of a door co-ordinator (if a door closer is fitted) so that the leaves close in the correct order.

The door co-ordinator itself can affect the fire performance of the doorset (see **Section 5**).

In doorsets incorporating intumescent seals, doors with plain edge meeting stiles are likely to provide a better level of fire resistance than doors with rebated stiles. Plain edge meeting stiles are more tolerant of differential door distortions in timber doors and more likely to be able to accommodate a purpose-made smoke seal than the rebated edge.

For these reasons it is recommended that pairs of timber fire doors have plain edge stiles with a conventional latch and striking plate rather than rebated meeting stiles with forend conversion units.

However providing there is satisfactory fire test evidence, timber rebated doors with their appropriate fittings can be used for pairs of fire-resisting doors.

For steel doorsets, test evidence of performance for a pair of doors with plain edges can be used to support a rebated pair of doors with a rebate up to 4 mm. This is not true in reverse.

### 6.3.5 Mortise Locks and Deadlocks

The fitting of a lock to a fire-resisting door will create the same problems of reducing the fire integrity of a timber door as has been mentioned for latches both rim (**6.3.3**) and mortice (**6.3.4**).

As locks are generally larger than latches, the amount of wood removed in fixing and the extra amount of metal introduced can make the reduction in fire integrity that much greater. In all cases documentary evidence of the suitability of the fittings for the specific doorset intended should be checked to ensure that the fire integrity of the doorset is maintained.

## Section 6: Lock & Latches

Where fire-resisting doors are normally kept locked (for example duct doors) and rely on the lock bolt to hold the door leaf in the closed position, it should be noted there is the human element of uncertainty of the door always being correctly locked. Appropriate signage/management instructions will need to be considered. (see **Sections 10 & 12**).

Some fire-resisting doors might serve as escape doors and the functionality of the locking device will need to be considered to ensure that there is no conflict with easy egress. This might entail some form of risk assessment and/or consultation with the local fire prevention officer. Further information on specialist panic/emergency exit devices is contained in **Section 12**.



*Mortise deadlock*

### 6.3.6 Bored-in Knobsets

Most knobsets require a large section of the door to be removed in order to accommodate the mechanism and through fixings. This is likely to reduce the fire resistance of the door. Certain designs of knobsets are more tolerant of fire exposure, whilst others can be installed in a way that will reduce the natural integrity risk. Where test evidence supports the ability of a knobset to satisfy these requirements, they can be used on doors of similar construction.



*Cylinder knobset*

### 6.3.7 Push button (digital) locks

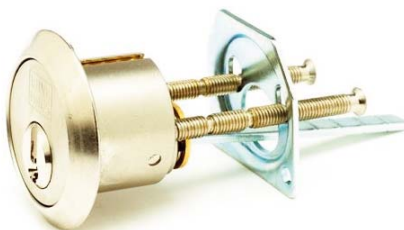
Many push button (digital) locks require a large hole to be made in the door in order to accommodate the mechanism and through fixings. This is likely to reduce the fire resistance of the door, especially if the lock incorporates electronic components and batteries. Where test evidence supports the ability of a push button lock to satisfy the integrity requirements of a fire door, they can be used on fire doors of similar construction. Any intumescent protection used during the test must be replicated on site.



*Push button lock*

### 6.3.8 Cylinders

In some of the devices referred to in **6.3.2 - 6.3.6**, the locking mechanism is operated by a cylinder which can be removed from the device.



*Round cylinder*



*Euro-profile cylinder*

In such cases the performance of the cylinder can be specified by reference to BS EN 1303 Building hardware - Cylinders for locks - Requirements and Test Methods.

For further information see also the Best Practice Guide:

- **Cylinders for Locks to BS EN 1303**

published by the DHF and included on the DHF website. A link is available from the GAI website:

## Section 7: Door Furniture

### 7.1 Introduction

Fire-resisting doorsets usually incorporate either:

- lever handles or knobs if the doors are latched, or
- pull handles/push plates if unlatched.

### 7.2 Critical Recommendations

#### 7.2.1

Lever handles and knobs should comply fully with:

- BS EN 1906 - Building hardware - Lever handles and knobs,
- preferably, this evidence should be provided by an approved third party certification or testing body.

Pull handles should comply fully with:

- BS 8424 Building hardware, Pull handles, Requirements and test methods,
- preferably, this evidence should be provided by an approved third party certification or testing body.

(For further information on certification schemes see **1.5 Documentation**).

#### 7.2.2

All door furniture should have demonstrated its suitability for the intended purpose, by inclusion in satisfactory fire tests to BS 476:22, BS EN 1634-1 or BS EN 1634-2, on a type of doorset and configuration on which it is proposed to be used. This evidence should be provided by an approved third party certification or testing body (see **1.5 Documentation**).



*Lever furniture with mortise sashlocks*



### 7.2.3

On timber doors the absolute minimum amount of wood should be removed in order to reduce the risk of fire or smoke penetration through the door.

### 7.2.4

The use of intumescent sleeves around the fixing holes is always recommended for timber doors and might be a requirement of the applicable fire performance assessment schedule in some cases.

## 7.3 Commentary

### 7.3.1

The material used in the construction of lever handles, knobs and pull handles/protection plates has not been found to greatly affect the fire performance of the timber doorsets to which they are fitted. Therefore it is not possible to state that any material is better than another in this regard. For metal doors, steel-cored plastic handles should not be fitted to the unexposed face without supporting test evidence.

Experience has shown that such fittings are susceptible to melting and ignition of the plastic on the unexposed face of the door.

### 7.3.2



*Lever furniture with back-to-back bolts (plan view)*

The durability of the fixings for lever handles will have a considerable bearing on the effective life of the products and the eventual safety of the occupants. Therefore when considering the selection of these items, preference should be given to those that can demonstrate compliance with the higher durability levels contained in BS EN 1906. These will have:

- support roses or backplates fixed back-to-back through the lock case,
- a performance bearing between the lever and rose,
- the spindle securely fixed into the lever on both sides.

## Section 7: Door Furniture

### 7.3.3

Generally it is also true that the actual size of the lever handle or pull handle has no effect upon the fire performance of the doors to which it is fitted.



*Pull handles*

### 7.3.4

Pull handles should use bolt-through fixings, rather than face-fixed screws, as these will prove more durable. The heads of the fixing bolts should be protected by a push plate or rose.

### 7.3.5

Door protection (kick) plates fitted at the bottom of the door have not been shown to have any effect on the fire performance of timber doorsets.

### 7.3.6

Push plates of conventional sizes, which can be screwed or adhesive-fixed, can also be specified without problems.

### 7.3.7

Where entrance doors also fulfill fire and smoke protection functions, they should use items of building hardware which follow the guidance given above.

### 7.3.8

For ease of use it is preferable that lever handles are fitted rather than knobs. (See BS 8300).

### 7.3.9

Wherever possible the fixing of a letter plate to a fire-resisting door should be avoided. Prime consideration should be given to installing the letter plate elsewhere. Both free standing and wall mounted postal boxes are available as an alternative.

There are letter plates on the market which have performed satisfactorily in fire tests in timber and steel doors. It is recommended that a product of proven performance and durability be selected, which has been included in satisfactory fire tests to BS 476:22, BS EN 1634-1 or BS EN 1634-2, in a door of a similar or weaker type of construction to that in which it will be fitted.

### 7.3.10

The materials from which door viewers are made will affect the performance of the door. Plastic lenses might melt very quickly leaving a hole large enough to cause early integrity failure. The same situation might arise with plastic or low melting point alloy casings. On the other hand, substantial steel or brass casings might also increase the risk of early integrity failure by rapid heat transfer through the thickness of the leaf of a timber door. As with all items of fire-resisting door hardware, on timber doors it is essential that the hole cut in the door to fit the device should be as small as is practically possible. It follows that door viewers should not be fitted to timber or steel fire doors unless the door viewer model is supported by evidence of fire performance in a door of the relevant material.

For further information see also the Best Practice Guide:

- **Lever handles and knob furniture to BS EN 1906**

published by the DHF and included on the DHF website. A link is available from the GAI website:

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)



## Section 8: Door Bolts

### 8.1 Introduction

Fire-resisting door sets might be required to be held in the closed position using bolts. The most common application is on double doors, but bolts may also be used on restricted access openings which need to be fire resisting.

For the purpose of this Code of Practice door bolts are divided into two categories:

- Surface mounted bolts
- Recessed (flush) bolts and mortise bolts

**Note:** This does not imply suitability of any device for fire door use.

(See **8.2** and **8.3** for further information).

### 8.2 Critical Recommendations

#### 8.2.1

The door bolt, keep and fixings should comply fully with:

- BS EN 12051 Building Hardware Door and Window Bolts, including Annex B,
- preferably this evidence should be provided by an approved third party certification or testing body.

(For further information, see **1.5 Documentation**).

#### 8.2.2

The door bolt, keep and fixings should have demonstrated their suitability for the intended purpose, by inclusion in satisfactory fire tests to BS 476:22, BS EN 1634-1 or BS EN 1634-2, on a type of doorset and configuration in which it is proposed to use them. This evidence should be provided by an approved third party certification or testing body. (See **1.5 Documentation**).

#### 8.2.3

Bolts should NOT be fitted to single leaf door assemblies on escape routes without prior consultation with appropriate fire authorities, and a full risk assessment by the Responsible Person under the RRO.

### 8.2.4

The size, strength and type of door bolt must be correct for the door to which it is fitted, bearing in mind:

- the type of door,
- the way it is likely to be used,
- whether subject to other factors such as:
  - air pressure, heavy traffic use,
  - abusive treatment,
  - use by elderly, infirm or disabled.

Where pairs of timber or steel doors are limited to latched and bolted test evidence, the engagement of the bolt in the frame and at the floor should not be less than that supported by the evidence.

### 8.2.5

A regular programme of maintenance should be undertaken, to ensure that the correct function is maintained for the life of the building. (See **Section 13**)

## 8.3 Commentary

### 8.3.1 General

Door bolts are available in a range of sizes and types, all of which are potentially suitable for use on fire-resisting doorsets. In addition to fire-resisting requirements, BS EN 12051 also details graded requirements and tests for:

- durability,
- safety in use,
- corrosion resistance,
- security,
- ability to resist abuse forces

which can be used to provide the basis for selection in **8.2.4**. Wherever possible, surface mounted bolts should be used in preference to recessed or mortise bolts.

## Section 8: Door Bolts

### 8.3.2 Installation

On timber doors, the mounting position on the door and the relationship to intumescent and/or smoke seals should be chosen carefully to minimise the risk of "burn-through" in the event of a fire. Bolts should NOT be fitted to door edges unless sufficiently wide strips of intumescent material can be fitted down each side of the bolt - within the thickness of the door edge. As a general guide these strips should be at least 5 mm wide for FD30 fire door assemblies, and at least 10 mm wide for FD60 fire door assemblies. Always ensure that the intumescent protection used replicates the fire tested conditions.

### 8.3.3 Surface Mounted Bolts

Provided they are NOT let in or wrapped around the door edge and surface fixing screws are used (NOT bolt-through fixings) these types of bolt do not significantly affect a timber fire-resisting door's performance.

Any deviation from the above in a timber door will require test evidence or assessment to validate the application.



*Surface mounted bolt*

### 8.3.4 Recessed (flush) & Mortise Bolts

These types replace wood with metal when used on a timber door and, however fixed, conduct heat more effectively. In consequence they will almost certainly require additional intumescent protection, and will always require test evidence or assessment to validate the application. Traditional flush bolts as used on timber doors are difficult to fit neatly to steel doors and it is recommended that flush bolts are selected which can be located away from the top and bottom edges of doors and have a facility for adjustment to ensure correct engagement into the frame and floor/sill.



*Concealed flush bolt*



*Mortise rack bolt*



### 8.3.5 Use on Escape Routes

Whilst provision is made within BS EN 12051 to ensure that operating forces are kept within reasonable limits (even after periods of abuse) door bolts are NOT suitable for emergency exit situations, and should NOT, therefore, be used on escape routes, except on the second leaf of double door assemblies where the first leaf in use is wide enough to meet relevant escape requirements.

For further information see also the Best Practice Guide:

- **Door and Window Bolts to BS EN 12051,**

published by the DHF and included on the DHF website. A link is available from the GAI website:

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)

## Section 9: Fire & Smoke Seals

### 9.1 Introduction

Intumescent door seals and smoke door seals are a vital part of a timber fire-resisting doorset. They are rarely used on steel doorsets. Metal doorsets that require intumescent seals to achieve performance will have the type or brand of intumescent stipulated in their certificates or assessments.

Intumescent strip products have progressed substantially since the introduction of BS 476:8: 1972. In today's complex market, there is a range of materials all offering slightly different performance. Size is no longer the sole criterion on which to base selection. Fortunately, the latest testing for interchangeability allows more freedom of choice than before, but the criteria for selection must be fully understood. The assessment report of a tested product will give information on a range of door options. Product with no valid test evidence should not be considered.

### 9.2 Critical Recommendations

The testing of fire doors is described in **Section 1** of this document. Hardware manufacturers and suppliers, doorset manufacturers, specialist distributors and member companies of the Intumescent Fire Seals Association, have carried out tests to monitor the contribution of intumescent and are able to advise on the correct use of the material.

#### 9.2.1 The Fitting of Fire and Smoke Seals

The preferred positions are:

- fire protection only - fit into a groove in the frame reveal
- fire and smoke protection - fit into a groove in either the leaf edge or frame. The leaf edge is normally preferred due to the lower resistance the leaf encounters on closing, thus avoiding sticking door leaves on site. (The arc described by the leading edge of the lock stile of a closing door gets closer to the frame than the usual 3 mm clearance allowed in the fully closed position. This means that the leading edge will contact a frame-mounted seal near its base, thus requiring greater force to push over and beyond it. The arc described by a smoke seal fitted to the centre of a closing door's lock stile results in only the tip of the seal contacting the frame, and consequently less force is required to complete the closing cycle). Brush seals are generally less prone to mechanical damage than blade seals, making them an option for fire doors in areas where damage is likely to occur. Blade seals are an option in areas where low resistance to opening is important and where there are possible acoustic sealing requirements.

#### 9.2.2 Concealed Under Door Lipping

In some instances the seal is concealed beneath the door lipping during manufacture. These doors may be altered for fitting on site, but great care must be taken to ensure the intumescent seals are not altered or damaged in any way.

### 9.2.3 Factors for Choice

The choice of intumescent is critical. The factors for choosing a specific type or size of intumescent strip for a fire and smoke door depend on:

- the fire resistance required (e.g. half or one hour)
- the type of door (e.g. single or double-leaf)
- the meeting stile detail if pairs of doors are involved. Plain meeting stile seals are fitted differently from those for rebated meeting stiles.

### 9.2.4

Because intumescent materials vary in their characteristics, it is recommended that manufacturers or specialist intumescent distributors are consulted before final specification. Door leaves are manufactured from a variety of core materials which affects the choice of intumescents likely to be suitable. Specifiers should consult the details offered by the door core manufacturer and stay within that guidance.

## 9.3 Commentary

### 9.3.1

Intumescent materials other than edge strips are used on fire-resisting doorsets. For example, thin sheet material can provide insulation and protection:

- behind hinge blades
- around mortise lockcases
- around concealed door closers



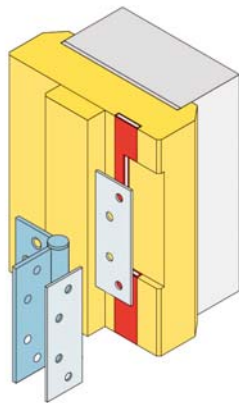
*Intumescent material in sheet form*

### 9.3.2

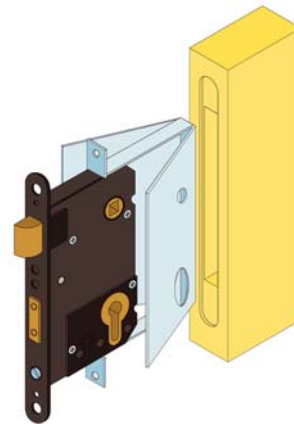
Intumescent pads can protect hinge positions. Various thicknesses are available e.g. 0.5 mm, 1 mm and 2 mm, all of which will offer protection to a greater or lesser degree. Check that practical requirements fall in line with test evidence.

## Section 9: Fire & Smoke Seals

Likewise, mortise lock/latch cases and strikes, and mortise-concealed closers usually need to be protected by intumescent gaskets. Seek advice as to the right product for the application.



*Pads behind hinge blades*



*Full gasket for mortise lock*

### 9.4 Intumescent Sizes / Options

Historically, 10 mm intumescent strip was known as a 30-minute strip, with 20 mm being the 60-minute version. This was wrong then and is still wrong today! Put simply, the 30-minute specification can be met on some doors with a 10 mm strip, but not on all. The bulk of today's testing is carried out with 15 mm x 4 mm for 30 minutes. The 60 minute ratings have also changed and are favouring two 15 mm x 4 mm sections running parallel, to give the required performance. The correct size of intumescent strip is specific to the door under consideration, and its size. Always consult the test evidence. There are no reliable "rules of thumb". The main sizes available are:

10 mm x 4 mm	15 mm x 4 mm
20 mm x 4 mm	25 mm x 4 mm

All of these are available as simply "fire only", or with an additional cold smoke seal option.



*Intumescent seal 10 x 4    with brush seal    20 x 4 with blade seal*

Cross-sections of intumescent door and smoke seals

Other sizes are as follows:

10 mm x 2 mm	10 mm x 3 mm	12 mm x 4 mm
30 mm x 4 mm	35 mm x 4 mm	38 mm x 4 mm

These latter sizes have their place in the industry, but they are less widely used. Trade literature and websites relating to intumescent material have a wealth of information for those wishing to increase their knowledge of the wide range of variants.

### 9.5 Types of Materials

#### 9.5.1

There are three recognised types of intumescent material used for door seals:

- Exfoliating Graphite
- Mono-ammonium Phosphate
- Hydrated Sodium Silicate

#### 9.5.2 Exfoliating Graphite

This is an extensively used intumescent material. The material has different forms and acts extremely well under a fully developed fire, giving the advantage of multi-directional expansion to fill the void between leaf and frame. It is a pressure-forming grey or black material, which is durable and highly resisting to aging. The range is comprehensive, covering most of the day-to-day lines as well as the less common sizes. They can be supplied with integral brush or bladed smoke seals in accordance with BS 476:31:1. Brush options are available with central plastic fins or pure bristle. The fins tend to make more noise. Pure bristle has the advantage of giving slightly lighter resistance to enable lower opening and closing forces. (See **Section 11**).

In general, exfoliating graphite has an advantage over other intumescent materials in as much as it is fully water/air-stable. This allows the materials to be cut on site without worry of ingress of moisture or atmospheric conditions. Some other intumescent materials are protected from the air by a coating over the edges of the cut profile, together with, in some cases, a glue-like plug inserted into the end of the strip. However, this addition will be negated when the items are cut to size on site in wet conditions. Seals based on exfoliating graphite can usually be over-painted without detracting from their fire performance. Care must be taken to prevent paint being applied to the smoke sealing element of a combined seal. Always check with a specialist before over-painting.

## Section 9: Fire & Smoke Seals

### 9.5.3 Mono-ammonium Phosphate

These are low pressure, high volume expansion intumescent, being a mixture of ingredients which for simplicity are often referred to as mono-ammonium phosphate types. By careful choice of mix it is possible to make a product which expands up to 40 times its original volume to form a soft, meringue like foam which fills voids without forcing off beads etc. The applications for these products include door seals, glazing and ironmongery protection. The foam produced by the mono-ammonium phosphate-based materials has good insulation properties.

This material is produced in strip form or within a carrier. Intumescent fire and smoke seals based on mono-ammonium phosphate can be designed to be completely resistant to atmospheric attack and moisture, giving excellent aging characteristics. Long-term tests have shown no deterioration in performance even after 15 years in high use areas. Mono-ammonium phosphate strips are available in a variety of shapes for differing door configurations. Many have integral smoke seals which have been tested, in accordance with the method described in BS 476:31:1, and shown to satisfy the leakage limits required in BS 9999.

Recent evidence shows that mono-ammonium phosphates are tolerant to over-painting with most paints, but always check with a specialist before over-painting. Care must be taken to prevent paint being applied to the smoke sealing element of a combined seal.

### 9.5.4 Hydrated Sodium Silicate

Hydrated sodium silicate seals have been supplied for many years by BASF under the branding Palusol. The major advantage of hydrated sodium silicate is that it activates at temperatures between 100°C - 120°C, which is significantly lower than other intumescent materials. This means that there is a greater overlap between the temperature at which plastic-based smoke seals deteriorate and the intumescent fire seal expands. In practice it is less likely that unacceptable leakage will occur in a real fire situation, where the increase in temperature is more gradual than in the BS EN 1634-1 fire test. Over recent years, new versions have been launched and care must be taken to establish the exact material. It is recommended that the base grade of material be clearly defined within the specification, to show which type of hydrated sodium silicate the manufacturer intends to use.

Intumescent seals based on hydrated sodium silicate produce a hard, crack-free, rigid foam. The material displays thermoplastic properties at temperatures in excess of 120°C. The water of hydration is converted into steam, causing the material to expand.



Seals based on hydrated sodium silicate for use in exposed situations are protected from atmospheric carbon monoxide attack with epoxy resin and a PVC sleeve. Aging tests have shown that these seals have a life expectancy of approximately 50 years, if supplied without altering the unit, or if brought back up to manufacturers' sealed specification on site.

Seals based on hydrated sodium silicate are available in a wide range of sizes to suit various door configurations and door cores. They can be supplied combined with a variety of smoke seals.

Wide strips of this intumescent seal protected by the epoxy resin coating are occasionally used in concealed situations under door lipping. The timber lipping provides the protection against both mechanical and chemical damage. The seal is fitted into a groove in the reverse side of the lipping. In a fire, the adhesive softens and the intumescent seals expand, and because of the positive pressure developed, the lipping is pushed off and the intumesced material forms an effective fire seal between the leaf and frame.

Seals based on hydrated sodium silicate can usually be over-painted without detracting from their fire performance but care must be taken to prevent paint being applied to the smoke sealing element of a composite fire and smoke seal.

### 9.6 What To Look Out For

Performance claims for intumescent material should be carefully checked:

- Valid documentary evidence must underpin any recommendation
- Is the material offered as described on the test document - it might look similar but is it the same?
- Are the tests/assessments in date? (Test and assessments have time limits on their validity. These are recorded on the documents).

### 9.7 Threshold seals

Recent tests of smoke logging carried out by various sections of the industry make it clear that smoke can and does issue in considerable volume under the threshold (BS 9999 indicates a maximum unsealed gap of 3mm). The problems of such a small threshold gap can be avoided by the use of minimal resistance drop seals that provide a seal only when the fire door is in the closed position, lifting clear of the floor as soon as the door moves away from the stop. Such products should only be considered if fire test evidence supports the performance claims made by the manufacturer and the product does not have a derogatory effect on the fire performance of the doorset.

## Section 9: Fire & Smoke Seals

### 9.8 Reference Points

The passive fire protection industry has various trade associations and third party approval schemes in place. Useful associations are as follows:

- **IFSA** (Intumescent Fire Seal Association) - **[www.ifsa.co.uk](http://www.ifsa.co.uk)**  
IFSA can offer excellent advice on its members' activities, giving unbiased information as to the best-positioned manufacturer to assist on specific applications.
- **ASDMA** (the Architectural and Specialist Door Manufacturers Association) - **[www.asdma.com](http://www.asdma.com)**  
whose members are specialist door manufacturers.
- **BWF** (The British Woodworking Federation) - **[www.bwf.org.uk](http://www.bwf.org.uk)**  
who have given long term commitment to the woodworking industry, offering sound advice and excellent guidance for all.
- **DHF** (Door and Hardware Federation) - **[www.dhfonline.org.uk](http://www.dhfonline.org.uk)**  
represents the steel door and shutter manufacturers and can offer advice on such products.
- **GGF** (The Glass and Glazing Federation) - **[www.ggf.co.uk](http://www.ggf.co.uk)**  
are specialists in their field and offer a range of services to those looking to satisfy current regulations for glazed specimens.



## 10.1 Introduction

Although fire safety signs do not play a direct role in the function of a fire-resisting door there is a need for the provision of the correct signage for safety purposes.

References in this Code of Practice relate only to non-illuminated signs.

Fire safety signs are divided into five categories but within the scope of this Code of Practice only two designations of sign are required according to the location of the sign and the purpose of the door.

- Safe condition signs, including escape route signs
- Mandatory signs: e.g. "Fire door keep shut".

The need for any sign within the building environment will be determined by the enforcing authority and/or the process of a formal risk assessment.

The use, application and correct position of the fire safety signs can make a major contribution to the effectiveness of good Fire Safety Management.

Doors which are provided on an escape route might require a mandatory notice sign according to their location and designation. They need to be identified as the aperture through which an escape route passes. The signs used in these circumstances are ESCAPE ROUTE SIGNS.

These are not attached to the door but fixed above the door aperture as part of Escape Route Signing. BS 5499:4: 2000 *Safety signs, including fire safety signs - Code of Practice for Escape Route Signing* provides guidance on the correct provision of signage for such routes. The fixing height for FIRE EXIT signs is also given in BS 5499:4.

Doors which are installed for fire resistance purposes within a building should be identified as intended for that purpose. These doors require a MANDATORY SIGN indicating that there is a requirement for the doors to perform a specific function, i.e. to provide a fire-resisting barrier in time of fire. Mandatory signs must be attached to the door to which they relate.

Reference should be made to BS 5499: 5: 2002 *Signs with specific safety meanings* to ensure the correct provision of these signs.



## Section 10: Fire Safety Signs

The fixing height for mandatory signs is recommended at 1500 mm ("eye level"). Each door must carry a sign on both faces unless it is an access to ducts etc. where there is no approach from the other side. (ADB - Appendix B:8)

### 10.2 Critical Recommendations

#### 10.2.1

All signs, whether ESCAPE ROUTE SIGNS or MANDATORY SIGNS are required to comply with SI 341 The Health & Safety (Safety Signs and Signals) Regulations 1996.

#### 10.2.2

BS 5499:4: 2000 *Safety signs, including fire safety signs – Code of Practice for escape route signing* and 5499:5: 2002 *Signs with specific safety meanings* satisfy these requirements. Used in conjunction with a formal risk assessment, these signs will satisfy all requirements under Building, and Health and Safety Regulations and Legislation.

#### 10.2.3

Signs with specific safety meanings in the form of three dimensional arrows or appropriate designated signs with supplementary text e.g. "Push bar to open", "Push pad to open", are required to be displayed where panic or emergency exit devices claim compliance with BS EN 1125: 1998 *Building hardware - Panic exit devices operated by a horizontal bar - Requirements and test methods* or BS EN 179: 1998 *Building hardware -Emergency exit devices operated by a lever handle or push pad - Requirements and test methods*.

#### 10.2.4

It is recommended that signs for all equipment, including fire equipment signs, required to ensure safe, efficient and effective egress, are adequately conspicuous and readily visible.

### 10.3 Commentary

#### 10.3.1

Exit signs above doors or indicating exit routes should be provided where they will help people to find a safe escape route. Signs on exit routes should have directional arrows according to the route to be taken. These signs are square or oblong, green background with white lettering. Signs should not be fixed to doors or positioned where they might be obscured by opened doors. Signs above doors or open spaces should be mounted between 2000 mm and 2500 mm from floor level. When positioned on walls they should be mounted between 1700 mm and 2000 mm from floor level. The use of arrows should correctly indicate the direction of travel leading to a place of safety. (See BS 5499:4: 2000 *Code of Practice for escape route signing* for further guidance).

#### 10.3.2

The Building Regulations 1991 Approved Document B 2006 Edition (5.37) recommends that every escape route (other than those in ordinary use) should be distinctively and conspicuously marked by emergency exit sign(s) of adequate size complying with the Health and Safety (Safety Signs and Signals) Regulations 1996. In general, signs containing symbols or pictograms which conform to BS 5499:4: 2000 and BS 5499:5: 2002 satisfy these requirements. In some buildings, additional signs might be needed to meet requirements under other legislation.

#### 10.3.3

Although Approved Document B 2006 edition states a requirement for marking it does not set out any specific guidance as to the frequency or definitive location of the safe condition signs. This is left to the discretion and interpretation of persons responsible for the safety of the building through Risk Assessment. Advice on fire safety signs, including emergency escape signs, is given in an HSE publication: *Safety Signs and Signals; Guidance on Regulations*, and BS 5499:4: 2000.

## Section 10: Fire Safety Signs

### 10.3.4

It should be noted that the EC Safety Signs Directive (92/58/EEC) contains an alternative range of pictograms, intended only as a guide but commonly found in mainland Europe. Both styles are permissible according to HSE Guidance Notes. The most important issue is that, whichever design is chosen, the SAME DESIGN is used throughout the same building and consistency is maintained. Supplementary text signs are desirable but not essential.



*EEC Directive*



*BS 5499: 4*

### 10.3.5

Mandatory signs to BS 5499:5: 2002 are required on all doors which are designated as fire-resisting. These signs are circular in shape, have a blue background with white lettering. Self-colour aluminium or satin stainless steel might be used as the lettering within the blue background but no other combinations are permitted. No supplementary signs are normally required.



*Examples of common fire door signs*

### 10.3.6

Approved Document B 2006 edition (Appendix B.8) of the Building Regulations 1991 for England and Wales recommends that all fire-resisting doors should be marked with the appropriate fire safety (mandatory) sign complying with BS 5499 *Fire safety signs, notices and graphic symbols, Part 1: 1990 (1995) Specification for fire safety signs* (now superseded by BS 5499:5: 2002) according to whether the door is to be:

- kept closed, when not in use,
- kept locked shut when not in use,
- held open by an automatic release mechanism.



## Section 10: Fire Safety Signs

The recommended fixing height for these signs is 1500 mm (eye level).

### 10.3.7

For Scotland the requirements are stated in the Technical Handbooks for compliance with the Building Standards (Scotland) Regulations 2006:Section 2.

### 10.3.8

BS 9999:2008 (10.4.4) recommends that where the risk assessment identifies a need for a fire sign, such signs should be displayed prominently, conspicuously and appropriately. It further recommends that the location of all fire safety signs be recorded in the fire safety manual.

### 10.3.9

Guidance is given in BS 5499:4 stating that:

"In order to ensure that occupants within a building are aware of their immediate escape route it is advised that the Exit or Fire Exit can be seen. If this is not possible then a sign or series of signs with a directional arrow will provide guidance to the final Exit or Fire Exit."

This recommendation is made to fulfil the employer's, manager's or occupier's obligation to ensure that building occupants know and are aware of their immediate escape route.



*Acceptable signs*

## Section 10: Fire Safety Signs

### 10.3.10

Where doors on emergency exit routes are secured by panic or emergency exit devices it is necessary to use the appropriate signs for the mode of operation. For all exit devices, operated by a "push" movement, the three dimensional arrow should be displayed showing the direction of operation. For panic devices conforming to BS EN 1125 an appropriate supplementary text sign should accompany the arrow and read "Push bar to open" or "Push to open". This is applicable to both type A and type B devices. For emergency exit devices conforming to BS EN 179 the supplementary sign should read "Push pad to open", "Pull to open", "Press to open" or "Turn (clockwise/anti-clockwise) to open" according to the method of operation. A directional arrow should also be included on the sign for "turn". In all cases a suitable sign should be included as part of the installation instructions. A 15 mm letter height is recommended for the supplementary signs.



*Signage for panic bar*

### 10.3.11

For sliding doors the appropriate sign with text "Slide door to open" should be displayed. The arrow should show the direction of "Slide to open".

### 10.3.12

Where there is a danger that a door designated as a fire exit might become obstructed because its importance as a fire safety measure is not appreciated, e.g. a final exit door opening out from the face of the building in a secluded area, or a seldom used intercommunicating door between rooms or occupancies, a conspicuous "FIRE ESCAPE - KEEP CLEAR" notice should be displayed on the appropriate face of the door. This is a mandatory sign and requires white lettering on a blue background.

### 10.3.13

Fire fighting equipment location signs, and prohibition signs should be considered at the same time as escape route and mandatory signs. Hazard signs might require consideration after occupation of the building.

### 10.4 Continuous Improvement

If the formal risk assessment determines that fire safety signs are required, there is an obligation to ensure that they are inspected and maintained on a regular basis, and that they retain their functional purpose within the fire safety management process and procedures.

### 10.5 Maintenance

Any damaged, worn or missing signs should be replaced immediately.

### 10.6 Fire Safety Strategy

Fire safety signs, when used appropriately and positioned correctly, fulfil a continuous, conspicuous and effective role in endorsing all seven key elements of excellence in fire safety strategy:

- prevention of fire,
- escape from fire,
- suppression of fire,
- confinement of fire,
- communication of fire safety management,
- communication of the emergency plan,
- education and training of building occupants.

### 10.7 Meaning of Geometric Shapes and Colours

- Prohibition sign  
Safety sign that indicates that a specific behaviour is forbidden. Comprising a red circular band with diagonal cross bar on a white background, the symbol within the circle to be black denoting the forbidden activity.
- Hazard sign  
Safety sign that gives warning of a hazard. Comprising a yellow triangle with black border and symbol within the yellow area denoting the designated hazard.
- Mandatory sign  
Safety sign that indicates that a specific course of action is to be taken. Comprising a blue circle with white symbol or lettering denoting the safety requirement.

## Section 10: Fire Safety Signs

- **Safe condition sign**  
Safety sign that indicates a safety action, the location of safety equipment or a safety facility, or an escape route comprising a green oblong or square with symbol or text in white.
- **Fire equipment sign**  
Safety sign that indicates the location or identification of fire equipment or how it should be used comprising a red oblong or square with symbol or lettering in white.
- **Supplementary sign**  
Sign that is supportive of a safety sign by providing additional clarification. This sign may comprise text or an arrow. When used with a safety sign it becomes part of the safety sign

**For details of safety colours and contrast colours for safety signs, geometric shapes and graphical symbols refer to BS 5499:1: 2002.**

## Section 11: Fire-resisting Doors on Accessible Routes

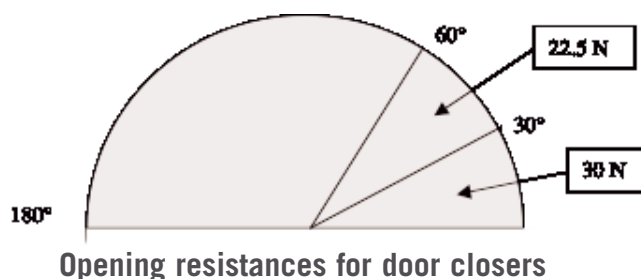
The publication of Approved Document M: 2004 (AD M) in support of the Building Regulations (England and Wales): 2000, recommends specific performance levels for all doors on accessible routes in all non-domestic buildings.



*Accessible routes must be usable by all*

In addition to making recommendations regarding sizes of door handles, their visual contrast from the door face, door sizes and vision panels, and other matters outside the scope of this document, AD M also defines acceptable limits for operating forces required to open the doors and these are aligned with the latest published edition of BS 8300:2009 which is quoted here:

"For disabled people to have independent access through single or double swing doors, the opening force, when measured at the leading edge of the door, should be not more than 30 N from 0° (the door in the closed position) to 30° open, and not more than 22.5 N from 30° to 60° of the opening cycle".



**Note:** the opening force stated in AD M 3.10.a relates to the force required at the opening position between 30° and 60°.

This force approximates to the opening forces stated in BS 8300: 2009 Amendment No 1. No maximum force is stated beyond 60° to allow for the provision of backcheck mechanisms where required. The guidance in AD M relates to door closing devices on doors to accessible entrances (2.13), manually operated non-powered entrance doors (2.14), powered entrance doors (2.18), internal entrance lobby doors (2.26) and internal doors (3.7 and 3.10).

## Section 11: Fire-resisting Doors on Accessible Routes

With careful selection of components, door closers may be specified that will meet the requirements of both the Construction Product Regulations (BS EN 1154) and AD M (Access to and use of buildings).

Higher efficiency door closing devices having an efficiency of 65% or greater should be specified in order to achieve the required minimum closing force of 18 N for BS EN 1154.

Where, in order to meet the opening force constraints of AD M, the door-closing device is unable to keep an entrance door closed against external conditions, consideration should be given to installing one of the following door closing systems:

- a power operated (automatic) door – AD M 2.21 and BS 8300 6.3.3 - sliding, balanced or swing,
- a low energy swing door – BS 8300 6.3.4,
- a power operated revolving door arrangement;  
(note the caveats in respect of revolving door assemblies in AD M 2.20 and BS 8300 6.3.5),
- an entrance lobby or air lock system of inner and outer doors,
- for the purposes of Building Regulations (England and Wales), a low power rated door closer on a door fitted with a suitable latch.



*Door automation with a low energy operator*

Where hinged or pivoted fire-resisting doors need to be accessible by disabled people, the door closing devices fitted should have 'controlled' action, conforming to the requirements of BS EN 1154, Annex A, be of a variable power type and conform to the recommendations above.

Annex A to BS EN 1154 states that controlled door closing devices with a power size less than 3 are not considered suitable for use on fire/smoke door assemblies.



This means that, in general, only high efficiency door closers mounted on doors with a width greater than 900 mm are likely to meet fire door requirements as well as the opening force limits described above. Controlled door closing devices of a lower power size and those with relatively low efficiencies might only be suitable for non-fire-resisting doors. Where the force required to open a fire-resisting door on a circulation route exceeds the limits described above, an electrically powered hold open device, either stand-alone or integral in the body of the closer, which conforms to the requirements of BS EN 1155, should be installed.



*Swing free closers offer no resistance to manual opening or closing*

The use of "swing free" controlled door closing devices should be limited to applications where doors are located for access to rooms or similar locations and not part of a circulation route.

The use of "delayed action" controlled door closing devices should similarly be avoided in circulation areas.

For non-fire-resisting doors which have a requirement to self close for reasons of privacy, acoustics or energy control, controlled door closing devices should be selected, fitted and adjusted so that the opening forces are well below the limits set out above, consistent with the doors functioning as intended. It is emphasized that, for non-fire doors, door closing devices of a power size less than 3 will normally be acceptable.

The opening force should be checked using a plunger-type force measuring instrument. Where measurements cannot be taken at the leading edge, they may be taken at a point on the face of the door up to 60 mm from the leading edge, a position approximately in-line vertically with the spindle of a lever handle or the centre line of a pull handle or push plate, in which case the opening force limits can be increased by approximately 2 N.

The accuracy of force measuring instruments available on the market varies and there are inherent difficulties in measuring forces on site. It is recognized, therefore, that any measurements will be subject to a degree of imprecision which could give rise to variations of 2 - 3 N.

## Section 11: Fire-resisting Doors on Accessible Routes

The ability of a controlled door closing device to close effectively while keeping within the opening force limits depends on:

- its efficiency,
- the resistances from edge seals,
- hinge friction,
- latch resistance,
- differential air pressure.

The effect of using a low-efficiency controlled door closing device is to reduce the closing force to a point where, coupled with the other resistances to closing, the door might not latch, or stay closed if unlatched. The use of high-efficiency closers can reduce the force required to open the door and increase the proportion of the disabled population who can pass through independently.

In some locations in a building, a controlled door-closing device incorporating a backcheck is sometimes used to prevent damage to adjacent walls or furniture and to the closer mechanism if a door is flung open with some force. However, when the door is opened slowly, the resistance effect is usually minimal. With some controlled door closing devices, the backcheck starts to become effective when the door is open at 70°. Care should be taken to ensure that controlled door closing devices, with or without backcheck, allow the door to open to provide the required effective clear width.

The maximum closing force exerted by a controlled self-closing device should be within 0° and 15° of final closure. Controlled door closing devices that do not have this characteristic should be avoided.



*Low opening forces help many in the community to have easy access through fire doors*

### 12.1 Introduction

Experience relating to escape from buildings and general safety has shown the importance of fitting doors on escape routes with suitable exit devices to enable the occupants of the building to escape quickly and easily in the case of fire or some other emergency. Factors to consider include:

- Different groups of users will have differing requirements to enable them to make an effective escape and this has to be reflected in the type of device chosen. For example, in buildings frequented by the general public it is important that doors can be released easily by people who might have no training in emergency procedures or the use of the exit device, and might therefore panic in the rush to escape.
- Other buildings might be occupied predominantly by authorised personnel, who have been trained specifically in the procedures for escape, and who are therefore unlikely to panic in the case of an emergency.
- Where escape route doors are part of the final exit from a building, there will be some additional requirements for security of the door against intrusion and burglary. In this case there can be a conflict between the requirements of building users to be able to escape easily and the requirements of building owners to secure their building and its contents against crime. This is addressed in **12.3.4**.
- Where escape route doors are part of the fire compartmentation of the building there will be additional requirements to ensure that the escape hardware fitted does not compromise the fire-resisting performance of the doorset.

For the purpose of this Code of Practice therefore, exit door hardware is divided into the following categories:

- Panic exit devices (for use where panic situations may be envisaged),
- Emergency exit devices (for use by trained personnel where panic situations are not envisaged),
- Exit devices for use on fire-resisting doorsets,
- Accessories for exit devices.

**Note:** This list does not imply suitability of any device for fire or escape door use - see **Section 12.3** for further information.



## Section 12: Panic & Emergency Exit Devices

### 12.2 Critical Recommendations

#### 12.2.1 General Recommendations (for all exit devices)

##### 12.2.1.1

The device and its accessories must be chosen taking account of the type of user:

- devices intended for use by the general public should be CE Marked to BS EN 1125 - Panic exit devices operated by a horizontal bar, and preferably provided with additional product certification by an approved third party certification body. (See **1.5 Documentation**).
- devices for use by trained personnel should be CE Marked to BS EN 179 - Emergency exit devices operated by a lever handle or push-pad, and preferably provided with additional product certification by an approved third party certification body. (See **1.5 Documentation**).

If there is any doubt about the conditions relating to building occupancy, it is recommended that devices covered by BS EN 1125 (panic exit devices operated by a horizontal bar) be specified.

##### 12.2.1.2

Devices for use on pairs of doors should have been specifically tested and approved for that purpose. (See **12.3.3.2**).

##### 12.2.1.3

Low projection exit devices should be used where there is restricted width for escape, or where the exit doors cannot open beyond 90°.

##### 12.2.1.4

Care should be taken that hinges and any seals are correctly fitted so that the escape doors are able to open freely once the exit device is operated.

##### 12.2.1.5

A regular programme of maintenance should be undertaken to ensure that the correct operational performance is maintained for the life of the building. (See **Section 13**).

##### 12.2.1.6

No additional security devices should ever be fitted to escape route doors unless specifically approved by Fire and Building Control Officers. (See **12.3.4**).

### 12.2.2

Additional recommendations for devices for fire door use

#### 12.2.2.1

The exit device and any accessories should have demonstrated their ability to be suitable for the intended purpose, by inclusion in satisfactory fire tests to BS EN 1634-1 or BS EN 1634-2, on the type of timber or steel doorset and configuration in which it is proposed to be used. This evidence should be provided by an approved third party certification or testing body. (See **1.5 Documentation**).

#### 12.2.2.2

Devices for use on pairs of doors should have been specifically fire tested on an appropriate double doorset assembly and approved for that purpose. (See **12.3.3.2**).

#### 12.2.2.3

The exit device should not include any dogging mechanism unless its use is proven by fire test evidence on self-closing unlatched fire doors. (See **12.3.3.1**).

### 12.3 Commentary

#### 12.3.1 General

The Building Regulations (England & Wales) 2000 Approved Document B 2006 Edition requires that all doors on escape routes be fitted with escape hardware that is simple to operate and does not require specialist knowledge or tools for its operation (e.g. panic bars).

Within the framework of the Construction Products Directive (98/106/EEC), these devices have been identified as playing an essential role in the safe escape from buildings in the case of fire. Compliance with BS EN 1125 or BS EN 179 will be deemed to satisfy the requirements of the Directive in this regard, and it is therefore strongly recommended that proof of compliance be obtained for any panic or emergency exit device before it is specified, installed or used.

European product standards have been developed to provide a benchmark for the performance and safety of escape building hardware and as such, they can be considered as describing best practice in this important area.



## Section 12: Panic & Emergency Exit Devices

Under these Standards exit devices are divided into two basic types:

- Panic exit devices to BS EN 1125: These devices are intended primarily for buildings where the public are likely to be present and a panic situation could arise if the building must be evacuated quickly. For this reason the devices are designed to operate by body pressure alone and require no knowledge of their operation to enable safe and effective evacuation of a building. BS EN 1125 contains specific performance tests to ensure that a panic device will release by body pressure even if people are pushing heavily on the door leaf itself while the device is being operated.
- Emergency exit devices to BS EN 179: These devices are intended for escape from buildings where the public are unlikely to be present, and where the staff in the building have been trained both in emergency procedures and in the use of the specific emergency exit devices fitted. For this reason, panic situations are considered unlikely, and these devices are therefore permitted to have higher operating forces and do not have to release by body pressure alone.

From the above descriptions it can be appreciated that it is very important that a device according to BS EN 1125 is always specified where there is a possibility that the public are present and that subsequently, a panic situation could arise.

BS EN 179 devices should be specified only where it is intended that the occupants will be trained in emergency escape procedures and are therefore most unlikely to panic. If there is any doubt, then a device to BS EN 1125 should be specified.

### 12.3.2 Escape Considerations

#### 12.3.2.1 Panic Exit Devices

The main purpose of the performance requirements contained in BS EN 1125 is to give safe and effective escape through a doorway with minimum effort and without prior knowledge of the panic exit device. The requirements emphasise the importance of ease of opening by the young, elderly and infirm.



*Escape routes must be usable by all*



Whilst varying degrees of external security will be provided by the panic exit devices covered in this Standard, the main objective is to enable a door to be opened at all times by hand or body pressure on the panic exit device fitted along its inside face, and not requiring the use of a key or any other object.

It is important that any panic exit device is able to operate safely for a realistic lifetime, and tests are included in BS EN 1125 to verify the durability of the product. Two categories of durability are recognised:

- Grade 6 - 100 000 test cycles
- Grade 7 - 200 000 test cycles

If the escape door to which the panic device is fitted is also used during the day as a normal access door, it is important to ensure that the panic device is proven for at least 200 000 cycles (Grade 7).

Panic devices are classified according to the amount that they project from the door face. When the door is in the open position at around 90°, any projection of the panic device effectively reduces the clear escape width of the opening. It is therefore important that a low projection device (100 mm or less) is chosen where the door might only be able to open to around 90°, in order to maintain a clear opening width.

### 12.3.2.2 Emergency Exit Devices

The main purpose of the performance requirements contained in BS EN 179 is to give safe and effective escape through a doorway with one single manual operation to release the emergency exit device, although this can require prior knowledge of its operation.



*Emergency escape lock with furniture*



*Emergency escape latch with push pad*

## Section 12: Panic & Emergency Exit Devices

The European Standard deals with emergency exit devices designed to be used in emergency situations, where people are familiar with the emergency exit and its hardware and therefore a panic situation is most unlikely to develop.

It is important that any emergency exit device is able to operate safely for a realistic lifetime and tests are included in BS EN 179 to verify the durability of the product. Two categories of durability are recognised:

- Grade 6 - 100 000 test cycles
- Grade 7 - 200 000 test cycles

If the escape door to which the exit device is fitted is also used during the day as a normal access door, it is important to ensure that the exit device is proven for at least 200 000 cycles (Grade 7).

Emergency exit devices are also classified according to the amount that they project from the door face. When the door is in the open position at around 90°, any projection of the exit device effectively reduces the clear escape width of the opening. It is therefore important that a low projection device (100 mm or less) is chosen where the door can only open to around 90°.

As emergency exit devices are intended for use by trained personnel only, they are permitted to have higher operating forces, and this in turn may permit higher security levels to be achieved. BS EN 179 includes static load tests for 1000, 2000 or 3000 N. The grade achieved will be shown by the 7th character of the classification system.

### 12.3.3 Exit Devices for Use on Fire-resisting Doorsets

Where panic or emergency exit devices are used on fire-resisting or smoke control doors there are additional performance requirements that have to be met, beyond those required for escape, to ensure that the device does not jeopardise the fire compartmentation properties of the doorset. The following points should be considered.

### 12.3.3.1 Dogging

Dogging is a method of holding the bolt(s) of the exit device in a withdrawn state, for easy passage through the door. Where the doorset relies on the provision of a bolt for its fire resistance rating, then devices with a dogging feature should never be used. However, dogging may be permitted where the fire test evidence has been obtained from unlatched fire doorsets, as these tests will have proved that the self-closing device fitted to that particular doorset is capable of maintaining the closed position without any help from a bolt.

In these circumstances, it is essential that the fire test evidence covers the particular doorset assembly of door leaf, frame, closer, exit device and hinges. Endorsement by a good certification scheme will have addressed all these points.

### 12.3.3.2 Double (pairs) Door Use

Both BS EN 1125 and BS EN 179 include specific durability and release tests depending on whether the device is intended for single or double door use. It is important to check that the device is approved for the correct end use, as there is no guarantee that a device approved for single door applications only will perform safely if used on a double door configuration.

Some products are tested and approved for both applications and these will be the better option if the precise end use is not known at the time of specifying.

Where exit devices are intended for use on double doorsets, particular care should be taken that any intumescent material contained in the meeting stiles is not damaged during the installation or operation of the exit devices. In the case of rebated doors, it is important to ensure that door lippings and any intumescent material is protected from potential damage by the latch bolt action.

For safety and reliability reasons, the traditional UK double panic bolt consisting of a single bolt and slave arm connected by bevelled plugs, is not permitted by BS EN 1125. For rebated pairs of doors, this product is now usually replaced by a panic latch on the first opening leaf and a panic bolt on the second opening leaf. More sophisticated multiple locking devices are also available. In all cases the manufacturer's installation instructions should be followed closely, particularly where supplementary intumescent protection is required to achieve the correct fire rating.



## Section 12: Panic & Emergency Exit Devices

### 12.3.4 Security

Both BS EN 1125 and BS EN 179 are concerned primarily with quick and effective escape from a building, and the question of security of the building and its contents from the outside is considered to be of secondary importance. All panic and emergency exit devices will provide a basic level of security against intrusion, but there is increasingly a need for higher security in buildings such as supermarkets and stores with high insured content, and even in schools and hospitals to protect the occupants against the attentions of intruders.

For these cases there are additional security measures that can be taken to enhance the physical security of the building, without compromising the ability of people to escape during an emergency. Such measures should always be discussed with local building and fire authorities and will generally be determined on a building occupancy and risk assessment basis.

When buildings are occupied, such measures include:

- exit devices equipped with additional locking, such as deadbolts or electro magnetic locks,
- exit devices equipped with local or remote audible alarms,
- door monitoring devices and closed circuit television,
- delayed egress devices.

In all cases it is essential that the escape function of the door be not compromised at any time while the building is occupied.

In particular, any additional dead bolt locking used must still enable the exit device to comply with the release requirements of

BS EN 1125 or BS EN 179. If delayed egress devices are to be used, they must be designed such that after the delay period approved by the building authority, the door will automatically be released. In the case of genuine emergency, such as a fire alarm or power failure, the door must be released immediately.

Panic and emergency exit systems incorporating the type of measures outlined above, are covered by two new European product standards, currently in draft form:

- prEN 13633 - Electrically controlled panic exit systems
- prEN 13637 - Electrically controlled exit systems.

These two standards will give much needed guidance on safe ways of combining physical security with effective means of escape, and they will be used to satisfy the requirements of the Construction Products Directive. Until they are available, it is strongly recommended that any proposed additional security measures to be applied to escape doors be discussed with the local building and fire authorities.

### 12.3.5 Accessories for Exit Devices

#### 12.3.5.1

Outside access devices (OADs): These devices are used to enable authorised access from the opposite side to the escape direction, and can consist of a cylinder, lever/knob or keypad assembly. All are connected to the operating mechanism or bolt(s) of the exit device in some way, either through a mechanical link or an electrical connection.



*Outside access device*

From an escape point of view it is essential that the provision of these OADs cannot override or inhibit the escape function from the inside, at any time. The manufacturer's data sheets should specify which OADs have been tested for use with a specific exit device, and this should be proved by checking that the test evidence covers the correct outside access devices. Use of a non-approved OAD might cause a dangerous situation in which the exit device would not release properly when called upon to do so in an emergency.

## Section 12: Panic & Emergency Exit Devices

From a fire compartmentation point of view, care must be taken that any OAD chosen will not compromise the fire rating of the complete doorset. It is therefore important to follow the manufacturer's installation instructions and also check that the fire test evidence includes the use of the appropriate OAD with the exit device.

### 12.3.5.2 Strike Plates

Most panic or emergency exit devices are offered with a choice of strike plates to suit different frame materials or configurations. For example, a panic latch might be approved for use on a single non-rebated door, the active leaf of a rebated pair of doors, an aluminium profile frame, a timber frame or a steel rebated frame. In each case a different strike plate might be needed. The design of a strike plate can have a very significant effect on the release forces and correct operation of an exit device, so care should be taken that the test evidence and approval covers the particular strike plate required.

### 12.3.5.3 Other Components

Break-glass emergency bolts - these devices are unable to comply with the design requirements of BS EN 179, as they require more than a single hand operation to effect an exit. For this reason, this Code of Practice cannot recommend the use of such devices.

Many other components might be used in conjunction with panic or emergency exit devices. In all cases these components must not be allowed to inhibit the escape function in any way. If appropriate certification from a third party is not available, then specific test evidence should be sought for all combinations of building hardware intended for use together.

For further information see also the Best Practice Guide:

- **Panic and Emergency Exit Devices**

published by the DHF and included on the DHF website. A link is available from the GAI website.

[www.dhfonline.org.uk](http://www.dhfonline.org.uk)

[www.gai.org.uk](http://www.gai.org.uk)





### 13.1 Introduction

#### 13.1.1

Doors designated as:

- on a fire exit route,
- fire and/or smoke resisting doors,

must be periodically inspected to make sure that they meet the same standards as when they were originally installed and commissioned.

#### 13.1.2

Much will depend on the general use to which the door is normally put. A door that is only used as an emergency exit might never be opened and will need periodic inspection and minor adjustment, whilst a door that is used as a staff entrance or "smoke-break" exit door will need more frequent inspections and maintenance.

#### 13.1.3

The Regulatory Reform (Fire Safety) Order (RRO) for England and Wales and a similar Order for Scotland place the responsibility for Fire Safety Duties and general fire precautions on the building owner or his representative and the appointed "responsible person" nominated as being the person ultimately responsible as defined in the RRO. Recommendations on the frequency of inspections are included in the Guides prepared for the "Responsible Person" in respect of the RRO for England and Wales. These are available on the **CLG** website. All premises are subject to a suitable system of maintenance. "Suitable" means, among other things:

- the maintenance is carried out regularly
- defects are remedied
- records of inspection and repair are kept.

#### 13.1.4

The conclusion is that the employer should ensure that fire-resisting doors and escape doors are kept in safe working order by a properly documented system of regular maintenance, carried out by competent individuals. (There is no specific requirement as to the qualifications to be held by such individuals).

#### 13.1.5

Building controllers may thus include such inspections in their regular fire drills and routine fire precaution inspections.



## Section 13: Maintenance of Building Hardware

### 13.2 Critical Recommendations

#### 13.2.1

The Management should include requirements on the competence of people employed to assist in health and safety matters, including maintenance. It is important to employ properly trained personnel.

#### 13.2.2

For the doors to work efficiently, regular and programmed maintenance must be carried out to all parts of the door. Work should be undertaken only by persons experienced in this type of work.

If outside contractors are used, they should sign the maintenance log maintained by the company.

#### 13.2.3

A maintenance log should be kept and all doors given a unique number.

#### 13.2.4

The maintenance period should be appropriate for the building; for high life risk, such as hospitals, schools, retired persons' accommodation, this may be monthly. Other buildings with low life risk may be annually. Refer to the RRO Guide appropriate to the type of building.

#### 13.2.5

The maintenance and replacement of components to maintain the correct performance of the doorset for the full life of the building is thus essential.

### 13.3 Commentary

#### 13.3.1 General

The most important factor is that these devices are designed to protect human life against fire and to ensure people can safely exit a building. Nothing must be done or neglected that could compromise this.

Building Regulations, and to some degree fire regulations, provide general guidance on the type of products to be used. Recommendations on the inspection and maintenance for each specific device and each part should be obtained from manufacturers and used against all such parts fitted to each door.

The types and uses of doors are many and each door will need to be treated as the situation dictates. The geographical location will also dictate the frequency and type of maintenance; wet salty areas will need special consideration. Wind-blown debris and illicit dumping of rubbish could render an emergency exit sealed. Doors used as staff "smoke break" exits will be subject to higher wear factors than those limited to occasional use.

Internal fire and smoke-resisting doorsets are at least as important as the final exit door, although it is unlikely they will have the same hardware as the final exit. However, hinges, closers, co-ordinators and seals all have as much importance. The incorrect closing action of such doors might cause serious injury to the building occupants who are more likely to use these doors in the course of the normal day. They are often subject to a higher degree of wear than final exit doors.

Vandalism and attempted forced entry will cause damage to external doors, as well as misuse by building occupants. Only regular periodic inspection will pick up these faults.

External doors will also need inspecting during seasonal changes to ensure continuing functionality.

Only parts of equal or a better standard should be fitted as running replacements or additions to fire/smoke and final exit doors; anything less could invalidate fire certificates and breach the building owner's responsibility to keep the doors in safe working order. If there is concern about suitability of replacements, test evidence from a competent authority should be obtained.

### 13.3.2 Hinges

Bear the mass of the door, the whole load being applied to just two or more metal pivot devices. They should be checked for wear in the pivot pin. Also ensure that the fixing screws are tight and all are effectively holding. Light lubrication might be required by local conditions. Hinges on doors in frequent use will wear quicker than those only opened for inspection or access to service ducts etc.

### 13.3.3 Floor Springs

Where floor spring or pivot devices are installed, careful inspection of the lower pivot should be undertaken to remove debris and any corrosive liquids deposited by inappropriate human use. The upper pivot should not show signs of wear, and indicated wear must be rectified to prevent the door jamming at critical times.



## Section 13: Maintenance of Building Hardware

### 13.3.4 Door Closing Devices

Door closing devices are designed and fitted to suit different uses: for instance, young persons or strong air pressure. Maintenance technicians should be aware that building use might change and they should make building supervisors aware in such cases.

Each type and make of closer will need servicing in differing ways but pivoting arms and terminal fixings should be checked for tightness and lubrication added as appropriate. Terminal fixings into the door and frame are subject to stress and should be carefully checked.

Opening and closing pressures should be checked and fire or smoke seals inspected to ensure they are not damaged and do not impede the smooth opening and closing action. Hydraulic units should be checked for loss of liquid which would indicate a failing device. Where floor springs are used, it is important that the door is in alignment with the frame, or in the case of pairs of doors, alignment of both.



Closing and latching speeds should be checked and adjusted as appropriate. Doors normally held open by approved devices should be inspected to ensure that the hold open action has not stressed the device. The correct opening travel should be checked to ensure that doorstops are not over-stressing the arm assembly.

### 13.3.5 Electro-magnetic Hold Open Devices

Hold open devices should be checked to ensure that no residual electro magnetic energy impedes the immediate release of the doors. The periodic check should be undertaken in conjunction with fire/smoke alarm testing or by night security when such doors are routinely closed as night fire precautions. Security patrols could be made responsible for logging failed actions.

### 13.3.6 Co-ordinators

These devices are used to close rebated sets of doors in the correct order to provide an effective seal. The maintenance schedule should include a check to ensure that each part is securely located and the screw fixings are tight. Any pivoting parts should be checked for wear and any protruding arms checked for straightness. The function should be checked over the full range of door openings and all parts lubricated as required.

### 13.3.7 Locks, Latches, Bolts and Furniture

The wide range of products makes it impossible to be specific in maintenance needs. All fittings should be examined and checked for secure fixings; moving parts should be lubricated as defined by the manufacturer. Bolts, rods and other protrusions should be checked to ensure they are straight and undamaged. Bolts for locks and latches should be checked to ensure they are fitting centrally into their respective keeps. Parts liable to corrosive influence should be washed, lubricated and protected. Moving parts that pass through braces or shackles should be examined for wear that might cause intermittent jamming or rusting.

### 13.3.8 Seals

Smoke and fire seals should be examined to ensure they are unbroken and secure in the door; that the gap in the door has not moved out of tolerance or the door moved out of square so as to prevent an effective seal. Worn or damaged seals must be replaced with the appropriate product.

**(Note:** it is unlikely that intumescent fire seals have been fitted to steel doors).

### 13.3.9 Panic and Emergency Exit Devices

Moving parts should be inspected for signs of wear and replaced as required. Lubrication should be used where indicated; screws and all fixings should be tested to ensure they are secure. Electro magnetic and electro-actuation devices should be tested with power off to ensure their continued availability following power cuts. Security devices should be tested for correct function, particularly that they do not impede the correct operation of the door. Floor sockets, whether easy clean or dust-excluding, should be checked and cleaned out.

### 13.3.10

In almost all cases, the installed products will have been supplied complete with fixing instructions and the correct maintenance data sheets. It is important that these documents are retained by the Building Manager and used as the basis of the maintenance schedule.



## Section 14: Product Standards and Definitions

### 14.1 Standards

#### 14.1.1 European Standards

There have been major changes in terms of product performance standards for architectural hardware (building hardware) and almost all previous British Standards have been replaced by European EN standards.

These Standards, which have been some ten years in the making, apply equally in all EU member countries. Generally they cover a wide range of performance levels from domestic to heavy public usage, and fittings for doors and windows from 20 Kg up to 160 or 200 Kg mass, and leaves of up to 2.5 m high by 1.6 m wide. Where appropriate, five levels of security performance and also corrosion resistance are categorised.

In order to help users, almost all of these standards use the same simple categorisation system. Although some products have extra categories, the first seven digits generally (but not always) relate to the same performances. These are fully described in **Section 1, Page 15**.

It is generally regarded as unacceptable for producers or distributors to make claims that start with such meaningless statements as "Designed to comply with" or "tested to...". Until the use of products that have valid test evidence becomes a legal requirement in the UK (see **14.1.2**), it is obviously important to be certain of the validity of claims of compliance. The ARGE Declaration of Compliance document is a recommended document in this regard as it removes any risk of confusion. (See **1.5.8**).





### 14.1.2

The following European product Standards have been published as British Standards:

- BS EN 179 - Emergency exit devices operated by a lever handle or push pad\*
- BS EN 1125 - Panic exit devices operated by a horizontal bar\*
- BS EN 1154 - Controlled door closing devices\*
- BS EN 1155 - Electrically powered hold-open devices for swing doors\*
- BS EN 1158 - Door coordinator devices\*
- BS EN 1303 - Cylinders for locks
- BS EN 1527 - Hardware for sliding doors and folding doors
- BS EN 1670 - Corrosion resistance
- BS EN 1906 - Lever handles and knob furniture
- BS EN 1935 - Single axis hinges\*
- BS EN 12051 - Door and window bolts
- BS EN 12209 - Locks and latches - Mechanically operated locks, latches and locking plates\*
- BS EN 12320 - Padlocks and padlock fittings
- BS EN 13724 - Apertures of private letter boxes and letter plates
- BS EN 14637 - Electrically continued hold open systems
- BS EN 14846 - Electromechanically operated locks\*

\* These standards are "harmonised". This means that products successfully tested to them can be CE Marked.

### 14.1.3 Other Related Standards

#### **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 476:31.1: 1983**

Fire tests on building materials and structures -  
Methods of measuring smoke penetration through doorsets and shutter assemblies: measurement under ambient temperature conditions.

#### **BS 4787:1: 1980 (1995)**

Internal and external wood doorsets, door leaves and frames:  
Specification for dimensional requirements.

#### **BS 7273-4: 2007**

Code of Practice for the operation of fire protection measures -  
Activation of release mechanisms of doors.



## Section 14: Product Standards and Definitions

**BS 8214: 2008**

Code of Practice for Fire door assemblies with non-metallic leaves.

**BS 5499:4: 2000**

Safety signs, including fire safety signs  
Code of Practice for Escape Route Signing.

**BS 5499:5: 2002**

Signs with specific safety meanings.

**BS 7036: 1996**

Parts 1 - 5  
Code of Practice for safety at powered doors for pedestrian use.

**BS 8424: 2004**

Building hardware. Pull handles. Requirements and test methods.

**BS 9999: 2008**

Code of Practice for fire safety in the design, management and use of buildings.

### 14.2 Definitions

**Accessible route**

Any route that is used to approach, or move around or within a building, and is accessible to disabled people.

**Closing moment**

Torque (Nm) generated by a door closing device which acts upon the door leaf during the closing operation.

**Cylinder**

Key operated device containing differs, usually separate from, but engaging with, its associated lock or latch.

**Deadbolt**

Bolt that is operated in both directions by a key, handle and/or thumb turn.

**Deadlock**

Lock that contains only a deadbolt.

**Dogging mechanism**

Mechanism fitted to an emergency/panic device for holding the bolt head(s) in the withdrawn position until manually or electronically reset.

### **Doorset**

Assembly of door leaf, frame, hinges and all other hardware, and including any fire or smoke seals.

### **Escape route**

Route forming the means of escape from any part in a building to a final exit.

### **Final exit**

An exit from a building where people can continue to disperse in safety and where they are no longer in danger from fire and/or smoke.

### **Fire integrity**

Measure of the ability of a specified doorset to resist and thus contain the effects of fire for a recognised period of time. (Usually expressed in minutes - e.g. FD60 or E60 implies a doorset capable of withstanding exposure to fire test for at least 60 minutes).

### **Latch bolt**

Moving part of a latch that engages the locking plate.

### **Light reflectance value**

The amount of light the surface reflects. The LRV scale runs from 0, which is a perfectly absorbing surface that could be assumed to be totally black, up to 100, which is a perfectly reflective surface that could be considered to be the perfect white. Because of practical influences in any application, black is always greater than 0 and white never equals 100.

### **Mortise latch**

Latch for fixing in a mortise, usually in the closing edge of a door leaf or window.

### **Mortise lock**

Lock for fixing in a mortise, usually in the closing edge of a door leaf or window.

### **Rim lock**

Lock for fixing on the face of a door leaf.

### **Tubular latch**

Mortise latch, which has a case shaped to fit into a cylindrical mortise.



## Section 14: Product Standards and Definitions

### 14.3 Abbreviations

#### **CEN**

European Committee for Standardization

#### **EN**

Euronorm (European standard)

