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Introduction to Fire Dampers

What is a Fire Damper?

It is a passive fire protection product used to prevent the spread of fire inside the ductwork through fire-resistance rated walls and floors. It is designed to utilize compartmentalization to prevent or slow the spread of toxic gases, smoke and fire

How does it work?

Fire dampers close when a rise in temperature occurs. They are usually activated by a thermal element which melts at temperatures higher than ambient (room temperature) but low enough to indicate an anticipated presence of a fire. It allows the springs to close the damper blades. They can also be activated by an electric signal from a fire alarm system.

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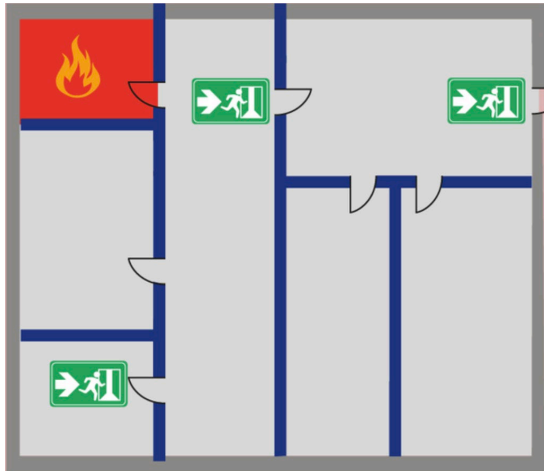
Structural Fire Protection

Fire protection in the buildings that includes:

- Active fire protection - including manual or automatic fire detection and fire suppression.
- **Passive fire protection - including *compartmentalisation,* fire dampers**
- Fire prevention - including minimising ignition sources, as well as educating the occupants and operators of the facility.

Compartmentalisation



Fundamental basis of fire protection. It divides a building into fire compartments to limit the spread of fire, it can contain single or multiple rooms. The main objective is to contain a fire within the fire compartment separated by fire-resisting walls and floors for a selected period of time.

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What is the difference between Smoke and Fire Dampers?

A fire damper closes once the duct temperature reaches a high enough level to melt a fusible link. A smoke damper closes upon the detection of smoke.

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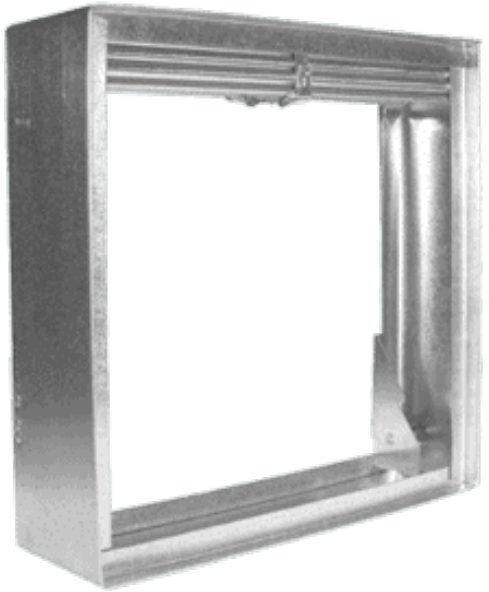
Different types of Fire Dampers

- Curtain Fire Dampers

Folding curtain fire dampers are constructed so that the interlocking blades fold to the top for maximum free area in the airway, to then be released once the temperature rises (normally rated at 72C +- 4C)to fill the airway and prevent the passage of fire.



- Intumescent Fire Dampers

Intumescent fire dampers are designed to expand in the event of temperature rise to prevent the passage of fire. They incorporate components that expand under the action of heat. Temperatures of expansion typically range from 120C to 270C.

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Different types of Fire Dampers

- Multi-Blade Fire Dampers

Constructed with a number of linked pivoting blades contained within a frame. Blades are released from open blade position at about 72C +-4C

- Single blade fire dampers

Constructed with a single pivoting blade contained within a frame. Blade is released from open blade position at about 72C +-4C

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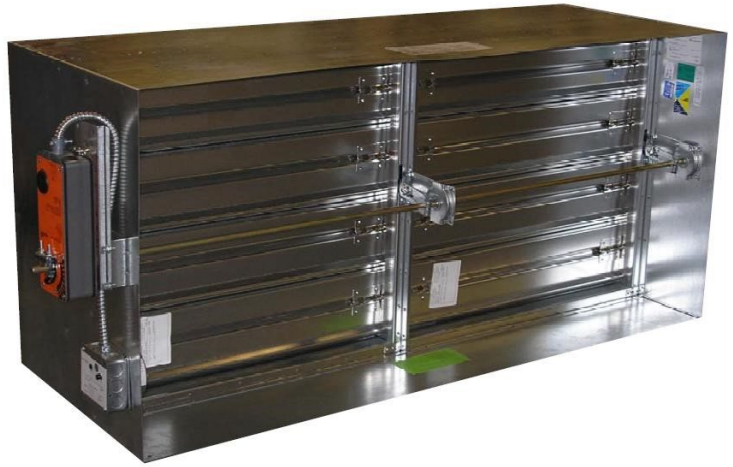
Different types of Fire Dampers

- Multi-Section

Where the duct is bigger than the maximum tested size of individual damper, manufacturers may provide multi-section units, which will generally be supplied with a joining strip or mullion strip to allow the unit to be assembled on site. The joining is not necessarily structural.



- Leakage Classified

Often referred to as fire and smoke dampers, they satisfy the appropriate integrity and reduced leakage.

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Regulations and Codes

Scotland

Statutory Instruments:

- The Building (Scotland) Regulations 2004
- Part 3 of the Fire (Scotland) Act

Documents supporting Statutory Instruments:

- Technical Handbook (Fire) 2011 for Domestic and for Non-domestic buildings.
- BS 476-22
- EN1366-1
- BS9999 – Annex v and W
- BSEHV 05, BSEHV 06

Northern Ireland

Statutory Instruments:

- The Building Regulations (Northern Ireland) 2000

Documents supporting Statutory Instruments:

- DFP Technical booklet E – Fire Safety 2005
- BS 476-22
- EN1366-1
- BS9999 – Annex v and W
- BSEHV 05, BSEHV 06

England and Wales

Statutory Instruments:

- Building and Buildings – The Building Regulations 2000
- The regulatory Reform (Fire safety) order 2005
- Construction Design and Management Regulations 2007

Documents supporting Statutory Instruments:

- Approved Document B: Fire Safety: 2006
- BS 476-22
- EN1366-1
- BS9999 – Annex v and W
- BSEHV 05, BSEHV 06

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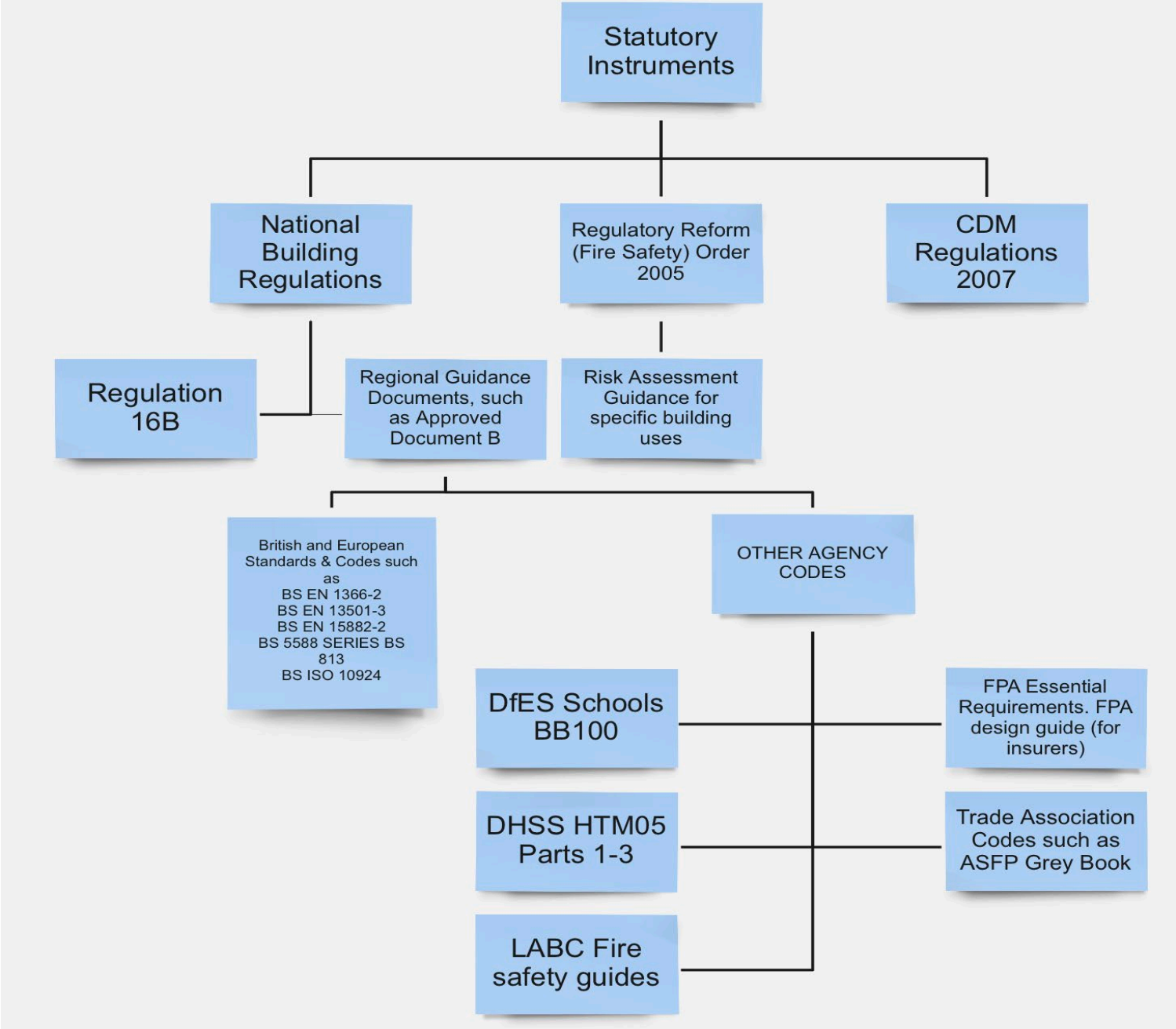
Regulations and Codes



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Design Checklist

No.	Question	Guidelines	Responsibility
01	What evidence of compliance with the latest Building Regulations is available for the selected damper installation method?	Damper manufacturer must provide evidence that the installation method meets with Building Regs.	System Designer.
02	What damper fire classification is required? Do the system design drawings have dampers marked with identification codes which cross reference back to a schedule of all dampers that includes their rating and location?	Each damper must meet the same minimum fire classification as all other system components	System Designer.
03	Into what substrate is the damper to be installed?	Wall or Floor?	Architect / Client.
04	From what is the substrate constructed?	Concrete, blockwork, dry-lining, etc	Architect / Client.
05	Is the damper frame / support compatible with the substrate type and intended installation method?	This is fundamental to a successful installation.	System Designer.
06	Has the damper manufacturer been consulted as to the most appropriate type and layout of dampers?		System Designer.
07	Is the method tested and approved for the type of barrier that is being protected?	Assemblies for block work walls may not be suitable for dry-lining barriers	Damper purchaser And manufacturer
08	How is the damper to be independently supported from the connecting ductwork?	Include guidance on the use of break away joints.	System Designer.
09	Can the intended installation be completed within the boundaries of the construction programme?	In dry-lining, openings must be accurately planned and set out in advance. It is difficult and expensive to form openings to tested standards after walls have been built	Lead Contractor.
10	Have methods of retro-fitting dampers which have been missed or modified been agreed?	Retro-fitting dampers in partitions is difficult.	System Designer.

No.	Question	Guidelines	Responsibility
11	Has sufficient room been allowed for building-in dampers when the entire ductwork, nearby walls, ceilings and services are installed?		System Designer.
12	Has a fire-stopping contractor been consulted prior to design completion to advise on whether a tested solution is available for the circumstances on site?		System Designer.
13	Has the fire-stopping manufacturer provided evidence to support the tested solution?		System Designer.
14	Does the fire-stopping test evidence relate to the actual application with appreciation of the wall type, the damper type and the frame type?		System Designer.
15	Will the fire-stopping manufacturer be on site to provide guidance and training during installation?		System Designer.
16	Are load bearing supports needed for vertical ducts		System Designer.
17	Is the installation of the builders work between damper frame and wall to be carried out by a suitably qualified and approved third party installer?		Lead Contractor
18	Have materials or insulation of a combustible nature been excluded from the duct within 500mm of a damper?		System Designer.
19	Has adequate space been provided allow for access to dampers for maintenance and testing purposes?	Consider access on both sides of the damper for both maintenance and future cleaning purposes.	System Designer.
20	Has pre-installation meeting been planned between the system designer, site management team, Building Control Body / Fire Authority, duct/damper installer, barrier subcontractor and manufacturers of drywall, damper and fire-stopping systems?	This is essential	Lead Contractor

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Installation Checklist

No.	Question	Guidelines	Responsibility
01	Has all the necessary technical information been made available for the damper installer and all other associated trades?	Refer to Clause 4.3	System Designer
02	Has a project-specific programme of sequenced installation activities been prepared?	An acceptable sequence to achieve the same design criteria can vary from project to project	Lead Contractor.
03	Does the programme sequence of other trades allow for there being sufficient space on all four sides of the damper to fit associated support systems, apply fixings and to complete the penetration seals	Inaccessible voids and cavities caused by adjacent walls, columns and structural soffits shall be considered during programming.	Lead Contractor.
04	Does the programme sequence ensure that there are no other services installed that would prevent the damper arrangement being fitted as per the system design?	Other trades cannot 'share' the openings for dampers and their penetration seals.	Lead Contractor.
05	Does the programme sequence ensure that there are no ceiling grids / tiles installed that would prevent ease of installation for all associated contractors?		Lead Contractor
06	Have solutions to any necessary on-site change to the installation sequence been transmitted back to the programmer so that future projects will benefit?	Altering the sequence of one or more contractors in order to achieve the design in a more practical manner shall be communicated back to the programmer for use on future projects.	Damper installer, Barrier contractor, Penetration seal contractor.
07	Has the system designer approved any ad-hoc instructions issued by a third party? e.g. The 'ad-hoc' insertion of stone mineral wool, or similar, in cavities	The inclusion of non-specified products, material and dimensional modifications may result in the invalidity of the final assembly	Damper installer, Barrier contractor, Penetration seal contractor.
08	Is the method tested and approved for the type of barrier that is being protected?	Assemblies associated with block work may not be suitable for dry-lining	Damper Purchaser Damper Manuf'cter
09	Is the opening in the dry-lined barrier correctly formed, trimmed and lined?	Do trimming members need to be tied back to the soffit and slab?	Barrier Contractor.
10	Prior to installation are method statements, COSHH assessments and risk assessments available to the installers?	The availability of clear instructions to the installers is essential in ensuring correct installation methods are adopted.	Damper installer, Barrier contractor, Penetration seal contractor.
11	Has the damper, duct and penetration seal been installed as per the specification?	Query before installation if any element appears to be non-compliant	All parties.
12	Has adequate space been provided to allow for access to the damper for maintenance and testing purposes?	Consider access on both sides of the damper for both maintenance and future cleaning purposes.	System Designer.

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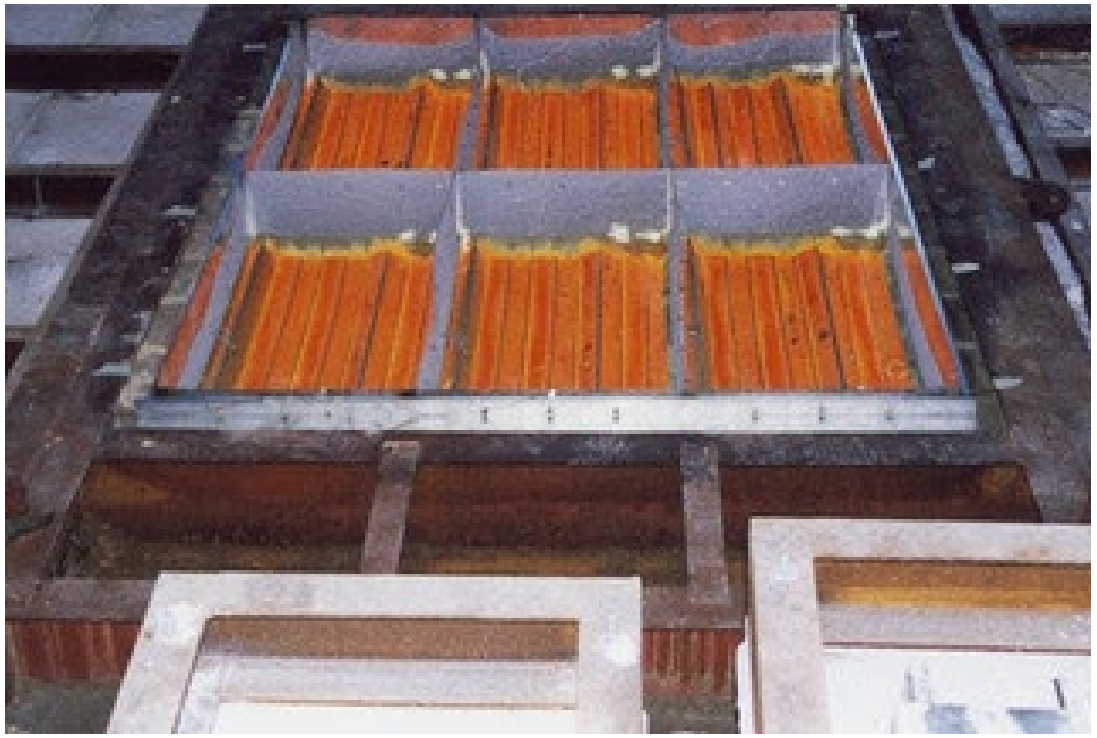
Testing - (image of furnace)

Test Evidence

Data obtained from a fire resistance test carried out to determine the suitability of a product, system or combinations to seal service penetrations. With respect to fire dampers this will be to BS EN 1366-2 with classification to BS EN 13501-3. Historical data to BS476-20/22 will only be applicable in certain instances (e.g. fan shut-down on detection of fire).

Testing - (image of furnace)

Testing - (image of furnace)



Testing - (image of furnace)

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Fire Damper Testing

https://youtu.be/22gW1LvZHLc

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Fire Stopping

Fire rated partitions, ceilings and floors are essential to ensure effective fire compartmentation and safe evacuation of the building.

Products installed include:

- intumescent mastics
- fire stopping batts and coatings
- fire rated compounds
- specialist intumescent collars or wraps for PVC pipes
- intumescent seals for construction joints

Other services include:

- intumescent coatings for fire protection of steel works
- application of fire protection
- application of boards
- application of fire-rated ceilings
- application of steel fire escapes

https://youtu.be/rNL17h6j4g4

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Fire Stopping

The passive fire stopping solutions utilised by Fire Protection contractors can prevent the movement of a fire for a range of BS and EN standard test time periods from 30 to 240 minutes.

Key components of the firestopping techniques include:

- Fire batts
- Covers
- Mastic sealants
- Fireboards
- Collars
- Mortars
- Fire curtains
- Putties
- Pillows

These are used to effectively fire-stop linear joints (head of wall to concrete slab), apertures and penetrations via floors and walls, cavity barriers, service openings and ducts and and combustible pipes and cables.

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Fire Stopping

Compliance

Fire Protection contractors install fire resistant partitions in compliance with ASFP Fire Resisting Non Load-bearing Partitions (Purple Book), all fire stopping installations are done to the requirements of BS 476 Part 24, and fire compartmentation works comply with BS 9999.

- Fire-stopping sealing solutions must be applied in full compliance with the manufacturer's requirements as well as verified for that purpose by BS/EN approved standards for the appropriate penetration type, aperture size and service provision.
- Installations of passive fire protection, fire-stopping sealing solutions should be carried out by fully trained and qualified specialists. Passive Fire Protection contractors use and apply fire-stopping sealing solutions in compliance with ASFP Fire Stopping & Penetration Seals For The Construction Industry (Red Book).

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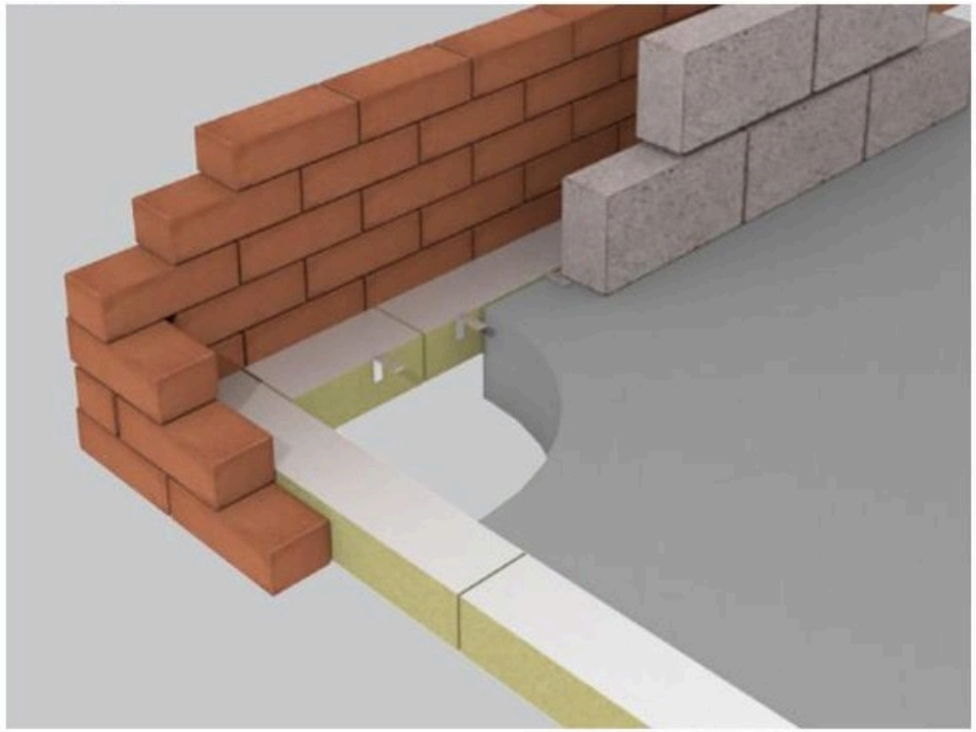
Different types of Fire Protection

Curtain & Cavity Barriers

Cavity barriers are passive fire protection materials that form cavity fire stops within buildings. They can be installed horizontally or vertically. When heated to high temperatures they expand to seal any gaps in the walls. This provides fire compartmentation.



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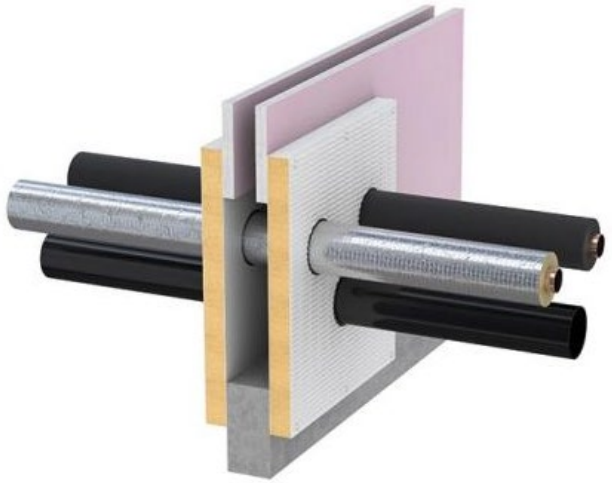
Different types of Fire Protection

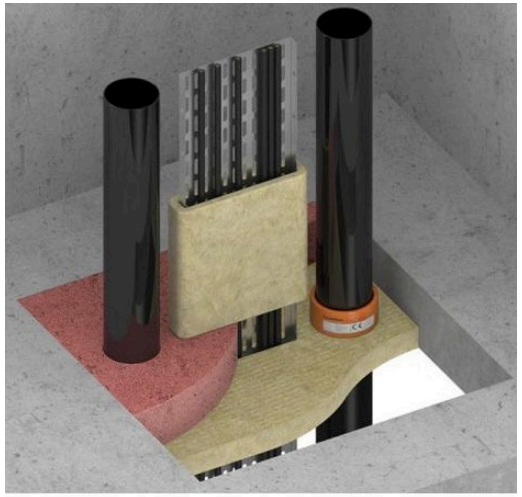


Fire Batts

These are ablative coated mineral wool firestop boards used to reinstate the fire rating of walls and floors penetrated by services. Some fire batts also aid the acoustic performance of some building structures, and they can provide an effective smoke seal.

Fire Sealing Compound

Fire compound is usually used for sealing electrical cable penetrations, when fire stopping walls and floors have become compromised by building programmes.



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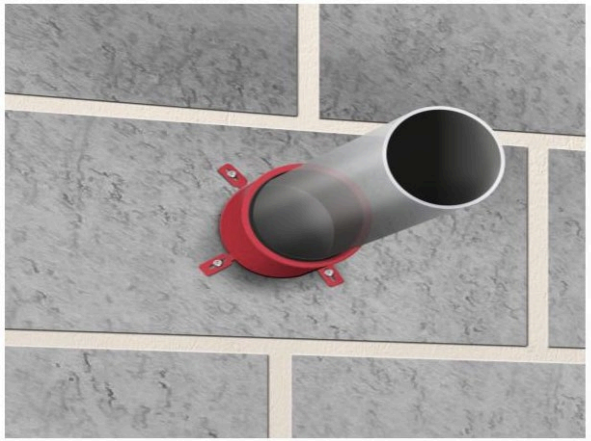
Different types of Fire Protection

Collars & Wraps

Pipe wraps and collars are designed for use on plastic pipes that pass through floors and walls. They have an intumescent material which expands inwards to squeeze the pipe until it is completely sealed.



Intumescent Sealant

This is generally applied to fire doors, windows, cables, pipes, joints, voids and other small holes through which fire could potentially spread. This creates a barrier to smoke and flames, and significantly reduces fire damage.

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Different types of Fire Protection

Fire Resistant Glazing

This is a process to make glass panels more resistant to flames, smoke and heat. There are different types of techniques that can be combined, each providing a different level of protection.

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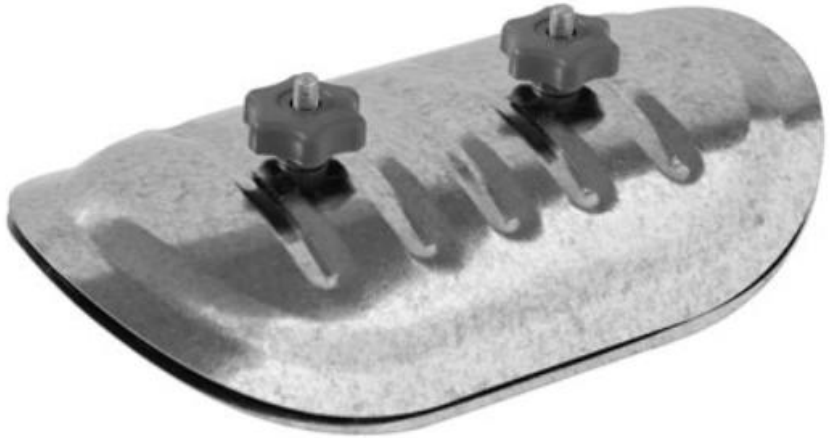
Access Doors

- They suit low, medium, and high velocity systems, and are required by building regulations to allow technicians easy access for cleaning and maintenance of both fire dampers and volume control dampers.

- Specialist cleaning contractors fit additional cleaning openings to suit specific cleaning methods and the practical site conditions.

- All openings should have sealed panels/covers designed so that they can be quickly removed and re-fixed.



This access door fits on the curved side of a circular duct with a rubber gasket. Can achieve maximum tightness class C.

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What are the safety regulations?

- The services coordinator should make sure that the panel/cover can be removed easily (i.e. there's nothing blocking it)
- It is standard practice to connect safety restraints to access panels in riser ducts.
- Access openings should have removable duct sections or flexible ducts/connections if necessary.
- Ductwork and duct supports are not designed for man access either inside or on top of the duct.

This access door fits on the flat side of a rectangular duct with fixing tabs and has a 25mm thick high density insulation. Both the door and the frame have a rubber gasket. Can achieve maximum tightness class C.

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Access Panels

- Access panels are provided next to equipment that is regularly serviced or accessed.
- The openings provide hand and/or arm access only, unless required by the system designer.
- It is standard practice to provide access panels for the inspection and servicing of plant and equipment.

Access Panels for Fire/Smoke Dampers

- Fire dampers need to be able to be accessed. The panels should be large enough for the testing and maintenance of the damper and the actuating mechanism.
- They also allow access to the blades and fusible links.
- Sometimes on multiple assembly units more than one panel is required and this is determined by:
  - External access conditions
  - The reach to the blades and fusible links

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Manufacturers information

https://paddeco.sharepoint.com/:b:/s/Paddeco/EYldbX_xqfdHr7KNtmy6YCABZ0-1j9kEfwDfJrl0RuQlmg?e=dT7NpA

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Code of Practice

The British Standard 9999 Code of Practice for Fire Safety in the Design & Use of Buildings states "…any grille or opening through the enclosure for ventilation purposes should be protected by a fire damper".

All fire dampers must be tested upon installation.

Fire dampers are designed to prevent a fire from being able to spread through the ductwork to other areas of a building. The technical definition of a fire damper is "mechanical device that is operated automatically or manually and is designed to prevent the passage of fire and which, together with its frame, is capable of meeting for a stated period of time the fire resistance criterion for integrity". Quite often installed fire damper devices have a fusible link, which is defined by BS 99999 as a 'device that releases a component such as a fire damper or fire shutter at a set temperature.' when the fusible link comes into contact with high heat, the link will melt, causing the damper to close and stop the spread of fire.

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Code of Practice

With modern technology and the introduction of more complex fire systems, many companies now opt to have their fire dampers operated automatically. A buildings fire alarm system can now be linked to automatic fire dampers electronically. Basically, if a fire is detected in a part of the building, an electric signal is sent to the fire damper telling it to close and prevent the fire spreading through.

Fire dampers play a crucial role in buildings' fire safety systems, which is why it is important that they operate correctly. The difference between a well-maintained fire damper and a poorly maintained fire damper could be the difference between life and death if there is a fire in your building. With this in mind, it is important to make sure that your fire dampers are inspected, tested and maintained on a regular basis. Regularly testing and maintaining your fire dampers can save lives.

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Code of Practice

BS 9999 fire damper maintenance legislation

With the enactment of the Regulatory Reform (Fire Safety) Order 2005, it is now the employer's responsibility to maintain their fire safety systems. BS 9999:2017 also states that: Arrangement's should be made for all fire dampers to be tested by a competent person on completion of the installation and at least annually, and to be repaired or replaced immediately if found to be faulty. Spring – operated fire dampers, should be tested annually and fire dampers situated in dust-laden and similar atmospheres should be tested more regularly.

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Code of Practice

Fire Safety Legislation Compliance

Fire dampers are installed within the duct system to prevent the spread of fire. If a fire breaks out and gets into your ventilation system are you sure that the condition of your fire dampers will not prevent them from fulfilling this essential role?

All fire safety systems must be regularly & professionally maintained to ensure the safety of building occupants - a faulty fire damper will not prevent the spread of fire.

Provision of an essential fire safety service should be considered whereby all your fire dampers will be cleaned, lubricated, drop tested and reset to ensure they are in good working order.

Faults such as damaged linkages can also be replaced.

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Code of Practice

What Is A Fire Damper Inspection Report?

A fire and smoke damper test completed by experts will provide you with a detailed report including;

- Photographic evidence
- Inventory of all tested Fire & Smoke dampers, including the location, damper number, damper result and if the damper failed then we will also provide a detailed explanation and the corrective plan or actions taken.

Having your Fire Dampers tested regularly, allows you to have peace of mind that your fire system is working and in order, highlighting any issues along the way and allowing you to make plans for replacements and upgrades over a scheduled period. Giving the highest priority to preventing the spread of fire should the worst ever happen.

According to the BS 9999 fire damper legislation, you must ensure that your fire dampers are repaired or replaced immediately if found to be faulty. It is highly recommended that you create a maintenance plan to help you budget and schedule repairs, ensuring your fire dampers remain in a fully working condition.

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Code of Practice

Whose Responsibility Is Fire Damper Maintenance?

According to the Regulatory Reform (Fire Safety) Order 2005, it is the employer's responsibility to maintain their fire safety systems. If you run a business or own a building it is your responsibility to book regular fire damper tests and ensures that a proper maintenance plan is followed.

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Handover Documentation

No.	Question	Guidelines	Responsibility
01	Are the dampers the correct type?	Confirm the damper is the correct type i.e. Fire, Fire/Smoke, Curtain type, Single/Multi Blade type, etc.	System Designer.
02	Are the dampers correctly identified?	Any unique system identification or plant item number must be clearly indicated on the damper or agreed location.	System Designer or Commissioning Engineer
03	Are the dampers located correctly?	The damper position shall be dimensionally checked against the installation drawings / details.	Damper Installer.
04	Have supports for both the damper and adjacent ductwork been installed in accordance with the approved method?		Damper Installer.
05	Are the dampers fitted in the correct orientation?	Is damper installed the correct way up and relative to airflow / access?	Damper Installer.
06	Is access, through the ductwork, to the damper unobstructed?	Unobstructed space shall be provided for safe access to damper. Also consider access through ceiling voids and adjacent services.	Damper Installer to advise System Designer if problems are foreseen.
07	Has the space around the damper, and within the penetration, been left clear and not been used for the passage of other services?	The presence of other services will invalidate the installation method.	Damper Installer to advise Lead Contractor if problems are foreseen.
08	Using the access opening provided, has the damper been left in the open position?		Damper Installer.
09	Has the dampers blade catch been released to simulate failure of thermal release mechanism (damper 'drop test').	Ensure blade operation is free from interference.	Damper Installer.
10	Has the damper been checked for internal cleanliness and freedom from damage? Are vertical casings in particular free from debris?	With the damper in the closed position inspection for damage.	Damper Installer.
11	Have the dampers blades been re-set following the drop test and the access panel replaced?	After re-setting the damper blades, check position shown on blade position indicator is correct.	Damper Installer.
12	At the time of the damper handover, is the fire barrier and penetration seal complete?	Damper installer to record, on the handover register, if any following trades have still to complete their activities.	Damper Installer.
13	Is the damper installation completed and available for handover prior to system commissioning?	Obtain relevant acceptance of the damper installation from the CDM coordinator	Damper Installer.
14	Is the completed handover register cross referenced back to the identification codes listed in the system designer's damper schedule?		Damper Installer.

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