Fire Damper, Firestopping & Cavity Barrier Inspections
in Healthcare Buildings

First Edition January 2024

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GOLDEN THREAD
Passive Fire Protection

FIRE DELAY

Acknowledgements

The following are thanked for the production of this document:
NAHFO London Working Group: Robert Blake, Mazin Daoud, Peter Glossop, Lee Harvey, Alan Oliver, Mike Ralph, Martin Stevens, Colin Turner.

With valued contributions from:
Air Projects, Peter Aldridge, ASFP, Assured Fire Safety Consultancy, David Barclay, Calfordseaden, Mark Chinery, Paul Church, Consort Insurance, Callum Craig, Moe Elmasry, Geoff Fieldsend, Neill Files, FSi Promat, Neil Green, Neil Griffiths, Patrick Heaney, IHEEM, Chris Ingram, Tim Jackson, Tina Jolliffe, Sem Kneeshaw, London Fire Brigade, Gary Martin, John McKenzie, Alan Nash, NHS England, NFCC, Nullifire, Ian Outram, Steve Patterson, Megan Percy, Gary Price, Protecta, Quelfire, Paul Riley, Safelincs, Jemma Scott, Liam Sutton, Shaun Sutton, Jason Thomson, John Tindell, West Sussex Fire & Rescue Service, Paul White, Nigel Williams, Phil Williams, Sam Williams & Brian Wylie.

Background

The National Association of Healthcare Fire Officers (NAHFO) is an organisation that acts as a national voice for all those associated with healthcare fire safety.

Having identified that there were no recognised or adopted ‘cradle to grave’ standardised systems for inspecting and managing fire dampers, firestopping or cavity barriers in healthcare buildings, a NAHFO London Working Group was formed in July 2022 to write a paper intended to assist in the development of systems for doing so. With the help of a robust peer review, a final version of the paper was agreed in November 2023 and the words have been used as the basis of this Reference Document with the intention of sharing healthcare building fire damper, firestopping and cavity barrier inspection best practice to a wider audience.

The First Edition was published in January 2024.

Foreword

The National Fire Chiefs Council (NFCC) has always promoted the critical role that compliant fire compartmentation plays in protecting us when we are asleep and when we are at our most vulnerable. Recent tragic events have yet again reinforced the important role that fire dampers, firestopping and cavity barriers have in saving lives and protecting property, which is especially important in healthcare premises when they are correctly designed into the fire strategy. Healthcare premises are buildings where we expect people to be safe and protected from fire and this guide will help ensure that fire compartments play a key role in that expectation.

This guide will assist in ensuring that these key structural fire protection elements are correctly specified, procured, installed and well maintained throughout the life-cycle of the installation. It represents a positive step forward in fire compartment design, construction and maintenance and will assist both NFCC and NAHFO to continue to help healthcare landlords comply with regulation and crucially assist in keeping some of the most vulnerable people in our community safe from harm.

Mark Andrews
NFCC Lead Officer; Higher Risk Accommodation

NFCC
National Fire
Chiefs Council

The professional voice of the UK Fire & Rescue Service

How to use this document

Fire safety advisors, passive fire protection inspectors and other fire industry professionals will hopefully find the whole document of interest, but it is also intended to be read and used by a cross-section of those whose involvement with fire dampers, firestopping and cavity barriers may only be brief, limited and incidental. For that reason, the information is split into 4 distinct 'easy to access and read' sections:

Section 1 covers newly installed fire dampers, firestopping and cavity barriers and their 'Type 1' inspections in healthcare buildings; so this section is likely to be of most interest to those involved in new build and major refurbishment projects involving the installation of new fire dampers, firestopping and cavity barriers, particularly for those with the responsibility of providing and receiving them in a compliant state.

Section 2 deals with different options and approaches for 'Type 2' inspections of existing fire dampers, firestopping and cavity barriers, often where very little written information regarding their specification, performance or fire compliance is available or may exist.

Section 3 deals with the ongoing, functional 'Type 3' inspections of fire dampers, firestopping and cavity barriers where they are known to be fire compliant to a suitable and sufficient standard for their location and usage, having already been either 'Type 1' or 'Type 2' inspected.

Section 4 deals with creating and sustaining robust Fire Compartment Management Systems for achieving and maintaining long term fire compartmentation compliance in a Hospital Trust or other healthcare organisation.

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0.1 Introduction:

0.2 Passive fire protection is an integral and important component of fire safety in buildings. Effective fire compartmentation is required to preserve life and protect buildings, their contents and other assets; often paramount in healthcare premises due to the varying dependency levels of occupants and the importance of its activities.

0.3 Fire and smoke resisting dampers and firestopping in fire walls, compartments and sub-compartments, together with cavity barriers in hidden voids, play a crucial role in controlling and restricting fire, heat and smoke spreading from its source uninhibited; also in achieving the required degree of containment and thereby ensuring the fire evacuation strategy of a building can be undertaken with life safety risk and disruption, including critical care, minimised.

Image courtesy of Chris Ingram

0.4 The term **'fire damper'** is defined in 'Approved Document B, Fire Safety Volume 2, Buildings other than dwellings' as: *"A mechanical or intumescent device within a duct or ventilation opening that operates and is designed to resist the spread of fire."* They are typically fitted to prevent fire, and in some cases smoke, from leaving one fire compartment and entering another.

Images courtesy of Air Projects

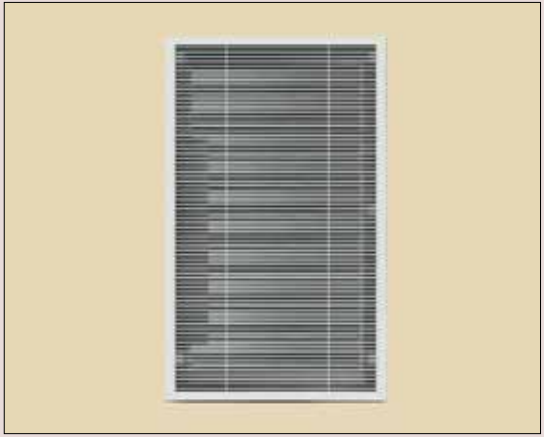
There are four main generic types:

i. Fusible link, spring operated; also known as 'manually resettable' fire dampers: These activate when a low melting metal 'fails' at a given temperature, usually 72 degrees C, allowing a spring, or sometimes gravity, to close an internal shutter, thereby closing the duct and restricting the passage of air, fire and smoke. **These dampers are commonly referred to and abbreviated as FDs.**

ii. Electrically operated (motorised) fire dampers: These dampers are normally operated by an electric motor and usually activated by an automatic signal from the fire alarm and/or an internal duct smoke detector, when they 'spring return close' and remain closed. They normally provide a barrier to both fire and smoke and are commonly specified and used for the protection of escape routes and sleeping areas. They are commonly referred to as 'fire and smoke' dampers, but this is a misnomer as they are fire dampers with reduced smoke leakage when closed and are not for complete smoke control. **They are referred to and abbreviated as MFDs.**

Images courtesy of Air Projects

iii. Smoke control dampers: These dampers form part of a smoke control system; closing to maintain compartmentation and opening to allow the passage of heat and smoke. They have 'drive open / drive close' actuators and no fusible links. They work under a smoke control 'cause and effect' schedule and it is not known until there is an incident which are to open, remain open or close. They have a different set of standards to fire dampers and different selection criteria. They are not 'fire and smoke' dampers and should not be used for this application. **They are referred to and abbreviated as SCDs.**



iv. Intumescent dampers: These operate by thermal activation of an intumescent material within the damper, which expands to completely fill the opening. Activation and expansion is dependent on the temperature at which the material expands, combined with the damper reaching the required temperature. Other limitations are that they cannot be cleaned and may dissolve with moisture.

Images courtesy of Air Projects

0.5 The term **'firestopping'** (also known as 'fire sealing', 'linear gap sealing' and 'penetration sealing') is used to describe the sealing of service penetrations, openings, joints and other gaps and imperfections, with proprietary products and systems, to reinstate or achieve a required level of fire resistance or an adequate smoke seal to the integral structure of a building, mainly intended to prevent the passage of fire and smoke.

Image courtesy of Golden Thread Fire Delay

Image courtesy of Nullifire

0.6 The term **'cavity barrier'** is used to describe any construction, material or system provided with the intention of sealing a cavity against the penetration of fire and smoke and / or to restrict its movement within the cavity, preventing fire and smoke spread.

Images courtesy of Golden Thread Fire Delay

0.7 Fire dampers and firestopping are often hidden away in voids and within the substrate of the building, as are cavity barriers, and this can sometimes prove to be a challenge in having them robustly inspected. The ways in which they can and should be inspected can also be manifold and complex, influenced by a number of factors including their type, age and criticality in terms of location, combined with the size, function and fire evacuation strategy of the building. It is very important that these critical life safety components are understood and correctly specified, procured, inspected and maintained if buildings are to perform as expected, should fire break out. By their very nature they are 'passive' until there is a fire, and only then will their fire performance in-situ be demonstrated.

0.8 Their method of inspection can be classified into three generic types:

Type 1: A prescriptive one, including invasive elements, that would typically take place soon after the dampers, firestopping seals and cavity barriers have been installed, or during the installation process, to identify if they are as specified and intended to meet Building Regulation, Healthcare and other required standards. The inspection would normally methodically compare what has been, or is being, installed with their specification details and the manufacturer's sponsored UKAS or equivalent evidence of performance to confirm compliance or raise any issues.

Type 2: A robust but potentially pragmatic and flexible one, which could be purely visual or may contain invasive elements, typically carried out on existing fire dampers, fire seals and cavity barriers in occupied buildings where there is often no evidence of performance and where no, or little, information exists. This type of inspection is to comply with the Regulatory Reform (Fire Safety) Order 2005 (hereafter referred to as the FSO), assessing if the condition of these elements of fire compartmentation are suitable and sufficient in terms of meeting and maintaining the requirements of both the building's fire risk assessment and its fire evacuation strategy to protect relevant people and ensure safe evacuation or protection in the event of a fire.

Type 3: Undertaken on fire dampers, fire seals and cavity barriers that have already been Type 1 or Type 2 inspected, where they are known to meet / have met the standard of fire compliance required and where an audit trail exists. This type of inspection is intended to ensure that suitably compliant fire compartments are maintained to a recognised, functional standard, to comply with the FSO, under Articles 17 and 38, which require that structural fire components and other life safety systems are suitably managed and maintained in an efficient and effective way to minimise life safety risk.

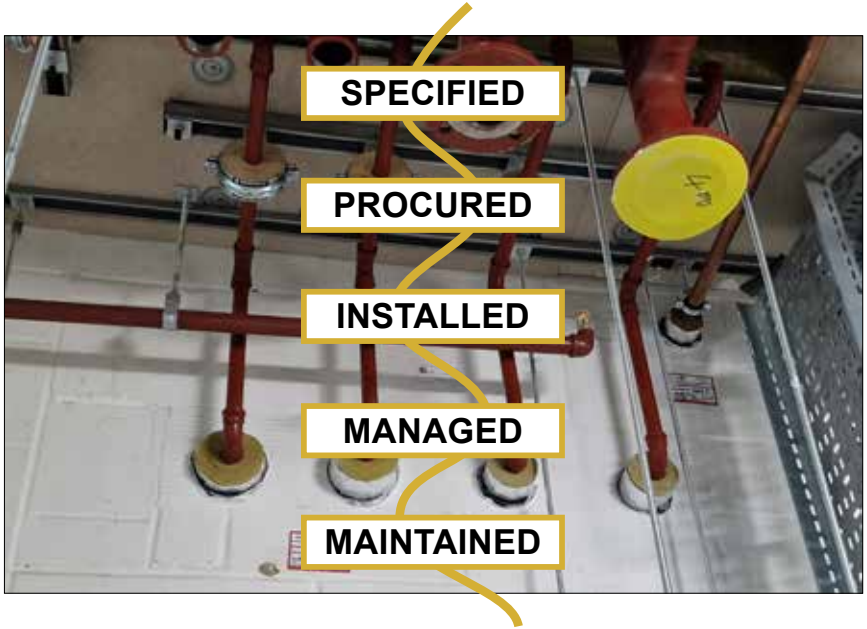
The 3 generic types of inspection procedures are outlined in this document.

0.9 Provision of plans, schedules and information:

Irrespective of what type of inspection takes place, there should be a full set of floor plans available, showing the location and intended rating and classification of fire compartmentation and individual, structural, fire safety components in the building. This should be in line with guidance on fire safety protocols in HTM 05-01 'Managing healthcare fire safety'. In older buildings, existing plans will often be out of date or even not thought to exist or be available; so, determining compartmentation boundaries and their required levels of fire resistance may need to be clarified.

0.10 All fire dampers, fire seals and cavity barriers should physically have a unique identifying number and related schedules should, where possible, include the manufacturer's name and reference to the relevant primary test evidence to which it should comply, along with other relevant information to meet the requirements of Regulation 38 of the Building Regulations and to effectively manage and maintain the components and overall fire compartmentation in compliance with Articles 17 and 38 of the FSO.

Image courtesy of Golden Thread Fire Delay



A golden thread of information should be in place for passive fire protection from 'cradle to grave'.

Image courtesy of Golden Thread Fire Delay

0.11 As per Dame Judith Hackitt's recommendations in her independent report following the Grenfell Tower fire (please see the Recommended Reading section) and to meet the requirements of the Building Safety Act 2022, all fire damper, firestopping and fire barrier inspections should be electronically recorded using software. Systems such as Bolster and Onetrace, that have the flexibility to accommodate the 3 inspection Types outlined in this document, should be considered, to create a 'golden thread' of information that can be used as the foundations of a robust electronic audit trail for managing remediation and future ongoing inspections. It will assist in their being maintained in a suitably compliant state in keeping with statutory requirements, ensure they do not deviate from product-specific BS EN tests, and that LPCB, FIRAS or equivalent independent Third Party audited certification, covering their fire compliance, remains valid.

0.12 This document provides risk-based guidance for those duty holders and other relevant persons with fire safety roles and responsibilities as outlined in the Fire Safety Act 2021, Fire Safety (England) Regulations 2022 and Building Safety Act 2022. Whilst much of the Building Safety Act 2022 applies primarily to high rise residential buildings, its remit is wide reaching, and elements, such as those relating to the role of the Building Safety Regulator (BSR), bolster fire safety rules and performance, imposing a much more stringent regime for building safety and compliance, including healthcare premises during the planning, design and construction phase.

0.13. Please note that the fire compartmentation referred to in this document includes 'main compartments' typically designed to provide 60 minute fire resistance, 'sub-compartments' usually designed to provide 30 minute fire resistance, and 'hazard rooms', 'protected routes', 'protected stairways', 'protected shafts' and 'cavity barriers' that may not align with compartment walls; all of which may have a fire resistance of 30 minutes, 60 minutes or greater – please see the 'Glossary of Terms' section for definitions and further guidance.

0.14. Please also note that the definition of 'healthcare building' in this document is *"any building used by the NHS and other healthcare providers"* rather than the narrower Firecode definition of *"a hospital, treatment centre, health centre, clinic, surgery, walk-in centre or other building where patients are provided with medical care by a clinician"*

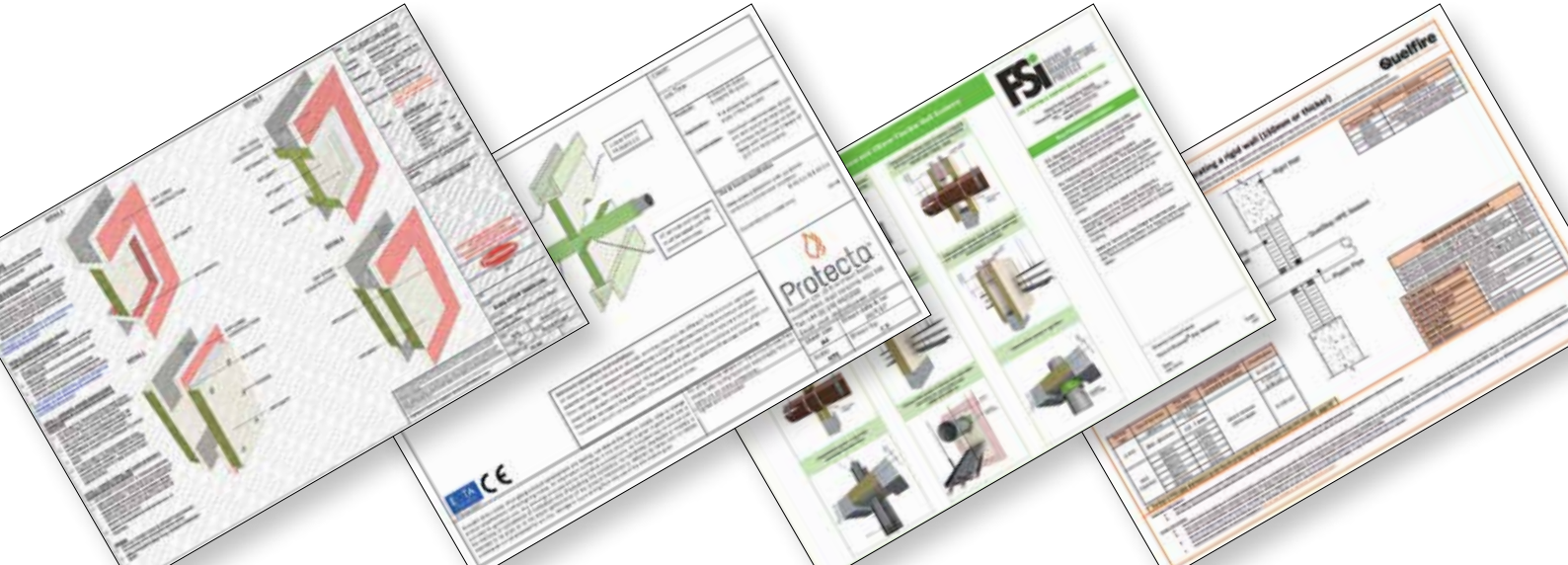
Warehouse used by an NHS Trust for storage.

Image courtesy of Golden Thread Fire Delay

Section 1; Type 1 Compliance Inspections of NEW Fire Dampers, Firestopping & Cavity Barriers

1.1 If the fire dampers, firestopping systems and cavity barrier materials are manufactured and installed under Third Party Certification Schemes and procured in line with Firecode HTM 05-02 and any special requirements for their location, then the standard should be satisfactory, as both the manufacturers and installers will systematically have a percentage of their production and work subjected to regular audits, inspected by the Certification Body using a comprehensive inspection form and calibrated measuring tools. However it should be noted that at present there are few Fire Damper and Smoke Control Damper installer schemes or certified installers.

The respective manufacturer's latest design and fire test drawings and installation details are normally used as a reference as to how they should have been manufactured and installed. The inspection of each element by the Certification Body should be both detailed and robust and installed products under such schemes should have labels to identify their ratings (classifications) and who manufactured and installed them so that full traceability is possible.



1.2 Certification Body standards and best practice requires the creation of a number-referenced schedule for each installed element (asset) with an applicable installation detail. Certification Bodies do not audit every install, so a comprehensive commissioning process should be used to confirm the installs against the schedules.

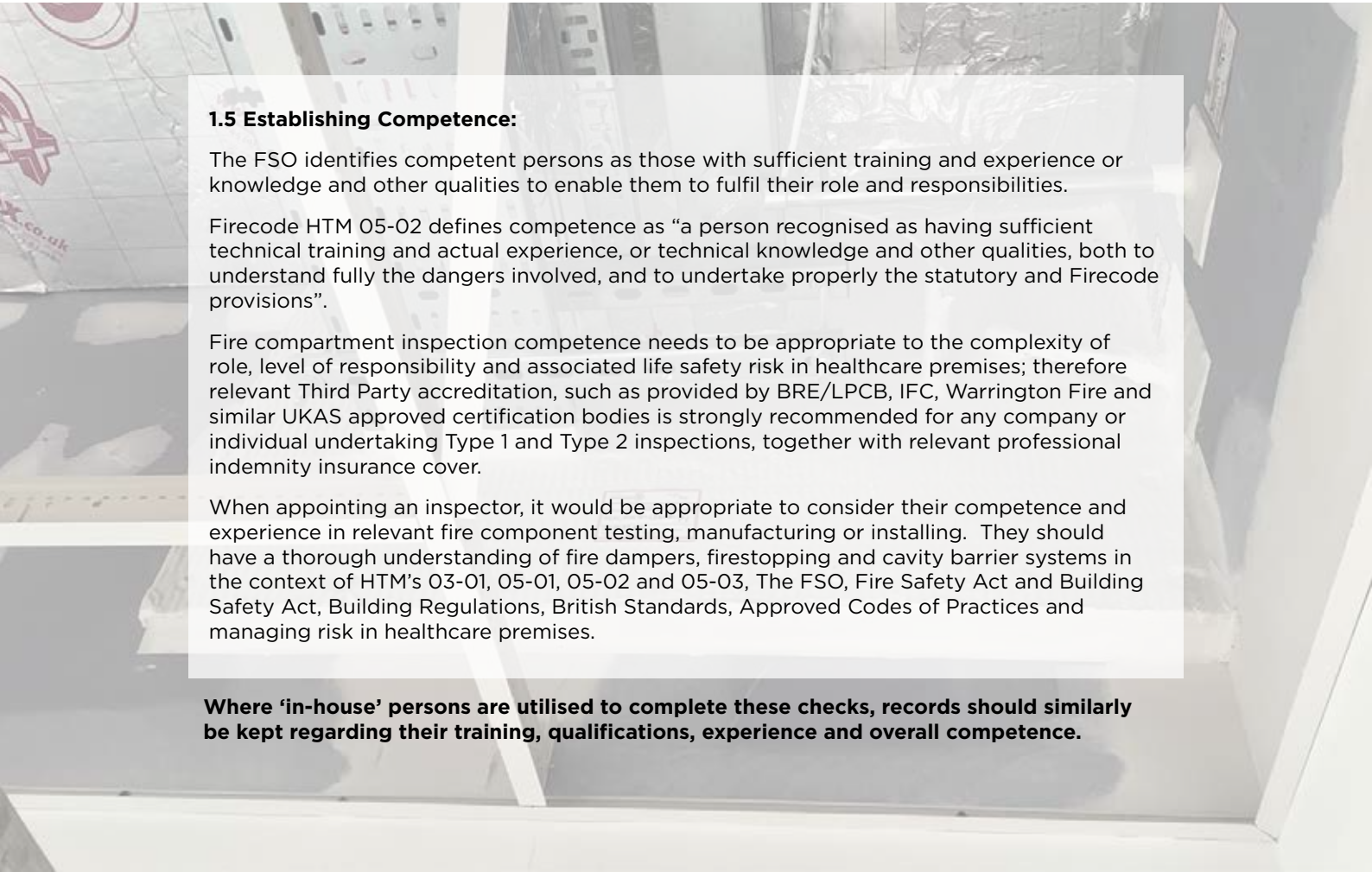
Certification Bodies require a reference schedule containing each installed element.

Image courtesy of Golden Thread Fire Delay

1.3 It may be prudent for those responsible for the building handover, preferably at an early stage in the installation process, to do spot checks to verify that everything is to the Scheme standard. This could include invasive checks that would be difficult to conduct later due to them being hidden away in voids. It would also be appropriate to ensure that a complete electronic 'audit trail' has been compiled, as described in 1.2 above, including valid test evidence in the manufacturer's current scope of approval, together with a UKAS or equivalent Certificate of Conformity for the installation, in a format easily accessed and user friendly, providing a 'golden thread' of information necessary for ongoing 'Type 3' inspections.

1.4 If the installers are not in a Third Party certification scheme then inspections to a similar standard will be required by someone with the competence to do so. This should be agreed and arranged at the procurement / pre-tender stage so that they can commence during the build contract, as checking purely at handover is too late to deal with many potential non-compliance issues.

N.B. No invasive (destructive) inspection should take place without the required skilled personnel and equipment available to immediately rectify the damage caused. It is a breach of the Building Regulations to knowingly leave a building element in an unsafe condition due to deliberate, planned actions or activities.



1.5 Establishing Competence:

The FSO identifies competent persons as those with sufficient training and experience or knowledge and other qualities to enable them to fulfil their role and responsibilities.

Firecode HTM 05-02 defines competence as "a person recognised as having sufficient technical training and actual experience, or technical knowledge and other qualities, both to understand fully the dangers involved, and to undertake properly the statutory and Firecode provisions".

Fire compartment inspection competence needs to be appropriate to the complexity of role, level of responsibility and associated life safety risk in healthcare premises; therefore relevant Third Party accreditation, such as provided by BRE/LPCB, IFC, Warrington Fire and similar UKAS approved certification bodies is strongly recommended for any company or individual undertaking Type 1 and Type 2 inspections, together with relevant professional indemnity insurance cover.

When appointing an inspector, it would be appropriate to consider their competence and experience in relevant fire component testing, manufacturing or installing. They should have a thorough understanding of fire dampers, firestopping and cavity barrier systems in the context of HTM's 03-01, 05-01, 05-02 and 05-03, The FSO, Fire Safety Act and Building Safety Act, Building Regulations, British Standards, Approved Codes of Practices and managing risk in healthcare premises.

Where 'in-house' persons are utilised to complete these checks, records should similarly be kept regarding their training, qualifications, experience and overall competence.

Image courtesy of Golden Thread Fire Delay

The image above, of a cavity barrier installed in the ceiling void of a Critical Care Unit, is an example of supply chain and handover inspection incompetence. Please note:

I. Inappropriate use of flammable polyurethane foam used to seal gaps

II. Coated batts inappropriately installed with no mechanical support and edges not sealed

III. Fire dampers not installed to a fire tested detail and not mechanically supported

1.6 The following provides details of what the 'Type 1' inspection process of Fire Dampers should include, based on BESA DW145:

This would typically be completed at the ventilation system validation stage of the project in accordance with HTM 03-01 'Specialised ventilation for healthcare premises' and the fire management guidance within HTM 05-01. However, the inclusion of the Trust Ventilation Authorising Engineer AE(V) and Trust Fire Officer at design stage will help to ensure that the original design is suitable, sufficient and compliant.

The validation and handover process, checks for installation and performance against the prevailing and applicable guidance and the design for the project. It is recommended that the design and coordination of services through good CDM 2015 management is validated at concept and design stage to ensure minimal risk of compliance issues at final handover validation. There should be a clear and comprehensive schedule of installed fire dampers and smoke control dampers detailing manufacturer, size, type, model reference, power and control details, substrate type, compartment barrier application, a reference to the installation method (drawing and specification) and fire resistance classification within the handover documents, which clearly cross reference to each individual damper location on the final 'as installed' drawing. As a critical part of the 'golden thread' of information, this is required and should be retained for the lifetime of testing and maintenance of the damper.

1.7 Pre-installation inspections that should take place include ensuring that the dampers are in good condition, are being stored where they are protected from moisture, dust and impact damage until installation occurs, and that transit tape is removed.

It needs to be ensured that the structure is sufficiently supported to conform to design specification.

1.8 Condition and suitability of supporting walls: Regarding the testing of fire dampers; huge numbers have been installed in fire rated plasterboard walls; however, some manufacturers may not have had their dampers tested in drywall construction. This is particularly true of single sided wall constructions, which are non-standard under the testing regime. Assessments are rare for non-standard / untested installation methods and it is critical that for future projects Trusts ensure at design or tender stage that there is certification to support their unique building project installation details. The designer must understand they are responsible for any deviations from standard practice as defined by the manufacturers and approval by AHJs does not protect them from litigation.

Dry wall openings must be 'lined', i.e. formed in accordance with the damper manufacturer's tested detail, and the sub structure should be constructed such that the fire damper fixing frame can be securely fixed through the plasterboard into a solid structure. The wall structure should form a structural "picture frame" in which to fix the fire damper mounting plate; please see image opposite:

Some dry lined walls will have specific maximum loadings and these should also be considered if they are required to support a damper and/or other services.

1.9 It needs to be ensured that the correct materials and fixings are used to connect the ducting to dampers. In some instances they are designed to fail at relatively low temperatures so that the ductwork can detach from the damper rather than pull it out of line if and when it sags due to effects of fire and heat. Self-drilling screws must not be used or tolerated.

Prepared openings for services in a dry-lined partition fire wall.

Image courtesy of ASFP

1.10 Fire Damper Inspection CASE STUDY:

The following inspection of fire dampers, as described by their Fire Safety Manager, was undertaken at a London Hospital NHS Trust during the commissioning of a new building in 2022 and is offered as an example of best practice:

"Importantly the Fire Safety Team were involved from the outset, including pre-start arrangements such that:

- *the dampers were to be delivered to site in batches, whereupon they would be inspected for damage by the installers.*
- *they were to be stored in a secure, dry, dust free room until installation.*
- *the firestopping was to be carried out by an accredited firestopping company employed by the main contractor.*
- *results were to be recorded electronically by the installers to form part of the 'golden thread' documentation handed over on completion.*

All of these arrangements took place.

We discussed and asked for inclusions and amendments to the fire strategy. We undertook regular site visits and attended regular meetings with the main contractor and sub-contractors. When the fire safety systems were installed, we checked the layout. This was an extremely useful process which resulted in, for example, obstructed sprinkler heads having to be re-positioned, VADs installed as per the fire alarm plans and the re-positioning of dampers as per the plans, or in addition, because of alterations to the layout. We witnessed the operation of both motorised fire and smoke dampers (MFSD) and thermally operated dampers commonly known as 'fusible link'.

Stage 1 inspections MFSD:

These took place once the dampers were in position and before the suspended ceilings were installed. I was accompanied by representatives of the main contractor, an independent MEP representative appointed by the Trust, and the company responsible for the installation of the dampers. I was armed with plans / schematics, steps, torch, note pad and camera.

The inspections involved:

- *Ensuring the dampers were installed in the correct position on the compartment line and properly supported.*
- *Checking that firestopping had been correctly installed in accordance with the manufacturer's detail drawings using previously approved products.*
- *Ensuring the access panels were suitably positioned to enable testing and maintenance.*
- *Ensuring the dampers were labelled with the correct references.*
- *Removing the access panels.*
- *'Commanding' the dampers to close via their actuator (testing that the electrical circuits were completed, tested and energised).*
- *Watching the indicator LED and the closing of the damper (ensuring that the direction of rotation was correct).*

- *Commanding the damper to go back to its design position.*
- *Documenting the result of the test.*

Thermally operated fire dampers (fusible link):
Completing the first 5 checks detailed above, plus …
- *Manually operating the damper to ensure it operated correctly.*
- *Resetting the damper to its original position.*
- *Documenting the result of the test.*

Stage 2 inspections:
These took place as part of the fire alarm commissioning and checking the 'cause and effects', this time accompanied by representatives of the main contractor, Trust MEP representative and the fire alarm installation company, armed with the same items as previously.

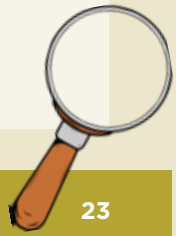
Our inspection involved:
- *Ensuring the inspection hatch was large enough and in the right location to allow inspection, testing and maintenance.*
- *Activation of the fire alarm system in different zones.*
- *Checking that the dampers had activated in accordance with the 'cause and effects', either visually or by listening to the motor functioning.*
- *Ensuring that the damper returned to its dormant position when the fire alarm was reset.*
- *Recording any failures.*

It was also identified at this time that additional services were installed in the ceiling void, which presented an obstruction to some inspection hatches. Recommendations were made, and this resulted in further inspections being undertaken by the Trust's Fire Safety Team to give sign-off.

All ceilings were in place at this stage and it was identified that some ceiling inspection panels were missing, which was communicated to the main contractor to correct.

With all new buildings, there is always the possibility of 'value engineering' being employed at some stage as part of a cost saving exercise during the build when costs start to spiral, and although the Fire Safety Team where heavily involved in the project, it is only after the soak period and during the first maintenance schedule starting that the true extent of any short cuts may become apparent.

At this time, we are experiencing several issues with motorised dampers showing faults on the graphic package, these include:
- *Reports of dampers opening and closing for no apparent reason.*
- *Broken thermal back-up links in motorised dampers.*
- *Increased pressure in rooms that make the opening of the door to the room more difficult when testing of dampers take place.*



1.11 Please note that Table 7 in HTM 05-02 gives guidance on where various types of dampers should be installed in specific locations of Healthcare Buildings.

	Fire and smoke damper activated by AFD	Fire damper (Thermal activation)	Air transfer grille – cold smoke (activated by AFD)	Air transfer grille (thermal activation)
Compartment floor	✓	X	X	X
Compartment wall	✓	X	X	X
Protected shaft	✓	X	X	X
Sub-compartment wall	✓	X	X	X
Cavity barrier	✓	✓	N/A	N/A
Fire hazard room	✓	✓	✓	X
Door to fire hazard rooms	N/A	N/A	✓	X
Doors in sub-compartment walls	N/A	N/A	✓	X
Doors in compartment walls	N/A	N/A	X	X
Doors to protected shafts	N/A	N/A	X	X
Notes: Fire smoke dampers and air transfer grilles activated by the fire alarm provide more responsive containment than thermally activated devices and are considered preferable. Air transfer grilles should not be fitted in fire doors unless accompanied by a test certificate provided by the door manufacturer.				

Table 7 Permissible locations of transfer grilles, fire dampers, and fire and smoke dampers

1.12 Fire Resisting Ductwork:

Fire dampers should not be installed within certain ductwork systems such as for kitchen extraction and lift shaft ventilation.

An alternative way for ductwork to breach a fire compartment without compromising fire resistance is for the ductwork itself to be fire resisting for a prescribed period of time. This can be achieved either by proprietary fire tested ducting systems or by cladding standard ducting and its supports with fire resisting materials, backed by fire test evidence. In healthcare buildings the period of fire resistance is normally required to be at least equal to the structural elements penetrated.

Where fire dampers are connected to a fire rated duct, designers should verify that the combined installation has been appropriately tested in accordance with BS EN 1366-2.

Comprehensive guidance is available in the ASFP's Blue Book, 'Fire Resisting Ductwork'.

Top image: Proprietary fire resisting ductwork.
Image courtesy of the ASFP

Ductwork made fire resisting by cladding with foil faced mineral wool board.
Image courtesy of Paul White

1.13 Type 1 Firestopping compliance inspections:

Reputable manufacturers of firestopping materials will have their products tested and verified by a UKAS, or equal, accredited Third Party Body.

Penetration systems for sealing walls should be tested to BS EN – 1366-3:2021 and plasterboard walls should be constructed also in accordance with guidance from BS EN – 1366:2021. All designed fire resisting walls are currently required to have a Fire Classification and be Fire Resistance Tested in accordance with BS EN - 13501 pt 2.

Approved document HTM 05-02 states:
1.27 There are many UK product certification schemes. Such schemes certify compliance with the requirements of a recognised document which is appropriate to the purpose for which the material is used. Materials that are not certified may still conform to a relevant standard.

1.28 independent schemes of certification and accreditation of installers and maintenance firms can offer confidence in the standard of workmanship provided.
***Regulation 7 of the Building Regulations** states that materials must be adequate and proper, adequately fixed and in a workmanlike manner.*

1.14 The use of installers who are in UKAS-member Third Party accredited schemes for firestopping, although not a legal requirement, will offer confidence in the standard of workmanship provided. Such schemes require that fire stopping is fitted in accordance with a manufacturer's specification.

In the case of newly fitted fire and smoke seals, one would expect to be provided with either a certificate or details of the seal including materials used. **This is a mandatory requirement to comply with Regulation 38 of the Building Regulations.**

There is no legal requirement to use the services of Third Party accredited contractors, but If non Third Party accredited installers are utilised, there is a legal requirement that they are competent to complete the work, as defined above. It is important that:

- Details of competence such as records of training, knowledge and experience are checked.
- A sample of the work is checked at handover, by someone competent to do so, to confirm that it is in line with manufacturer's technical details insofar as is possible; suggested minimum 5% sample providing there is confidence that service apertures have been suitably designed (as outlined in the following point 1.15).
- Records are kept of points 1 and 2.

1.15 Wherever possible, firestopping installations should be based on primary test evidence as shown in supplier's standard test detail drawings. Engineering judgements, 'permitted field of application' documents, product evaluations and non-standard solutions such as sealing around fire dampers that are not directly installed on the fire compartment line for restrictive reasons, should only be undertaken as a last resort and under discretion and agreement in writing by those with responsibility for the building's fire safety.

Products and installers should be selected at the project design stage; ideally with only one Third Party certified manufacturer's system, only one Third Party installation specialist being used throughout, and the building's fire and acoustic performance requirements being shared as early in the process as possible to avoid unnecessary changes in design.

One person in the project team should be made accountable for delivering compliant firestopping and auditing the process from conception to handover, with other individual responsibilities being agreed from the outset to remove grey areas and ambiguity.

3D BIM modelling should be used to design service openings, with each penetration given a unique reference and setting-out position to allow them to be constructed and formed to the right size in the right location.

To ensure design compliance, every intended penetration must be reviewed at the design stage by a firestopping specialist to ensure that such factors as spaces between individual services match fire test evidence; also that potential issues such as the chemical incompatibility of some sealants with C-PVC sprinkler pipes is addressed.

To ensure compliance, the installation sequence must be that those forming the apertures sign them off to the M&E contractor, who in turn sign them off to the firestopping company; **however, some firestopping may be required during M&E installation, especially during the installation of ductwork and dampers, to ensure that necessary sealing can take place when access is available.**

The firestopping installation company may be required to install fire rated insulation to some pipework, 500mm either side of compartment walls. It also needs to be determined who is responsible for ensuring that all services are adequately supported within 500mm of compartment walls.

1.16 Pre-installation verification:

Prior to commencement of work, a review should take place to confirm that no alterations to the design have been made that might affect the drawings and hence the products and components to be installed. If alterations have been made then these need to be assessed by a suitably qualified person e.g. a representative of the fire stopping manufacturer, a fire safety engineer, a certification/testing body, a consultant working for the installer or any combination of these.

Confirmation should be sought to ensure that the installation company is to produce a Firestopping Schedule, which should identify each individual installer by name, the seal locations, classify them as types and materials used, their dimensions, if they are all within the remit of a fire test detail drawing and 'before' and 'after' photographs of the seal.

Verification of individual operative competence should be sought if the installation company are not members of a Third Party installer scheme.

Planned and random inspection of installations should be carried out during installation to ensure that seals are being installed in accordance with the installer's approved method statement and the manufacturers' installation instructions. It is also necessary to ensure that handover documentation will provide all required information including a register of seals, marked drawings, product information and certification to ensure that the firestopping can be managed and maintained, potentially for the life of the building.

Image courtesy of Golden Thread Fire Delay

1.17 A client inspection list of spot checks during installation to verify compliance could include:

1. Ensuring that the type, size and configuration of firestopping is covered by manufacturer's fire test evidence and that 'crowding' and density of services isn't invalidating fire test evidence.
2. Checking that openings in dry-lined walls are being correctly formed, trimmed and lined.
3. Ensuring that seals are being installed as per the specification, including that only one manufacturer's materials are being used as a fire tested system, all physical materials stored on site are 'in date' and the manufacturer's guidance details are being followed, such as all substrate and batt edges are being 'buttered'; i.e. sealed and pointed with acrylic mastic as per the manufacturer's instructions.
4. Checking the seal from both sides to ensure that details such as pattress fixings, when applicable, are symmetrically compliant.
5. Investigating if the work is being carried out under a Third Party installer scheme, and if not, what evidence is being provided to establish operative competence.
6. Ensuring that all installation information, including photos and a unique seal number, is being captured electronically by the installation team to ensure that a 'golden thread' of information is being compiled.
7. Checking that all services breaching seals are adequately supported, including approved fire tested fittings, within 500mm of the seal either side of the compartment wall.
8. If applicable, ensuring that firestopping is taking place in stages around ductwork and dampers in accordance with the damper's tested detail, so that access is possible for fire compartmentation to be correctly sealed.
9. Ensure intumescent closing devices are installed around combustible services in accordance with size, material type, diameter and pipe wall thickness stipulations. All closing device installations should be checked against the manufacturer's instructions.

Closing device fitted.

The finished seal.

Images courtesy of Golden Thread Fire Delay

1.18 As stated by the ASFP in TGD 17 (please see 'References and Further Reading') In particular, it is good practice to inspect frequently to ensure that inappropriate unauthorised modifications have not been made. Where modification occurs for the addition or removal of services, the fire penetration seal must be reinstated within the permitted field of application of the sealing system.

"It is good practice to inspect frequently to ensure that inappropriate unauthorised modifications have not been made".

Image courtesy of Golden Thread Fire Delay

A client list of spot checks at handover to verify compliance could include:

- That additional retrofitted services have been adequately sealed to a fire-tested detail and have not compromised the performance of other seals.
- That all services breaching fire walls have been installed and all penetration seals are complete and labelled.
- That any temporary seals, for example using intumescent pillows, have been replaced by the intended permanent seal.
- That all handover documentation has been provided in compliance with Building Regulation 38.

1.19 Handover Register (Inspection sheet):

To both ensure compliance with Regulation 38 and give guidance as to what documentation is required at handover, it is recommended that the specification of a Handover Register is agreed with the Main Contractor prior to the works being awarded.

The completed Handover Register is the final document containing all information for the fire stopping works completed, which will be kept in the Safety File with other Regulation 38 details for the building. This should present an inventory list of the firestop seals with all supporting information to confirm compliance. The list should be detailed with the following information:

- Each location where a firestop has been installed should be itemised with a unique number (code) and 'before' and 'after' installation photos taken.
- There should be basic information for the material and type of fire stop used.
- Certifications of compliance for all fire stopping materials used should be provided as an appendix to the Handover Register. This is for the purpose of accommodating any further maintenance and repairs.
- Each installed fire stop should detail its period of fire resistance (in terms of both fire integrity and heat transfer insulation).
- Horizontal seals forming a barrier should detail their load-bearing capability.
- As far as practical, detailed locations should be given for each fire stop. Where multiple simple fire stops of identical type are installed in a small area, they can be served by a single label provided the area is not exceeding 2m in horizontal direction and the number of fire stops is identified on the label.
- Date of installation.
- Name of installer and company name.
- Certificates and installers accreditations or other evidence of competence should be provided.
- Copies of the installer quality check inspection sheets.
- Statement of satisfaction with the compliance standard from the installer.

1.20 The ASFP's '9 Golden Rules', herewith, can be seen as a useful guide to facilitate compliance throughout the installation inspection process:

1. *Ensure an early engagement with firestopping manufacturers and specialist installers.*
2. *Review the fire strategy documents and fire strategy plans in conjunction with the M&E specifications.*
3. *Identify all of the service types passing through the compartment floor or wall including any insulation products. Establish the space required to install and firestop the services.*
4. *Follow the 'Design process for penetration seals'.*
5. *Only select firestopping products which are Third Party certified by a UKAS accredited organisation. Firestopping products should be certified or CE marked and tested using the relevant standards.*
6. *Ideally select one firestopping manufacturer throughout the project. Products from different manufacturers should not be mixed in the same opening unless there is clear test evidence to substantiate their use.*
7. *Request copies of the Third Party certification from the manufacturers. These should be reviewed by a suitably qualified person to ensure the certification and field of application is relevant for the situation.*
8. *Ensure the installers of ALL service penetration seals are Third Party certified by an organisation such as FIRAS, LPCB, IFC, BM TRADA etc.*
9. *Implement a structured inspection plan to include photographic evidence as the work proceeds.*

Ensure adequate provision is made to access above and around services to install penetration seals.

Image courtesy of the ASFP

1.21 Linear Gap Seals:

Linear gaps occur where different elements of a building interface and this is where non-compliance issues are particularly prevalent, especially if the interface detail hasn't been designed and responsibility for the gap is ambiguous. Firestopping requirements must be expertly determined, considering a number of factors such as the required level of fire resistance and how the interfacing components might behave in a fire, in terms of expansion and deflection, to guarantee compliance. The attainment of fire compliant linear gap seals can be problematic if the passive fire protection of a building has been fragmented into different sub-contractor's work's packages. The responsibility for the linear gaps must therefore be unambiguously allocated by the Principal Contractor.

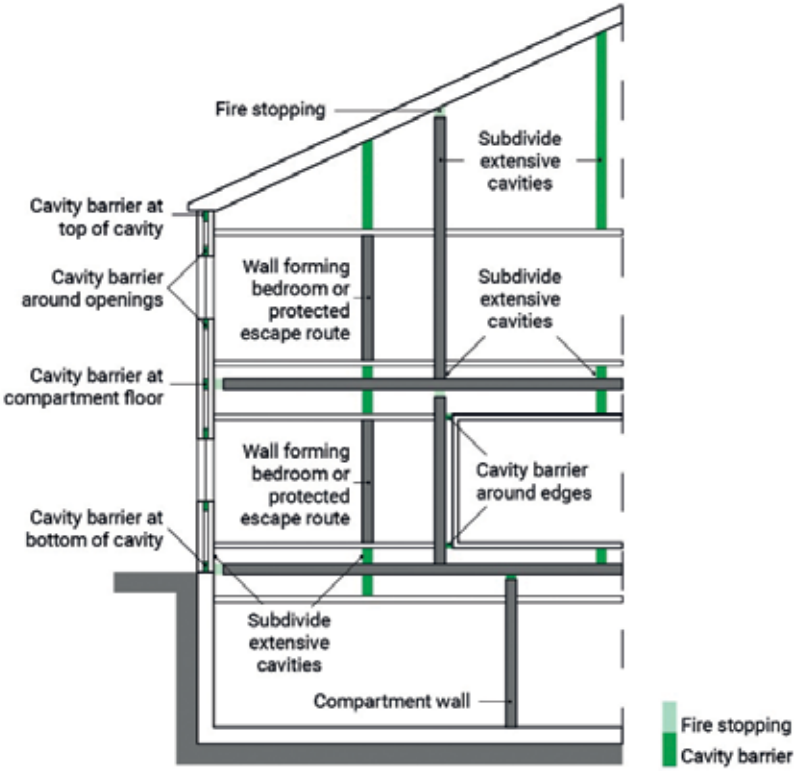
Image courtesy of Golden Thread Fire Delay

Robust QA standards and inspections are required to ensure products are only installed as fire tested and that the correct type of intumescent mastic is specified for each application. Third Party Accreditation for both product and application is a key requirement:

- Acrylic mastics are the most widely used, but also the most basic in terms of fire performance.
- Silicone mastics are waterproof and generally more flexible – they should be used in cavity voids and other areas where thermal movement of the structure and moisture may occur.
- Graphite mastics generally have both a high expansion capability and the ability to exert pressure. They should be used around cables and small plastic pipes as they will displace and dam penetrations as such services melt.

1.22 Type 1 Cavity Barrier compliance inspections:
Fire and smoke compliant cavity barriers are essential in some locations in healthcare premises to inhibit the unseen spread of fire, smoke and heat within concealed spaces. Typically, cavity barriers are designed and intended to prevent the passage of smoke, provide 30 minutes fire integrity and 15 minutes insulation.

1.23 Approved Document B, section 9.2, outlines that cavity barriers are to be provided both to sub-divide a cavity and to close the edges of cavities. The typical locations where these are required are given in ADB diagram 9.1 Provisions for Cavity Barriers, shown herewith:



1.24 In addition, Firecode HTM05-02, in paragraph's 5.58 to 5.67 inclusive, provides detailed information regarding specification requirements in healthcare buildings and departments including where they should NOT be located.

1.25 'As built' drawings of buildings need to be provided by the architect or builder to identify where the cavity barriers are to be located, together with full specification information, including fire tested fixing details.

1.26 Because some if not all barriers are located and hidden within the structure of the building, it is fundamentally important that those responsible for its fire safety satisfy themselves that those managing the project are fully aware of cavity barrier compliance requirements detailed in ADB and recommended in Firecode and that representative locations are inspected and details recorded by someone competent to do so during the installation process. A complete 'golden thread' of information, including photographs, is required to provide evidence of compliance; storing details within the building's 'fire file' so that the information can be located, accessed and used.

Raised floor cavity barriers being installed in a new build project.

Image courtesy of Golden Thread Fire Delay

1.27 Checks should take place during the design and procurement process to ensure that the barriers are of the correct materials and specification, factoring in such issues as building settlement, deflection, stability, shrinkage, thermal expansion and contraction, service breaches and fire rated fixings. This should be matched by physical inspections when installation takes place to ensure that what has been designed, specified and procured is being competently installed.

Such evidence may be required by stakeholders including Building Control, Local Fire Authority and insurance providers. In addition, spot checks should be undertaken of both installations and the QA process by a competent person on behalf of the Trust or organisation, as the building owner or manager is ultimately responsible for ensuring competent installations and provision of information in compliance with Regulation 38 of the Building Regulations.

1.28 In some locations, cavity barriers must be in line with compartmentation walls within the occupied areas so that compartmentation is complete from the storey level to the roof rafters and must be within 20 metres of the next barrier.

1.29 The fabric of the cavity barrier can be constructed of several different types of material providing it is fire tested as a system, Third Party certified and will hold back fire, heat and smoke for specified time periods. Where stud partitions are used, studding must be at least 0.5mm thick for steel or 38mm for timber.

Image courtesy of Golden Thread Fire Delay

1.30 Where ducts pass through cavity barriers, the correct type of fire damper should be specified, with the fire damper manufacturer's details followed regarding installation, support and firestopping around.

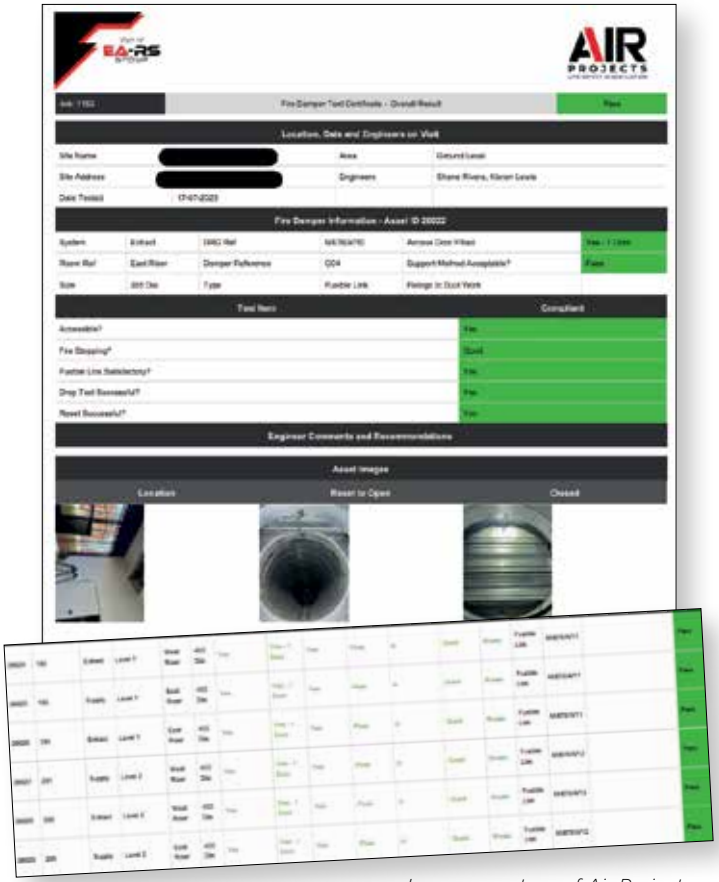
All cavity barriers should only be installed and sealed by Third Party accredited contractors, or those with proven competence to do so.

1.31 The Inspection of Documentation to Comply with Regulation 38

Ensuring that documentation to comply with Regulation 38 is robust and complete can be seen as an integral part of the Type 1 inspection and 'sign off' process on a new build project. As a guide, irrespective of what structural elements have been installed, the golden thread of information should include:

- A detailed description of the agreed and completed scope of works
- As built drawings, updated as necessary to accurately reflect what has been inspected and signed off at handover
- Product data sheets, including COSHH data and test certificates
- Installation reports
- Certification of works with a list of any caveats or other limitations
- Any agreed Warranties or Guarantees

The Principal Contractor should agree to provide all the above in a separate 'fire file' in advance of the commencement of works.



Images courtesy of Air Projects

Section 2; Type 2 Compliance Inspections of EXISTING Fire Dampers, Fire Seals & Cavity Barriers

2.1 Type 2 Inspections are undertaken on existing fire dampers, fire seals and cavity barriers, often where little or no information currently exists or is readily available. Such inspections play a vital role in a hospital Trust or healthcare organisation assessing its existing fire compartments in terms of fire compliance and understanding if those components falling below the required performance level have the potential to be remediated to an acceptable standard or need to be replaced.

2.2 They need to be carried out by competent persons (please see Section 1, 1.5), who in addition to knowing how to inspect new fire compartmentation in healthcare environments should also be thoroughly familiar with industry approved installation and repair techniques on existing structural fire components. The inspections should be recorded, preferably electronically, with a pass / fail criterion.

Competently assessing existing fire dampers, fire seals and cavity barriers, as with other fire safety critical components, is an important skill in the support of responsible spending, but crucially the level of inspection needs to be suitable and sufficient for the type and use of building and location (risk rating) of the fire compartmentation. Because the standard of inspection may be audited or questioned by other stakeholders, a written set of inspection protocols, outlining how the fire compartmentation should and has been inspected, is strongly advised, especially if the process is going to be undertaken by competent, internal personnel.

Type 2 inspections are likely to be the most onerous with regards to the research needed, as the inspector, or those who deemed them competent to undertake the role, may become directly accountable for the fire performance assessment. Relevant professional Indemnity insurance is therefore recommended and evidence of such should be obtained by the Trust or healthcare organisation before such inspections take place.

Image courtesy of Golden Thread Fire Delay

2.3 If they do not already exist, the inspector should compile a clear and comprehensive schedule of installed passive elements, including fire and smoke control dampers, detailing as applicable and where identification is possible, manufacturer, size, type, model reference, power and control details, compartment barrier details, a reference to the installation method (drawing & specification) and fire resistance classification. It should be made clear where the gaps in the schedule are, including, initially, access issues. If a control panel is involved, its operation and correspondence to the dampers must also be checked and recorded.

This will become a critical part of the 'golden thread' of information, to be retained for the lifetime of their maintenance and testing. After critical assessment, it should be presented to those responsible for the fire safety of the building to agree required actions, that should be implemented within one year. **If the building is defined as a HRRB there is also a legal requirement to report any discrepancies to Fire & Rescue.**

2.4 Following a Type 2 inspection, Fire Risk Assessors may consider active fire protection measures in place, such as suppression systems, that would reduce the risk and therefore the required level of fire compartmentation compliance. This would be in keeping with Government guidance given in Building a Safer Future, released in December 2018, which states (in para 2.21) that: *"Buildings should be considered in a holistic manner and mitigation measures should be layered appropriately based on the use of the building and the risks posed".*

2.5 An up to date set of fire strategy drawings for the building, normally in keeping with HTM guidance, is essential to ensure that inspections are only carried out on compartment walls required to have fire and smoke resisting properties.

2.6 In the absence of information on the components being inspected, those undertaking Type 2 inspection evaluations should not only be comparing their condition in compliance with HTM requirements, but also their importance in terms of what they are protecting *(criticality factor)* and therefore what level of compliance is suitable and sufficient for their location. ***This needs to be expertly assessed by a fire safety professional responsible for the building; for example 'sanitary accommodation' rooms in mental healthcare settings may be deemed as hazard rooms due to patients having the propensity of using such rooms as a location for starting a fire.***

By doing so a fire compartment 'action priority' report can be established, leading to measured fire safety improvement to reduce risk from year one; not only actual risk from fire for people, the building's fabric and activities but also in terms of protecting the Trust or organisation and its management. It provides documents that can be shared with external auditors to demonstrate consideration of FSO Articles 17 and 38, as part of a coherent fire compartment management system with a commitment to year-on-year improvement.

2.7 The limitations of remediating existing passive fire protection components without previous certification or certainty of fire performance needs to be fully understood, and careful consideration should be given to the extent it is acceptable and even economically sensible to do so. Any repairs that do take place should be undertaken as a fire tested system in accordance with the product manufacturers fire tested detail drawings.

2.8 *It is good practice for those carrying out 'Type 2' inspections, especially in the absence of an installer's label, to affix uniquely numbered, dated, identification stickers to advise that a competent inspection on the component has taken place, who inspected them and to help locate and identify individual items referenced on drawings and / or schedules.*

The inspection of fire compartmentation in terms of what it is protecting (criticality factor) needs to be expertly assessed by those responsible for the fire safety of the building.

2.9 Type 2 Fire Damper compliance inspections:

Healthcare organisations should ensure that they have a full inventory of all installed fire and smoke dampers within their premises giving their rating, type and unique identifying number; their location being identified on fire strategy drawings.

Each damper must be fully accessible, typically by means of two access hatches, so that they can be robustly inspected, cleaned and maintained.

2.10 Crucially, they also need to be Fire Risk Assessed to determine if the type of damper is suitable and sufficient for each location in the context of the buildings current fire evacuation strategy. Checks will normally include:

- Is there a damper in this location, in good condition, functioning and adequately maintained?
- Is there one or more access hatch in this location that enables the damper to be adequately inspected, maintained and cleaned? **If not, it should be recorded and actioned.**
- Is it the right type of damper for its location, e.g. providing adequate smoke control to protect escape routes and sleeping accommodation?
- Is the damper fixed and supported in accordance with the manufacturer's instructions for the correct model and specific compartment barrier?
- Does the fire damper have the correct fixing frame or installation casing relative to the wall or structure within which it sits.
- Is there a complete and functioning inventory of fire dampers showing their location, type, size and how they are being managed and maintained?

The existing fire damper has a suitable access door and barcode.

Image courtesy of Air Projects

2.11 Type 2 Firestopping compliance inspections:

Under Article 17 of the Regulatory Reform (Fire Safety) Order, there is a legal requirement to maintain passive fire protection *"in an efficient state, in efficient working order and in good repair".* Guidance issued under Article 50 of the Order states that the objective should be to reduce the remaining risk to a level as low as reasonably practicable (ALARP).

Most healthcare buildings will have some form of passive fire protection which may degrade over time, e.g. due to the removal of services, movement, water damage, cracking.

In addition, it may be necessary to install further services such as electrical cabling or medical gas pipelines through existing passive fire protection; typically 'coated batt' systems for whom the manufacturer/specification is unknown. As a general rule, manufacturers will only specify that their materials are fitted as part of a system that they have had tested. This means that, for example, an ablative coated mineral wool batt from one manufacturer can only be sealed with intumescent acrylic mastic, or indeed other products, from the same manufacturer for the seal to be Third Party certified. This does not mean that the products from another manufacturer will not work effectively, just that they have not been tested together.

2.12 It follows therefore that where the manufacturer of the original seal is known, their products should be used to repair a seal in accordance with their technical details and the appropriate fire tested detail drawing.

Where the manufacturer of the original seal is known, their products should be used to repair a seal in accordance with their technical details and the appropriate fire tested detail drawing.

Image courtesy of Golden Thread Fire Delay

Where the existing ablative coated material is UNKNOWN, then the following two scenarios are advised:

1. An existing ablative coated mineral wool batt fire seal has been damaged due to the removal of services and the retrofitting of new ones; please see the image below:

Image courtesy of Mazin Daoud

As can be seen in this image, the original seal appears to have been installed to a good standard with mechanical fixings and no evidence of cracking, suggesting that the joints have been 'buttered'; however, the manufacturer of the original seal is unknown and therefore the remediated seal cannot be Third Party certified. The options are to replace the seal, or have it repaired by someone with the competence to do so, providing those responsible for the fire safety of the building, having assessed the seal's location in terms of evacuation strategy and risk, are happy for the seal to be remediated 'within the limits of its repair'.

Following an ALARP methodology, the existing seal CAN be repaired using a fire tested system, as far as is possible following the manufacturer's specification and in line with a related fire test detail.

2. In contrast, an existing ablative coated mineral wool batt of unknown manufacture in poor condition, with extensive cracking and no mechanical fixings present, as shown in the image below, should NOT be remediated, as even if repaired there is no evidence that the seal would provide the requisite fire resistance. **Using an ALARP methodology it would be appropriate to replace the whole seal:**

Image courtesy of Mazin Daoud

2.13 When inspecting an existing barrier to assess if it can be remediated or should be replaced, the following issues should be considered:

- Has it been labelled to show that a QA system was in place, and mechanically fixed as tested to provide adequate strength to withstand fire and structural deflection? (unlike the seal in the image right).

- Has it been adequately installed around services, sealing all gaps, in keeping with a fire -tested detail drawing? (unlike that shown in the image right).

Images courtesy of Golden Thread Fire Delay

2.14 In addition there is a need to consider the substrate to which the barrier is affixed and whether or not this can be assessed as providing adequate fire resistance.

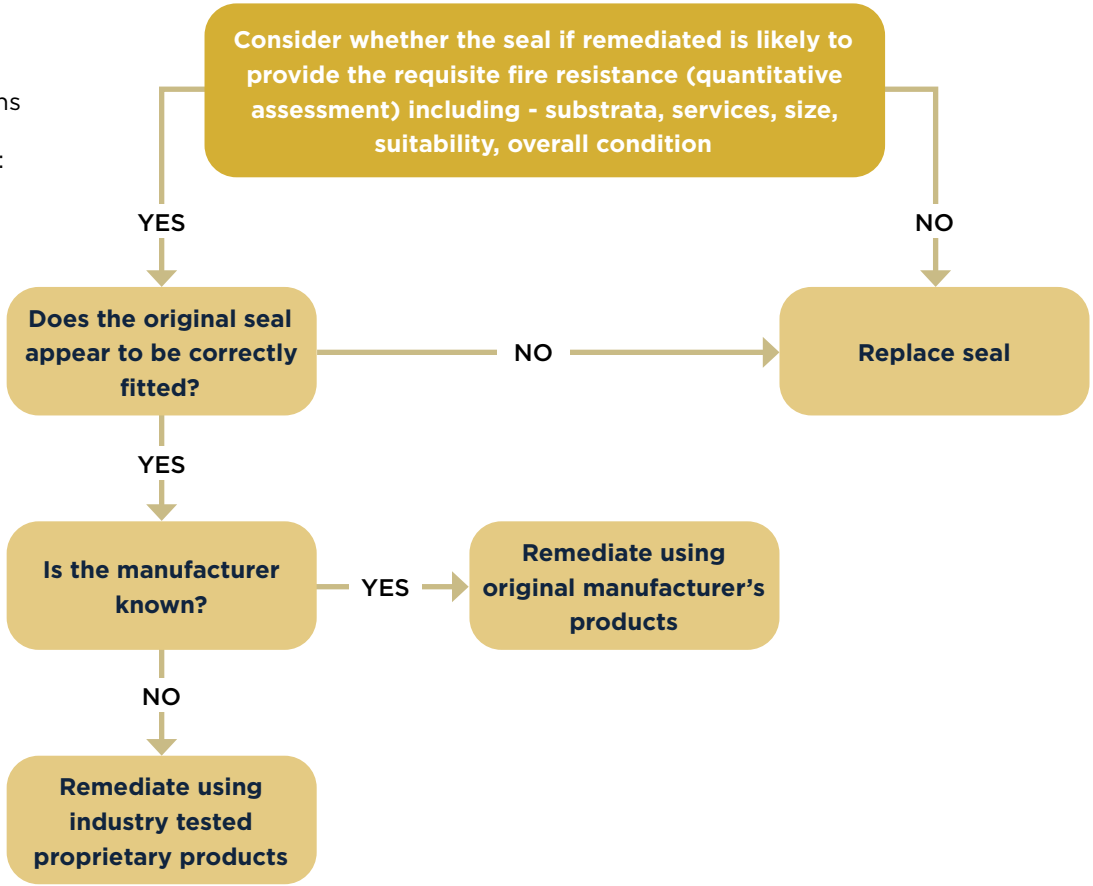
As a guide, **30 minute fire resistance** will typically be provided by 75mm brick or 50mm blockwork, or for timber or steel studded walls with 1 sheet of 12.5mm or greater plasterboard on each side, with the joints taped and jointed. **60 minute fire resistance** will be provided by 75mm brick or blockwork, or for timber or steel studded walls, 1 sheet of 12.5mm or greater "fire rated" plasterboard or 2 x 12.5mm plasterboard (joints staggered, not aligned) on each side the joints taped and sealed. **120 minute fire resistance** can be achieved with 2 x 15mm plasterboard, providing it has been installed to a manufacturer's fire tested detail.

Evaluating the construction of the surrounding structure and its likely fire rating is key to determining how it should be or should have been firestopped; for example a dry-lined wall, irrespective of its board thickness, needs to sealed from both sides of the wall to prevent fire and smoke potentially entering the cavity, unless the cavity has been closed off and sealed (framed) during its construction to a fire tested standard; the details of which being typically provided in drawings by board or metal studding suppliers and manufacturers.

Where fire resistance is provided on only one face of the studwork, for instance a fire rated ceiling or an external wall, firestopping may be required to one side only, usually being the risk side; for instance a fire resisting ceiling to a store room as detailed in HTM 05-02 section 5.42.

Guidance on the fire integrity of compartmentation can be obtained from the BRE publication 'The Integrity of Compartmentation in Buildings During a Fire'.

2.15 The following diagram gives a visual outline of the information and options outlined above and is provided for guidance:



Courtesy of Mazin Daoud

2.16 In the case of a remediated seal, the installer cannot Third Party certify the original seal for which they were not responsible. There is no legal requirement for a certificate to be issued **but there is a legal requirement under the Fire Safety Order to assess that the repaired seal will provide a level of fire performance suitable and sufficient for its location.** In this case the following two-stage actions are required and need recording:

Stage 1:

- Assess that the existing barrier is in a location that can be repaired, rather than replaced, **providing the barrier is in a repairable condition**
- Assess in writing whether the original barrier is in a repairable condition and has the potential to achieve the required fire resistance period
- Assess the competency of those carrying out the repair
- Choose and state in writing the manufacturer's products to repair the seal and assess which of their fire tested details will be appropriate to repair the barrier

All the above needs to be carried out by competent persons and recorded by those responsible for the fire safety of the building before any repairs take place.

If repairs have been approved, the following **'Stage 2'** information for each repair should be recorded electronically:

1. A photograph of the original seal before remediation.
2. Approximate measurement of the original seal overall and the area to be repaired.
3. Details of the need for remediation, e.g. "new sprinkler pipe installed".
4. Materials used, including name of products and manufacturer.
5. Unique number, name of installer and date (with this information physically labelled on the repaired seal).
6. A photograph of each repaired seal after affixing sticker.
7. The seal location recorded on a floor plan.

It needs to be appreciated that in existing live buildings with existing fire dampers and other mechanical services it is not always practicable to follow standard tested firestopping details, and the certification of new firestopping work may have to be caveated accordingly. This includes retro-fitted fire dampers, which may be impossible to fire stop to a tested detail.

2.17 Ad hoc Fire Test:

A fire test, sponsored by Golden Thread Fire Delay, was arranged and carried out on Thursday 19th January 2023 to support and provide evidence as to what extent breaches in existing barriers of unknown materials might be successfully repaired, based on typical scenarios highlighted above, i.e. new cables retrofitted, new cables added to an existing cable tray, existing services being removed to leave a redundant hole, the introduction of a medical gas pipe, and the addition of a CPVC sprinkler pipe. The test was undertaken by the FPA in conjunction with UL International UK Ltd at FPA's test centre in Blockley, Gloucestershire and was witnessed by Sam Williams of Great Ormond Street Hospital on behalf of NAHFO.

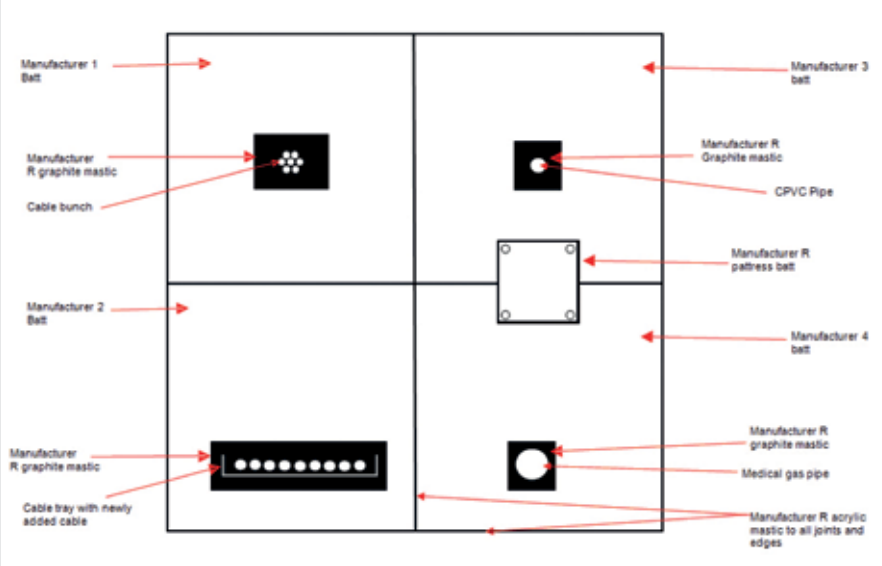


Image courtesy of Golden Thread Fire Delay

A fire barrier as shown left was designed to incorporate coated batt systems from 4 of the biggest fire stopping manufacturers in the UK and a 5th manufacturer of choice was selected to provide the "repair system". The test followed the methodology of EN 1366-3: 2021. For the purpose of this document, the 4 manufacturers are referred to as 'manufacturers 1 to 4' and the manufacturer's system used for the repair is referred to as 'manufacturer R'.

The diagram indicates the fire barrier as it was designed for the test to highlight the different manufacturer's mixed products in the seal:

During the test, none of the seals showed any signs of failure in accordance with the test standard and the test was stopped after exceeding the designed and intended fire resistance of 60 minutes in terms of integrity, heat transfer resistance and stability.

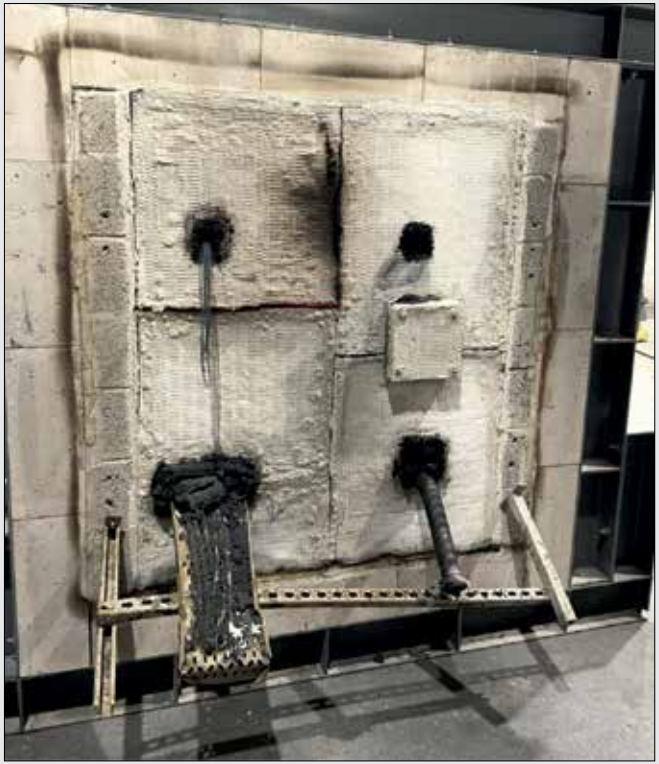
The test provides evidence that existing barriers of an unknown source can be successfully repaired, providing that the original barrier is in a good condition, was installed to a competent standard following the manufacturers' fire tested details and that the subsequent repairs also adhere to the product manufacturer's installation details.

4 images of the tested seal from the internal (furnace) side and external (non-furnace) side both 'before' and 'after' the test are shown below:

i. Before the test; internal, (furnace) side:

ii. Before the test; external (non-furnace) side

Images Courtesy of Golden Thread Fire Delay



iii. After the test; internal (furnace) side

Images Courtesy of Golden Thread Fire Delay

iv. After the test; external (non-furnace) side

2.18 Type 2 Cavity Barrier compliance inspections.

In existing buildings, cavity barriers should be physically located, marked on drawings where possible, and expertly inspected and assessed in terms of likely fire performance by those competent to do so.

2.19 Where breaches are found, a survey should be carried out by an accredited installation company to ensure that repairs or replacements are specified in line with an approved detail in accordance with fire test evidence.

2.20 To ensure that the principles of progressive horizontal evacuation can be completed, compartmentation, including cavity barriers in void areas of critical locations, should be inspected where possible to assess if performance is likely to be of a suitable and sufficient level so that the occupants of the building are kept safe from the effects of flame, heat and smoke. This is especially important where the dependency of patients may mean that they are not able to be moved without interfering with ongoing treatment.

Top Image: Damaged cavity barriers should be repaired using the same materials, in accordance with the manufacturer's fire tested detail, or replaced.

Bottom Image: Cavity barriers that have not been installed within the parameters of a fire test need to be assessed to determine if they are suitable and sufficient for their location or need replacing.

Images courtesy of Golden Thread Fire Delay

2.21 Cavity barriers separating adjacent areas are of particular importance in reducing the spread of flame, heat and smoke from, for example, non-patient areas into patient occupied areas.

They should contribute to the building's fire evacuation strategy, holding back the effects of fire for a suitable and sufficient period and also work in conjunction with surrounding materials especially where they come into contact with external cladding. Services passing through cavity barriers, including fire dampers, must be sleeved to a manufacturer's fire tested detail.

2.22 It needs to be accepted that some barriers, hidden away within the structure of the building, cannot be inspected. Some healthcare buildings are of an age where the installation is very unlikely to be compliant with today's standards. There is a further issue of the presence of Asbestos which up until the mid-1980s was widely used in many applications. It may be necessary to accept and risk manage such issues for practical reasons until the building or area is refurbished.

Services passing through cavity barriers must be sleeved to a manufacturer's fire tested detail.

Image courtesy of Golden Thread Fire Delay

Section 3; Type 3 Ongoing, Functional Fire Damper, Fire Seal & Cavity Barrier Inspections

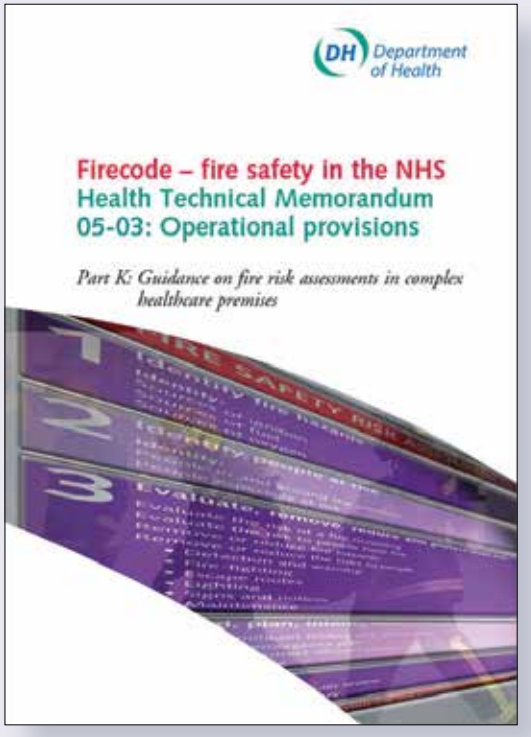
3.1 These are intended to manage and maintain compliant fire and smoke resisting components to a satisfactory standard, meeting the legal requirements of Articles 17 and 38 of the FSO.

3.2 There are a number of factors that will help determine a satisfactory standard, a suitable system and the frequency of inspection, not least the importance of the components in terms of overall fire containment.

3.3 Guidance for ongoing maintenance of structural fire safety components in healthcare buildings can be found in HTM 03-01 Part B, HTM 05-03 Part K, and BS 9999:2017.

HTM 03-01 Part B under point 1.46 states *that to comply with the Workplace (Health, Safety & Welfare) Regulations and Building Regulations, it is essential that all ventilation systems must be subject to at least a simple visual inspection annually.*

HTM 05-03 Part K under point 5.147 recommends that *"all structural fire protection and elements of fire compartmentation should be inspected and any remedial action carried out" annually.*



3.4 Type 3 Fire Damper inspections:
In accordance with BS 9999:2017, inspections should be undertaken annually. Local regulations/conditions may override this with periodic inspection being carried out more frequently where corrosive or dirty conditions prevail. The maintenance log should be reviewed at each inspection and the frequency adjusted as required dependent upon findings.

3.5 It should be borne in mind that HTM's 03-01 and 05-03, and BS 9999 are guidance documents, not mandatory, and they do not consider the CRITICALITY of the component in terms of location. This is an important factor, which should be considered when determining inspection frequency in healthcare buildings.

3.6 Criticality:
The level of criticality of fire components, in line with the HTM 05 series, should be considered in conjunction with the location, medical need and ability to evacuate. This should be evidenced within the care plan for patients and also in PEEPS for any staff requiring assistance to egress.

Occupant dependency: the categorisation of occupants on the basis of their likely need for assistance to make their safe evacuation in an emergency. The following categories are referred to in the Health Technical Memoranda:

- **Independent:** occupants will be defined as being independent:
  - if their mobility is not impaired in any way and they are able to physically leave the premises without staff assistance; or
  - if they experience some mobility impairment and rely on another person to offer minimal assistance. This would include being sufficiently able to negotiate stairs unaided or with minimal assistance, as well as being able to comprehend the emergency wayfinding signage around the facility.

- **Dependent:** all occupants except those classified as "independent" or "very high dependency".

- **Very high dependency:** those whose clinical treatment and/or condition creates a high dependency on staff. This will include those in critical care areas, operating theatres, coronary care etc. and those for whom evacuation would prove potentially life-threatening.

In addition, there are likely be areas of a healthcare building that are critical in terms of maintaining treatment continuity, for example an MRI scanner or imaging department. Although not necessarily critical for immediate life safety, the loss of such equipment and resources may be prejudicial to diagnosis or treatment and as such should be identified, by an Emergency Planning Officer, Compliance Manager or others and the appropriate level of criticality recognised.

A Renal Unit needs to be robustly protected in terms of critical care continuity.

Image courtesy of Golden Thread Fire Delay

3.7 Practical Considerations:

Type 3 inspections are intended to maintain fire compartmentation and individual components contained within, to a standard that has already been robustly inspected in terms of performance by those competent to do so. As such it may be appropriate for these functional inspections to be carried out by estates personnel who would not be expected to be experts in fire compartmentation compliance. It may be equally appropriate for a fire safety advisor or an accredited inspector to perform spot checks in some locations, especially in high risk locations, in order to ensure required fire inspection standards and fire compliance are being maintained, and in doing so 'audit the process'.

Special fire compartment inspection provisions may need to be made for acute mental health units and other areas where HBN 03-01 may apply.

3.8 Type 3 Fire Damper inspection checks:

Fire and smoke dampers need to be routinely inspected to ensure that they are in good condition, connected, not wedged open and generally compliant.

HTM 03-01 part B gives inspection guidance, stating:
* 1.31 that *"regular tests, at intervals agreed with the local prevention officer, will need to be carried out in order to demonstrate the continuing efficiency of the fire detection and containment systems".*
* 4.13 that *"all fire dampers should be tested as part of the annual verification".*

3.9 IHEEM Fire Safety Technical Guidance No. 2 *'Maintenance, Fire/Smoke Dampers' states that; frequency of inspection should be based on three factors a) the criticality of the system, b) the operating environment (if the environment is not considered normal e.g. dusty, the frequencies may need to be revised, such revision should be based on a documented risk assessment), c) past history. If similar dampers have shown a high failure rate then maintenance should be more frequent."*

Examining a fusible link.

Image courtesy of Air Projects

3.10 BESA technical bulletin VH001 (version 3, August 2022) states that annual damper inspection is of high criticality and gives the following information on PPM inspection and maintenance checks, to be undertaken by a competent person:

All Fire and Combined Fire / Smoke Dampers
Visually inspect the fire damper's internal components for signs of corrosion, dirt or dust.
In line with the manufacturer's instructions, clean and lubricate the damper and perform a drop test.
Collect digital photographic evidence of damper condition prior to, during and after testing procedures.

Electro-Mechanical Fire Dampers and Combined Fire / Smoke Dampers
Inspect latching mechanism, operating cable and remote controller (incl. indicator lamp).
Ensure cleanliness of, damper guide channels, springs and around the units on completion.
Check and ensure correct operation of shutter mechanism. Ensure free fall of damper(s).
Check and ensure security of all access doors and gaskets. State possible sources of air leakage.
Report any defects and record all actions undertaken.
Collect digital photographic evidence of damper condition prior to, during and after testing procedures.

Air Transfer Fire Dampers & Combined Fire / Smoke Dampers
Inspect latching mechanism, operating cable and remote controller (incl. indicator lamp).
Ensure cleanliness of damper guide channels, springs and around the units on completion.
Check and ensure correct operation of shutter mechanism. Ensure free fall of damper(s).
Check and ensure security of all access doors and gaskets. Check for air leaks.
Report any defects and record all actions undertaken.
Collect digital photographic evidence of damper condition prior to, during and after testing procedures.

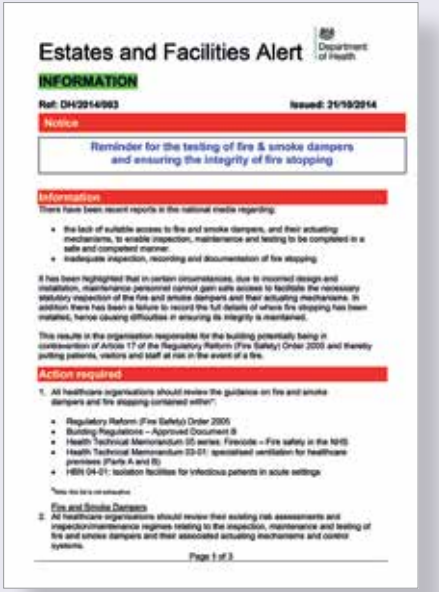
High Intumescent Block Fire Dampers
This type of damper can become blocked & impeded. They should therefore be part of the maintenance programme.

Fire damper installed within a dirty extract duct. Fine dust within the duct poses a fire risk and could hinder the damper from working.

Image courtesy of Air Projects

3.11 Smoke Control Dampers (SCDs) used in smoke control systems for means of escape require a weekly system check, to be carried out by a competent person. Motorised Fire Dampers with an ES classification under the control of a panel also require weekly checks, but providing records are kept, this may be mitigated via zones in accordance with BS 9999.

3.12 A department of Health Estates and Facilities Alert reference DH/2014/003, issued on 21/10/14 (please see the References & Recommended Further Reading' section) reminded all healthcare organisations of the need to test fire and smoke dampers and ensure the integrity of firestopping. The document highlighted "inadequate inspection, recording and documentation of firestopping" and "the lack of suitable access to fire and smoke dampers, and their actuating mechanisms, to enable inspection, maintenance and testing to be **completed in a safe and competent manner".**



Estates and Facilities Alert

Department of Health

INFORMATION

Ref: DH/2014/003 Issued: 21/10/2014

Notice

Reminder for the testing of fire & smoke dampers and ensuring the integrity of fire stopping

Information

There have been recent reports in the national media regarding:

- the lack of suitable access to fire and smoke dampers, and their actuating mechanisms, to enable inspection, maintenance and testing to be completed in a safe and competent manner.
- inadequate inspection, recording and documentation of fire stopping.

It has been highlighted that in certain circumstances, due to incorrect design and installation, maintenance personnel cannot gain safe access to facilitate the necessary statutory inspection of the fire and smoke dampers and their actuating mechanisms. In addition there has been a failure to record the full details of where fire stopping has been installed, hence causing difficulties in ensuring its integrity is maintained.

This results in the organisation responsible for the building potentially being in contravention of Article 17 of the Regulatory Reform (Fire Safety) Order 2005 and thereby putting patients, visitors and staff at risk in the event of a fire.

Action required

1. All healthcare organisations should review the guidance on fire and smoke dampers and fire stopping contained within*:

   - Regulatory Reform (Fire Safety) Order 2005
   - Building Regulations – Approved Document B
   - Health Technical Memorandum 05 series: Firecode – Fire safety in the NHS
   - Health Technical Memorandum 03-01: specialised ventilation for healthcare premises (Parts A and B)
   - HBN 04-01: Isolation facilities for infectious patients in acute settings

*Note this list is not exhaustive

Fire and Smoke Dampers

2. All healthcare organisations should review their existing risk assessments and inspection/maintenance regimes relating to the inspection, maintenance and testing of fire and smoke dampers and their associated actuating mechanisms and control systems.

Page 1 of 3

An example of poor installation illustrating self-tapping screws used to fix the galvanised duct to the fire damper spigot.

Image courtesy of Air Projects

3.13 Type 3 Inspection of Firestopping and other Structural Items. Guidance on the frequency of inspecting of fire compartmentation in healthcare buildings can be found in HTM 05-03 Part K, which under "Annual tests and checks" states:
5.147 "All structural fire protection and elements of fire compartmentation should be inspected and any remedial action carried out"

Illustration of a Grille / Diffuser mounted fire damper located within the grille plenum itself to maintain a ceiling compartmentation barrier. The fusible link is missing and has been replaced by a plastic cable tie to hold the fire damper blade pack open in order to ventilate the room. This is poor practice, non-compliant and compromises the integrity, performance and design of the fire safety device.

Image courtesy of Air Projects

However, it is recognised that this guidance is generally not adhered to. As stated in the IHEEM technical guidance document:

The practicality of inspecting fire compartments in a large hospital each year make this task very difficult to achieve and beyond the remit of ALARP. The Estates and Facilities Alert (referred to above – please see 3.12) indicates that there should be provided a permit to work system for any works that may impinge on the integrity of firestopping. If this is coupled with a risk-based approach to inspecting fire-compartments, this should give a satisfactory level of confidence in compliance with legislative requirements in the Order.

3.14 If a complete annual survey is found not to be practical then it should be recognised that the fire risk in some hospital locations will be greater than others due to factors including areas where patients have 'high dependency' such as in Critical Care Unit and Theatre areas. Other considerations include areas critical to patient care that require a high level of protection such as imaging departments and renal units, and locations such as mental health units where there is a high arson risk. There is also of course a need to protect main evacuation routes.

3.15 Factoring in these issues may lead to adopting the following matrix or similar:

The following table shows the frequency with which fire compartmentation may be physically checked for damage, deterioration, deficiencies or penetrations.

Notes:

- *For water suppression protected areas the frequency of checks may be reduced by up to 50% dependent on a risk assessment.*
- *For buildings which meet the height criteria for HRRB's, the frequency should be increased to the next highest from the matrix.*
- *Very high dependency patient areas such as ITU and theatres compartmentation should be checked as above, where this proves operationally difficult to achieve, in alternate years this may be checked from one side only.*
- *Any areas where they are checked every 60 months should be rotated so that 20% of such areas are checked annually. This needs to be recorded and stored as a 'golden thread of information' for future reference, including being detailed in Fire Compartmentation Protocols and marked on fire strategy drawings.*
- *Hospital streets adjoining dependent patient areas can be checked from street side only annually; however, they should also be checked from ward side at least every 60 months.*

	Low likelihood of penetrations	Medium likelihood of penetrations e.g. typical ward or department	High likelihood of penetrations e.g. hospital street / plant room
Independent patients / non patient areas	120 months	60 months May be relaxed to 120 months if a robust audited 'permit to work and reinstatement' system is in place	60 months This should be rotated so that 20% of areas are checked annually
Dependent patients	60 months May be relaxed to 120 months if a robust audited 'permit to work and reinstatement' system is in place	60 months This should be rotated so that 20% of areas are checked annually	12 months N.B. hospital streets can be checked from street side only, although they should also be checked from ward side at least every 60 months
Very high dependency patients	12 months May be relaxed to 60 months if a robust audited 'permit to work and reinstatement' system is in place	12 months	6 months May be relaxed to 12 months if a robust audited 'permit to work and reinstatement' system is in place

Courtesy of Mazin Daoud

Please note that this matrix is provided as a guide only and needs to be tailored to an individual building in terms of what is suitable and sufficient.

3.16 A key measure to minimising the risk of fire compartment failure is to introduce a system for controlling and managing external contractors, Estates personnel and others from the uncontrolled breaching of fire walls and barriers, typically due to the installation of new services, by employing a 'permit to work' system. This should effectively manage both damage and compliant reinstatement, including temporary firestopping measures if appropriate.

IHEEM Fire Safety Technical Guidance document No 1 'Fire Compartmentation' recommends that a Local Operating Procedure is developed to provide effective control measures on which the following guidance is based:

In the event of needing to penetrate ANY fire walls, ceilings or floors within the Hospital to run supplies from one area to another, the person carrying out the work will be responsible for ensuring that the fire integrity of the wall is not breached or affected in any way without obtaining permission from the building manager.

Fire compartment drawings should be obtained from the Building Manager before commencing works to ensure that the location of any breaches created are accurately located and recorded.

In the event of penetrating through a wall, ceiling or floor, a 'penetrations log sheet' should be filled in and returned to the Building Manager at the earliest opportunity.

The Building Manager will arrange for a Third Party accredited firestopping company to attend and carry out the repair(s), firestopping all breaches with an appropriate system in keeping with a manufacturer's fire tested detail, labelling and recording work in keeping with Third Party audited procedures.

3.17 Although the use of Third Party certified installers is widely recommended, including in Approved Document B, there will always be occasions when for practical reasons it is acceptable for a non-specialist to undertake limited firestopping work; for example someone retrofitting a single small diameter data or fire alarm cable through a small number of walls where the penetrations created will be under 25mm and the use of a specialist firestopping company to reinstate the fire resistance of the compartmentation could be disproportionate. In this type of scenario it is important that those managing the work and/or are responsible for the fire safety of the building are involved prior to the work taking place to ensure that the permit to work or RA MS being generated provide information on the products proposed (which should be both Third Party certified and fire tested for the requirement), and are satisfied that those undertaking the firestopping will be competent to do so and will follow the manufacturer's installation instructions. It is important that chemical compatibility between cables and the selected sealant is checked prior to application.

3.18 Type 3 Cavity Barrier inspections:

For accessible barriers there should be an ongoing schedule of periodical inspection, ideally by the same contractor or consultant who is accredited and familiar with the manufacturer of the in-situ barriers, and who can re-certify if small breaches are found and require remedial repair from other works having taken place.

Cavity barriers hidden away and inaccessible should be recorded to acknowledge they are not being periodically inspected.

Cables retrofitted through a cavity barrier fire damper, meaning that it will be unable to close effectively in the event of a fire.

Images courtesy of Golden Thread Fire Delay

Section 4; Creating a Robust Fire Compartment Management System

4.1 Applying the 3 Types of inspections outlined in this Reference Document is a key element to achieving a fire compliant healthcare building, as part of a holistic and robust Fire Compartment Management System. The following list of recommended actions is provided as useful guidance on how such a system might be implemented:

4.2 Decide on budget and timescale. This is potentially a major exercise, likely requiring both a high level of commitment and resource. It should be noted that an accurate cost is unlikely to be determined prior to the action plan being implemented due to a lack of initial information.

4.3 Decide on the key players and their roles in terms of creating and delivering the system; probably involving both internal and external personnel.

4.4 Agree a targeted action plan; acknowledging budget, access and time constraints. It would be reasonable to adopt a pragmatic approach to establish a reasonable time frame, in which to complete the required works. Any approach taken in this respect should be underpinned by the risk assessment process. Also, it would be advisable to discuss the plan with any Authority having jurisdiction (AHJ's) e.g. The Fire & Rescue Service (Enforcing Authority), insurers etc. to ensure they are satisfied with the proposed time scales. If an action plan and time scales are agreed and adopted, this should be reviewed at regular intervals by Senior Management (1) to monitor progress, and (2) where necessary to amend time frames for completion, for example, where there is a change of risk level or change of use within the building, e.g. an out-patient area being converted to an in-patient area.

4.5 Create a unique set of Fire Compartment Protocols for the Trust or organisation, which would outline all of the required actions, responsibilities and details, and be used to communicate and share those actions with others. Everything stems from this, so it needs to be carefully considered, written and agreed by senior managers. Key elements will include how information is to be stored, shared and updated; managed by an overview process/committee for ensuring actions are delivered.

4.6 Implement an audit of fire component procurement systems and the introduction of Type 1 inspections for all new buildings or refurbishments. The importance of these actions cannot be over-emphasised as they will have an immediate impact on both compliance and future maintenance costs.

4.7 Create fire component schedules on a building-by-building basis, comparing their condition with their importance (criticality). Each identified component should be Type 2 inspected, not only comparing its condition with Firecode requirements but also the importance of the compartmentation in terms of what it's protecting (criticality factor of 1-4) and therefore what level of compliance is suitable and sufficient. By doing so a fire compartment 'action priority' schedule can be established, commencing cost-effective, measured fire compliance improvement, to significantly reduce risk from year one. This would encompass not only actual risk of fire for people, the hospital's fabric and activities, but also protection of the Trust or organisation and its management, as it provides documents that can be shared with external auditors in compliance with FSO Articles 17 and 38, showing a coherent fire compartment management system with a commitment to actual year on year improvement.

4.8 Carry out an audit of functional fire compartment inspections and PPM activities to ensure that those structures and components being Type 1 and Type 2 inspected are then being handed over to a system that can effectively manage and maintain the locations in terms of both working efficiency and compliance.

4.9 Carry out fire door surveys for each building. Clearly the fire resisting doors contained within the fire compartments are integral to overall fire compliance and their inspection cannot be ignored or carried out in isolation. Please refer to the 'sister' reference document 'Fire Door Inspections in Healthcare Buildings'.

4.10 Identify and satisfy fire compartment training needs. The majority of which is likely to be fire compartment awareness training, which can be quickly delivered and easily refreshed by those competent to do so.

Relevant Glossary of Terms

The following definitions are provided both to assist in the understanding of this document and also for general information and guidance:

ADB: Approved Document B; a document giving guidance on how to comply with fire safety aspects of the Building Regulations.

AHJ: The authority having jurisdiction.

Air Transfer Grille (fire and smoke): a device that will allow the passage of air in normal use, but when activated will contain both 'cold', i.e. ambient smoke and hot gases – usually activated by heat and an electrical interface with the detection and alarm system.

ALARP: As Low As Reasonably Practicable; a key concept in fire safety and in particular fire risk assessment, based on the Law of Diminishing Returns, whereby risks are reduced until a point is reached where the cost to reduce the risk further would be disproportionate to the benefit achieved.

Aperture: an opening in a fire wall created for a door, vision panel, building services or ventilation grille.

ART: Approved Repair Technique.

ASET: Available Safe Egress Time.

ASFP: Association for Specialist Fire Protection.

BESA: Building Engineering Services Association.

BIM: Building Information Modelling.

BM TRADA: a UKAS accredited certification body that provides independent third party certification fire services for manufacturers and installers.

Bolster Software: a building surveying and inspection system.

BRE: the Building Research Establishment; a former government national laboratory, now part of a charitable organisation called the BRE Trust.

Cavity Barrier: any construction, material or system provided with the intention of sealing a concealed space against the penetration of smoke or flame; also both subdividing and closing cavity edges, to prevent or restrict smoke or flame spread within the cavity.

CDM 2015: the Construction Design and Management Regulations 2015.

CERTIFIRE: an independent third-party certification scheme, operated by Warrington Fire, that audits performance, quality, reliability and traceability of products and systems.

Compartment (fire): part of a building, comprising one or more rooms, spaces or storeys, constructed to prevent the spread of fire and its effects to, or from, another part of the same building, or an adjoining building. (A roof space above the top storey of a compartment may be included in that compartment).

Compartment Wall: a fire-resisting wall used to separate one fire compartment from another; in healthcare premises typically designed and intended

to have a minimum period of fire resistance of 60 minutes (or 30 minutes in single-storey buildings).

Final Exit: the termination of an escape route from a building, intended to give direct access to a place of safety outside the building.

FIRAS: a voluntary UKAS accredited third party certification scheme run by Warringtonfire for installation contractors of both passive and active fire protection systems.

Fire Compartment: – see Compartment (fire) above.

Fire Damper (FD): a mechanical device within a duct or ventilation opening that operates automatically and is designed to resist the spread of fire. Integrity only (E) tested to EN 1366-2.

Fire Hazard Room: a room or other area which, because of its function and/or contents, presents a greater hazard of fire occurring and developing than elsewhere.

Fire Integrity: the extent over a given time that a structural component, such as a fire damper, fire seal or cavity barrier can withstand and prevent fire as well as smoke from breaching it. The letter for denoting integrity in fire test documents is “E”.

Fire Resistance: the ability of a structural component to fulfil, for a stated period of time, the required fire integrity and thermal insulation as expected in a standard fire resistance test.

Fire Resisting Component: an element designed and installed to resist the passage of fire and/or gaseous products of combustion, capable of meeting specified performance. The term can sometimes include a cover, hatch, or other form of protection to an opening in a fire-resisting wall, floor, fire barrier or ceiling, or in a structure surrounding a protected shaft.

Firestop (or fire stop): a seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the passage of fire and smoke.

Firestopping: the sealing of service penetrations, openings, joints and other gaps and imperfections, with proprietary products and systems, to reinstate or achieve a required level of fire resistance or an adequate smoke seal to the integral structure of a building, mainly intended to prevent the passage of fire and smoke.

Fire Safety Order (or ‘FSO’): an abbreviation of The Regulatory Reform (Fire Safety) Order 2005, which is also commonly referred to as the RRO.

Fire Tested Detail Drawings: drawings issued by firestopping supply companies to show how their systems have been tested and to give guidance to installers as to how they should be installed around various services to achieve a required level of fire resistance.

FRA (FRA’s) can be either Fire Risk Assessment(s) or Fire Risk Assessor(s).

Golden Thread of Information (for passive fire protection components): an accurate, linked record of the component's specification, fire test evidence and certification and all the information required to ensure traceability and that it has been installed to comply with Regulation 7 of the Building Regulations and can be maintained to comply with Regulation 38 of the Building Regulations and Articles 17 and 38 of the FSO.

Hazard Room: – see Fire Hazard Room.

Healthcare Building (Firecode definition): a hospital, treatment centre, health centre, clinic, surgery, walk-in centre or other building where patients are provided with medical care by a clinician.

Healthcare Building (broader definition used in this document): any building used by the NHS and other healthcare providers.

HTM: Health Technical Memoranda.

IFC: Independent Fire Consultants who are UKAS accredited fire consultants and part of the Kiwa IFC Group.

IHEEM: Institute of Healthcare Engineering and Estate Management.

Intumescent Material: a product that swells as a reaction to fire (heat).

Intumescent pipe collar: a pipe closure device incorporating an outer casing and containing intumescent material.

Intumescent pipe wrap: a pipe closure device that is fitted internally, typically within a fire-rated structure.

LPCB: the Loss Prevention Certification Board; sometimes referred to as the Loss Prevention Council; part of the BRE Trust.

LPS: Loss Prevention Standard (as in LPS 1197).

Main Compartments: areas into which the building are divided to reduce travel distance and which are designed and intended to provide 60 minutes' fire resistance.

MEP: Mechanical, Electrical and Plumbing.

Motorised Fire Damper (MFDs): a mechanical device within a duct or ventilation opening that is activated by a building's alarm system and designed to resist the spread of fire and smoke. ES classification, tested to EN 1366-2. Not to be used in smoke control systems.

Onetrace: an electronic recording tool suitable for structural fire components.

PAS; Publicly Available Specification.

PEEPS: Personal Emergency Evacuation Plans; that is intended, in the event of a fire evacuation, to ensure persons who require assistance can escape safely.

Primary Test Evidence: a report based on a physical fire test of a manufacturer's component carried out by an independent 3rd party accredited test house.

Progressive Horizontal Evacuation: the evacuation of patients, staff and other relevant persons away from a fire into a fire and smoke-free compartment or sub-compartment, of relative immediate safety, typically on the same level of the premises.

Protected Route: a route designed to be of fire-resistant construction for a specified time to provide a means of escape.

Protected Shaft: a shaft that enables persons, air or objects to pass from one compartment to another, and which is enclosed with fire-resisting construction.

Protected Stairway: a stairway discharging through a final exit to a place of safety (including any exit route between the foot of the stairway and the final exit) that should be adequately enclosed in fire-resisting construction.

RIBA: Royal Institute of British Architects.

RRO: please see 'Fire Safety Order'.

Refuge: an area designed and intended as a place of temporary safety within a building. This may be an adjoining compartment, sub-compartment or lobby, capable of holding all those threatened for a given period, from which there may be potential for further unassisted escape should that become necessary.

SFG20: created in 1990 by the Building Engineering Services Association (BESA) and widely recognised as the industry standard for building maintenance specifications.

Smoke Control Damper (SCD): a damper to be used in drive open / drive closed systems under the control of a smoke control 'cause and effect' system. Tested to EN 1366-10.

Sub-compartment: areas into which the building can be divided to reduce travel distance and which are designed and intended to provide 30 minutes' fire resistance.

Sub-compartment wall: a fire-resisting wall used to separate one sub-compartment from another, having a designed and intended minimum period of fire resistance of 30 minutes.

Third Party Certification: A conformity assessment process carried out by a body that is independent of suppliers and installers to provide confirmation that products, installations, inspection services and handover documents meet specified standards.

Trunking: A metal or plastic casing designed to accommodate cables.

UKAS: United Kingdom Accreditation Service.

VADS: Visual Alarm Devices.

Warringtonfire: is the trading name of Warringtonfire Testing and Certification Limited; a UKAS accredited fire consultancy.

References & Recommended Further Reading

Approved Document B (Fire Safety) – volume 2 – buildings other than dwellings 2019
Approved Document E: Resistance to the passage of sound 2015

ASFP 'Guide to Passive Fire Protection for Fire Risk Assessors'
ASFP 'Ensuring Best Practice for Passive Fire Protection in Buildings'
ASFP et al 'Firestopping of Service Penetrations; Best Practice in Design and Installation'
ASFP Blue book – Fire resisting ductwork
ASFP Grey book – Fire dampers
ASFP Red book – Firestopping: linear joint seals, penetration seals and cavity barriers
ASFP Technical Guidance Document 17; Code of practice for the installation and inspection of fire stopping systems in buildings: linear joint seals, penetration seals, small cavity barriers

BESA DW145; Guide to Good Practice for the Installation of Fire and Smoke Dampers
BESA VH001 Fire and Smoke Damper Maintenance version 3, August 2022

BRE - The Integrity of Compartmentation in Buildings During a Fire

BS 476-22:1987 'Fire Tests on Building Materials and Structures Part 22: Methods for Determination of the Fire Resistance of Non- Load bearing Elements of Construction'
BS 476-31.1:1983 'Fire tests on building materials and structures. Methods for measuring smoke penetrating through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions'
BS 9999:2017 'Fire safety in the design, management and use of buildings'
BS EN 13501-1 'Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests'
BS EN 13501-2 'Fire classification of construction products and building elements – Classification using data from fire resistance tests, excluding ventilation services'
BS EN 13501-3 'Fire classification of construction products and building elements – Fire resisting ducts and fire dampers'
BS EN 13501-4 'Fire classification of construction products and building elements – classification using data from fire resistance tests on components of smoke control systems'
BS EN 1366-1: Fire resistance tests for service installations. Fire resisting ventilation ducts
BS EN 1366-2:2015 Fire resistance tests for service installations. Fire Dampers
BS EN 1366-3:2021 Fire resistance tests for service installations. Penetration seals
BS EN 1366-8: Fire resistance tests for service installations. Multi-compartment smoke control ducts

BS EN 1366-9: Fire resistance tests for service installations. Single compartment smoke control ducts
BS EN 12101-8: Components for smoke control systems – smoke control dampers
BS EN 15650:2010 Ventilation in buildings. Fire dampers

Building Regulations Regulation 7
Building Regulations Regulation 38

Building Safety Act 2022

Competence Steering Group for Building a Safer Future 'Setting the Bar; a new competence regime for building a safer future' October 2020

Construction Design and Management Regulations 2015

Construction Products Regulation 2011

Department of Health Estates and Facilities Alert DH/2014/003 (21.10.2014)

Equality Act 2010 Gov.UK

Firecode HTM 05-01 2013
Firecode HTM 05-02 2015
Firecode HTM 05-03 parts A (2013), B (2006) and K (2008)

Fire Protection Association 'Passive Fire Protection Handbook' 2011

Fire Safety Act 2021

Fire Safety (England) Regulations 2022

Dame Judith Hackitt 'Building a Safer Future; Independent Review of Building Regulations and Fire Safety' Final Report 2018

Golden Thread Fire Delay 'Fire Door Inspections in Healthcare Buildings' May 2022

Health Building Note 03-01 Adult Acute Mental Health Units

HTM 03-01 'Specialised ventilation for healthcare premises'

The Institute of Healthcare Engineering and Estate Management (IHEEM) FSTP 'Guidance Document No. 1 Fire Compartmentation'

The Institute of Healthcare Engineering and Estate Management (IHEEM) FSTP 'Guidance Document No. 3 Maintenance Fire / Smoke Dampers'

LPCB Redbook

MHCLG 'Building a Safer Future: an Implementation Plan' 2018

NHS Estates and Facilities Alert DH/2014/003 21.10.2014

Regulatory Reform (Fire Safety) Order 2005

RISCAuthority FPA 'Building Regulations 2010 Approved Document B: Fire safety (Volume 2 – Buildings other than dwelling houses) Incorporating Insurers' Requirements for Property Protection' 2015

Paul White 'Smoke Control Dampers'

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It is recognised and should be noted that there are different regulations and healthcare fire safety provisions, covering England, Wales, Scotland, Northern Ireland and the Isle of Man and this is likely to increase in line with further devolution. Because the majority of regulations have stemmed from U.K. regulations, which still mainly apply for England, we have based this document on regulations applicable to England unless there is anything significant to fire compartmentation covered in regulations elsewhere. We have done so in order not to get bogged down in regulations, as they are not the main focus of this document, but we would welcome adaptations being created for other parts of the United Kingdom as soon as this can be arranged.