BIM4Housing's Expert's Recommendations on Mitigating Risk to Fire Dampers, while Strengthening the Golden Thread

(In their own words with edits)

Second Edition

July 2023

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And the experts listed in Appendix 6

Below are recommendations that we, as BIM4Housing, are putting forward as the findings of our subject matter experts. We do not claim these findings to be definitive, but we would hope that they would provide 'accountable' and 'responsible' persons with some of the detail they would require to ensure that risks are mitigated.

Format

The structure of this set of information is designed to be consumed in various ways by different stakeholder groups doing different things. Therefore, information mentioned in one section may be repeated in another, so they can be applied to a particular activity.

Also, we have sought to organize the information to make it more machine-readable so, although the lists could be reduced by combining similar items, this would make them less easily used in applications.

Despite the need to edit and contextualise, we have tried to retain the authentic voice of our experts throughout. This is especially so in the Appendices, where no colloquialism is left unturned.

Terms of use

This document is not intended as an end-result, but as a snapshot of a dynamic, on-going piece of work being developed by Subject Matter Experts who represent the different interest groups.

We hope it is helpful, but it should not be used in isolation, since, as we have learned from our collaboration, no one knows everything- and experts often disagree. It should therefore be used to supplement other sources of information, all of which should be validated by a responsible person applying it to a project.

Comments and additional contributions are welcome, and a panel of volunteer experts will review suggestions to assess/validate them and augment our recommendations as required.

This document can be viewed, downloaded, and commented upon at https://bim4housing-blackbox.com/publications/

INTRODUCTION

BIM4Housing Structure

We have six Working Groups of experts who understand the individual Stakeholder needs of Development, Design, Construction, Manufacturing, Operations, and the specialist Advisors who support the whole process. Each Working Group determines the problems they are experiencing that could be alleviated by better information, often from a different Stakeholder group and they collectively establish Workstreams to collaborate and share knowledge to come up with practical solutions.

They have established Workstreams for MMC, Data Standardisation, Sustainability and Fire Safety and the latter has, in turn, established Round Table workshops that bring together SMEs who really understand specific asset types.

(See Appendix 1 for Structure Diagram)

Fire Safety Methodology

In 2021 it was determined to take individual fire-critical assets and examine impacts and influences through their lifecycle. A series of online discussions were held, along with one-on-one calls and an email gathering of views and inputs. In 2022 this consultation culminated in a series of Roundtable discussions, each with a clear focus and targeted output. BIM4Housing's expert team was enhanced by guests from the GTI, along with other fire safety specialists throughout the process.

Phase 1 defined the over-arching questions that need to be answered, for each asset type, to deliver the BIM-plus solution necessary to the effective functioning of the Golden Thread in terms of Fire Safety.

The questions defined are:

- What risks does the asset mitigate?
- To what risks is the asset, itself, susceptible?
- What information is needed about an asset, to ensure it performs as required?
- What tasks/method statements/procedures are required to ensure the asset is installed, commissioned, inspected, and maintained properly?
- What level of competency/training needs to be in place?
- How should product changes be recorded?

Phase 2 sought to answer those questions, offering a set of recommendations to mitigate risk and to help to deliver The Golden Thread, through the effective management of required information.

Phase 3 saw the Recommendations published on the BIM4Housing Blackbox web site enabling further comment and input to enhance the document.

Phase 4 saw a second tranche of roundtables, which sought to update the Recommendations in the light of the Fire and Building Safety Acts and other industry changes. This Second Edition is the result.

BIM HOUSING
Round Tables

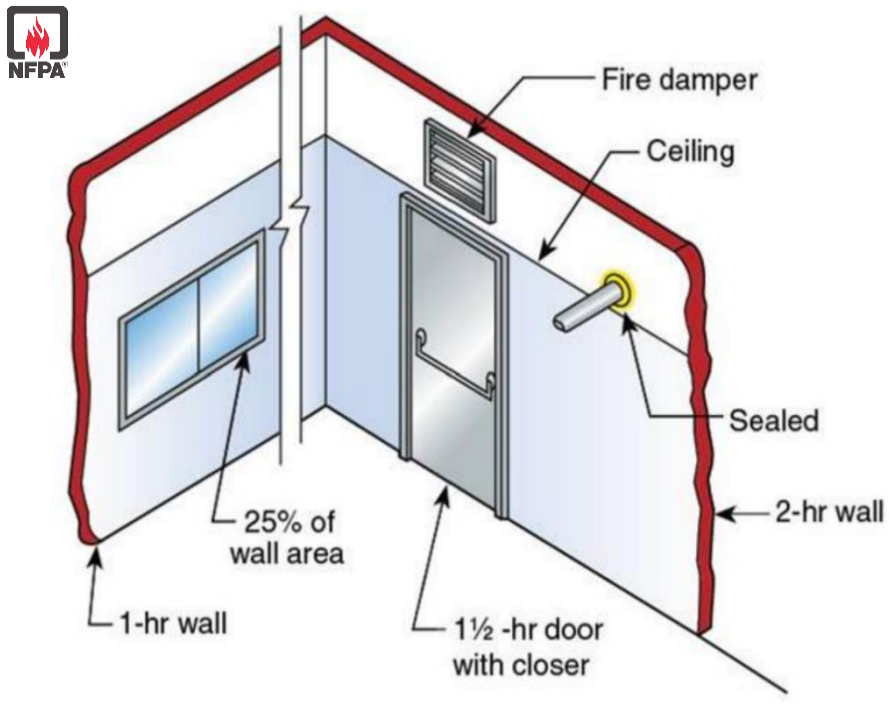
Dampers Methodology

The output from a Roundtables (3rd and 13th September 2021) was collated and contextualized and combined with further subject matter expert input. Significant participant engagement was achieved prior to the events. The resulting report was then peer-reviewed.

Now, eighteen months on, we are reviewing the Guidance in light of recent legislation and any change in industry practice.

What are Fire Dampers?

Fire dampers are passive fire protection products used in heating, ventilation, and air conditioning (HVAC) ducts to prevent the spread of fire inside the ductwork through fire-resistant walls and floors. They should not be used in smoke control systems.



Fire and Smoke Damper Installation

E Classified Fire Damper (FD)

An integrity only fire damper that closes (and stays closed) to maintain compartmentation, generally under a spring when a fusible link melts in a fire.

ES Classified Fire damper (MFD)

A fire damper with an additional reduced smoke leakage (S) classification, generally required to close in response to a smoke detector signal. They are generally motorised to open and have a spring return and fusible link for closure. They close and stay closed in a fire or smoke incident.

NOTE: ES classified fire dampers, often with the misnomer fire/smoke dampers (FSDs, MFSDs), must not be confused with or used in smoke control systems that require Smoke Control Dampers (SCDs) which have a different set of standards, have a drive open/drive close actuator, and do not have fusible links.

EI and EIS Fire dampers

These are fire dampers of either of the above types that have an additional Insulation (I) classification.

This is optional under UK guidance but may have been selected by designers for a range of reasons.

FINDINGS

It was determined to look to 'codify' risks to enable teams to coalesce around tackling a problem, run scenarios to simulate what might happen and how collaboration can reduce the risk of them happening.

Clearly, it is not desirable for the 'Accountable Person' to be absolved of responsibility for not anticipating a risk, simply because it was not on this list of suggested risks- which should be considered a 'steer' not an absolute. However, without a list, it becomes impossible to define and deliver the information needed.

Q1a. What risks do fire dampers mitigate?

a) Risk to fire-fighter's access

b) The risk of the spread of fire and products of fire (fire, smoke, heat) through ventilation ductwork)

c) The risk of the spread of fire and products of fire (fire, heat) via cavities in external and internal walls, along with other concealed cavities (such a roof and ceiling voids)

d) Risk of spread of fire and heat between building compartments

e) Risk of speed of fire spread

f) Risk for a number of uncontained areas

g) Risk of inhibiting safe exit from the building

h) Risk of fire brigade not having enough time to attend before fire spread

i) Risk of Injury/harm/loss of life to residents/occupants

j) Risk of damage to property, building or structure

(See Appendix 2 for Additional Participant Input)

Q1b. What compromises fire damper's ability to perform as required?

a) Risk of wrong installation in the supporting construction used:

- Risk of incorrect vertical seal depth
- Risk of incorrect horizontal seal depth
- Risk of incorrect seal depth through the wall
- Risk of incorrect layers of aperture framing
- Risk of incorrect distances between other services within the wall to meet the fire test data of the compartment barrier, fire dampers and ducts.
- Risk of incorrect wall seal material e.g., different seal material manufacturer without direct test evidence or a different density of material
- Risk of incorrect wall deflection head details

- Risk of distances of supports/drop rods from the penetration seal and differ from DW144
- Risk of the fire stopping installer not being competent in fire damper installation (this is different from installing pipes and cables (EN1366-3 is not relevant to fire dampers - penetration seals need to be tested with the specific fire damper and cannot just be used because they have an EN1366-3 test. – to explain, fire dampers are tested, including the penetration system and have a test-based fire resistance, pipes and cables do not)
- Risk of the seal around the fire damper not being sound
- Risk of aluminium or sacrificial fasteners being replaced with self-drilling screws, meaning that duct cannot fall away in a fire as it is supposed to do

b) Risk of adequate access not being provided on both sides of the damper, thus preventing cleaning, inspection, and maintenance

c) Risk of incorrect replacement components having been installed

d) Risk of the building and individual apartments when fire dampers don't close properly or are propped open

e) Risk of human intervention on ancillary assets, such as smoke detectors, impacting on asset performance

f) Risk of information on an individual asset being incomplete, inaccurate, or absent

g) Risk of information on an individual asset not being supplied in both digital and physical format

h) Risk of other trades and employees not appreciating the asset's function and so compromising its performance

i) Risk of non-appreciation of the differences between performance of assets in compartmentalised areas versus performance of assets in shared circulation areas

j) Risk of vandalism or simply misuse

k) Risk of damage by contractors or occupants

Materials

a) Building movement / shrinkage

b) Laboratory testing not covering real-life scenarios

Installation

a) Failure to install properly, not following the manufacturer's instructions due to ignorance, lack of skill and knowledge

b) Incorrect installation of service penetrations:

- insufficient spacing of services (too close together)
- not installed to manufacturers recommendations (e.g., dampers and ducts)
- incomplete base material (e.g., no lintels in solid walls, openings in partitions not framed and lined)

- insufficient service supports (too wide spacing, non-fire classified materials, unsuitable anchor fixings into soffit (non-fire classified, not designed for support in fire)
- non fire classified service supports

c) In service damage/disturbance to fire damper through maintenance, replacement of services, pipe leakage etc also influences fire damper efficacy

d) Incorrect installation of builder's work holes (service openings)

e) Wrong fire damper for application and /or orientation

f) Incorrect installation method / model selection to permit safe and satisfactory connection to building element

g) Fire damper not in line with compartment element, although this might be allowed if the fire damper has been tested on the surface or away from the wall, but this must be shown in the fire damper manufacturer's instructions

h) Fire damper not supported independently back to structure following the manufacturer's instructions (e.g., supported by adjacent ductwork to which its attached)

i) No expansion sleeves / breakaway connection (sacrificial aluminium rivets) at connections to mitigate duct expansion and thrust in event of fire causing displacement of fire damper from opening

j) Use of self-drilling screws in place of aluminium rivets as shown above

k) No breakaway joints to allow duct to detach in fire

l) Installation checks not carried out (e.g., transit tape still in place locking shutter mechanism)

m) Insufficient base material preparation (e.g., no lintels in solid walls, unframed and lined openings in partition walls, three side apertures, no expansion head allowances)

n) Inadequate and unsuitable fire damper and duct supports

o) Fire damper installed in same opening as pipes and cables – this might be allowed if further testing has been undertaken to B S EN 15882-5 and is shown in the fire damper manufacturer's instructions

p) Refurbishments and upgrades

q) No maintenance programs

r) No annual testing and reset

s) Inappropriate fixings- threaded rods holding up fire dampers with plastic washers would not be shown within the manufacturer's guidelines

t) Incorrect aperture size will not replicate the tested product and rating

u) Despite design requirements, the actual installation prevents access

v) No communication/advice sought by designers form installers and maintenance companies to help them identify where the access issues will be in the future once the building is handed over to the end user. Also, to prepare for different fit outs like CAT B and CAT C

BIM HOUSING
Round Tables

Q2. What information is needed about fire dampers to ensure they perform as required?

It is important to understand how the information will be used and how the information will vary depending upon the context in which it will be used. Initially, this was the subject of quite a lot of debate – largely driven by a worry about 'information overload'. However, with a truly cross disciplinary team of SMEs, it was possible to drill down to understand the detail of why a role would need certain information.

The aim was to collect all the information all stakeholders need against all products and leave it to each role to configure their software applications to only see the information they need for that individual task.

a) Base material

b) Type
   - movement of structure and services
   - environment exposure
   - service maintenance

c) Location (both space(s) and x, y, z coordinates)

d) Fire resistance classification required

e) Intended use inputs on selection of type

f) What has been installed, by whom and when

g) Other requirements:
   - Durability/long term resistance
   - Airtightness

h) Test evidence of compliance to match the intended use i.e., size of opening closure of opening when it's a flexible wall(drywall) and be suitable for the type of services penetrating the wall or floor

i) Is the fire damper positioned to allow access for maintenance?

j) What fire damper accessories needed for compliant installation (e.g., which type of builders' frame and installation method)

k) What supports are needed for continuous support during fire (e.g., fire classified channel, supports, anchors)

l) What approvals for fire dampers (CE / UKCA / UKNI marking are mandatory)?

m) Is design approach for fire damper holistic? E.g., has whole penetration been considered for the space required, site coordination, restraint, differential movement in fire, deflection etc. etc.

n) Fire damper manufacturer approval for use in combined penetrations as tested to BS EN15882-5

o) Identification of use (fire, integrity, reduced leakage, or insulation)

p) Areas needed to be accessible for inspections

q) Limitations

r) Lifespan

s) Maintenance requirements- Cause and effect of the non-maintenance fire dampers

t) Timescales for likely upgrades or replacement

u) Presence of local security, so they cannot be tampered with or misused

v) Planned works in the building

w) As built / O&M manuals to show the locations of where the fire dampers have been installed and following what installation method

x) Levels of protection 30/60/90/120 (refer compartmentation drawings)

y) Means of application. i.e., brick or block, around plastic pipes or within plasterboard construction

z) A true cause and effect of all active systems that are interlinked

aa) Position, access from both sides (inspection and duct cleaning)

bb) Check installation seals around the outside

cc) Fire dampers shall be clearly marked as per section 7 of BS 15650 and numbered using a suitable indelible label. The numbers shall then be included on an as installed drawing showing their exact location

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Round Tables

Q3. What tasks are required to ensure fire dampers are installed, commissioned, inspected, and maintained properly?

It should be a given that any work on fire safety critical assets should always be undertaken by competent people, probably 3rd party accredited. However, that person must be supported with any information that they might need to reduce the risk of an important step being missed and to provide an auditable record of what tasks were completed. This is common practice in M&E maintenance, where the industry has developed a significant library of standard procedures and tasks lists, along with roles/competency required.

An air-conditioning unit, for example, is maintained by a qualified air conditioning engineer, but the engineer is also issued with a check list for them to record what was done.

A similar industry-wide check list for installation, commissioning, handover, maintenance, and recycling could be agreed.

a) Ongoing checking of the selected materials should be made to ensure resilience of the chosen fire damper solution with any maintenance/inspection procedures and regimes written into the O&M

b) Check that installers of fire damper and ducts are accredited

c) Installers should check the fire damper against the prescribed installation method and the compartment barrier type before installing

d) Check compartment barrier has been constructed properly and in accordance with barrier manufacturers guidelines and also the fire damper manufacturers guidelines and requirements, checking that each does not compromise the other, hole sizes, deflection head requirements etc.

e) Check manufacturer has sufficient technical details and method statements to aid installation (materials, dimensions, support details etc.)

f) Check manufacturer has method statement for commissioning and that there is a sign off procedure by a third-party- not the manufacturer or the installer.

g) Identify a suitable standard of testing, refer to BS9999 Annex W for fire dampers (FDs) and BS9999 Annex I for actuated motorised ES classified fire dampers (MFDs)]

h) Check what is the due diligence if something to assist in the installation is ignored, it must not be ignored, not following the manufacturer's instructions is a design change that needs to be justified, the design responsibility now lies with the person making a change or ignoring the instructions

i) Check labelling

j) Ensure any trade that comes to your building is offered the fire strategy drawings and they mark the areas that they have worked on onto the drawing

k) Check that the fire dampers are installed, commissioned, and maintained by an organisation with relevant third-party accreditation (LPS 1531 etc)

l) The positioning of the damper being installed in the correct location. If we have say a 1m x1m hole and the damper should be centred but ends up being offset something can be mentioned in that section to avoid the error

m) See BS9999 for timescales, but third party inspection and reporting is normally done annually. The interim inspections would be by competent people locally

n) SFG 20 latest guidance states 12 months for testing and is highlighted in BESA VH001

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Fire dampers (FD) (E classification)

INTERVAL	TASK	NOTES	RECORD	RISK	Who
Daily	If the FD has a microswitch that is connected to an indicator or control panel, check for faults and incorrect indications at the MFD panel	Corrective Action (CA) Action taken to prevent recurrence (ATTPR)	Keep records by asset number	Advise of risk	Local competent person
Weekly	-	-	-	-	-
Monthly	-	-	-	-	-
Annually For each fire damper asset	1. Confirm asset list of fire dampers	Check for changes	Add, remove asset numbers as required		Third party competent person
	2. Confirm installation method against manufacturer's instructions	Confirm against original install/commissioning information or careful comparison with manufacturer's instructions	If installation is incorrect or cannot be confirmed, then the fire damper may not function in maintaining the compartmentation system Provide photographic evidence all round and from both sides	Confirm Or If not confirmed advise of risk	
	3. Confirm state of penetration seal and its integrity	Any imperfections or concerns must be reported	If this is incomplete then the fire damper may not function in maintaining the compartmentation system Provide photographic evidence all round and form both sides	Confirm penetration seal complete Or Advise repair necessary Advise of risk if incomplete and unrepaired	
	4. Ensure each damper can be accessed from both sides.	This means being able to open and gain access to the ductwork to see the inside of the fire damper from both sides with the ability to operate the damper, observe full open and closure, and clean the unit	Add to record If this is not possible, then advise that access is required Provide photographic evidence all round and form both sides	Confirm adequate access Or Advise access needed Advise of risk as fire damper is unchecked and uncleaned	
	5. Estimate adjacent duct cleanliness	Dirty ductwork is also a fire risk	Provide photographic evidence		
	6. Operate the damper to move to the closed position	Verify that the damper physically closes completely	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	7. Operate the damper to move to the open position	Verify that the damper physically opens completely	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	8. Inspect the latching mechanism and ensure it is secure.	Verify	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	

	9. If there are any external release mechanisms, cables etc associated with the FD confirm their condition and functionality	Verify	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	10. If there is any external witing associated with the FD (microswitch indication), examine the condition of all associated wiring and terminations.	Verify	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	11. Remove any dirt, dust or debris from within damper assembly.	Confirm that the fire damper has nothing that can interrupt its operation	-	-	
	12. Clean the damper in accordance with the manufacturer's recommendations.	Confirm that the damper has been cleaned	Provide photographic evidence Add to record Check prior record, to see if anything has changed	Done/ Not done Advise risk if there are continuing issues	
	13. Report any severe corrosion to the client.	If the fire damper is not opening and closing very easily this would be unacceptable	Provide photographic evidence Add to record Check prior record, to see if anything has changed	Advise risk	
	14. Where lubrication is required, the damper manufacturer's specific instructions should be followed	Preferably the fire damper should just be left in the cleaned state	If the fire damper has been lubricated add this to the record	-	
	15. Check and ensure security of all access doors and gaskets. Check for air leaks.	Confirm	-	-	

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Round Tables

Motorised Fire Dampers (MFD) (ES (EIS) classification) connected to control panels or directly to smoke alarms.

INTERVAL	TASK	NOTES	RECORD	RISK	Who
Daily	Check for faults and incorrect indications at the MFD panel	Corrective Action (CA) Action taken to prevent recurrence (ATTPR)	Keep records by asset number	Advise of risk	Local competent person
Weekly	Simulate alarms and confirm fire damper actions on panel	CA ATTPR	Keep records by asset number	Advise of risk	Local competent person
Monthly	Simulate alarms and confirm fire damper actions at the fire damper	CA ATTPR	Keep records by asset number	Advise of risk	Local competent person
Annually For each fire damper asset	1. Confirm asset list of fire dampers	Check for changes	Add, remove asset numbers as required		Third party competent person
	2. Confirm installation method against manufacturer's instructions	Confirm against original install/commissioning information or careful comparison with manufacturer's instructions	If installation is incorrect or cannot be confirmed, then the fire damper may not function in maintaining the compartmentation system Provide photographic evidence all round and from both sides	Confirm Or If not confirmed advise of risk	
	3. Confirm state of penetration seal and its integrity	Any imperfections or concerns must be reported	If this is incomplete then the fire damper may not function in maintaining the compartmentation system Provide photographic evidence all round and form both sides	Confirm penetration seal complete Or Advise repair necessary Advise of risk if incomplete and unrepaired	
	4. Ensure each damper can be accessed from both sides.	This means being able to open and gain access to the ductwork to see the inside of the fire damper from both sides with the ability to operate the damper, observe full open and closure, and clean the unit	Add to record If this is not possible, then advise that access is required Provide photographic evidence all round and form both sides	Confirm adequate access Or Advise access needed Advise of risk as fire damper is unchecked and uncleaned	
	5. Estimate adjacent duct cleanliness	Dirty ductwork is also a fire risk	Provide photographic evidence		
	6. Verify that the damper can be operated by a fire alarm signal, control panel, or heat/smoke detector, in accordance with the system design.	Check continuity from detector to the individual fire damper	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	7. Examine the condition of all associated wiring and terminations.	Verify	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	8. Operate the damper to move to the closed position	Verify that the damper physically closes completely and that any lights/indications on the control panel also indicate this correctly	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	

	9. Operate the damper to move to the open position	Verify that the damper physically opens completely and that any lights/indications on the control panel also indicate this correctly	Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	10. Inspect any connection mechanisms and the actuator	Confirm that all mechanisms are complete, and that the actuator is securely fixed to the fire damper. Confirm that the fusible element arrangement is fitted to the duct correctly	Provide photographic evidence Add to record Check prior record, to see if anything has changed Have previous Corrective Actions been completed?	Pass/fail Advise risk if there are continuing issues	
	11. Remove any dirt, dust or debris from within damper assembly.	Confirm that the fire damper has nothing that can interrupt its operation	-	-	
	12. Clean the damper in accordance with the manufacturer's recommendations.	Confirm that the damper has been cleaned	Provide photographic evidence Add to record Check prior record, to see if anything has changed	Done/ Not done Advise risk if there are continuing issues	
	13. Report any severe corrosion to the client.	If the fire damper is not opening and closing very easily this would be unacceptable	Provide photographic evidence Add to record Check prior record, to see if anything has changed	Advise risk	
	14. Where lubrication is required, the damper manufacturer's specific instructions should be followed	Preferably the fire damper should just be left in the cleaned state	If the fire damper has been lubricated add this to the record	-	
	15. Check and ensure security of all access doors and gaskets. Check for air leaks.	Confirm	-	-	

Q4. What level of competency/training needs to be in place?

Industry training courses are critical, but they must be complemented by additional knowledge-transfer from people with many years real experience.

Individual manufacturers have product-specific training which complements the more general training. Such training resources need to be provided in all cases where a product is used – both for new build but also as part of the long-term H&S/O&M information, ideally held as machine-readable data in the Asset information model to ensure maintenance teams have easy access to critical information.

a) Follow latest Best Practice guidance for openings within compartment barrier for the manufacturer the compartment barrier has been using

b) Follow latest guidance for openings within compartment barrier as recommended by the compartment barrier supplier, as well as the fire damper manufacturer's information

c) Use accredited installers for fire damper/duct installation (they must be competent to assess suitability of the compartment barrier and how to support and restrain fire damper in any given compartment barrier)

d) Use test data and installation instructions to determine spacings of services (including separation of duct/ fire dampers from other service penetrants)

e) Employ 3PA accredited contractors, when using CE/UKCA/UKNI products for fire resistance

f) Ensure manufacturer competency in providing
   - Product training
   - Technical support
   - Engineering design to overcome non-standard applications

g) The building design should take account of the use of fire resting products and other fire resistance requirements to ensure that they can be installed correctly following the manufacturer's instructions

h) The person undertaking the work should be competent, but they should be supported with check lists for installation, commissioning, inspection/maintenance, decommissioning/replacement

(See Appendix 4 for Additional Participant Input)

Q5. How are the changes from one product to another recorded?

Robust Change Management requires an information baseline against which the different states – current, proposed, final and ongoing change – can be measured and reported.

The baseline information should contain the required performance in a machine-readable/actionable form and the Change Management process should enable that to be compared with:

a) the actual performance of the designed solution (probably generic)
b) the performance of the chosen product against the generic
c) the performance of an alternative (value engineered?) product
d) the record of what was actually used/installed.

Requirements and Suggestions

a) A schedule of safety critical elements for the building, to include products specified. This should include fire dampers

b) Baseline against which to compare proposed alternative products (Some designers have expressed reluctance to propose (not specify) a specific manufactured product that will satisfy their design due to liability, procurement rules and fees)

c) A classification can be provided, but this should match the comparable classification specification for the compartment barrier. If the two do not match or incompatible products are proposed, then this will have to result in a change request

d) Consideration of space to construct and instal is a significant issue. If the required solution does not fit, then a change will be required, as perhaps walls will have to be moved

e) Not all manufacturers provide all the solutions for a given compartment barrier, therefore clear selection, to meet the barriers called for by the building design, is imperative

f) This schedule would be “Locked” at a specific design stage, after which changes to products specified should not occur except for exceptional reasons

g) A formal change management system is required to ensure that any unavoidable changes are validated by a ‘responsible’ person e.g., original designer and/or fire engineer

h) There is a well-established change management process in construction called Technical Submissions in which requested changes from the specifications/recommendations, that were created by the designers (and selected manufacturers), need to be formally reviewed and approved. Design-and-Build procurement has affected that process and it should be reestablished in a way that the performance of a proposed product, and its constituent components, is easily compared with the proposed alternative and, if agreed, it is recorded as a Technical Deviation

i) Impact Assessment

j) Validation of changes would include verifying that the new product met all the requirements for the application with no detriment to the overall design, the details of which should be recorded (Changes in the product may be made between design and procurement, procurement and installation, handover, and ongoing maintenance)

k) More onus needs to be on the client during the collation of Information Requirements and the updating of design models into 'as installed' content suitable for Asset/Facilities Management

l) Full Disclosure of the product is needed at handover so that after Work Stage 7, if a manufacturer goes out of business or products change the record is there in perpetuity

m) Asset database must be kept up to date with core data for new installs. Installation documents should be held in a centralised digital location. Once BIM/COBie level data is manageable within the asset management system then this will be used as the main source of data

n) BIM, CAFM, Asset and Housing management systems must inform the change management process

o) H&S files for each building (cradle to grave) must be supplied, recorded, and be updated with notification of changes and the implications

p) Warranty information of the existing and the proposed products should be provided to allow proper consideration to be made on the selection of an alternative or replacement. If a product has a shorter life than another, this information should be available to inform selection. Given some of the products will be in locations that are difficult to locate, the longevity of a product could have safety implications

q) Compliance systems should be informed with the information from the AIM

r) Asset tagging (barcode) systems and processes should be considered as forming part of the change management process

s) Procurement should be included in the process, recording what was purchased and feeding that into the BIM process to locate where they were installed, or which products they are replacing

t) Specification or design brief for the business (performance and or product) should be recorded in a machine-readable format to enable validation against the Golden Thread

u) Record the compatibility and compliance of any ancillaries and confirm they comply with the test data? (Ironmongery, door access control systems, vision panels, vents)

v) Any adjustment, repair, addition to / removal of product, ironmongery or fittings must be recorded and should only be undertaken by a licensed / accredited contractor (this includes and modification to an existing asset)

w) The asset information needs to enable comparison but the original performance spec of the fire damper and the related information such as Fire Strategy should form part of that Technical Deviation process. The FMs must be able to update the Asset Information Model with machine-readable data of the newly installed product

x) Recording who has worked on/replaced the component and their entitlement/competence to do so

y) Evidence that the component's performance in relation to the part it plays in the system has been considered and is warranted

z) Manufacturers must provide a component list (e.g., ironmongery on a door) so if anything breaks, a direct replacement can be used

aa) Removal of certain products/materials must be undertaken by people who are on an approved list, certified by an accreditation body and should require advance notice to all certification holders, with signoff to ensure traceability

Robust Change Management requires an information baseline against which the different states – current, proposed, final and ongoing change – can be measured and reported including PIM's and AIM's (Project Information Models and Asset Information Models)
The baseline information should contain the required performance in a machine-readable/actionable form and the Change Management process should enable that to be compared with:

- the actual performance of the designed solution (probably generic)
- the performance of the chosen product against the generic
- the performance of an alternative (value engineered?) product
- the record of what was actually used/installed

a) Approval needs to be sought before work commences and where any changes to specification is to be made. Design and specification of FSDC is vital as not all firestopping performs the same despite appearing similar

b) Pre-approval for change of specification before installation

c) Checking that product to be used match specification

d) Digital recording of fire dampers being used (photo, coding, labelling)

e) Commissioning and maintenance manuals provided and part of O&M manuals

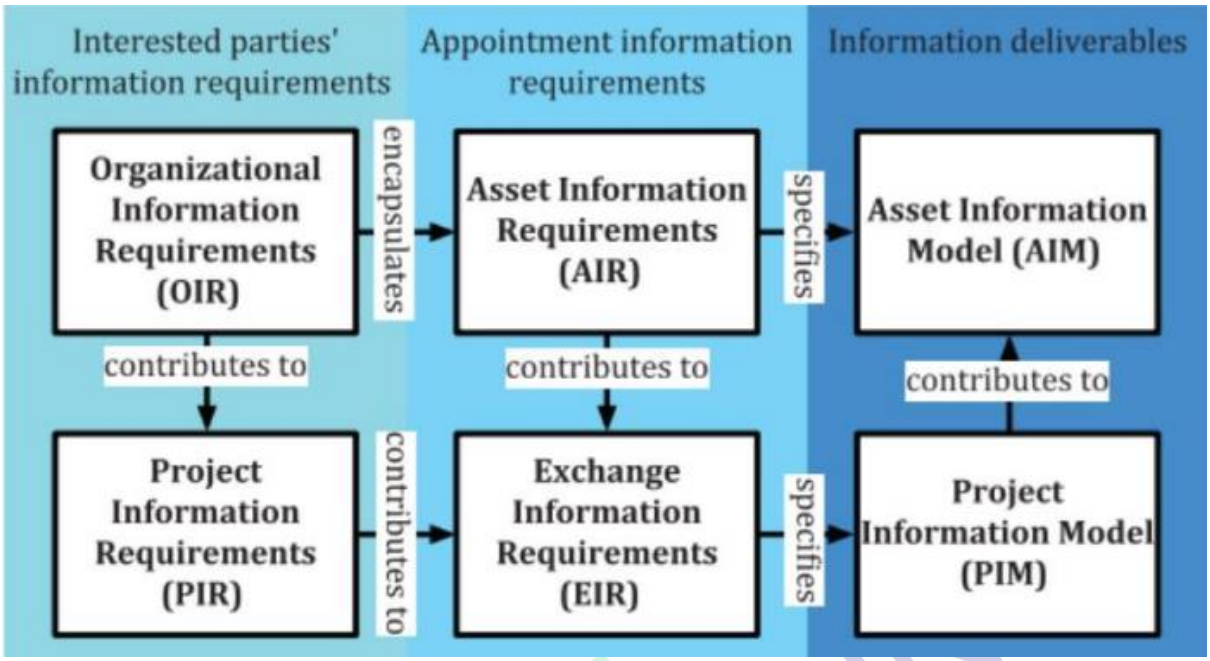
f) Robust design control process, with detail review and change authorisation, should be within ISO 9001 process control

g) BIM models and data storage such as Fire Emergency Files need to complete in its entirety not just ‘what is available’. This could be on a local files or IT software solution or possibly on a central system. Key element is that 5/10/15/20 years down the line the relevant information is available

h) Need to audit the information to confirm that the correct holes, infill, products etc have been used

i) Product should be agreed as part of the overall design and never put as a contractor design portion. Equal and approved by the principal designer

This ISO 19650 diagram is informative.



(See Appendix 5 for Additional Participant Input)

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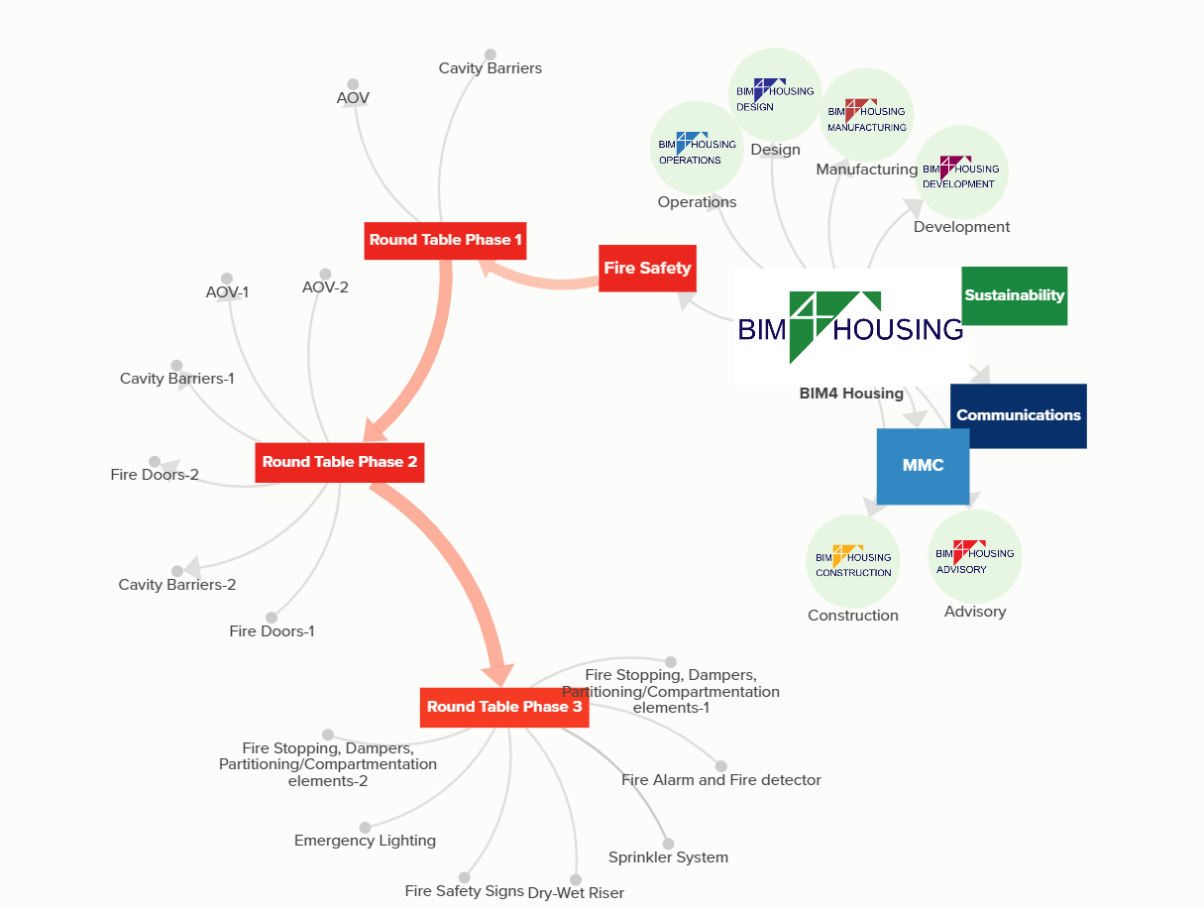
APPENDIX 1

BIM4Housing Structure



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APPENDIX 2

Additional Participant Input Question 1a

The list below is not a complete list and I know some of the later standard numbers have changed i.e., chimneys.

- EN 1363-1: General requirements (tests)
- EN 1366-1: Fire Ducts
- EN 1366-2: Fire dampers
- EN 1366-3: Penetration seals
- EN 1366-4: Linear joint seals
- EN 1366-5: Service ducts and shafts
- EN 1366-6: Raised access floors and hollow floors.
- EN 1366-8: Smoke extraction ducts
- EN 1366-9: Smoke extraction ducts single compartment
- EN 1366-11: Fire Cable Systems and Components
- EN 1366-10: Smoke control dampers
- EN 1366-19: Chimneys
- EN 1364-1: Fire resistance tests for nonloadbearing Elements
- EN 1364-2: Ceilings
- EN 1364-4: Curtain walling

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APPENDIX 3

Additional Participant Input Question 3

Industry-standard testing & maintenance instructions – example extract from BESA's SFG20.

Testing and reporting procedure

Testing should include but is not limited to the following steps:

1. An inventory of all fire dampers to be tested.
2. All fire dampers will be manually released to ensure the integrity of the spring-loaded shutter.
3. The fusible link should be inspected for any deformity or damage.
4. The fire dampers will be cleaned and lubricated within the closed position.
5. The fire dampers shall then be opened and re-set.
6. Any severe corrosion found shall be reported to the client.

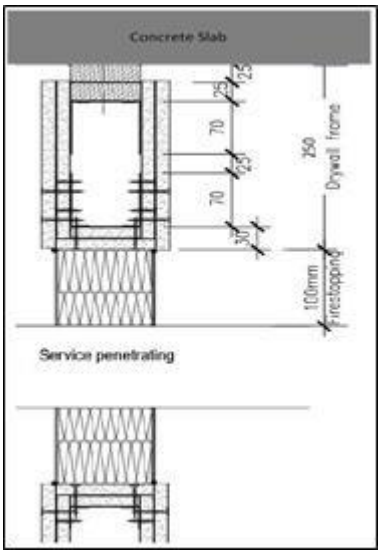
Reports should include but are not limited to the following items:

a) Test results with client information including position within the building/system, date, and name of operative shall be recorded and any comments noted if further action is required.
b) Assess all fire damper installations with reference to the manufacturer's instructions, the compartment barrier, fire damper model etc. Advise the client
    a. if wrong
    b. you are unsure and suggest a second opinion
    c. or you feel that an invasive assessment be made to ensure compliance with the manufacturer's instructions
c) Inspection results including positive tests and details of failed fire damper operation.
d) If drawings are provided, update and annotate details.
e) Digital photographic evidence of fire damper condition prior to and after testing procedures unless otherwise specified by client.
f) Explanation of failed operation and recommended corrective or remedial action.

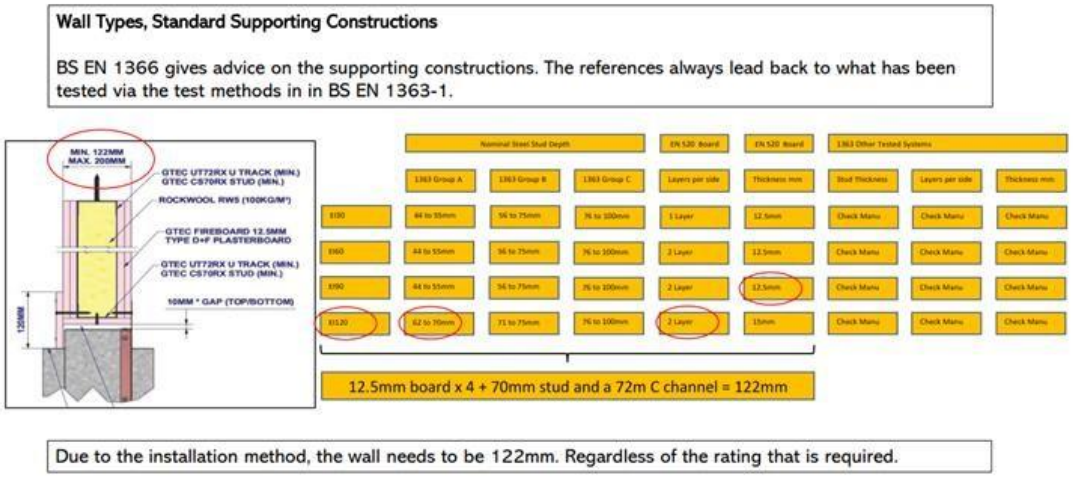
Before you move a VCD, you must mark its position and return it to that position because if not, you will change the whole balance of the system, affect flows and energy usage. etc

Installation

An example of a fire damper tested in detail and the reliance on the wall depth, thickness.



Building Deflection is the way a structural element moves under load from above. There are various types of loads that can be applied from above and these can result in the standard supporting construction required fire safe deflection heads in excess of 250mm.



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There needs to be a directive that the designers need to take advice from a maintenance company to help them identify where the access issues will be in the future once the building is handed over to the end user. Also, to prepare for different fit outs like CAT B and CAT C.

APPENDIX 4

Additional Participant Input Question 4

- There is no benchmark for any qualifications or third-party certification schemes and no regulatory controls on passive fire.
- Inspection is the first step of maintenance - so fire assets need inspection therefore they are assets - QED- you must monitor its condition and check to see if it has been disturbed.
- It is easy to keep an eye on assets that are visible - passive is generally hidden in building fabric but still needs to be viewed.

it is important to have basic fire behaviour science understanding, so it gives the installer / checker and understanding of when to raise a red flag.

Competency / Training
Specific Actors such as Designers, Constructors, Installers, Manufacturers etc each have specific training and competencies that they need.
This section needs to identify the different Actors and the competencies needed. The focus is predominantly on Manufacturers and Installers where other Actors needs should also be addressed.

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APPENDIX 5

Additional Participant Input Question 5

The Golden Thread does not mean everything about a building and its history needs to be kept and updated from inception to disposal. The objective of the golden thread is building safety and therefore if information is no longer relevant to building safety, it does not need to be kept. Models reflect both Design and Construction models with ownership and therefore liability associated with Changes made in each. Mechanism for updating models may impact on a model owners' liability. A Designer may refuse to change a model to reflect as built as they will not take liability for a Constructor installed product. Change management along with ownership and liability needs to be reflected.

Accountable person under the new Building Safety Act
The performance of the penetration seal for trays/pipes/trunking, fire dampers, FR ducts, SE ducts, chimneys(flues) in terms of their classification is required to be verified against the classification of the wall and the requirement of the specific requirements for the purpose of the system to which they are installed. Then any change can be judged from them

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APPENDIX 6

Participants

Ana Matic	Scott Brownrigg
Antonio De Sousa	Hydro-X
Colin White	Smoke Control Dampers Limited
Conor Logan	Colt UK
Daniel England	PRP
David Peacock	TÜV SÜD
David Poat	Notting Hill Genesis
Deane Sales	New Terra
Emma Murphy	Thrive Homes
Gavin Richards	Indepth Hygiene Services Limited
George Stevenson	ActivePlan
Ian Doncaster	Fire And Smoke Solutions Ltd
James Lucas	PH Water Technologies
John Fennah	Siemens AG
Martin Milner	Milner Associates
Mike Smith	Bailey Partnership
Mustafa Alhashimi	Clarion
Nick Haughton	Sapphire Balconies Ltd
Paul McSoley	Mace
Paul McSoley	Mace Group
Paul Oakley	ActivePlan
Paul White	Ventilation Fire Smoke Ltd
Richard Michael	Camden
Scott Fenton	Mace Group
Stephen Gore	Swegon Air Management Ltd
Steve Fitchett	Total air solutions
Sue Wilbraham	Metropolitan Thames Valley