BIM4Housing's Expert's Recommendations on Mitigating Risk to Cavity Barriers, while Strengthening the Golden Thread

(In their own words with edits)

Second Edition

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Written and compiled by: Richard Freer, Director BIM4Housing

And the experts listed in Appendix 9

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

Cavity Barriers Methodology

The outputs from a first Roundtable (20th July 2021) were finessed at a second Roundtable (3rd August 2021). In each case, significant participant engagement was achieved prior to each event, with each Roundtable having different participants.

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

What is a Cavity Barrier?

Cavity Barriers are there to decrease the spread of smoke and flames between fire compartment separations within hidden voids and uninterrupted cavities withing buildings, such as external cavity walls, raised access floors or suspended ceilings. They support the essential delay of fire spread to allow people to safely evacuate a building, as required by building regulations, while contributing to some level of property protection. They are a hidden, yet critical part of the passive fire protection components within a building. However, the term “cavity barrier” also applies to other barriers used in different locations. Approved Document B gives some added clarity (See Appendix 2)

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.

1a. What risks do Cavity Barriers mitigate?

a) Risk to fire-fighter's access
b) The risk of the spread of fire and products of fire (fire, smoke, heat) via cavities in external and internal walls, along with other concealed cavities (such a roof and ceiling voids)
c) The risk of spread of fire, smoke, and heat between building compartmentations
d) Risk of speed of fire and smoke spread
e) Risk of number of uncontained areas
f) Risk of inhibiting safe exit from the building
g) Risk of fire brigade not having enough time to attend before fire spread
h) Risk of system failure
i) Risk of Injury/harm/loss of life to residents/occupants
j) Risk of smoke damage and subsequence
k) Risk of compromising security, both for the building and individual apartments
l) Risk of reduced thermal efficiency
m) Risk of degraded acoustics
n) Risk of damage to property, building or structure

(See Appendix 3 for Additional Participant Input)

1b. To what risks are Cavity Barriers, themselves, susceptible?

a) Risk of incorrect replacement components having been installed
b) Risk of incorrect installation
c) Risk of the wrong product in the wrong application
d) Risk that the cavity barrier is positioned wrongly
e) Risk of being removed
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 that the asset has not been tested against the 'Cause and Effect' document
i) Risk of other trades and employees not appreciating the asset's function and so compromising its performance
j) Risk of non-appreciation of the differences between performance of assets in compartmentalised areas versus performance of assets in shared circulation areas
k) Risk of vandalism or simply misuse

l) Risk of cavity barrier being damaged by materials falling down the cavity - particularly external masonry walls where mortar can fall
m) Risk of change in required standards? e.g., materials installed 30 years ago may not be to today's standards

Materials

a) Building movement
b) In service and under fire load / shrinkage
c) Excessive water damage
d) Mechanical Damage
e) Laboratory testing not covering real-life scenarios

Installation

a) Refurbishments, upgrades and work during new builds, which (unknowingly and unchecked) puncture of the cavity barrier during refurbishment or upgrade, such as:
    i. External Façade treatment – addition of new wall panels or disturbing the cavity barrier in situ
    ii. Thermal improvement installations within the building
    iii. Installation of new services through the ceiling space and walls, and partitions without an understanding of the role/duty of the above elements in the general arrangements, and reinstatement to functionality
    iv. Installation of new fixtures and fittings
    v. Lack of appropriate remedial /replacement fire-stopping or reinstating of cavity barrier after refurbishments, repairs, and renewals
    vi. Building change of use requiring relocation and or replacement of cavity barrier

b) Installation not complying with manufacturers instructions
c) Installation incompetence
d) Installed in wrong position
e) The cavity barrier not having been tested against relevant test standard

Inspection

a) Not inspected either during installation before being 'covered up' (Once void sealed, no way of determining if there is a cavity barrier in place at all. No access for post installation inspection)
b) Foil tape obscuring missing elements due to insufficient inspection

(See Appendix 4 for Additional Participant Input)

2. What information is needed about Cavity Barriers to ensure they perform as required?

It is important to understand how the information will be used and how the context will vary what information is required. 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 of the information all stakeholders need against all products and leave it to each role to configure their software applications to see only the information they need for that individual task.

Requirements

a) Type of Cavity Barrier – open state or closed full filled (stone wool, steel plate formats, timber)
b) Size of cavity
c) Manufacturer
d) Design life
e) 'As Built' drawings and documentation should be made a requirement of the contract

Specification

a) Cavity seal material
b) Insulation type
c) Product composition
d) Evidence that the design has been carried out appropriately by competent persons
e) Evidence of the design is suitable

N.B - Does the product carry BSi identify UPIN or similar?

Performance

a) Minutes/hours of fire resistance
b) Field of application for test results; integration and insulation ratings
c) Evidence the right product has been used (to include demonstration of suitability for intended use, product specification and limitations, use-specific test evidence.)
d) Performance characteristics
e) The responsibility of the cavity barrier towards enabling the building element to perform its role as needed
f) Projected movements and tolerances of walls and floors
g) Projected wind/snow load
h) Design life requirements

Materials

a) Surrounding substrates
b) Fitted vertically or horizontally
c) Cavity trays fitted
d) Weep vents
e) Record of batch numbers, purchase orders and delivery notes to ensure traceability

Construction

a) Position of wall ties
b) Party walls
c) Mobility of cavity barrier- can it be repositioned?
d) Wall type (brick, concrete, light wall etc.) and fire rating

Installation

a) Specific location
b) Evidence that the installation has been carried out appropriately by competent persons
c) Evidence that the installation methods are suitable
d) Evidence that the product is specified in design documents and site-specific methods of installation have been considered by designers
e) Dated site images of the installation alongside written records (taking note of elements that will be covered up in the final build)
f) End use certification
g) Installer and their certification
h) Documentation confirming its having been installed in accordance with installation instructions.
i) Installation date
j) The general arrangement of building element that the cavity barrier is to be installed in.
k) The role /duty that the said building element (that is to receive the cavity barrier) is playing in the general arrangement of the building
l) A listing of all components and accessories of the cavity barrier and the part each one plays in ensuring that the cavity barrier performs as required
m) Immediate vicinity (electric, duct etc.)
n) Traceability of "hidden" cavity barriers
o) Time of installation/mounting
p) What the cavity barriers are to be installed against - e.g., masonry to masonry or render cladding to timber frame

Inspection

a) If it is to be inspected; how? E.g., for an EWS1
b) Evidence that the inspection has been carried out appropriately by competent persons

Maintenance

a) Maintenance requirements
b) Contact for replacement materials
c) Evidence that the maintenance and servicing has been carried out appropriately by competent persons
d) Whether EWS1 form is required

(See Appendix 5 for Additional Participant Input)

3. What tasks/method statements/procedures are required to ensure a Cavity Barrier is 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.

See FRAEW in accordance with PAS 9980 for existing buildings under scope of Fire Safety Act 2021

Correct installation is critical to the success of the cavity barrier. Buildings will 'move' over time and its performance must be assessed against a potential fire in a building that could happen years after installation.

Requirements

a) Legislation/standards it complies with
b) Warranty conditions/service life statement
c) An independent review on manufacture

Specification

a) Specification of the cavity barrier must not be changed from that specified
b) Fire engineering assessments might be acceptable from a competent Chartered Fire Engineer. The client's consultants and contractors should appreciate the limitations in the direct field of application (DIAP) for product tests
c) EJ's to be completed in line with PFPF guidance

Materials

a) Do not make substitutions of products when system tested (which might be LPS 1501 system testing for Modular) unless extended field of application (EXAP) rules have been established by the system test standard. For BS 8414 there are substitution rules in BS 9414

Installation

a) As built / O&M manuals to show the locations of the cavity barriers that have been installed.
b) Application of the barriers including compatible components (manufacturers guidance and test evidence that they can be installed within that guidance)
c) Product lifespan within the specific system it is being used within (if installed within an external facia having a 2-year product lifespan would not be suitable. This may be within the manufacturer's guidelines)
d) 100% photographic records of installation for Cavity Barriers that are inaccessible

e) Preferably third-party certified materials, products and systems should be installed by third party certified installers, under UKAS accreditation

Inspection

a) Proof of competency of inspectors
b) Ensure that the tests provided as evidence are representative of the building if using a system test as evidence of compliance
c) Post work inspection
d) Ensure access to cavity barriers is always possible

(See Appendix 6 for Additional Participant Input)

4. 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.

Installation

a) Those involved in the design and installation should be able to demonstrate training /qualifications relevant to the systems they design/install and be members of a recognised organisation such as the Smoke Control Association with accreditation through the likes of the UKAS Approved IFC SDI 19 Smoke Control System Installer Accreditation Scheme

b) Competency of individual installers demonstrated through certification with a suitable 3rd party accreditation provider. This should include the provision of the manufacturer's fitting instructions

c) Specification of which third party accreditations are acceptable (e.g., Trada, Firas, BM Trada, IFC etc.) should be required

d) Ongoing demonstrable CPD of installer (not simply the company they work for). For example, operatives installing products should have achieved L2 NVQ Diploma in Wood Occupations (Construction) - Site Carpentry (CSCS blue card) or L2 NVQ Diploma in Associated Industrial Services Occupations - Passive Fire Protection (Construction), both with the mandatory module for Installing Fire Resisting Timber Door sets in the Workplace

e) Supervisors should have achieved L3 NVQ Diploma in Wood Occupations (Construction) -Site Carpentry (CSCS gold card), or IFE Level 3 Certificate in Passive Fire Protection or be named as a competent supervisor in the company UKAS accreditation (see https://essentialsiteskills.co.uk/course-index)

f) Installer should have manufacturer-led product-specific installation training, in addition to any formal UKAS accreditation

g) Manufacturers should offer installation training, either in their own right, or sub-contracted out to a specialist to provide that service

h) Code of practice should include training materials

i) Competence of trainers needs to be determined

j) The STA has a training programme and test for installers and looking to develop it for approval, but it moves slowly

Maintenance

a) Manufacturer-specific installation, commissioning, inspection, maintenance/repair, replacement, and recycling requirements should be retained to inform future maintainers of the manufacturers' recommendations

b) Mandatory awareness training should be in place for all people working on site and carrying out maintenance in buildings

c) Training for the operational team should be required on Standards (BS, CEN etc.) plus to give a basic understanding of how to read drawings, commissioning certs, O&M's

d) BSI Flex 8670 focuses on the competence of individuals and expects that organisations use this core criteria as part of their management of competency (planning, monitoring, reviewing etc.). This also enables the capture of the skills, knowledge, experience, and behaviors necessary to the undertaking of a defined role, function, activity, or task

(See Appendix 7 for Additional Participant Input)

5. How should product changes be 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

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

d) 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

e) 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

f) 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)

g) 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

h) 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 (BSi is a suitable method of retaining information in perpetuity)

i) 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

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

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

l) 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

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

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

o) 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

p) 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

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

r) 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)

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

t) Evidence that the component's performance in relation to the part it plays in the system has been considered and is warranted

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

v) 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

(See Appendix 8 for Additional Participant Input)

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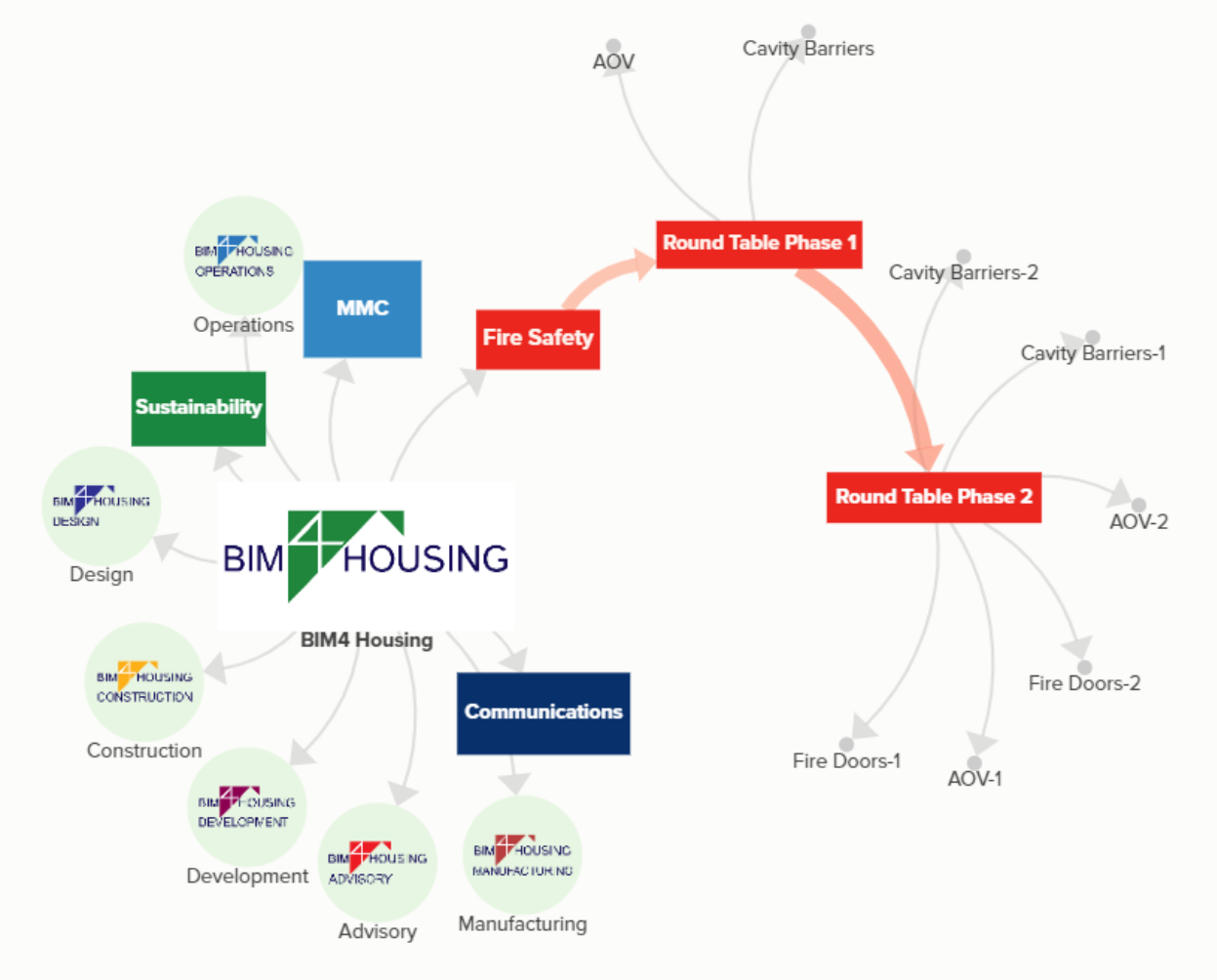
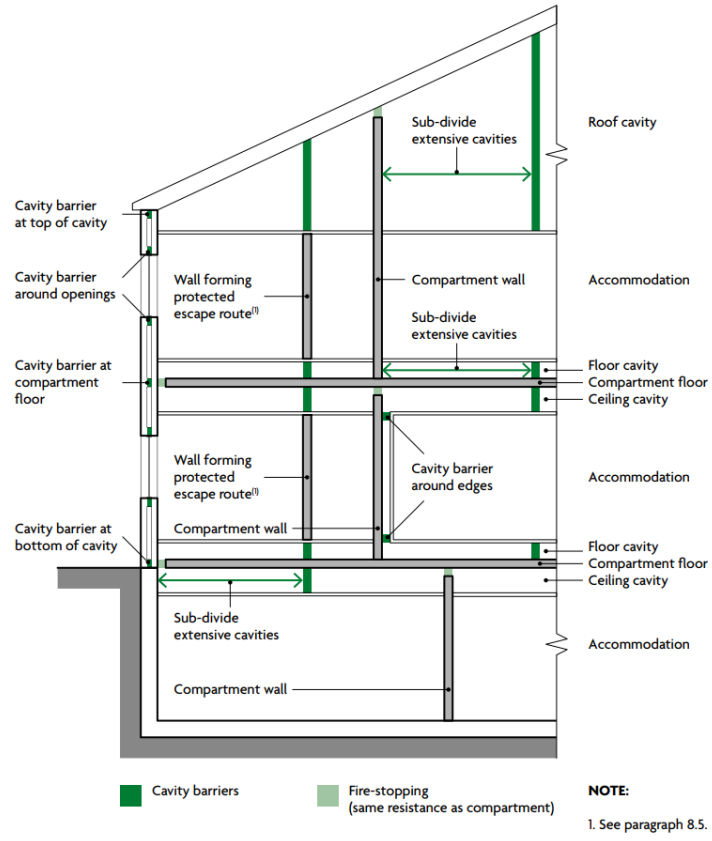
APPENDIX 1

BIM4Housing Structure



APPENDIX 2

See para 8.2



NOTE:

1. See paragraph 8.5.

Diagram 8.1 Provisions for cavity barriers

Construction and fixings for cavity barriers

8.8 Cavity barriers, tested from each side separately, should provide a minimum of both of the following:

a. 30 minutes' integrity (E 30)

b. 15 minutes' insulation (I 15).

They may be formed by a construction provided for another purpose if it achieves the same performance.

See also clause 8.9

APPENDIX 3

Additional Participant Input Question 1a

BUILDING REGS DEAL WITH LIFE SAFETY - NOT PROPERTY
There is always a risk of a fire in a flat or building. the risk is to life and property and depending on the audience will depend on interpretation of that risk and the risk appetite. A fire in a flat which doesn't spread beyond the flat of origin can kill the occupants and destroy the home. The legal enforcers (HSE and Fire Brigade) are only interested in fires that spread beyond the flat of origin because it relates to the law on which they enforce. The risk to life or injury or property damage is real from any fire, but the consequence and risk appetite of that risk depends on the audience, owner, occupier, business, enforcer.

The law says:

B3 Internal fire spread (structure)

B3-(4)

"The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited."

https://www.legislation.gov.uk/uksi/2010/2214/schedule/1/made

In Approved Document Part B Appendix, A: Key terms the definition of Cavity Barrier is:

"A construction within a cavity, other than a smoke curtain, to perform either of the following functions.

- Close a cavity to stop smoke or flame entering.
- Restrict the movement of smoke or flame within a cavity."

This is in contrast to the ADB Appendix A: Key terms definition for Fire Stopping, which is:

"A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke."

ADB makes a clear distinction between cavity barriers and fire stopping as:

ADB Volume 1 - Diagram 8.1 Provisions for cavity barriers (Flats)

ADB Volume 2 - Diagram 9.1 Provisions for cavity barriers

There are four distinct categories of cavities:

1. **Cavities concealed by non-fire resisting internal construction.**

ADB Diagram 8.1/9.1 expects 30(E)15(I) cavity barriers internally below raised floors, behind wall linings and above suspended ceilings, or above ceilings below a roof.

2. **Cavities within external cavity walls**

ADB excludes double-leaf masonry cavity walls with leaves of a minimum of 75mm, which is also applied to double-leaf concrete cavity walls or combinations of masonry and concrete leaves. Otherwise ADB Diagram 8.1/9.1 expects minimum 30(E)15(I) cavity barriers within external cavity walls. But ADB allows the external wall to have no minimum fire resistance and does not require a protected zone at the edges of internal compartment walls and floors, which might also be a party wall condition.

3. **Cavities within roof construction**

ADB Diagram 8.1/9.1 does not graphically recognise this category. ADB allows the roof to have no minimum fire resistance and does not require a protected zone at the edges of internal compartment walls, which might also be a party wall condition.

4. **Cavities within internal compartment walls and floors**

ADB Diagram 8.1/9.1 does not graphically recognise this category. Cavities are present within internal compartment walls or floors in any building that is not solid wall and floor construction, which is frequently the case in Modern Methods of Construction (MMC). It is important to control cavities of this category and ADB should be augmented. In this category it is better to think of fire stopping relating to compartmentation, rather than cavity barriers.

Intumescent cavity barriers are often used where air flow is required in normal operation, so cold smoke would move freely until the intumescent has activated at elevated temperatures.

APPENDIX 4

Additional Participant Input Question 1b

As an installer, we are asked to certify installations, yet they should be installed to manufacturers' tested solutions and then certified by us as installing to that - if there are not tested solutions, and Building Control will not accept this.

Significant Water ingress can also contaminate the product and therefore could create respiratory issues within the building over time. Curtain Walling fixing details do not always allow a full installation of slab edge products, yet it is not always possible to install from mast climbers. There is no one 'passing' buildings, it just needs to be inspected as you go.

If extensive cavities within internal compartment walls and floors include combustible materials, that fire load may be vulnerable to fire penetrating through building services or as gaps open in the deflecting primary or infill structures, allowing flame, heat and hot or cold smoke to spread unseen and inaccessibly beyond the compartment of origin. In the case of Permanent Stacked Modular Buildings that can mean horizontally and vertically.

Open State Cavity barrier products as standard, are often tested within a laboratory in with a clear uninterrupted cavity. Often these cavities are populated with bracketry which means the contractor has to install the barriers in 2 pieces or cut around the element. This is as standard, not tested, especially with open state cavity barriers where handy angle which supports cladding panels where a clear cavity for drainage and ventilation is required. It is possible and quite common for individual manufacturers to design and develop project specific tests, based on EN and other applicable standards, that replicate, as far as is practicable the end use condition. Supplementary Evidence of performance can also be gained using data from BS 8414 or equivalent tests, which are system tests, and therefore can assess the role/performance of cavity barriers in more realistic end use conditions. Manufacturers undertaking product tests are obliged to follow the procedures mandated by the standards, EN/BS/ASTM/industry sponsored that they test to, and these focus on the performance of the product *in isolation*. When they adapt the test for an alternative construction other than mandated, the output is considered “ad hoc” and whilst useful in terms of understanding, is not considered bona fide under the rules of the test standard itself.

This also includes the increasing use of steel masonry support angles which are fixed the edges of concrete slabs and create a lot of spatial congestion in terms of their depth and content. The ideal positioning for a cavity barrier is away from this congestion in external walls, so that a clear uninterrupted barrier is formed.

Foil faced stone wool slab cavity barrier systems use foil tape to seal abutting joints. I have found that foil tape hides elements of barriers which are missing due to workmanship/practical installation issues. Not sure how you can combat this without getting rid of the foil face systems or increasing the frequency of inspections to mitigate.

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APPENDIX 5

Additional Participant Input Question 2

There is currently no published harmonised EN test for Cavity Barriers. The promised BS EN 1364-6 from 2016 has failed to be completed. Until that impasse is resolved:

- *EOTA TR 031 Fire Resistance Tests for Cavity Barriers – 2008* and *ETAG 026 Fire Stopping and Fire Sealing Products - Part 5 Cavity Barriers – 2011* are the only guidance available for "Closed State" cavity barriers in all four categories of cavity construction. EOTA TR 031 considered that Intumescent materials have a service life of 10 or 25 years, but no longer is proven as a state of the art. At the time of the development of the EOTA standard in 2011, 10 years ago, 10/25 years was considered sufficient, and reflected industry requirements more than it did the potential physical capabilities of the intumescent itself, in relevant exposure conditions. Recent multiple exposures/weathering using the nominated tests in EOTA TR 031 of OSCB (open state cavity barriers) by some manufacturers, have proven that service lives of 60 years are available. Individual manufacturers should be consulted for their positions on service life and the appropriate evidence to support any claims.

- *16/30324104 DC BS EN 1364-6. Fire resistance tests for non-loadbearing elements. Part 6. Cavity Barriers* can be read for "Open State" cavity barriers in the external wall, which in practice are fixed horizontally only.

It was never the intention of the technical committee that OSCB thinking could be applied to the category of cavities within internal compartment walls and floors. The use of OSCB is primarily now in ventilated cavities within external walls.

It is possible and current industry practice to use the *BS EN 1366-4:2006+A1:2010 Fire resistance tests for service installations. Linear joint seals* as fire stopping in the BS EN 1366 series that relate to Building Services. This test is primarily for unventilated, aka "Full fill" cavity barrier types, where no ventilation is required and intumescent are generally not required. This is a test is carried out between two rigid fixed concrete sides to a furnace aperture, as are most of the product level tests of this nature, as they are designed to assess the performance of the product *"in isolation"* If the substrate into which cavity barriers are fitted are neither concrete and are affected by movements and tolerances, a fire engineering assessment is required for their application, or evidence from tests such as BS 8414 or similar ad hoc tests.

ETAG 026 GUIDELINE FOR EUROPEAN TECHNICAL APPROVAL of Fire Stopping and Fire Sealing Products Part 5 Cavity Barriers

CE marking/UKCA certification attested against a product standard for fire seal products identifies a number of essential characteristics a fire seal must provide in addition to its fire performance including reaction to fire, durability, environmental use and content, release or emission of dangerous substances.

These properties are essential for selecting the correct product. I know that some open state cavity barriers can be exposed to the elements for a long number of weeks before being closed in. This is quite common, and the individual manufacturer should be consulted to provide assurance/comment on the exposure of the products to the elements.

New building method, such as the use of SFS and sheathing boards are not always thought through properly. Although the SFS wall construction may be classified for a specified fire resistance, that is from one side of a room to another.

What happens if the sheathing boards run continuously with the edge of the concrete slab, for a cavity barrier between floors?

Intumescent materials embedded within compartment floors and walls cannot be accessed. **Permanent Stacked Modular Buildings: Technical Checklist for England – Issue 01**

https://www.riscauthority.co.uk/public-resources/documents/resource/iq8-technical-checklist-for-england-permanent-stacked-modular-buildings-753

https://www.riscauthority.co.uk/resource-download/753

IQ8 Building System Questionnaire: Permanent Stacked Modular Buildings – Version 1.0

https://www.riscauthority.co.uk/public-resources/documents/resource/iq8-buildings-system-questionnaire-permanent-stacked-modular-buildings-interactive-748

https://www.riscauthority.co.uk/resource-download/748

Is this Uniclass or Uniclass 2015, which is the proprietary version monetised by NBS.

What about CAWS classifications available in NBS Chorus?
Most contractors are still using Common Arrangement of Work Sections as an alphanumeric. Can they be doubly defined to CAWS and Uniclass?

As a sub-contractor the issue we have with BIM, and the language you referred to, means that we need to wait until this has been agreed - or we end up buying a Betamax and everyone else is on VHS!

Risk to cavity barrier - testing procedure for PVC cavity closers filled with stonewool and are tested as linear joint seals. They are never tested as a 3D seal, and you will find in all PVC cavity closers that there is a hole with no barrier in each corner.

Testing of cavity barriers - if a cement/other sheathing board over sails a concrete floor slab 2 cavities are formed: 1 between the board and floor slab and one between sheathing board and cladding.
No testing has been done on the integrity of a single sheet of cement or sheathing board; boards are tested as walls fitted to a metal/timber stud from one side of a room to the other. There is industry work underway to test cavity barriers and the performance of same within SFS constructions.

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Additional Participant Input Question 3

There is test data on cavity barriers attached to different internal substrates - Steel Frame and Timber Frame, plus numerous BS 8414 tests. If your opinion of BS 8414 is not positive that's a choice, but the data exists, so to say there is no test data is not correct.

Insurers in future may require proof that Cavity Barriers or Fire Stopping were installed to all joints to satisfy Requirement B3-(4) of Schedule 1. of the 2010 Building Regulations, which is a life safety requirement under Regulation 8 of the 2010 Building Regulations and Section 1 of the 1984 Building Act.

In Approved Document Part B Appendix, A: Key terms the definition of Cavity Barrier is:

"A construction within a cavity, other than a smoke curtain, to perform either of the following functions.

- Close a cavity to stop smoke or flame entering.
- Restrict the movement of smoke or flame within a cavity."

This is in contrast to the ADB Appendix A: Key terms definition for Fire Stopping, which is:

"A seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke."

ADB makes a clear distinction between cavity barriers and fire stopping as:

ADB Volume 1 - Diagram 8.1 Provisions for cavity barriers (Flats)

ADB Volume 2 - Diagram 9.1 Provisions for cavity barriers

There are four distinct categories of cavities:

1. **Cavities concealed by non-fire resisting internal construction.**

ADB Diagram 8.1/9.1 expects 30(E)15(I) cavity barriers internally below raised floors, behind wall linings and above suspended ceilings, or above ceilings below a roof.

2. **Cavities within external cavity walls**

ADB excludes double-leaf masonry cavity walls with leaves of a minimum of 75mm, which is also applied to double-leaf concrete cavity walls or combinations of masonry and concrete leaves. Otherwise ADB Diagram 8.1/9.1 expects minimum 30(E)15(I) cavity barriers within external cavity walls. But ADB allows the external wall to have no minimum fire resistance and does not require a protected zone at the edges of internal compartment walls and floors, which might also be a party wall condition.

3. **Cavities within roof construction**

ADB Diagram 8.1/9.1 does not graphically recognise this category. ADB allows the roof to have no minimum fire resistance and does not require a protected zone at the edges of internal compartment walls, which might also be a party wall condition.

4. **Cavities within internal compartment walls and floors**

ADB Diagram 8.1/9.1 does not graphically recognise this category. Cavities are present within internal compartment walls or floors in any building that is not solid wall and floor construction, which is frequently the case in Modern Methods of Construction (MMC). It is important to control cavities of this category and ADB should be augmented. In this category it is better to think of fire stopping relating to compartmentation, rather than cavity barriers.

If extensive cavities within internal compartment walls and floors include combustible materials, that fire load may be vulnerable to fire penetrating through building services or as gaps open in the deflecting primary or infill structures, allowing flame, heat and hot or cold smoke to spread unseen and inaccessibly beyond the compartment of origin. In the case of Permanent Stacked Modular Buildings that can mean horizontally and vertically.

There is no test for Cavity Barriers. The promised BS EN 1364-6 from 2016 has failed to be completed. Until that impasse is resolved:

- *EOTA TR 031 Fire Resistance Tests for Cavity Barriers – 2008* and *ETAG 026 Fire Stopping and Fire Sealing Products - Part 5 Cavity Barriers – 2011* are the only guidance available for "Closed State" cavity barriers in all four categories of cavity construction. EOTA TR 031 considers that Intumescent materials have a service life of 10 or 25 years, but no longer is proven as a state of the art.

- *16/30324104 DC BS EN 1364-6. Fire resistance tests for non-loadbearing elements. Part 6. Cavity Barriers* can be read for "Open State" cavity barriers in the external wall, which in practice are fixed horizontally only.

It was never the intention of the technical committee that "Open State" cavity barrier thinking could be applied to the category of cavities within internal compartment walls and floors.

It is possible to use the *BS EN 1366-4:2006+A1:2010 Fire resistance tests for service installations. Linear joint seals* as fire stopping in the BS EN 1366 series that relate to Building Services. But this test is carried out between two rigid fixed concrete sides to a furnace aperture.

There is a plethora of training schemes being commissioned to instruct on how to install passive fire protection measures. For our part, we offer the following:

- Training on installation to anyone that requests it.
- The training is assessed to an ISO standard, not so much for its technical contact, which is unique, but for its ability to pass on the instructions in a uniform, consistent, and understandable format. The training session comes in 3 parts, pre training assessment, the

training phase, and post training assessment. You have to complete all 3 to have completed the training. The last phase is a practical inspection of an installation by the trainees.

- Thereafter we offer access to our inspection App, supplemented by with physical visits from our own engineers. The premise is that we offer as much practical support as we can to ensure that the products are installed as they should be, to a standard that is acceptable to all stakeholders.

We are also part of the early adopters of the BSI Identify scheme which allows , via the scanning of a QR code affixed to the product, access to vital data in perpetuity https://identify.bsigroup.com/ the intent here is to ensure that anyone at any time has access to data in the years to come that will not be interrupted by "Error 404" or by broken web page links.

Cold Work Permits
We recommend all our clients, to protect our passive works and that they record all works following original installation. Something as simple as giving a marked-up drawing to site, noting anywhere that works have taken place and then hand this to the FM, Estates, etc allowing someone to investigate after those works and thus determine if any passive measures have been compromised. We use large triangular warning signs on walls that have been designated a fire wall, stating Do not Penetrate, even this hasn't worked.

Permanent Stacked Modular Buildings are best provided with a photographic record of every installed product in the stack, installed to fire testing (which might be LPS 1501 system testing) and reported as part of the Regulation 38 Information Exchange.

On many projects, we have approached the main contractor to advise that they should not proceed with works, such as a fixed ceiling, as our works are incomplete in an area or have finished an installation to be advised that follow on trades shall be penetrating the barrier and we monitor this to ensure we can repair this before leaving site. Previously, there had been some sign off/milestone/checklist to ensure all works were completed before the next stage of works commenced, this is more evident with the reduced labour on sites with the pandemic limiting occupancy.

The current CSCS cards show the trade qualification on the back of the card, but not clearly advising what has been achieved, unlike the previous listing of all modules. The passive fire NVQ is achieved after completing a core module surrounding health and safety etc and then you only need to complete two of the 5 modules available to achieve the card.

Facilities Managers and the "Responsible Person" under the Regulatory Reform (Fire Safety) Order 2005 need the Regulation 38 Fire Safety Information handover. ADB Volume 1 and 2 has a list of Regulation 38 information.
No product test for cavity barriers then how can there be a Regulation 38 handover.
Leaks and water damage from sanitary facilities may require replacement of Cavity Barriers and Fire Stopping to get fire Insurance.

APPENDIX 7

Additional Participant Input Question 4

There is an art in training. Many have jumped on the band wagon of seeming to provide something, which in reality is often lacking and creates more problems than it solves. You would not use a Sony TV manual to operate an LG TV, in my experience many of these courses are potentially useful grounding, but the onus should be in the supplier of the product to supply the training on installation, and help determine what is good and what is bad?

You also have the complication that some cavity barriers, say for Rainscreen, are often installed by the cladding contractor, and not by a specialist. This does not necessarily mean that they are liable to be installed incorrectly, and many cladding contractors have sought their own competency scheme accreditation to achieve compliance, but most of them also seek product manufacturer training IN ADDITION to any general appreciation they may have had from a course that is general in nature. Using specialists does not, in my experience confer compliance, but it will add cost, and slow down the installations. In some areas, specialists can be useful, but most cavity barriers are relatively simple to install, and competence can be achieved by “non specialists” . you will have vested interests who want to promote a greater market for themselves by creating an air of mystery around installation and wear their installing badges to support that mystique.

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Additional Participant Input Question 5

https://www.ciob.org/news/ciob-riba-publish-guide-on-highrisk-elements-of-buildings

With FRA's with one big issue being that the Risk Assessor are often not qualified or do not come from a Fire background, I would say that a detailed risk assessment that goes above and beyond the PAS79 is needed that would ensure that even if someone doesn't understand fire that they do the correct checks. e.g. checking lift cavities and getting into attic spaces.

The sub-contractor or main contractor should have to provide evidence that the system they are proposing is 'fit for purpose' rather than the usual specification clause similar or approved. A proforma should be generated identifying the key points that need to be addressed and all parties manufacturer, architect, fire consultant, main contractor and sub-contractor should sign this off so that they all take responsibility.

The insurance industry has a better control on what needs to be built that the construction industry, if the insurance policy specifies that XYZ is required, you would achieve greater engagement.

The client sets the terms of the design in Work Stage 0 and 1 as they assemble their consultant team by Work Stage 2. It is the client that has to define the design for life safety as the minimum requirement in Section 1 of the 1984 Building Act, or do they want to go further to achieve a degree of property protection in consultation with Insurers. Some clients are happy to let the building burn to the ground provided everyone can escape and no Fire and Rescue Service personnel are injured. Moorfield Hotel, Brae, Shetland 27 July 2020 fire is an example. Great success. No injuries. Total asset loss

Mechanisms exist to deal with specification changes - the issue is often that a good specification is compromised by a spec change that is driven by monetary concerns. The client or whoever procures the building needs to accept that safety cannot be sacrificed on the altar of cost.

Why is there no Gateway in the Golden Thread at Work Stage 1 for the client's brief? Why wait until Planning?
How will the Building Safety Regulator's minions check that what is built by Gateway 3 is what was technically designed at Gateway 2 in the Cavity Barriers they can't see any longer?
Of course, Gateways are only HRRBs.
Most buildings with most Cavity Barriers are not falling under HSE regulatory scrutiny.

The regulator wont check between gate 2 & 3 it is up to contractor/client to evidence that they built what was designed.

The decision to include Cavity Barriers happens at Work Stage 3, 2, 1 or 0 as soon as the client adopts a form of MMC. If you make a distinction between compartmentalisation and the elements that actually make up a compartment wall and floor you will get very confused.

Thinking ahead generally requires investment by the building procurer. Contractors need to understand that consultants have thought ahead.

For new build, there should be a Fire Strategy at an early stage of design as just like proper services co-ordination. The Fire Strategy will determine compartments and the need for fire stopping.

Installers arrive on site and are often asked to design based on what has been installed by others - therefore we can only install what is possible, this may differ from spec.

https://landingpage.bsigroup.com/LandingPage/Series?UPI=BS%20ISO%2015686

Fire strategy provided to an installer at an early stage will also allow monitoring the building project develop and can allow us to cause a pause in project programme where we feel that we can see a clash /issue, but we are not always on-site full time, subject to size of project/site team engagement.

The RIBA did a huge amount of work on a Fire Safety Overlay on the RIBA Plan of Work 2020. Then didn't publish it. Why not?

Housing Associations can aggregate client demand for Cavity Barrier and Fire Stopping good manufacturing, design, construction, and Regulation 38 handover practice.

Why is there no fire resistance required in the external wall when the Cavity Barriers externally are specified by ADB to be 30(E)15(I)?

Shouldn't the external wall have the same minimal fire resistance?

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APPENDIX 9

Participants

Adam Heath	Siderise
Andrew Taylor	Association for Specialist Fire Protection
Audrey Hesse	Chartered Architect
Bex Gibson	Livewest
Bradley Cooper	SH Group
Chris Hall	Siderise
Dan Griffiths	DIG Ltd
Dave Peacock	TÜV SÜD
David Litherland	Halspan
David Poat	Notting Hill Genesis
Duncan Alabaster	Polyseam
Edward Coster	Clarion
Emma Murphy	Thrive Homes
Gavin Pierson	The Guinness Partnership
George Stevenson	ActivePlan
Ian Abley	FPA
Johnny Furlong	L&Q
Jonathan Evans	Ash and Lacy
Laura Smith	Gentoo Group
Martin Milner	Milner Associates
Michael Strömgren	Briab
Mike Richardson	PRP
Neil Yeomans	Orbit
Nick Haughton	Sapphire Balconies Ltd
Patrick Wilson	PW Architects
Pauline Tuitt	L&Q
Pencho Studenkov	Origin Housing

Peter Brierley	Sovereign
Ranie Goolcharan	Origin Housing
Rick Burgess	PRP
Scott Sanderson	PRP
Seren Walker	The Barnet Group Ltd
Sharon McClure	Avesta group
Steve Aldridge	ACMS-UK
Steve McAlinden	Thrive Homes
Stewart Bailey	Virtual Viewing
Suzanne Whitehead	Clarion
Tim Vincent	Rockwool
Tom Cannon	Hill Group
Wayne Parris	Origin Housing