BIM4Housing's Expert's Recommendations on Mitigating Risk to AOVs, 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/

BIM4HOUSING
Round Tables

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
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AOV Methodology

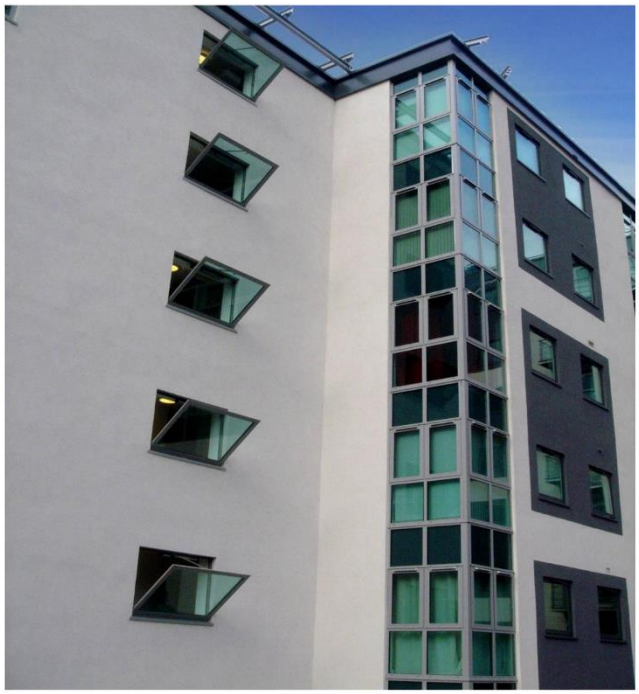
The outputs from a first Roundtable (21st July 2021) were finessed at a second Roundtable (26th July 2021). In each case, significant participant engagement was achieved prior to each event, with each Roundtable having different participants.

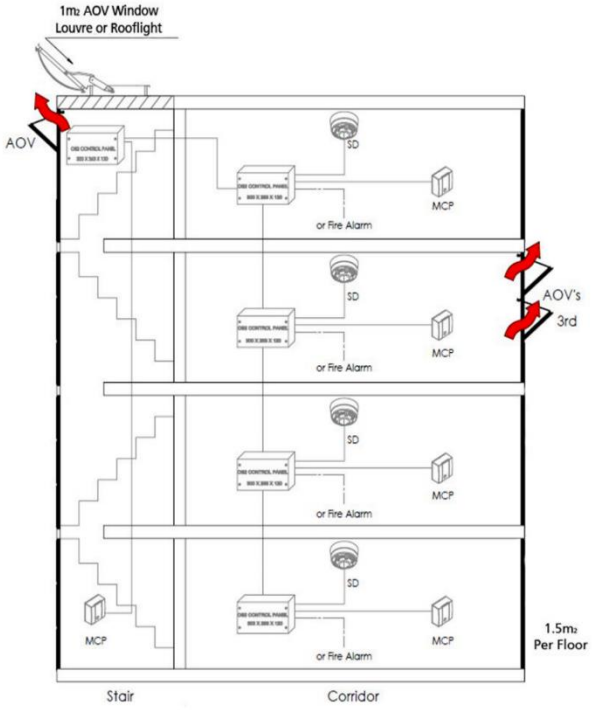
Now, eighteen months on, we are reviewing the Recommendations in light of recent legislation and any change in industry practice.

What is an AOV?

Automatic Opening Vents (AOV) is a collective term for Smoke Vents, Natural Smoke and Heat Exhaust Ventilators (NSHEVs). It is a component of a smoke control system and normally consists of an actuator and a window, door or louvered vent.

The function of an AOV in residential buildings is to control the elements produced by fire (smoke & heat), so to assist in maintaining tenability within the means of escape for both building occupants and fire-fighters. It should also assist with the prevention of smoke spread to other parts of the buildings, protecting the building, its contents and reducing the risk of flashover.





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 does an AOV mitigate?

a) Risk of smoke build-up
b) Risk of heat build-up
c) Risk of replacement air not being supplied
d) Risk to fire-fighter's access
e) 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) and between building compartmentations
f) Risk of speed of fire and smoke spread
g) Risk of number of uncontained areas
h) Risk of inhibiting safe exit from the building
i) Risk of fire brigade not having enough time to attend before fire spread
j) Risk of Injury/harm/loss of life to residents/occupants through diminished visibility and smoke inhalation and suffocation
k) Risk of smoke damage and subsequence
l) Risk of heat damage
m) Risk of compromising security, both for the building and individual apartments, when doors don't close properly or are propped open
n) Risk of reduced thermal efficiency
o) Risk of degraded acoustics
p) Risk of damage to property, building or structure
q) An AOV could mitigate against the risk of multiple cross corridor doors being open at any one time

1b. To what risks is an AOV, itself, susceptible?

a) Risk of additional items having been placed into an escape route (such as a sofa), not having been considered at design stage, could provide fuel for a fire, and have the potential to counteract the AOV/smoke extraction system
b) Risk of incorrect replacement components having been installed
c) Risk of human intervention on ancillary assets, such as smoke detectors, impacting on asset performance
d) Risk of system failure
e) Risk of information on an individual asset being incomplete, inaccurate, or absent
f) Risk of information on an individual asset not being supplied in both digital and physical format

g) Risk that the asset has not been tested against the 'Cause and Effect' document
h) Risk of other trades and employees not appreciating the asset's function and so compromising its performance E.g. The retrofitting of downpipe's binding interfering with opening
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 when a smoker pushes it open to remove smoke
k) Risk that the AOV and its controlling system doesn't fail-safe (though this is not always possible)
l) Risk that the AOV is used for daily ventilation without change of application
m) Risk end users don't know how often the AOV system requires checking/servicing

Materials

a) Risk of building movement / shrinkage
b) Risk of excessive water damage
c) Risk of some Laboratory testing not covering real-life scenarios

Installation

a) Refurbishments and upgrades (Risk of AOV not being aligned following layout change E.g. major refurbishment)
b) Risk of detritus gathered in over years and not cleared out
c) Risk of the AOV being sealed shut
d) Risk of the AOV being forced open
e) Risk of an AOV not being readily identifiable, resulting in lack of consideration for its operability
f) Risk of non-related works, such as scaffolding, interfering with an AOV's opening and closing
g) Risk of changes in the local environment impacting on performance. E.g., Increasing the height of adjacent buildings can affect wind force and direction
h) Risk there is no differentiation between types of smoke control systems (mechanical or natural, for example)
i) Risk of a roof light being used as access, leading to the Actuator being used too frequently or be damaged and therefore failing to perform when required
j) Risk that if the AOV is used to access the roof, there will not have been the realisation that it will need to be reset
k) Risk of AOV being utilized outside its primary purpose E.g., For environmental ventilation.
l) Too much signage or info about AOV can be confusing
m) If they are triggered by a smoke detector, then AOV might open too early or too late
n) Incorrect system set up (so that not all AOVs open up at the same time and create a chimney effect instead of getting rid of smoke)
o) Deterioration of gasket seals where plastics and rubbers reduce over time and become adhesive which can prevent vents opening
p) Risk of products being used as an AOV that are not tested and certified for that purpose

(See Appendix 2 for Additional Participant Input)

2. What information is needed about an AOV, to ensure it performs 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.

Requirements

a) The AOV must meet the relevant standard - BS EN 12101-2 and the criteria set within it
b) A description of that system (main components, their number and location and what they serve)
c) A cause-and-effect analysis of that system, including how it interlinks with other fire safety systems (Appendix 3.ii)
d) The location of each AOV - including commissioning settings and installation height, recorded as machine-readable information in the Asset Information Model, in such a way that it is clearly identifiable in an elevation view
e) O&M instructions in both digital and document (pdf) format
f) Documentation defining the application of the system. i.e., outlined within a written fire strategy or fire statement within gateway 1

Specification

a) The type of system the AOV is part of (mechanical smoke ventilation, Natural buoyancy, smoke shaft, etc.)
b) Evidence to support traceability of the product from specification
c) Proof of competency of those involved in specification
d) Technical specification of installed system confirming the system grade and level of automatic detector coverage
e) Ongoing validation of the aerodynamic free area (0.9m2) and response delay (60s)
f) Documentation defining the specification of the system i.e., open, or closed protocol requirements
g) The product DOP will have the number of tested cycles and it could be anything from no declared performance to 10,000 plus

Performance

a) Evidence of testing against specific AOV performance criteria (e.g., that the AOV achieves the aerodynamic free area 0.9m2 in under 60 seconds) via system simulation of the cause-and-effect schedule
b) Have an Event Log Book– to know how many operations are performed
c) Monitoring condition of AOVs and classifying systems by their vulnerability and criticality

Materials

a) Product lifespan outlined by the manufacturer
b) Evidence of testing against specific AOV performance criteria (e.g., that each AOV achieves the aerodynamic free area 0.9m2 in under 60 seconds) via system simulation of the cause-and-effect schedule

c) Product data sheets for all system components

Construction

a) Evidence that the right product/system has been used
b) System drawings (System schematic and layout drawings)
c) As installed zoning plans/drawings
d) Schematic and schedule of system confirming location and type of system components (manual call points, automatic detector heads and control panels)
e) Technical information on interfaced systems (e.g., Emergency Voice Communication System)

Installation

a) Spatial location (inc x/y coordinates)
b) Proof of competency of those involved in installation
c) Detailed manufacturer instructions on installation and commissioning
d) Details if the AOV has been retrofitted or upgraded, e.g. When and How
e) Commissioning certificates
f) Warranty expiration date
g) Evidence of third party accreditation of the installer (if required)
h) Third party accreditation for the system (as installed, if required)
i) Manufacturer's installation instructions as machine-readable data for each model of a product
j) If it's an older system what would be the standard it was designed to at the time of installation?
k) Is the system part of an engineered solution, with deviations or variations against the current standards?

Inspection

a) Spatial location (inc x/y coordinates)
b) Cause-and-Effect matrix and Cause and Effect configuration (A functioning as installed)
c) Commissioning test report confirming functionality of automatic detectors, manual call points, Cause-and-Effect protocols with all required interfaced systems and power supply back up duration
d) Commissioning Certificates for the installed system and/or systems components in accordance with a relevant system design standard

Maintenance

a) Spatial location (inc x/y coordinates)
b) Detailed manufacturer instructions on routine maintenance, fault correction, lifecycle and recycling
c) Manufacturer information on any components that are likely to need replacing during the lifecycle of the building
d) Activation history- particularly frequency of activation (Appendix 3.iii)
e) Listing of compatible components for replacement such as call points, manual keys, actuation arms etc.
f) Manufacturer's maintenance instructions
g) Operations and Maintenance manual for the system and components

h) For repairs and maintenance, the components need to be defined as part of the AOV. There needs to be a safeguard against a service company replacing a part in a n AOV which is not the original part used when the certification test was passed.

(See Appendix 3 for Additional Participant Input)

3. What tasks/method statements/procedures are required to ensure an AOV 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.

Requirements

From Draft BS8644:

a) Technical specification of installed system confirming the system grade and level of automatic detector coverage
b) As installed zoning plans/drawings
c) Schematic and schedule of system confirming location and type of system components (manual call points, automatic detector heads and control panels)
d) Product data sheets for all system components
e) Technical information on interfaced systems (e.g., Emergency Voice Communication System)
f) Cause-and-Effect matrix and Cause and Effect configuration (A functioning as installed)
g) Commissioning test report confirming functionality of automatic detectors, manual call points, Cause-and-Effect protocols with all required interfaced systems and power supply back up duration
h) Commissioning Certificates for the installed system and/or systems components in accordance with a relevant system design standard
i) Operations and Maintenance manual for the system and components
j) Evidence of third-party accreditation of the installer (if required)
k) Third party accreditation for the system (as installed, if required)
l) Ensure accessibility to all that need to have access to fire alarm systems (no closed protocol)

Installation

a) Manufacturer's installation instructions as machine-readable data for each model of a product
b) Evidence of testing against specific AOV performance criteria (e.g., that each AOV achieves the aerodynamic free area 0.9m2 in under 60 seconds) via system simulation of the cause-and-effect schedule
c) Ongoing validation of the aerodynamic free area (0.9m2) and response delay (60s)

A certificate for the building will be issued, as opposed to a certificate for each opening vent within the building or space.

Members of the SCA are likely to have the right level of assurance in place.

Specific checks should be included on component of AOV systems above and beyond what is mentioned on SFG20 (example below)

The ability to reconfigure a system is often restricted for safety reasons. This level of access is often referred to as Closed Protocol. It is important that access to configure systems is available from more than one competent provider (e.g., through a network of organisations trained to use the technology).

Maintenance

a) Manufacturer's maintenance instructions

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

1	Fixing and weathering	Check condition and clean all dirt from internal and external weathering channels and surfaces of the ventilator. Take precautions to prevent inhalation of bird droppings.
2	Louvres/flaps or dampers	Clean bearings and lubricate as necessary.
3	External hand control where fitted	Check and adjust.
4	Operating mechanism	Check action for smooth operation and to ensure they open and close correctly. Lubricate all linkages in accordance with manufacturer's recommendations.

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 of 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) Design, installation, and commissioning certification should be carried out by a competent 3rd party certified contractor

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, like existing Health & Safety training

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 4 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

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) The asset information needs to enable comparison but the original performance spec of the AOV and the related information such as Fire Strategy and Cause and Effect 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

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

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

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

w) 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

Maintenance

a) Some designers have expressed reluctance to propose (not specify) a specific manufactured product that will satisfy their design due to liability and fees, but if we are to have a robust

change management process, we need to have a baseline against which to compare proposed alternative products

b) This is particularly true for safety critical elements which should be considered “Locked” at a specific stage in design, after which changes to products specified should not occur except for exceptional reasons

c) The Technical Deviation process should ensure that any changes, which are unavoidable at times, are fully considered by those qualified to do so e.g., the original designer and/or fire engineer appointed, maintenance experts and the regulator. The checks would involve 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

Operational Phase

a) This same change management process should be applied when maintenance teams need to replace an asset. Clearly, this requires the asset information to be sufficiently complete to enable that formal comparison but the original performance spec of the AOV and the related information such as Fire Strategy and Cause and Effect 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, along with the related information detailed above

b) It might be that the ‘Change’ is the modification of an existing asset. One of the fire safety experts mentioned that they discovered, by chance, a plan to replace a manual opening window (for ventilation) in a compartment which already had smoke control, which could have had serious implications

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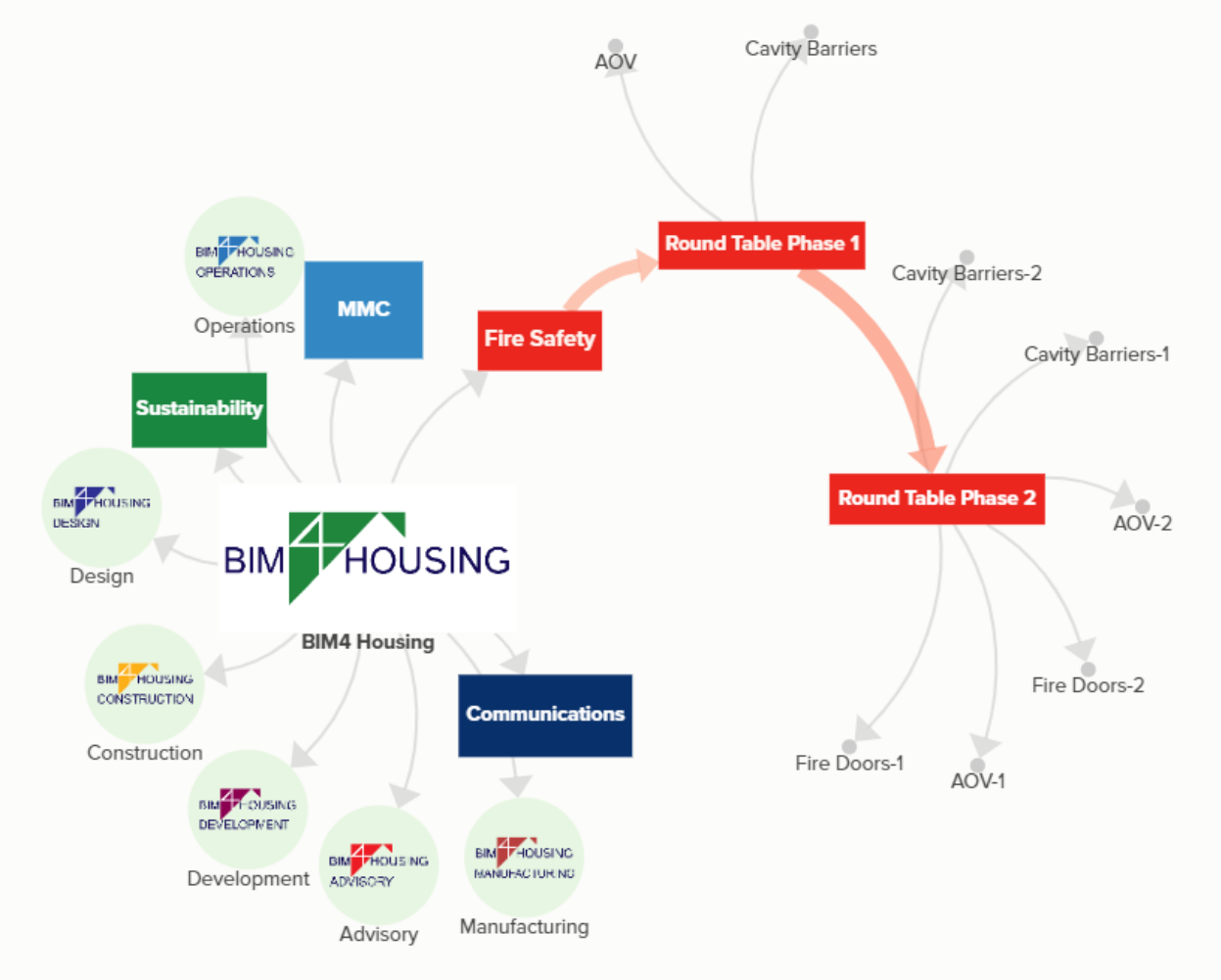
APPENDIX 1

BIM4Housing Structure



APPENDIX 2

Additional Participant Input Question 1

i) According to Approved Document B Volume 1, 2019 edition Building Regulations 2010 B1 Smoke control of common escape routes by natural smoke ventilation:

3.49. Despite the provisions described, it is probable that some smoke will get into the common corridor or lobby from a fire in a flat. There should therefore be some means of ventilating the common corridors/lobbies to control smoke and so protect the common stairs. This means of ventilation offers additional protection to that provided by the fire doors to the stair, as well as some protection to the corridors/lobbies. Ventilation can be natural (paragraphs 3.50 to 3.53) or mechanical (paragraph 3.54).

3.50. Except in buildings that comply with Diagram 3.9, the corridor or lobby next to each stair should have a smoke vent. The location of the vent should comply with both of the following.

a. Be as high as practicable.

b. Be positioned so the top edge is at least as high as the top of the door to the stair.

3.51. Smoke vents should comply with one of the following.

a. They should be located on an external wall with minimum free area of 1.5m^2

ii) An example “small, simple building” system under ADB (under 11 metres) will be an AOV at the head of the stair to effectively use the stair enclosure as the smoke shaft (a principle which, in itself, can be problematic). An AOV in the stair may be intended to do one (or both) of two things – to provide makeup air to the lobby, particularly for a mechanical system designed using the “floppy door” principle, and/or to allow smoke ventilation at high level from the stair enclosure itself. In reality, the arbitrary 1.5 sq. metre vent in a lobby may be ineffective at achieving its goals. as the arbitrary size is a corruption over time from historic guidance (which would originally have stipulated cross-ventilation via two vents between them achieving 30 sq. ft (i.e. three square metres). This evolved over time in CP3 Chapter IV Part 1 and effectively “lost” one of the two vents, the remaining size of which was in essence 1.5 square metres, rather than based on a real scientific or engineering principles.

iii) The other part of this is the performance-based design approach, is where AOVs do what the fire strategy needs them to.

- There needs to be a distinction between different types of smoke control system which may be present in residential settings:
- Natural systems
- Mechanical
    - Extract systems
    - Pressurisation systems

It is really important that the original design for any kind of ventilation provided in the common parts for life safety means of escape and firefighting is documented in the fire strategy and then made clear for the key stakeholders in the building including residents, maintenance contractors, housing, surveyors, repairs teams etc. One way to communicate is to put signage on or adjacent to the window/vent.

BS EN 12101 series is the relevant product standard for AOVs/NSHEVs and this has an essential characteristic classification for reliability (Re 10000 for dual purpose operation).

Also consider the viability of natural ventilation in high rise, is this the right application and should consideration then be given to mechanical.

Risks AOVs present to others:

n) Risk of falls from AOV windows
o) Finger trapping, etc
p) Risk of falling components from height
q) electrocution

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APPENDIX 3

Additional Participant Input Question 2

i) According to Approved Document B:

Where ADB is adopted as the design criteria, the AOV should be located on an external wall and reliably achieve a design open free area such as 1.5m^2.

An NSHEV (industry standard name for an AOV) should comply with EN12101-2: 2003. In order to comply, the product must have been subjected to various tests in an accredited laboratory, underwritten by an Approved Body and only then is it allowed to be placed on the market. Importantly the results can only be expressed by the manufacturer in a table of essential characteristics via a Declaration of Performance (DoP). Certain essential characteristics are critical to ensuring the AOV performs as required. In our example the Aerodynamic Free Area (EN12101-2 doesn't recognise "free area") and the response delay (response time) of less than 60 seconds are critical. These characteristics are also measurable after installation and can therefore be used to validate the correct operation of the AOV.

This is an extract from the relevant table from the SCA guide.

Essential Characteristics of a Natural Smoke and Heat Ventilator tested to EN 12101 part 2 2003

SCA recommended performance characteristics by application

EN12101-2 Annex ZA

Essential Characteristics	Notes	Unit	Relevant Clauses	Vertical	Top of stair Combined roof pitch and vent pitch angle > 45° [Note 1]	Top of stair Combined roof pitch and vent pitch < 45° [Note 1]	Top of smoke shaft Vertical [Note 2]	Top of smoke shaft Combined roof pitch and vent pitch angle > 45° [Note 1]	Top of smoke shaft Combined roof pitch and vent pitch angle < 45° [Note 1]	Corridor Vertical	Corridor Combined roof pitch and vent pitch angle > 45° [Note 1]	Corridor Combined roof pitch and vent pitch angle < 45° [Note 1]
Nominal activation conditions/ sensitivity	Informative		4.1, 4.2	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v	e.g. 24v
Response delay (response time)		s	7.1.2	<60s	<60s	<60s	<60s	<60s	<60s	<60s	<60s	<60s
Operational reliability emergency operation only	Reliability Re (number of operations)		7.1	Re 1000	Re 1000	Re 1000	Re 1000	Re 1000	Re 1000	Re 1000	Re 1000	Re 1000
Operational reliability emergency operation and comfort ventilation (dual purpose)	Reliability Re (number of operations)		7.1	Re 10000	Re 10000	Re 10000	Re 10000	Re 10000	Re 10000	Re 10000	Re 10000	Re 10000
Aerodynamic free area *Coefficient of discharge Cvo (without side wind) ** Coefficient of discharge Cvw (with side wind)		m^2	6	0.7*	0.7**	0.7**	0.9*	0.9**	0.9**	0.9*	0.9**	0.9**
Performance parameters under fire conditions [mechanical stability]	Classification in accordance with Annex B		7.5	B300	B300	B300	B300	B300	B300	B300	B300	B300
Ability to open under environmental conditions	Snow Load SL	Pa	7.2	SL 0	SL 0	SL 500	SL 0	SL 0	SL 500	SL 0	SL 0	SL 500
	Low ambient temperature T	°C	7.3	T 0	T 0	T 0	T 0	T 0	T 0	T 0	T 0	T 0
	Wind Load WL	Pa	7.4	WL 1500	WL 1500	WL 1500	WL 1500	WL 1500	WL 1500	WL 1500	WL 1500	WL 1500
Reaction to fire	Classification in accordance with EN13501-1		7.5.2.1	e.g. E								

Note 1 Consult manufacturer's data for instructions on the use and fitting of wind baffles
Note 2 Could be susceptible to adverse effects from wind. Refer to chapters 6 and 8.

ii) Cause-and-effect strategy, and overall building fire strategy. People need to understand what the AOVs are there for, and how they actually work in practice. They should have this understanding to be able to test the systems, and thereby identify any performance gaps. RPs also need to understand how critical the AOV is, and what interim measures are likely to be required in case of failure.

iii) We need to consider device level activation recording to understand the frequency of operation. This is very relevant to understand longevity of the AOV. If the AOV is used for smoke ventilation only then the number of operations should be no more than annual testing routine (e.g. 12 per year). If the AOV is used for environmental ventilation the number of operations would be considerably higher. The classification of the product should be Re 10000. If it is RE 1050 then it is likely the actuation mechanism will fail prematurely. Being able to interrogate the AOV to establish the number of operations completed would be very helpful.

iv) The AOV's size / free area / location needs to be reviewed against other elements of the building e.g., the height of the AOV's outlet has to be say 500mm above any other element on the roof within a 2m radius. CFD analysis is also now required by Building Control to prove the location / size is adequate from our experience. The issue is that for a designer - the information about the product / size etc. will only be known in construction stage (as this is typically when the specialist M&E sub-contractor is appointed).

v) Consistency of format for information is essential. E.g., do we define information in mm or m or cm. It will make it easier for all to understand all information.

a) How is it designed to perform in that space O&M, Installation Drawings, Commissioning Certificate?
b) How should it be maintained - Part of O&M – Maintenance Schedule
c) What type of system is it – Powered with roof vents? Window vents, what kind of actuator (chain, linear)
d) Does it serve a dual/multi-function e.g., ventilation for the building?

vi) Testers need to have an appreciation of slight nuances/tolerances between standards - say BS, EN, etc. - and that these should be raised when identified.

vii) Fire risk assessors and landlords are unlikely to know where to locate this information. It should be an integral part of the fire risk assessment and subsequent reviews, as it is critical to evacuating the building. This documentation should part of the buildings Fire Risk strategy.

If dual purpose for ventilation other AOV's should also close. Lockout is a cause and effect issue for the system rather than an individually AOV product issue.

BS EN 12101-8 as a relevant standard for smoke shaft dampers as well as BS EN 12101-2 for AOV's

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APPENDIX 4

Additional Participant Input Question 4

Competency and training should be appropriate to the level of interaction with the AOV. For example, some who test, and service will need to know more. Housing staff and caretaking staff who carry out routine inspections should be aware of their purpose. Those who audit should also be aware of their function.

Clients "Assume" assessors are competent in all things fire, this is not the case and assessors should be challenged on their specific competencies.

Things go wrong at a granular level.

Competency and training will be dependent on the system complexity. For example, a simple AOV in a lobby won't take much explaining, whereas a mechanical ventilation system will be more complex, particularly if it has secondary functions (such as environmental ventilation).

Good training courses like a 4-day NEBOSCH course are useful, but they must be complemented by additional knowledge-transfer from people with many years real experience.

There are also bodies that provide training but masquerade as certification bodies. It should be clear which certification is valid.

APPENDIX 5

Additional Participant Input Question 5

It is critical that the performance requirements of the product (the essential characteristics) are identified as early as possible in the design process and not deviated from. The Building Safety Bill's Gateway 1 (a hard stop) requires the approach to fire safety to be identified from a finite set of options (e.g., ADB, BS9991, BS7974). So, if ADB was chosen, then the fire performance criteria for the AOV (1.5m2 free area as Q1 above) is immediately established and in theory cannot change once the design is allowed to progress to Gateway 2. Therefore, any manufacturer who can provide compliant products would be eligible to supply the product and in line with the draft of BS 8644-1 mentioned above, information required at the specific the exchange point must be provided. Non fire essential characteristics would vary from manufacturer to manufacturer but ideally this would be easily captured in COBie or FIREie data.

DRAFT BS 8644-1

4.3.4 Construction stage | IEP C

4.3.4.1 Content of fire safety information

Fire safety information at this stage should:

a) demonstrate that the installation of materials, products and systems are in line with the design intent, relevant standards and manufacturers' installation requirements.

b) demonstrate how changes to the proposed design, materials, products and systems are evaluated against the fire safety objectives and approved.

5.1.3 Relationship of FIREie to information exchange points (IEPs)

Each IEP should have a defined set of information deliverables that should be included in the FIREie exchange, via data responses or reference using the "Document" tab, as seen in spreadsheet view of the FIREie exchange.

5.2.8 Type

The "Type" tab should contain information relating to the types of products, and their fire safety requirements, used in the construction of the built asset about which information is being exchanged.

The detection required to make the vents automated is often assumed to be fire alarm systems alerting. Sometimes multi sensors or heat detection are installed incorrectly. Also, sometimes fully functioning fire alarm panels are installed rather than specific AOV panels. Also, the equipment is not always accessible.

Are changes to the building specification e.g., suspended ceiling, going to impact on any specific fire designs?

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APPENDIX 6

Participants

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Anthony Childs	Hackney Council
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Audrey Hesse	Chartered Architect
Bill Watts	Max Fordham
Conor Logan	Colt UK
Dan Griffiths	Dixon International Group Ltd
Danny Pyrah	Unite Students
David Jones	ICM
Deane Sales	Ea-Rsgroup
Dwayne Florant	L&Q
Edward Coster	Clarion
Gareth Greatrix	London Councils
George Stevenson	ActivePlan
Helen Buchan	JLA
Ian Doncaster	Fire and Smoke Solutions Ltd
Ilona Lynch	A2Dominion
Jack Ostrofsky	Southern Housing Group
Jack White	Clarion
James Banner	Orbit
Jeremy Malet	Shellen
Jim Hannon	LFS Fire Solutions and Maintenance
Josephine Bakulyowa	PRP
Keith Todd	RBKC
Kelly Lee	Orbit
Lee Taggart	Golding homes

Leona Kuo	SE Controls UK
Luke Hazelwood	L&Q
Mark Pratten	Airey Miller
Mo Fisher	PRP
Nabil Moughal	A2Dominion
Nicholas Nisbet	AEC3
Noel Pells	PRP
Paul McSoley	Mace Group
Paul Oakley	ActivePlan
Pauline Tuitt	L&Q
Pencho Studenkov	Origin Housing
Peter Brierley	Sovereign
Phil	Manchester Sustainable Communities
Phil Finch	Belimo
Phil Stacey	Barrett Homes
Ranie Goolcharan	Origin Housing
Reyhaneh Shojaei	Cambridge University
Ricky Cook	JLA
Ron Burns	WilliaamCox
Scott Simpson	AOV UK
Stephen Gore	Swegon Air Management Ltd
Steve Aldridge	Acmsuk
Steve McAlinden	Thrive Homes
Stewart Kerr	Salix Homes
Suzanne Whitehead	Clarion
Tom Spencer	Stockport Homes
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