BIM4Housing's Expert's Recommendations on Mitigating Risk to Emergency Lighting, while Strengthening the Golden Thread

(In their own words with edits)

Second Edition

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And the experts listed in Appendix 3

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.

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Round Tables

Emergency Lighting Methodology

The output from a Roundtable (17th September 2021) was collated and contextualized and combined with further subject matter expert input. Significant participant engagement was achieved prior to the event. The resulting report was then peer-reviewed.

What is Emergency Lighting?

Emergency lighting is installed in buildings in case of a mains power failure and provides sufficient illumination to allow occupants of the building to evacuate safely. Types of emergency lighting include emergency exit signs, recessed fluorescent lights, powerful halogen emergency spotlights for larger spaces, emergency ceiling lights and downlights, and so on.

The Regulatory Reform (Fire Safety) Order 2005 requires that 'emergency routes and exits requiring illumination must be provided with emergency lighting of adequate intensity in the case of failure of their normal lighting.'

The requirement does not apply to domestic premises.

Approved document B defines emergency lighting as 'lighting for use when the power supply to the normal lighting fails'. It defines escape lighting as 'The part of the emergency lighting that is provided to ensure that the escape route is illuminated at all material times.'

Approved document L defines emergency escape lighting as '.....that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving.'

In addition to the requirement to illuminate emergency routes and exits, open area lighting may be provided to allow occupants to reach an escape route, and where occupants are involved in activities that may present some danger if they are not completed, there may be high-risk task area lighting. There may also be standby lighting to allow occupants to continue with their normal activities in the event of a power failure.

Emergency lights are powered by back-up batteries. The lights detect when mains power has failed and immediately switch to using the back-up battery. The battery should be capable of powering the light, for a defined period, but as a means of conserving power, the light output may be reduced, sometimes to just 10% of the normal output.

The Fire Precautions (Workplace) Regulations 1997 and BS 5266 part 1 require that building owners test emergency lighting regularly and maintain them in proper working order. Light fittings have a green LED indicator which shows they are charged and functional.

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.

What are the component elements of an Emergency Lighting system?

a) Low proximity way finding
b) Way finding escape signing
c) Batteries -central battery systems
d) Batteries - self-contained
e) Luminaires
f) Control gear
g) Transformers
h) Generators
i) Test Switches
j) UPS
k) Cables
l) Connectors
m) Fire rated fire cable clips
n) Portable battery systems (e.g., torch)

Are there any dependencies on other systems?

a) Back up electricity e.g., battery or generators
b) Perhaps links to fire alarm systems
c) Lighting System
d) Lighting Control System
e) Mains electricity to charge the batteries
f) Any signage that is externally illuminated, either for visibility or (re)charging, has a dependency on the external light source

Q1a. What risks does an Emergency Lighting system mitigate?

a) Trips, Slips and Falls in the event of power loss
b) Orientation of occupants with signage and direction in the event of power loss
c) Illumination for locating life safety equipment
d) Highlighting location of panic hardware and security override
e) Illumination in the case of a stay-put strategy

Q1b. To what risks are Emergency Lighting systems susceptible?

a) Smoke
b) Vandalism
c) Lack of effective testing and maintenance
d) Battery failure
e) Poor design, not correctly specified or located
f) Building churn without redesign

g) Delay of backup generators
h) Restrike of high-pressure lamps
i) Supply cables cut/damaged during works
j) Poor operation, for example hold-off circuits that prevent emergency lighting operating while a building is empty, but need resetting when building is reoccupied
k) Unnecessary drain down test, some customers ask for more than 1 x 3hr test
l) Coordinating the frequency and timing of a full 3-hour duration test may drain the batteries, and therefore temporarily, reducing the system's capacity. To mitigate this risk, staggered self-tests can be performed. (In the draft of the revision of EN50172 there is a 5 yearly test to measure the illuminance in the space from the emergency lighting. This will also need careful planning)

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Round Tables

Q2. What information is needed about Emergency Lighting systems 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 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.

a) Formal Fire Risk Assessment
b) Fire Safety Strategy
c) Location (inc x,y,z coordinates)
d) Manufacturer
e) Model number
f) Technical specification sheet
g) Designer
h) Installer
i) Installed date
j) Tested – type of test, date, and result, by whom
k) Batteries – including replacement date(s), by whom
l) Other maintenance – what, when, by whom
m) Logbook and maintenance records
n) Emergency escape illumination
o) Emergency escape route illumination
p) High-risk task illumination
q) Number of lamps for emergency lighting systems – ensuring that the maximum number of 20 luminaires, supplied from any circuit protective device on a centrally powered systems pr EN 50172, is not exceeded
r) Electrical circuit identification
s) The % of redundancy built into an area (typically 10% for open plan offices and call centres}
t) Any central control system and location of controller
u) Input voltage
v) Input current
w) Battery duration
x) Charging voltage
y) Charging current
z) Lumen output
aa) Input wattage
bb) luminance effects of wall covering
cc) luminance level required
dd) Illuminance level required
ee) For replacement and new installations, a lighting design report should be produced, and made available, from inputted survey data and required lux levels. The report will utilise a readily available software programme, such as DIALux, to show results and exact positions of fittings
ff) The positioning of luminaires and the way they throw out light (transverse or axial)
gg) Local area lighting

hh) High Risk areas as per BS5266 should be defined to allow identification of areas where increase illumination of 15lux may be required - this is often missing from the Exchange Information Requirement

ii) Check change in photometrics when retrofit LED kits are used

Q3. What tasks are required to ensure Emergency Lighting systems are installed, commissioned, inspected, and maintained properly?

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

An air-conditioning, for example, unit 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.

Designer: to design the emergency lighting systems in accordance with the responsible person's risk assessment and the fire strategy for the building using appropriate Emergency lighting standards and best practice documentation as a baseline to ensure safe escape from the building. Follow the design with regular quality checks.

Consideration should be given to the choice of wall and ceiling colours that enhance luminance performance within stairways and escape routes.

Installer: to install the emergency lighting system in accordance with the designer's documentation to test and commission both photometrically and electrically (as necessary) the system and provide all as fitted documentation in line with the actually installed installation and to handover the system to the client.

BS 5266-1 Emergency Lighting PART 1: CODE OF PRACTICE FOR THE EMERGENCY LIGHTING OF PREMISES has the following (or equivalent):

Annex H (informative) Model completion certificate
Annex I (informative) Model certificate for completion of small new installations

Proposed furniture/fixture locations need to be clarified to ensure light will not be blocked.

Maintainer: to be responsible for the ongoing inspection, testing and maintenance of the system and updating all emergency lighting revisions on to record information and maintaining the logbook.

BS5266-1 includes the following (or equivalent):
Annex J (informative) Emergency lighting logbook
Annex K (informative) Model certificate for verification of existing installations
Annex L (informative) Additional guidance on the compliance checklist and report for an existing site
Annex M (informative) Model periodic inspection and test certificate

The industry-standard maintenance instructions – as an example from BESA's SFG20.

	Code	Task	Action
	20853.00.T1	Self-contained fittings	-
	20853.00.T2	Annual test (self-contained fittings)	1. Each luminaire and internally illuminated sign should be tested as per the monthly test detailed in SFG 37-01 but for its full rated duration in accordance with the manufacturer's information. 2. The supply of the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that normal supply has been restored. 3. Visually inspect each luminaire for damage. 4. The charging arrangements should be checked for proper functioning. 5. The date of the test and its results should be recorded in the Log Book. 6. Issue a periodic Emergency Lighting Inspection and Test Certificate to certify continued compliance of the installation.
	20853.00.T3	Batteries	1. Check condition and date of expected life. 2. Renew if necessary, any replacement battery should be compatible with the fitting and its control gear and as approved by the manufacturer.
	20853.00.T4	Centrally powered fittings	-
	20853.00.T5	Annual test (centrally powered fittings)	1. Each luminaire and internally illuminated sign should be tested as per the monthly tests detailed in SFG 37-01 but for its full rated duration in accordance with the manufacturer's information. 2. Visually inspect each luminaire for damage. 3. The supply of the normal lighting should be restored and any indicator lamp or device checked to ensure that it is showing that normal supply has been restored. 4. The charging arrangements should be checked for proper functioning. 5. The date of the test and its results should be recorded in the Log Book. 6. Issue a periodic Emergency Lighting Inspection and Test Certificate to certify continued compliance of the installation.

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

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

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

BS5266 refers to competency standards for the designer, installer, and the maintainer. The responsible person must ensure they engage competent people for all stages of procurement and operation of the emergency lighting system, from the time they first occupy the building until they leave.

The definition of competency is not established within BS 5266 Part 1. A full member of the Society of Light (MSLL) a CIBSE group, who has sufficient emergency-lighting knowledge through relevant experience, or the British Association of Fire Engineers (BAFE) has a competency qualification course that can be accessed through the mid-career college.

- Manufacturers should offer installation training, either in their own right, or subcontracted out to a specialist to provide that service
- Installer should have manufacturer-led product-specific installation training, in addition to any formal UKAS accreditation
- code of practice should include training materials

CIBSE
https://www.cibse.org/Training-Events/CIBSE-Training/Training-Topics/Lighting-Courses
https://www.cibse.org/training-events/cibse-training/training-topics/fire-safety-courses LIA/ICEL
https://www.thelia.org.uk/page/EmergencylightingICEL BAFE
https://www.bafe.org.uk/become-bafe-registered/bafe-sp203-4-assessment-and-registrationprocess

All works shall be carried out by a competent contractor, who can demonstrate this competency by membership/registration of the relevant professional body. All operatives responsible for the works shall hold the current qualification/certification relevant to the task; evidence of this certification shall be held by the contractor for inspection by the client prior to the commencement of the works.

Maintenance

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

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

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 and O&M's

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 behaviours necessary to the undertaking of a defined role, function, activity, or task.

Test facility
Each emergency lighting system should have an appropriate means for simulating failure of the normal supply for test purposes (e.g., manual isolating device or automatic testing).
The test facility should be able to be used for both monthly short tests and annual full duration tests.
The test facility should be protected from unauthorized operation.
Functional operation should be checked at least every month .
Testing for full rated duration should be performed on each luminaire at least. annually. One of the following precautions should be taken during the full rated. duration tests:

a) Perform the test while the building is empty or at times of minimal risk; or
b) Only test alternate luminaires at any one time, so that the building has a charged luminaire next to the unit under test.

A visual inspection should be performed on each luminaire at least annually.
Section 13 of BS 5266 refers to servicing and repair of emergency lighting.
BS5266 Section 12 Routine inspections and tests
3rd party accreditation scheme https://www.bafe.org.uk/bafe-fire-safety-services/emergency-lighting-systems?gclid=CjwKCAjwkeqkBhAnEiwA5U-uMzO21PF-nxbAItckL3wbNPkzhf4NVRrUsZTu_7dlAGRtp0GbNtp0yBoCOm8QAvD_BwE

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

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

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

a) the actual performance of the designed solution (probably generic)
b) the performance of the chosen product against the generic
c) the performance of an alternative (value engineered?) product.
d) the record of what was 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 re-established 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 made by the client to ensure collation of Information Requirements and the updating of design models into 'as installed' content suitable for Asset/Facilities Management. Compliance systems should be informed with the information from the AIM

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

j) 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. BIM, CAFM, Asset and Housing management systems must inform the change management process. The asset information needs to enable comparison but the original performance spec of the Emergency Lighting 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

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

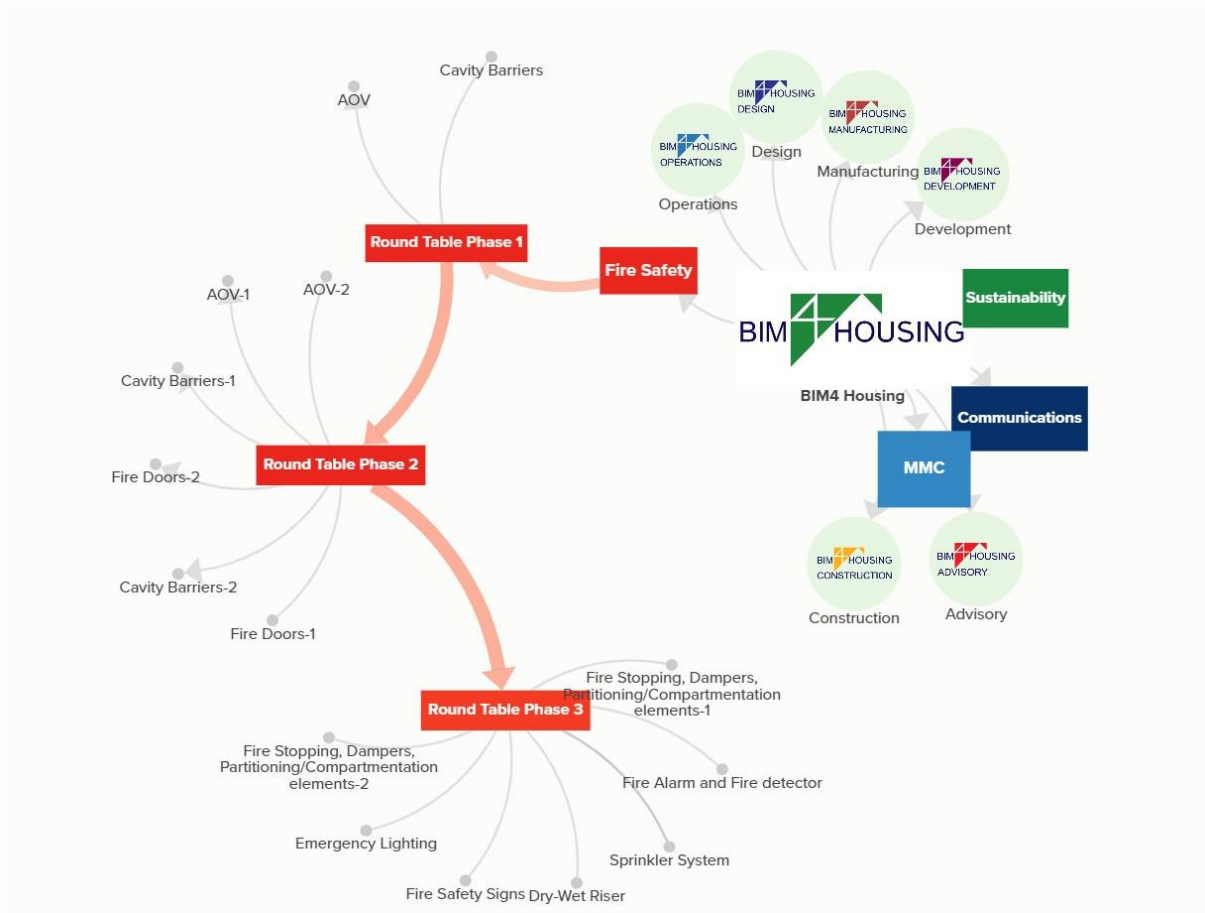
m) Specification or design brief for the business (performance and or product) should be recorded in a machine-readable format to enable validation against the Golden Thread

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

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

APPENDIX 1

BIM4Housing Structure



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APPENDIX 2
Additional Participant Input Q 2

This falls into 2 areas 'the design stage' of the building, so should be covered in the planning and design consultation stage, and all details provided in the Reg 38 pack and introduced within the fire strategy document. It would not be in the fire risk assessment unless it was considered as needing improvement because of changes in the building since built and occupation. This leads to the 2nd area where this questions falls. Changes in legislation, or guidance for existing buildings and where improvements or the health and safety or fire safety risk assessment has identified that emergency escape lighting is required or needs to be improved. In this situation, the list is Q2 can be applied to ensure the system is installed correctly and is fit for purpose.

Local area lighting- part of emergency [IW1] [CW2] lighting that provides illumination for people allowed to remain temporarily in a premise during a mains supply failure if it is risk assessed for the activities that are allowed to be performed.

Local area lighting is effectively "stay put" lighting and is detailed in prEN1838 and will be fed forward into BS5266. (It is currently mentioned in an annex of BS5266)

https://www.hochikieurope.com/storage/product_resources/auditable-documents-1526374027.pdf just sent a summary of the changes to BS 5266 2016. This introduces the term emergency safety lighting'.

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APPENDIX 3

Participants

Chris Watts	Wavelength Fire Safety
David Linsley	Gateshead Council
George Stevenson	ActivePlan
Gordon Rolfe	Platinum Property Management
Ian Smith	Select-Consult
Jack White	Clarion
Jarek Wityk	Winter Electrical
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Jeremy Malet	Shellen
Jim Creak	Jalite Plc
Joanna Harris	Sodexo
Martin Baines	Camden
Paul Bray	Plymouth Community Homes
Peter Thorns	Zumtobel Group
Richard Michael	Camden
Steve Osborne	BPHA