Investigation and review of external cladding and internal fire separation at

Barton House
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Bristol
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Prepared for:

Bristol City Council

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EASTON BEVINS
CHARTERED BUILDING SURVEYORS

1. Resident Summary

1.1 Easton Bevins have been instructed by Bristol City Council to undertake an investigation of the external wall insulation systems, the existing Fire Risk Assessments, and the standard of internal fire protection in a number of externally clad high rise residential blocks and to recommend any works necessary to improve overall fire safety. Barton House is one of the blocks being considered.

1.2 This assessment has been carried out using thermal images to identify fire barrier positions within the cladding, and then removing sections of render in selected areas to confirm the accuracy of the thermal images. The inspection revealed that whilst barriers have been installed to each elevation, they are not present at every floor level as expected.

1.3 It is important to understand that there are essential differences between the system used on Grenfell Tower and that used at Barton House. The insulation material and the external surface are different and there is no ventilation gap between the two to allow for rapid vertical fire spread. Much of the media reporting of the Grenfell issues is not relevant to Barton House.

1.4 The internal layout of the building and escape routes were assessed against current standards and a sample of pipes and cable penetrations between floors were exposed and the quality of the fire seals was inspected and assessed.

1.5 The design and layout of the building and common escape routes is not comparable with current guidance but with the open walkways and dual staircases the likelihood of a flat fire prejudicing escape is considered low. The original internal layout of the flats which resulted in the escape routes via the balconies is no longer considered practical and additional protection measures are necessary.

1.6 New buildings as tall as Barton House would be required to have sprinklers. Installing sprinklers in existing blocks is being assessed separately by The Council. This review has determined that with the recommended modifications and remedial works the overall fire safety in the building will building will meet current guidelines and allow for safe containment and escape.

2. Executive Summary

2.1 Easton Bevins have been instructed by Bristol City Council, to undertake an investigation and review of the external wall insulation system, the existing Fire Risk Assessment, and the standard and condition of fire containment provisions throughout a number of externally clad high rise residential blocks in order to come to a considered opinion of how these features draw together to form an overall view of fire safety. Barton House is one of the blocks being considered

2.2 There has been much public discussion recently about the performance in fire of cladding materials and systems. There are essential differences between the system used on Grenfell Tower and that used at Barton House. The insulation material and the exposed surface are different and more importantly there is no ventilation gap between the two to allow for rapid vertical fire spread. It is also apparent from more recent Grenfell evidence that the detailing around replacement windows played a significant role in allowing the fire to spread into the cladding. This issue is not relevant to Barton House

2.3 This assessment has been carried out in association with Ocuair Ltd who have carried out thermal imaging of the exterior of the building. A sample of relevant findings are included as appendix 1.

2.4 The joint approach with Ocuair was developed across all the blocks in order to find an accurate and cost effective method of assessing externally, and eventually without intrusive investigation, the condition of external wall insulation systems (EWI) and to identify key elements of those systems, specifically the rockwool fire barriers and fixing positions. In this case, the thermal imaging produced variable results, confirming across all elevations, with a reasonable level of confidence, the outcome of the physical inspections.

2.5 The next strand to the investigation was to review fire containment provisions in both the common areas of the building and between flats, to assess their effectiveness in safeguarding the means of escape. There are very few service ducts in the common areas and a sample of only three ducts within flats were opened up and the quality of the duct construction and of the fire seals around floor and wall penetrations was assessed.

2.6 Finally, with reference to the current Fire Risk Assessment, the building layout and overall construction were inspected and the compartmentation and escape routes were assessed against current Building Regulations and British Standards.

2.7 The external inspections revealed that the fire barrier installation is variable around the building, with barriers only at alternate floor levels to all but one elevation, and at inconsistent levels resulting in lack of continuity at corners. There is no regulatory or practical logic to installing at alternate levels. This and the lack of continuity will need to be resolved by remedial works.

2.8 The intrusive investigation of the service ducts revealed that pipes, conduits and cables are generally well protected and there is no justification from the small sample inspected to warrant larger scale investigation.

2.9 This block has open air walkway access to the flats. Current guidance requires that staircases be separated from walkways despite the open ventilation. The staircases are not isolated from the walkways and are contained in 8m long corridors devoid of cross ventilation. This situation is difficult to reconcile with current guidance.Consideration should be given the providing separation, which can be achieved quite easily on plan, but it will leave one flat on each floor directly accessed from the stairwell, contrary to current guidance.

2.10 The bedrooms within each flat are classified as inner rooms, escape only being possible via the main living room. One bedroom has a window to the access walkway, the other does not. The building was originally designed, as improbable as it now sounds to allow for escape down from one balcony to another through an access hatch and ladder. These balconies are now enclosed and although technically still available for use, have become an integral part of the flats and no longer appropriate for escape. These bedrooms are therefore at an increased risk and as a minimum, improving early warning with additional smoke and heat detectors is essential. Alternatively, the fitting of an automatic water fire suppression system (AWFSS) would significantly improve the potential for safe escape and would adequately justify the internal layout.

2.11 A number of very sturdy steel beams and supporting columns have been installed beneath some of the floor slabs. The reason is unclear but it is assumed that they are of structural significance, probably installed as additional bracing following the Ronan Point incident in 1968 and therefore require fire protection. The current plasterboard linings are not imperforate and will require improvement.

2.12 The review of the layout and construction concludes that the means of escape provisions pre-dates current and the past guidance dating back to 1962. The staircases are not separated from the walkways, and notwithstanding the open air walkways, all guidance from 1962 to date requires that they are. Despite the current guidance, the likelihood and a single flat fire prejudicing both escape stairs would seem minimal.

3. Description

3.1 Barton House was designed and constructed around 1958. This long pre-dates current legislation and Building Regulations. It also pre-dates the standard used for the later built high rise blocks in the city i.e. the British Standards Institution Code of Practice CP3 Chapter IV 1962. This guidance consolidated accepted contemporary practice, but full details of the requirements at the time of construction not known. The building is a 15 storey reinforced concrete framed construction with precast concrete panel walls. The top floor level is approximately 45m above ground level.

3.2 There are two concrete staircase, one at each end of the main open access deck serving all floors. Two lifts are provided to the central lobby area. The staircases have an external door at ground floor level so evacuation is possible without passing though the entrance lobby. At all upper levels the stairwells are not separated from the open walkways.

3.3 The building is T shaped with all but two flats on each level accessed from the open sided deck. Refuse chutes at each floor level are located adjacent to the secondary staircase. They are accessed externally at ground floor level and are fitted with a local water sprinkler head.

3.4 The maximum likely occupancy of the building is 462

3.5 There is a variety of communal and office accommodation at ground floor level and a large boiler/plant room located in the basement and accessed externally

3.6 External wall insulation (EWI) was fitted to the building in the mid-1990s and over-coated in 2010.

4 External Inspection

4.1 The cladding system installed on Barton House consists of expanded polystyrene (EPS) slab 150mm thick covered in a meshed render system comprising a cementitious basecoat and the coloured acrylic top coat. This was overcoated in 2010, the original system manufacturer could not be confirmed.

4.2 At the time of inspection the external faces of the building were in good condition, generally free from significant cracking and delamination.

4.3 EPS systems such as this should be provided with fire resistant barriers within the insulation layer at each floor level from second floor slab upwards. Thermal imaging has been used on a number of buildings to identify the presence and location of the fire barriers without the need for costly high level access and exposure.

4.4 The thermal imaging produced inconsistent findings for the positions of the barriers. The decision was taken to expose the potential barrier positions in order to test the efficacy of the thermal imaging. Intrusive investigations were undertaken to expose the presumed barrier positions and record their presence or otherwise, their composition and fixing details. This was carried out to the full height available with the cherry picker access, up to the 5th floor slab level.

4.5 The external render was cut through in 16 locations on 4 elevations at the 2nd, 3rd , 4th and 5th floor slab levels and the full make-up of render, mesh and basecoat was removed over an area of generally 1200mm wide by 300 or 600mm tall in order to confirm the spacings of the barrier fixings. On completion of the inspection the render system was reinstated with basecoat, mesh and coloured top coat to match as closely as possible the current finish.

4.6 There has been much public discussion recently about the performance in fire of cladding materials and systems. The essential differences between the system used on Grenfell Tower and that used at Barton House are as follows:

- Rendered EPS installations are tested as a system rather than as a hybrid of components that had not been tested together as a system.
- EPS is not the insulation used on Grenfell.
- The metal rainscreen with the combustible core installed on Grenfell is not present.
- The EPS is protected by the render rather than having an exposed surface.
- There is no cavity between the insulation and the cladding panel to create a chimney effect.

4.7 The Building Regulations requirement for external cladding has evolved in the time since the system was installed. These requirements and the classification of materials have been subject to significant scrutiny since the Grenfell fire and there is still scope for interpretation. But, as a generic material, many rendered EPS system have been

subject to performance testing as directed by BRE 135 and tested to BS 8414. Although the "naked" EPS when exposed directly to fire will have achieve only Euroclass D or E, when encapsulated in by a render coat, the systems meet the requirements of BS 8414 . Since the Grenfell fire the BRE have reaffirmed historic test results for many EPS and other wall cladding systems in order to distinguish tested system from hybrid components. Although the system details are not known, it is clear that as a generic system, rendered EPS meets the BS8414 testing criteria.

4.8 Barriers were not found in all the expected locations. The installation varied from elevation to elevation and was found to be at inconsistent heights on the same story.

- Elevation 3, over the exit from the main staircase – Barriers were found only at 3rd and 5th floors. Thermal images suggest this alternate spacing continues for the remainder of the elevation.
- Elevation 4, adjacent to the secondary staircase/refuse chutes – Barriers were found at each floor level from 2nd to 5th. Thermal images confirm this spacing over the whole elevation.
- Elevation 7 over the main entrance – Barriers found only at 3rd and 5th floor levels, but were positioned around 400mm above floor slab level. Thermal images are inconclusive in both identifying this pattern and confirming it a t higher levels.
- Elevations 8 to the right side of the main entrance- Barriers were again found only at 3rd and 5th floor levels. They are at slab level but did not extend to the corner with elevation 7 whose barriers are set around 400mm higher.

Those barriers that were exposed for a sufficient width had adequate fixings.

What can be deduced from this exposure sample is that the installation of barriers is far from consistent and on several elevations (potentially all but one) not as per the manufacturer's (albeit unknown) or regulatory guidance.

4.9 The installation at alternate levels has no logical or regulatory justification. Compartmentation needs to be maintained and this is required at every floor level.

4.10 The barrier installation on elevation 7, some 400mm above floor slab level has no logic. The stopping short of the corners with the adjacent elevation is equally nonsensical. But even if they had been extended they would not have been continuous around the corners with those on elevation 7.

4.11 All of the "long" elevation 6 is open walkway and no barriers would be required . The opposite side, elevation 4, aside from the secondary stairwell is mostly taken up with windows and infilled balconies. The presence and positioning of barriers on this elevation has not been investigated. It is understood that the now infilled balconies consisted of a concrete parapet wall with a glass infill panel. The details of how this was filled in and insulated over are not known, but the thermal imagery for all relevant elevations shows no reliable evidence of barriers to the balcony sections and feint

potential confirmation that barriers in the original wall section may be installed only at alternate levels and well above floor slab level.

4.12 There seems no clear reason why barriers would not be installed at floor slab level. It could be argued that it makes little practical difference to the prevention of vertical fire growth where a barrier is installed, and slab level is an arbitrary and convenient convention.

4.13 However, where there are windows at every level, the ability of a fire to pass from one to the next will be affected by the barrier positon. If installed as expect, in line with the floor slab, that is to say around 200mm above window head height, any breakout of a fire into the insulation would be curtailed around 1000mm below the window above, and only a minimal height (approx. 200mm) of insulation could become exposed to the fire. In this case, when installed some 600mm above window head level, more insulation would be compromised, the gap to the window above would then only be around 300mm and the likelihood of spread from floor to floor would be much increased.

4.14 On the basis of this evidence it has been confirmed that fire barriers are fitted:

- At every floor level only on elevation 2 to the south of the secondary staircase.
- To elevations 3, 7 and 8 barriers have only been installed from the 3rd floor upwards, at alternate levels, and are not continuous around at least one corner.
- Between windows on elevation 7 the barriers have been installed well above floor slab level, and there is weak thermographic evidence to suggest that this is repeated on all other relevant elevations.
- The balcony infill detail has not been exposed, but on elevation 4, if barriers are fitted they cannot be continuous with those that have been confirmed .

4.15 Notwithstanding these discoveries, it should be borne in mind that the performance of systems such as this is heavily dependent upon the condition of the render covering. It provides the separation of the insulation from an external flame. Detailing around window openings must provide a continuous barrier to prevent flame spread from a breached window reaching the insulation. If the render remains intact during a fire, the barriers are redundant. Conversely, the presence of cracks in the render may allow fire to reach the insulation beneath, whereupon the barriers become crucial. The surface finish and detailing of the render are generally intact and show no defects that would compromise the integrity of the system.

5 Internal Inspection

5.1 In assessing fire safety within the building it is necessary to consider a number of parameters.

- Structural fire integrity to ensure the building will not collapse.
- Compartmentation in order to prevent a fire spreading beyond reasonable limits.
- Means of escape to ensure that safe areas and escape routes are identified and protected
- Fire stopping at junctions and service penetration through otherwise fire resisting constructions such as walls and floors.

5.2 The building has previously been the subject of a Fire Risk Assessment (FRA) carried out in September 2018 by BCC's Building Control Department. The requirement for a Fire Risk Assessment arises from the Regulatory Reform Order 2005 and applies only to the common parts of residential buildings. It does not therefore form a detailed analysis of the entire building nor is it usual to expose hidden areas that have been the subject of this investigation and have given rise to additional recommendations. The assessment has been carried out in a methodical manner and includes all issues expected to be covered

5.3 Schematic plans of the site, as developed by BCC are used to identify the layout of the flats and common parts and to determine the location of the service penetrations

Structure

5.4 Although no detailed construction plans were available, the building is a cast in situ reinforced concrete framed construction. Detailed analysis of the design is beyond, and not necessary for this investigation. At the time of construction, the structure of the building would likely have been required to have 4 hour's fire resistance and there is no reason to believe that the concrete frame will not achieve this. Under current Regulations, new residential blocks over 30m tall require 120 minutes fire resistance.

5.5 Throughout the building, it seems that additional steel beams and columns have been added in variety of locations. These steel beams are of very heavy section and have been reported to the Council's structural engineers for further comment. Steel beams are not inherently fire resisting and must be provided with protection from heat. In this case a double layer plasterboard lining has been provided on a timber framing. This is one of the accepted methods of fire protecting steel.

5.6 The exact purpose of these steels is not clear, but it must be assumed that they are an essential part of the structure of the building and therefore require the same level of fire protection as the original concrete structure i.e. 120 minutes. The thickness of plasterboard lining required to achieve this depends on the dimensions of the beam

and on how many sides the beam is exposed, this results in a figure called Hp/A which determines the thickness of plasterboard required. In this case the beams are placed underneath the concrete floor slabs and therefore have three exposed sides. The supporting columns are built into the glazing and are therefore effectively exposed on four sides. The exact beam sizes could not be confirmed but they appear to be 127kg 203 UC sections. The columns are unknown.

5.7 The Hp/A of these beams for three sided protection is 60. In order to achieve 120 minute's fire resistance, plasterboard manufacturer's data stipulates 2 layers of 12.5mm fireline board. It appears that standard plasterboard has been used so the full details and function of the steels will need to be determined in order to more accurately assess the need for fire resistant. The specification of, and hence the requirement for the columns is not known.

5.8 It is also clear that the boxing in of the beams is not imperforate. From the small sample of beams inspected, the plasterboard in not continuous where passing through cupboards and at junctions. The boxings also communicate directly with other plasterboard ducting within the flats used for ventilation systems, and these will need to be fully isolated if the beams are to be fully protected.

5.9 There are also exposed steel beams over the store cupboard next to the lift with no fire protection.

Compartmentation

5.10 The compartment floors and the walls between flats, corridors, lobbies and staircases are structural elements of the building and formed from cast concrete and concrete block. They will provide the necessary fire separation without additional measures.

5.11 Fire doors installed in these compartment walls are generally required to achieve 30 minutes fire resistance (AD B Table B1). A detailed inspection of each and every door was not within the scope of this report and it is understood that The Council have a program of inspection underway.

5.12 There is no compartmentation between the staircases and the access walkways, it would seem the open nature of the walkways being considered sufficient to dispense with the required separation.The only separation provided above ground floor level is between the flats and the common areas.

Means of Escape

5.13 The building was designed and built in the 1950's, prior to both the current format of The Building Regulations and the previous British Standard CP3. It is commonplace for older buildings, although compliant with the regulations of the time, to deviate significantly from modern design philosophies and present problems to the assessor in reconciling the design, often resulting in ill-considered and potentially ineffective

additional works being specified to try to shoehorn the design into the current regulatory framework.

5.14 There are two staircases serving every floor but there is no compartmentation of the common spaces once above ground floor with the staircases and the open approach decks forming and single uninterrupted space. The staircases are not isolated from each other as required other than by the open sided decks.

5.15 Current requirements for the common parts of blocks of flats with a two staircases and an open deck approach to flats are not stipulated in Approved Document B, which refers instead to BS5588pt1. Current guidance is best found in BS9991. Both BS 5588 and BS 9991 require that the stairs are separated from the approach decks by 30 minute fire doors. The building was clearly designed without door separation of the stairs from the walkways and this is contrary to both current thinking and design guides produced shortly after construction.

5.16 Both stairways are approximately 8m from the ventilated walkway with no means of cross ventilation. There are fixed windows adjacent to the main staircase. It is likely that these windows were originally open to the elements in order to ventilate the stairwell. The secondary stair case has one glazed façade, now all fixed, which may originally have been partial open.

5.17 All but two flats in each floor are accessed from the open walkway, but as the landings at each end are fully enclosed and not cross ventilated there is one flat adjacent to the stairs, which would be directly affected by smoke rising up the main stairwell, and one other next to the lifts that would not benefit from the full ventilation effect of the walkway. They are analogous to the dead end situation detailed in current guidance, but exceed the maximum permitted travel distance. Reinstating the ventilation opening will have the unintended consequence of reintroduce another conflict with current guidance, wherein fire spread from the windows of the adjacent flat, may affect the stairwell.

5.18 The internal layout of the flats included bedrooms accessed via an internal hallway which is in turn accessed via the flat's living room. One of the bedrooms has a window onto the external walkway. Although not compliant with current requirements as an escape window it could be used for Fire and Rescue access. The other bedroom is on the opposite side of the building and accessed an external balcony. These balconies were originally open sided but have since been enclosed by cladding the concrete parapet wall and infilling above with double glazed windows. The open balconies were originally made with an escape hatch in the floor and ladder to allow escape to the balcony below, the intended escape strategy after this point is not clear.

5.19 Under current guidance inner rooms are not permitted unless they are kitchens or bathrooms or have an alternative means of escape. The affected bedrooms pose an additional risk to sleeping occupants. The enclosed balcony will not allow an occupant to bypass a fire in the living area. Early warning by means of a fire detection and alarm system is considered essential to provide early warning. Arguably a more significant

margin of safety would be afforded by an automatic water fire suppression system (AWFSS) system.

5.20 Escape via the balcony below would not be considered appropriate under current guidance, but would have provided limited protection for an escapee had the balconies not been enclosed. Now, the balconies are an integral part of each flat and the floor between them must be treated as a compartment floor. Whilst the floor slabs will be adequate, there are plastic rainwater pipes passing through each floor slab. These have no fire protection and represent a clear breach of the compartmentation between flats which will need to be remedied. This can most easily achieved with an intumescent collar.

5.21 The original hatches have been infilled from below with intumescent coated rockwool slabs and have the original cast iron “manhole“ covers above which, depending on the thickness of rockwool used, are considered likely to meet the 120 minute fire resistance criteria

5.22 Fire doors are crucial to the effectiveness of the fire containment and means of escape strategy. Flat entrance and communal doors in the building are generally of a good standard and well maintained. It is understood that a program of formally checking individual doors and glazed screens has been implemented. Windows opening into the external walkway need not be fire resisting so long as the cill height is no lower than 1100mm above the walkway.

Fire Stopping

5.23 Fire stopping of services passing between compartments can be a significant weak point for smoke and fire to spread. Barton House has very limited service risers located in the common spaces, most pass directly between flats in the vicinity of kitchens and bathrooms.

5.24 There is a full height duct behind the lift shaft and a small electrical duct to the right of the lifts which is nominally sealed at each floor level, but not to an acceptable standard. Whilst each floor is clearly catagorised as a compartment floor, given that there is no separation of the stairs and access decks at any level, it could be argued that sealing these common ducts at floor level is not required. However the uncompartmented layout would not pass scrutiny under current guidance, so allowing any unsealed penetrations between floor levels to go un corrected would seem cavalier.

5.25 The ducts within the flats carry cast iron rainwater and soil pipes. Steel heating pipes also pass through the floors. There appears to be no common extraction ductwork in this building. The ducts can be accessed within the bathrooms and are fitted with recently installed cement board access panels on timber framing. The access panels were removed, either in their entirety or, access holes were cut and then then resealed upon completion of the inspection.

Commentary

5.26 There are two fundamental methods to protecting service penetrations and each is acceptable on its own. If they are contained within a fully fire resisting enclosure with the same resistance to fire as the floors through which they pass (in this case 120 minutes requirement), then the integrity of the penetrations through the floors are irrelevant. Alternatively, if they are not contained within such an enclosure, then the fire resistance of the floor penetration needs to provide the necessary protection. Building Regulations classify such enclosures (except those containing solely domestic drains) as protected shafts. Ducts solely containing domestic drainage are subject to variations/relaxations of this requirement, but in the case of this building, the common ventilation/extraction system runs within the same duct passing between flats and these concessions are therefore not available.

5.27 For vertical risers forming a protected shaft, the provision of an access panel is clearly necessary at each floor level. Building Regulations (AD B B3 appendix B) stipulates doors (for which we can infer access panels) need only have half the fire resistance of the shaft walls, in this case 60 minutes.

5.28 It must also be noted that protected shaft walls need to have the requisite fire resistance when exposed from either side (AD B Table A1). Concrete and masonry meet this requirement but irrespective of the access panel material, if it is fixed to a timber structure exposed to the interior of the duct, it will not meet the requirements unless it is a preformed and certified door and frame.

Observations

5.29 The common ducts contain telecoms/data cabling, conduits and sundry electrical cables, many of which will have been installed since the building was built and are also subject to periodic access and adjustment. The cable bundles pass though the floor slabs in a variety of haphazardly filled and sealed holes. There are also ad hoc penetrations in the walls of the duct for cables and conduits.

5.30 Many of these penetrations, although they have been subject to previous fire stopping measures are not considered adequately protected.

5.31 The mastic used throughout these ducts is taken to be fire resisting, but it is not a high expansion intumescent, i.e. it will not expand to fill gaps once heated. Therefore unless the mastic has been forced deep into a cable bundle and fills a significant depth so that the cable sheath is protected, any mastic fill is likely to be ineffective.

5.32 The ducts passing between flats carry soil pipes and rainwater pipes with connections for both into each flat. These ducts walls are formed of cast concrete and the pipe penetrations are generally cast into the concrete floor slabs. The ventilation systems

within the inspected flats are a retrofit system and do not connect to a communal extraction pipes. The building does not appear to have been built with such ductwork.

5.33 Branch pipes from bathrooms and kitchens passing into the duct are another potential weakness in the integrity of the duct. From the limited sample of flats that we were able to inspect, the infill around the pipes is variable but on balance does not warrant immediate remedial works. Inspection of a much larger sample of such ducts would confirm our findings.

5.34 The access panels within the flats seem to have been systematically replaced in recent times with cement board onto a timber frame. If these ducts are to be classified as protected shafts, then the framework supporting the boards also needs to be fire resisting, which would preclude the use of raw timber. However as the floor slab penetrations appear to be generally adequate between flats, ducts enclosure need not be relied upon to provide all the fire resistance at these locations.

5.35 The full height risers are without doubt protected shafts and therefore the access panels (doors) need to achieve 60 minute's fire resistance. In part due to the fall risk within this shaft the access is by means of a locked fire door. These are 44mm thick and give no indication of having more than 30 minute fire resistance. However it is understood that this door type has been third party tested and significantly longer endurance certified.

Recommendations

6.1 We have demonstrated that the cladding system is generally in good external condition and its performance with regard to fire penetration is likely to match the standard against which it was originally tested. However, fire barrier positions are not in accordance with recognized guidance both in terms of the number and position of barriers. The barrier placement must be further investigated and remedial works confirmed with the system manufacturer.

6.2 Fire proofing within all the common ducts in the communal spaces needs to be reviewed and is likely to require minor improvement in order to meet the necessary fire separation requirements.

6.3 In the flat ducts, whilst a larger sample of examples would be helpful, there is sufficient evidence to believe that most pipe penetrations through floor slabs are satisfactory and the upgrading of access panel frames is not crucial to ensuring overall fire resistance.

6.4 The lack of separation between the staircases and the external walkways and the consequent lack of ventilation to the stairwells is difficult to justify against modern guidance. Separation or reinstatement of open ventilation to the landings should be considered.

6.5 The plastic rainwater pipes passing between balconies will need to be fire protected and the depth of rockwool infill confirmed

6.6 The purpose of the additional steel beams and columns needs to be reviewed and if, as expected, they are required to achieve 120 minute fire resistance then both the boxing and the standard of jointing and sealing will need to be improved. Any unprotected steel, either in flats or in store cupboards will need to be protected.

6.7 The current program of checking and recording fire individual doors and glazed screens should be completed and any works actioned.

6.8 The inner room situation of the bedrooms within the majority of flats is a significant issue that requires the minimum measure of an enhance fire detection and alarm system. Alternatively a sprinkler system would provide arguably greater protection to sleeping occupants.

Summary of findings

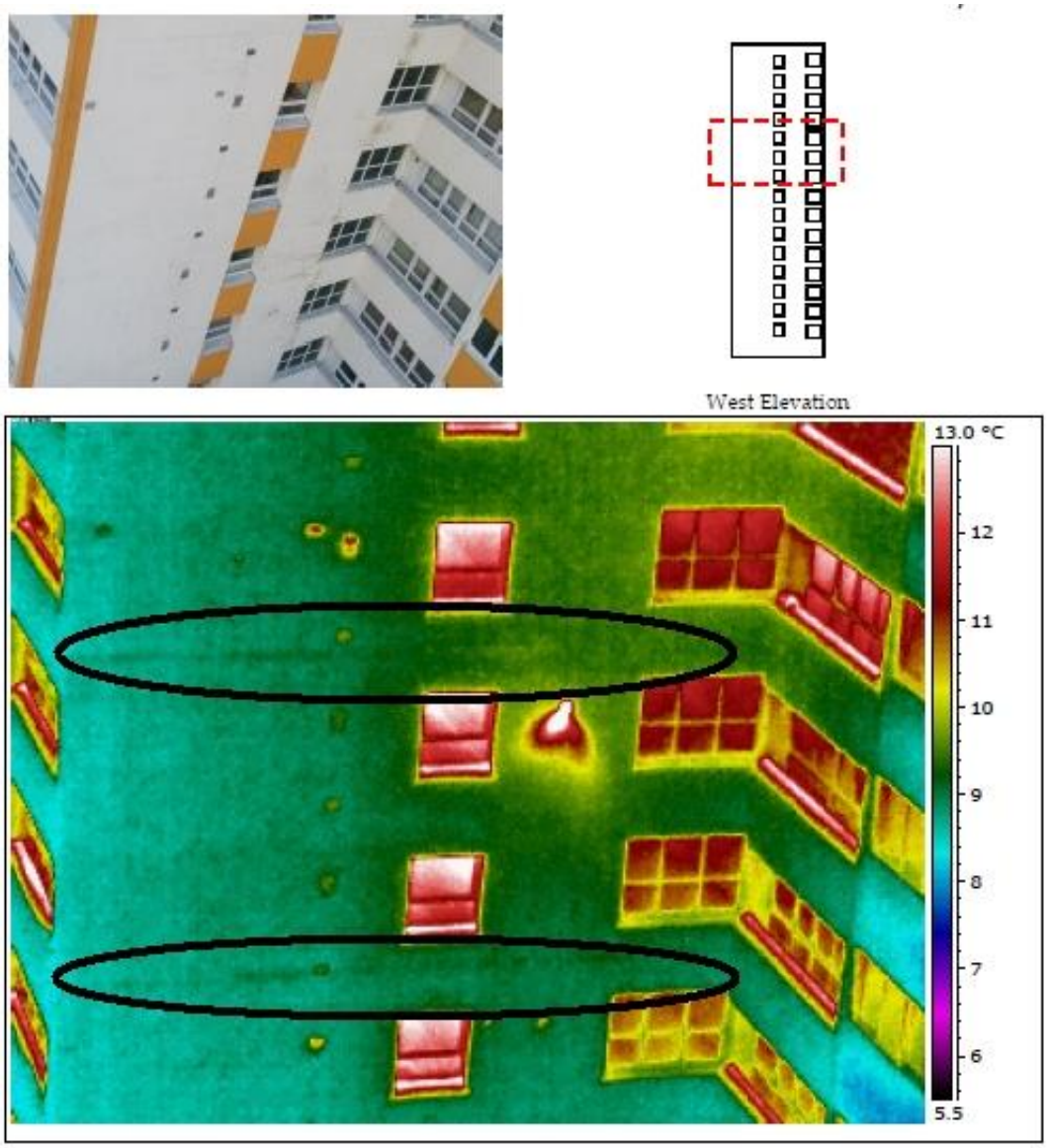
Parameter	Compliance with current requirements
Structural fire integrity	Original structures comply but additional steel beams do not unless they can be shown to have no structural significance
Compartmentation	Stairwells not separated from walkways. Balcony separation breached by rainwater pipes
Means of escape	Stairwells not separated from walkways nor isolated from each other. Flat bedrooms are inner rooms and balcony side bedroom is at additional risk
Fire stopping	Generally complies but minor improvements recommended
Cladding	Fire barriers not present in all expected locations

Recommendations

Item	Priority
Check fire doors and screens	1
Review internal fire detection and alarm provision to inner rooms	1
Review sealing to floor penetrations in in common area ducts and between balconies	3
Separate stairwells from walkways with fire doors and reinstate open ventilation.	2
Improve cladding to steel beams	3
Inspect all elevations to confirm cladding fire break positions and undertake retro fitting.	2

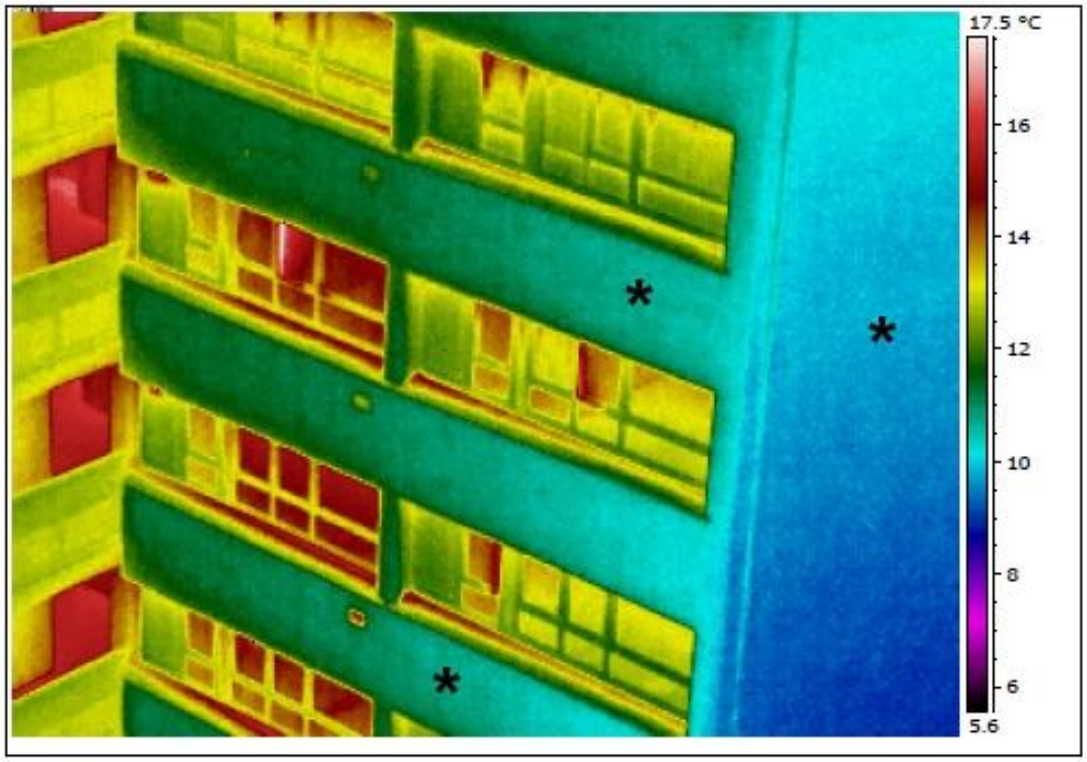
Appendices

Appendix A. Photos

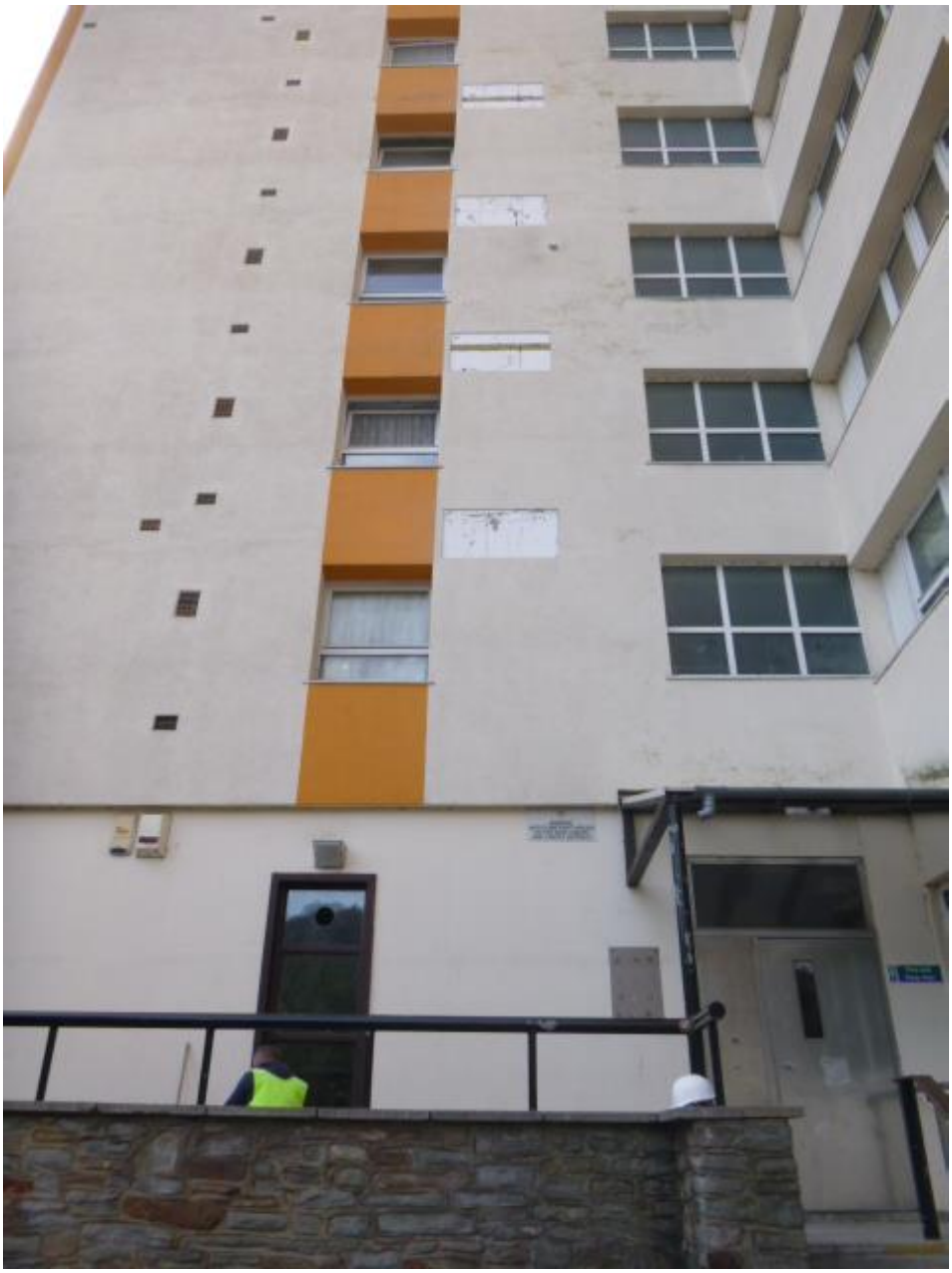


1, 2 and 3. Thermal image of typical elevation 3 showing defined thermal signature for barriers at alternate floor slab levels as confirmed in photo below.

West Elevation



4, 5 and 6. Thermal image of elevation 7 (and 8) showing poorly defined thermal signature for barriers. Notably above slab level to elevation 7 as shown below.



7. Elevation 3 with fire barrier found at alternate levels from third floor upwards.

8. Elevation 4 with fire barriers at each floor level around the stairwell enclosure.

9. Elevation 7 note barriers only at alternate levels and approximately 400mm above floor slab level

10 Elevation 8 note fire barriers still at alternate levels but installed at slab level and therefore not continuous with elevation 7

11 Elevations 8 note fire barriers stop approximately 900mm short of the corner with elevation 7 and therefore would not be continuous even if installed at the same level

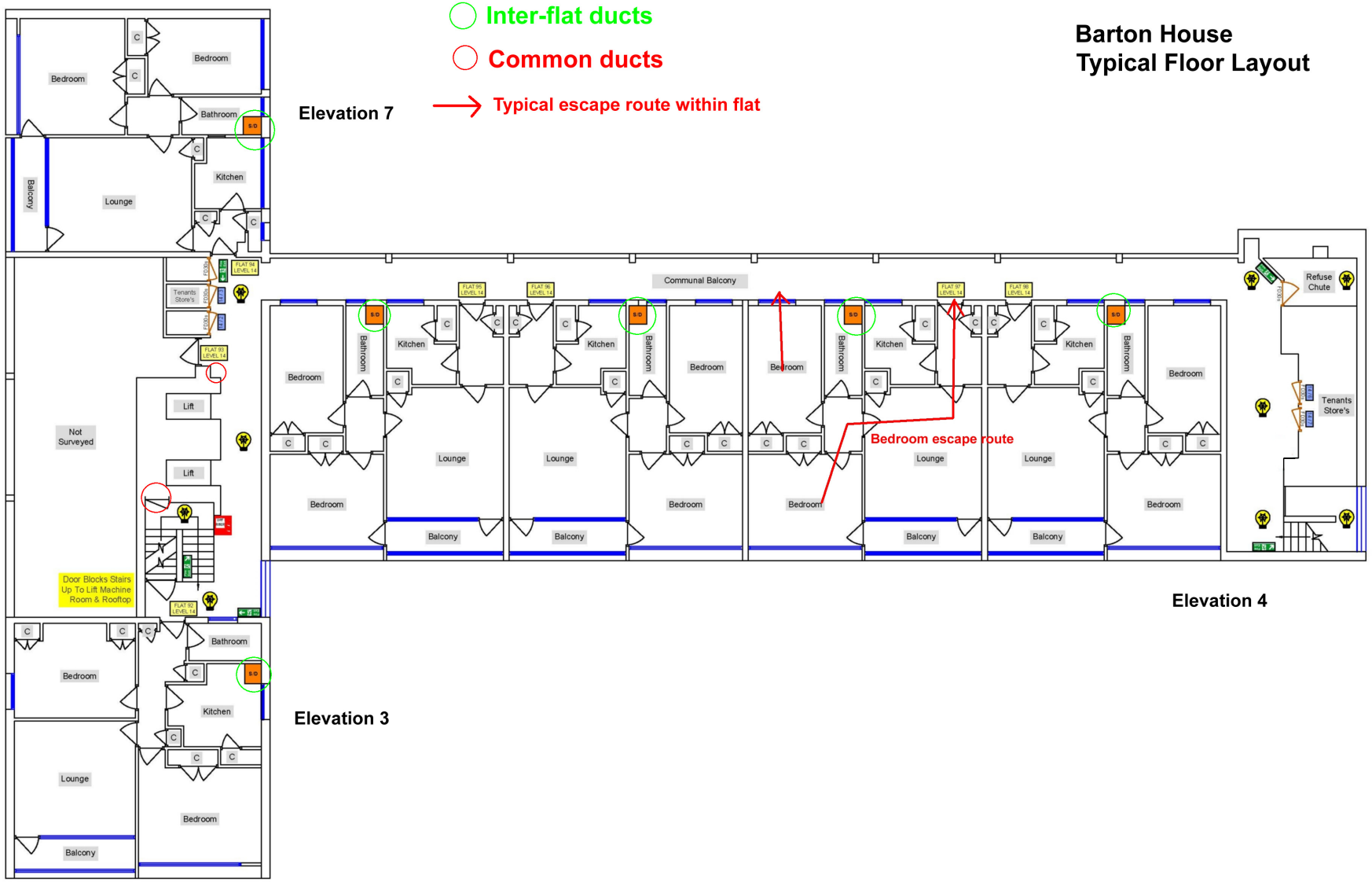
Appendix B. Floor Plans

Barton House
Typical Floor Layout

Inter-flat ducts

Common ducts

Typical escape route within flat



Development & Special Projects Strategy, Planning & Governance St Annes House, St Annes Road St Annes, Bristol BS4 4AB	Address Barton House Aiken Street Bristol BS5 9SL	Floor Plan	Scale:1.100	Rev	Description	By / Date
		Drawn by SJB	Date Sept 2013	A	Emergency Lighting / Flat Numbers & Fire Door Disc Numbers	RB 24/02/16
		Drawing No. 59SL-Bar-FS-003				