EWS1 Report

133-176 Gordon Crescent, Croydon

30th April 2021

Croydon Borough Council

12125BB

Revision History

Version	Date	Author	Comments
01	30/04/2021	Lee Wilson	Initial issue to client

Document reference
12125BB

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Contents

1. Introduction

BB7 have been appointed to conduct an intrusive survey and provide a comprehensive report forming an EWS1 assessment for 133-176 Gordon Crescent, Croydon, CR0 6NX.

This report outlines BB7's intrusive survey findings, analysis of the external wall systems, and conclusions. BB7 intrusively surveyed the building on 25th March 2021; the survey was conducted by James Groves, Steve Golding, and Lee Wilson.

The full building description is found in Section 2 of this report.

Figure 1. South elevation

Figure 2. North elevation

This document and the associated EWS1 form are only applicable to 133-176 Gordon Crescent. Please note that this document and associated EWS1 form is valid for a period not exceeding 5 years. In accordance with Note 03 of the EWS1 form, this report and the associated EWS1 form have been reviewed by a chartered registrant with the Engineering Council UK (Chartered Engineer) who is registered through the Institution of Fire Engineering.

In reviewing and applying their signature to these documents the Chartered Engineer is verifying that, although they may not have attended site in person, they agree that the inspection was carried out by a suitably experienced engineer and they agree with the assessment and outcome.

2. Building Description

The building has 11 storeys including a basement and is served by a single stair core. The building contains 43 dwellings and provides sheltered and general needs housing, respectively. Typically four apartments are present on each floor level.

The residential accommodation is from the first to tenth floor with storage, offices, laundry and day rooms and amenity space provided in the basement area, this appeared not to have been used at the time of the inspection, however, evidence of activity was present. At the top of the stair access to a lift plant room on the roof, is provided via a restricted use ladder. The sprinkler system and pumps are housed in this area from evidence found on the equipment it appears to have been installed in approximately 2018. The sprinkler system does not cover the entire building as some of the private residents have refused coverage based on there being stop ends on pipes outside a limited number of apartments.

There is also a bin chute that runs the height of the building which is accessible from the stair lobby where the flats are accessed. The bin store at ground floor level is provided with sprinkler protection to reduce fire growth and a fusible link damper to restrict fire spread into the chute itself.

Flats are separated from the staircase on all floors by a single ventilated lobby where travel distance is within 7.5m from the flat entrance doors to the door to the staircase. The ground-floor lobby does not appear to be provided with any provision for smoke control. A permanent vent is located at the head of the staircase. Smoke control afforded to communal lobbies consists of actuators fitted to windows, which form automatic opening vents (AOVs). Associated automatic fire detection is located within lobbies to activate the AOVs. The stair core is separated from the ventilated lobby by a Georgian wire glass partition. The head of the stair core is ventilated with a permanent vent (PV).

Two fireman's lifts are provided, each lift serves every other floor level, i.e. one serves odd numbered floors only and the other serves the even numbered floors. A dry rising main outlet is installed within lobbies on even numbered floor levels.

The single staircase descends to ground and lower-ground floor level. Escape from the ground-floor level is signed through the ground-floor lobby, past flat entrance doors, which is not an appropriate provision. It is believed that the original design of the premises incorporated means of escape via the lower-ground floor level via a protected route to a final exit door. At ground floor the final escape is through a lobby formed mostly of UPVC panelling and double glazing and would be at risk during a fire. This extended lobby is a later addition to the building and can be seen in Figure 3 below. The brick-built section encloses a passenger lift which provides disabled access between ground and lower ground levels, meaning that the current final escape route is connected to the lower ground floor level amenity space.

Figure 3. Ground floor extension

The building was originally constructed circa 1965 – 1966 as part of the Morland Road Estate (REF https://www.towerblock.eca.ed.ac.uk/development/morland-road) and the original construction was a large panel system.

The Fire Service has reasonable access to the building and all facades of the building can be reached from the rear carpark. The other elevations have slightly restricted access due to the fencing provided around the site, however, it is not considered that there would be an undue delay in terms of getting water onto a façade fire.

Since the building was constructed, out of An LPS concrete panel system described in Section 3. The façade form first floor upwards has been overclad with an aluminium cassette panel system. The aluminium panel system was infilled with mineral wool, no balconies or other protrusions were noted during the visit. It has been presumed the over cladding works were carried out around the late 1990's. The ground floor and lower ground floor of the building have not been over-clad, the existing structure is present and has been painted at some point in time. The openings on the front and rear elevations are provided with glass panes rather than the combustible infill panels observed on other buildings.

BB7 have not been provided with Fire Risk Assessments for the building.

Figure 3 shows a site plan of building demonstrating the location of the buildings and the boundary formed by the surrounding streets.

Figure 4. Ariel view of the development

3. LPS Construction

Large Panel System (LPS) construction is a form of construction where large storey height pre-cast Reinforced Concrete panels are assembled on site to form the buildings' structure, this was a very popular method of construction for council housing in the 1960's and 1970's made semi-famous by the Ronan point collapse in May 1968 following a gas explosion. LPS buildings can be designed to be up to 24 storeys in height, but 133-176 Gordon Crescent is substantially lower than this.

Figure 5. Ronan point collapse

The Ronan point collapse was caused by a gas explosion on a mid-level floor. The explosion dislodged loadbearing panels which triggered a disproportionate collapse. This report does not consider collapse mechanisms under Approved Document A; such an assessment should be carried out by a structural engineer. Croydon Council should satisfy themselves that the structural health of the building is not a risk to life safety during a fire event. Furthermore, it has not been possible to determine the insulation present in external wall panels, and as such it cannot be determined whether a deflagration event could occur. It was typical for the blowing agent to be Pentane in the 60's and 70's. This report therefore does not consider deflagration risks as this would need to be determined by a DSEAR expert.

There are many types of LPS construction, and it is not possible to definitively state which type of structure was used; however, it is known that 133-176 Gordon Crescent was constructed by Wates in the late 1960's. A large number of LPS buildings were based on the Bison method of construction. Typically, the external walls of LPS buildings are similar to that shown in the figure below and correspond to the site findings.

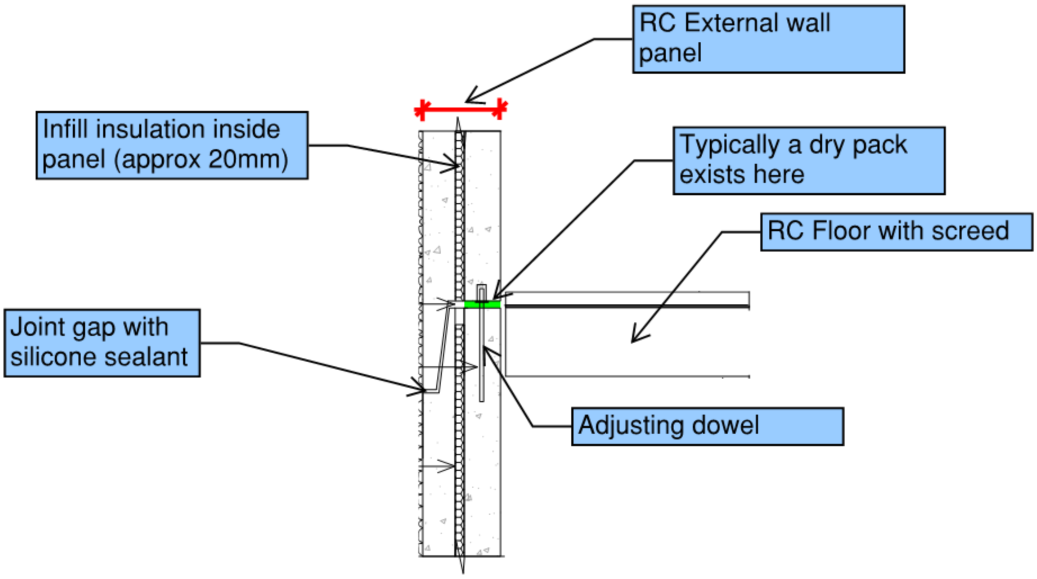

Figure 6. Typical composition of external walls

It can be seen that there is a thin insulation layer within the panel itself and there is a path to this cavity from outside at the joint gap. This insulation is typically a form of EPS or XPS which is a highly combustible substance, however, it is encapsulated between two >100mm leaves of RC which means it is offered a significant degree of protection. The cavity in which the insulation exists is generally 20mm wide, but this can very across the different manufacturers. Based on making drill holes at the building it was found that the cavity was within the 20-25mm range. There is a route for fire spread via the joint between panels, the silicone sealant used is of a substantial volume and will offer some fire resistance into the panel system, however, a period of time cannot be determined. Typically, a dry pack is present which aids in preventing fire re-entry into the building.

Whilst there is a risk of fire making its way to this zone, the risk is substantially lowered by the 100mm layer of mineral wool insulation which has been provided as part of the re-cladding works. On that basis the combustible insulant in the structural panel itself has been largely not considered as part of this report. Due to the location of the insulant, it is not likely to contribute to uncontrolled fire spread. Furthermore, if fire did reach the insulation the rate of fire spread in this cavity would be likely low on the basis that the cavity has a small width and will not entrain air to any great degree, and the fire would need sufficiently make its way through the insulation to spread which would take time to accomplish. On that basis it is considered reasonable to omit this layer of insulant from the main risk assessment, however, it will still be acknowledged to exist.

Due to the different types of structural wall present in LPS buildings (i.e. flank wall, side wall, etc) there are panels of different styles which have been noted. Typically, most panels are the same as that noted in Figure 5, the difference of note is the coarseness of the facing material. The other system that exists commonly is a facing brickwork system. The exact method of construction is not known, however, from investigations it is clear that a cavity exists between the brick work and the substrate behind. Again, there are multiple types of construction method that could be employed here, so assumptions based on common practice have been made as part of this assessment.

Similar to the method shown in Figure 6 there are a number of instances where the facing brick work is supported with an RC upstand/downstand. The residual cavity formed is similar to that shown in Figure 7.

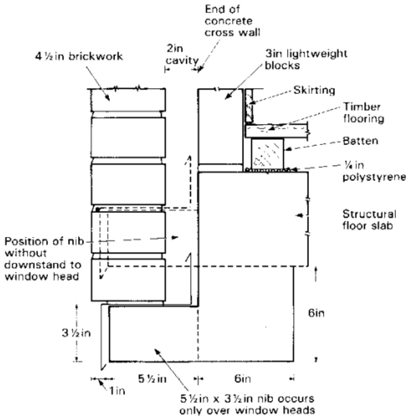

Figure 7. Typical brick on RC downstand

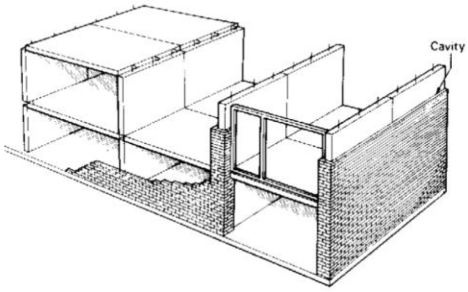

Figure 8. Typical brick façade to LPS

A cavity is typically formed between the facing brick work and the RC structure/block work substrate. Based on drill hole surveys this cavity was found to exist., but it could not be determined whether insulation exists in this cavity.

Typically, cavity barriers can be omitted from cavities formed between two layers of masonry which are >75mm thick, and the guidance has historically allowed for combustible insulation to be present in such cavities. This is due to the fact that masonry is dense, inert, robust and non-combustible and is very unlikely to contribute to uncontrolled fire spread. As per the rest of the wall system the brick work is situated by c. 100mm mineral wool insulation which will offer a high degree of protection. On that basis it is considered reasonable to omit the areas behind the facing brick work from the risk assessment, however, the presence will still be acknowledged.

The image in Figure 8 shows typical buildings from the Morland Road Estate which 133-176 Gordon Road is part of. It can be noted from the images that multiple external wall types are present (RC and brick work) as described above in this section.

Figure 9. View of Morland Road Estate

4. Scope & Limitations

4.1 Scope

This report is based on the information provided by Croydon Borough Council. The scope was to review the building and the product will be an EWS1 form and accompanying report. Please note that this report and the EWS1 form issued will only apply to the buildings specifically noted in Section 1 of this report.

Under the EWS1 process, the building may require remedial works before it is satisfactory. As part of this scope, we will provide a completed EWS1 form for the building, which is designed to satisfy lenders.

We cannot guarantee that lenders will be satisfied with the EWS1 form but this form has been agreed by many lenders and, as far as we are aware, is the only system available for this purpose.

The EWS1 form has been coordinated by RICS and supported by MHCLG in principle.

4.2 Limitations

This review is for the sole and exclusive use by Croydon Borough Council in relation to the buildings noted in Section 1 of this report only.

This review considers the combustibility and risks of external fire spread via the external walls only, and does not endorse any other elements of the design such as alarm, suppression, structural protection, etc.

In the site survey a reasonable sample of locations were reviewed. We can only base the findings of our report on the sample information gathered during these site surveys.

4.3 Relevant Legislation & Guidance

The decision was taken by the client that the building will be subject to an assessment to quantify the risk posed by the wall materials to residents with respect to health and safety.

As part of the UK Government approach to fire safety since the Grenfell Tower fire, information has been supplied to building owners, particularly those who own and manage multi-storey residential buildings. Most recently, a document entitled '*Advice for building owners of multi-storey, multi-occupied residential buildings, (2020)*' provided advice for multi-storey buildings of any height.

As part of that guidance, it states that, the Requirement B4 is clear and requires that "*the external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and location of the building. The need to assess and manage the risk of fire spread applies to buildings of any height*".

5. EWS1 Assessment Scheme

5.1 Requirements

Irrespective of the application of regulation to existing buildings and those under construction, valuations for residential apartments in a block now seek confirmation of compliance with the limitations in the use of combustible materials.

As it is not possible to verify this in a majority of existing premises a scheme has been devised in conjunction with the Building Societies Association and UK Finance to include an inspection and assessment option on the relative risk in case of fire.

In summary, the concept is for a technically competent engineering professional to inspect or otherwise ascertain the material used and construction of the external walling types and associated attachments. Subject to the findings of the inspection and the combustibility of the materials, options are available to assess whether it is considered to present an unacceptable level of risk and if remedial action is necessary.

Dependent on the outcome the following reports and documents will be required:

- A1 – EWS1 form completed with A1 confirmed plus inspection report
- A2 – EWS1 form completed with A2 confirmed plus report of assessment and conclusions regarding acceptable risk
- A3 – EWS1 form completed with A3 confirmed plus report of assessment and conclusions regarding unacceptable risk plus report giving remedial and interim measures
- B1 – EWS1 form completed with B1 confirmed plus report of assessment and conclusions regarding acceptable risk
- B2 – EWS1 form completed with B2 confirmed plus report of assessment and conclusions regarding unacceptable risk plus report giving remedial and interim measures

An EWS1 form is primarily intended for buildings where the highest floor is greater than 18m above ground level, or where there are reasons where a higher risk is associated with the building type, e.g. care homes etc. This building is in scope as it is >18m in height.

5.2 Mechanism for Fire spread

When reviewing a building with combustible products on the façade, the EWS1 form asks for the following to be considered in accordance with note 9 of the aforementioned (as detailed under the scope section 1.2 of this document.)

There is obviously some subjectivity as to exactly how to apply these requirements and further uncertainty as to how a particular wall build up or a wall with multiple build ups will behave in a fire.

BR 135 describes the mechanism for fire spread in Figure 03 of the document. This is illustrated in the figure below of this document.

This details that it is possible for fire to spread even on a building with a non-combustible façade via the windows. This mechanism is called restricted fire spread because fire may spread to the apartment above but it would then need to grow and develop before breaking out again to spread to the apartment above. This is described in BR 135 as follows:

"Following the initiation of a fire inside the building, if no intervention occurs, the fire may develop and break out from the room of origin through a window opening or doorway . Flames breaking out of a building from a post-flashover fire will typically extend 2m above the top of the opening prior to any involvement of the external face, and this is therefore independent of the material used to construct the outer face of the building envelope.

This form of fire spread should be feasible for the fire service to extinghuish and prevent it from spreading.

Rapid fire spread may be due to combustible materails which form part of the external wall build up or via fire spread within the cavity.

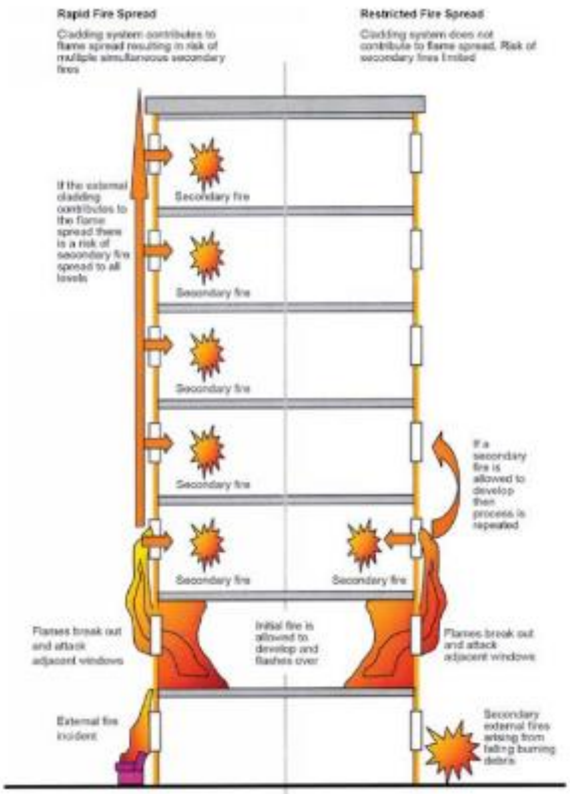

Figure 10. Mechanism for fire spread

When considering the requirements of the EWS1 form, the most probable prediction is made of the most possible worst reasonable case is reviewed against this criteria.

Then factors such as the height of buildling, the number of stairs, the provision of fire service access, the passive and active measures, are reviewed to evalulate the risk.

This is detailed in Section 7: External wall analysis.

6. Survey findings

6.1 Survey

BB7 intrusively surveyed the building on 25th March 2021. The survey was conducted by James Groves, Steven Golding and Lee Wilson. BB7 had pre-determined multiple survey locations on the building to maximise the findings of the visit and provide a representative sample, these were specified at compartment lines and around openings to ensure that cavity barriers were provided in their respective locations. The locations were agreed with the contractor ahead of the survey. BB7 surveyed 5 locations across the building.

When surveying buildings from a fire safety perspective, confirming the existence of issues over several areas is key to ensuring a reliable survey. The number of survey points were specified so that any issues could be confirmed where found or could be proven as a "one off" if only found once. The number of locations surveyed was intended to provide reliability in the findings.

Five areas were surveyed as shown in the following figure.

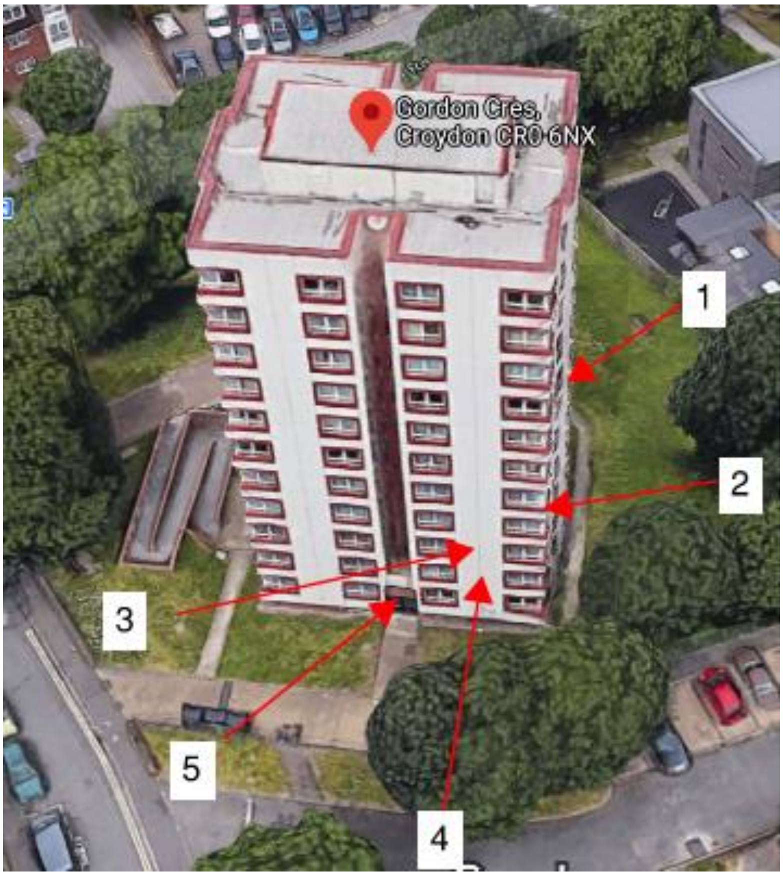

Figure 11. Areas inspected

6.2 Location 1

Location 1 was on the East elevation at the fourth-floor party wall and both horizontal and vertical cavity barriers were identified. The system was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system.
- Builders paper over 130mm reinforced mineral wool insulation with metal & carbon fixings. (Figures 16 & 17).
- 130mm horizontal (floor level) reinforced mineral wool cavity barriers with metal fixings has been folded over in some areas to increase the level of compression (Figure 12 & 13). It was noted in various areas that compression was not being achieved and some gaps were clearly visible.
- Vertical (party wall) reinforced mineral wool cavity barrier. The cavity barrier sat in front of the mineral wool insulation (i.e., did not break the insulation) and did not appear to be under compression at all. (figure 13 & 16)
- 100mm solid concrete. A hole was drilled through the concrete to determine the thickness; however, it could not be further determined what was behind the concrete without potentially compromising the integrity of the structure and causing damage internally (Figures 14 & 15). In some cases brick work was found, this is likely to be a flank wall. Please refer to Section 3 for further information.
- Around windows a Mineral wool insulation has been installed on all sides but only at floor levels and party wall lines cavity barriers are present.

The same build up was identified at each of the upper-level cladding areas.

Around windows it was noted that a mastic that isn't fire rated has been used to seal the windows in. Cavity barriers were not a requirement around windows on blocks of flats until the year 2000, therefore assuming the re-clad occurred in the late 1990's the lack of barriers would have been Building Regulations compliant.

Figure 12. Location 1, Horizontal cavity barrier seen from above. Rockwool insulation, building

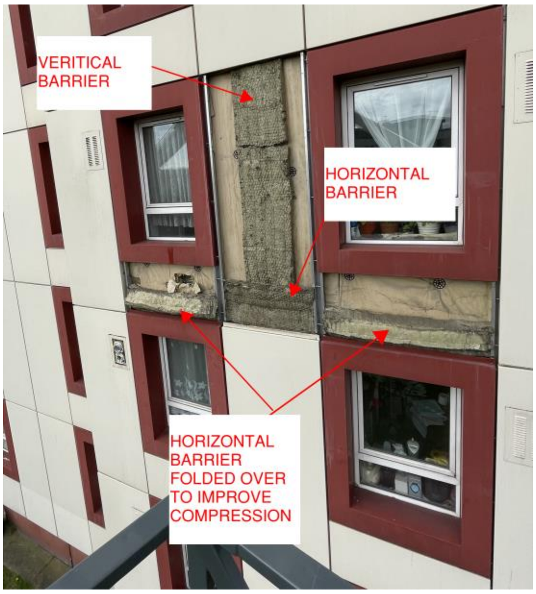

Figure 13. Location 1, Horizontal & vertical cavity barriers exposed. Note that two barriers are not folded to be under compression and the

paper and the wall beyond can be seen.

barriers are interrupted by the cladding rails.

Figure 14. Concrete panel behind insulation exposed and trial hole drilled to test depth.

Figure 15. Trial hole drilled to 100mm into LPS substrate. The RC was thicker, only a 100mm hole was made

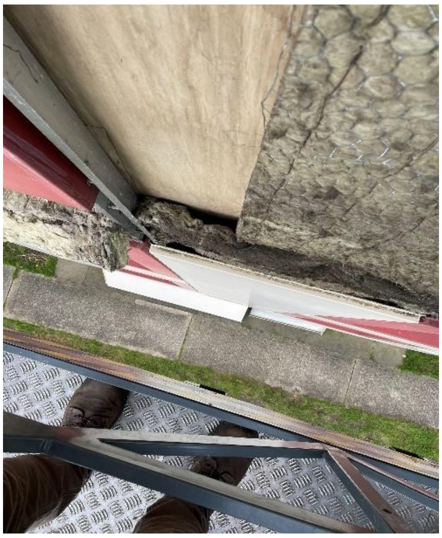

Figure 16. Vertical cavity barrier positioned behind the horizontal and not under compression

Figure 17. Horizontal barrier not under compression along the line of inspection area 1 and not folded such that it is under compression.

The barriers were mineral wool type product reinforced with wire, which were common at the time of installation. This cavity barrier has to be folded over in order to ensure that the barrier fills the full depth of the cavity to reach the rear of the cassette panel, however, the barriers were found in some cases to be poorly fitted with gaps appearing next to the façade carrier system, it was not under compression so it may allow fire to bypass the compartment line here, which is not permissible.

6.3 Location 2

Location 2 was on the South Eastern corner of the building at the second-floor slab level and a horizontal cavity barrier was identified. The concrete structure behind was also drilled into to identify the thickness.

Figure 18. Location 2 Continuous cavity barrier at floor level. Again cavity barriers can be seen not to be under compression.

Figure 19. Location 2 – Horizontal barrier pulled back to exposed building paper and fixings behind.

6.4 Location 3

Location 3 was at the third floor around a flat window. Mineral wool insulation has been installed around the windows but cavity barriers have not been provided. As per location 1 this was allowable at the time of the re-clad. The horizontal barrier can be seen below at floor level but nothing above and it has not been installed under compression. Gaps between the window and the surrounding masonry have been filled with a mastic material, whether it is fire rated mastic is unknown. Another trial hole was drilled into the LPS substrate and as with the previous hole a depth of 100mm was achieved.

Figure 20. Location 1.3 horizontal cavity barrier

Figure 21. Location 1.3 original window frame behind insulation

Figure 22. Location 3 mastic above window

Figure 23. Location 3 mastic below windows

Figure 24. Location 3 right hand detail with masonry visible. At this point the RC upstand likely supports the brick as seen in Section 3.

Figure 25. Location 3 Horizontal barrier below and rockwool positioned vertically at the side of the window

Again, the barriers were mineral wool type product reinforced with wire, which were common at the time of installation. This cavity barrier has to be folded over in order to ensure that the barrier fills the full depth of the cavity to reach the rear of the cassette panel, however, the barriers were found in some cases to be poorly fitted with gaps appearing next to the façade carrier system, it was not under compression so it may allow fire to bypass the compartment line here, which is not permissible.

Generally all cladding rails are considered to be outside spaces because the inside of the "C" shape takes the cladding returns and sits exposed to the open air. The rear of the rails sits against the insulation and the cavity barriers sit between rails. Between windows on different floors is a central rail which is not open to fresh air and forms a cavity between compartments. This will be addressed in Section 9.

6.5 Location 4

Location 4 is below area 3 on the second floor.

The concrete panel system is replaced with masonry cavity wall in this case. A trial hole was drilled to exposed the cavity, the brick work depth was found to be approx 100mm and there appeared to be a clear cavity behind.

Figure 26. Location 4 extract window exposed. It is noted from other building examined the panels visible behind the refuse chute are not fire rated

Figure 27. Location 4 cavity barrier was in compression against the lip of the cladding but would not have reached the rear of the cassette. Metal framing system fixed back to LPS substrate.

Figure 28. Location 4 Junction between the brickworks and concrete LPS panels exposed. Metal rain drip tray in position

Figure 29. Location 4 trial hole drilled in the masonry to expose the 75mm clear cavity beyond.

Figure 26 shows that cavity barriers are not under compression.

6.6 Location 5

Location 5 was on the ground floor of the South elevation. The bin store was inspected, and it appears the ground floor is a cast concrete base as is the roof of the bin store. There has been a fusible link damper installed on the refuse chute, but this appears to have been tied back with string, this should be removed. The bin store also has a sprinkler head installed to reduce fire growth.

Figure 30. Location 5 cast concrete walls which are part of the original structure.

Figure 31. Location 5 Sprinkler head visible in bin store area. Also note the fusible linked damper has been tied back, this should be removed.

Figure 32. Location 5 penetrations in bin store roof – the RC roof has fresh air above.

6.7 Other areas

Infill panels

Infill panels are not present on the upper floors of the building, however, they are present at ground floor level forming the current final escape route between the main building and the ground/lower ground floor lift shaft. BB7 did not intrusively survey these panels, however, they have been opened up to identify its construction on a number of similar buildings. It was found that the infill panel is a composite panel consisting of an unknown thermoplastic material sandwiched between two thin layers of steel. The panels appeared to be the same from a visual survey on this block. They will therefore be considered as a combustible panel unless proven otherwise.

Figure 33. Location 5 penetrations in bin store roof – the RC roof has fresh air above.

Ground/Lower ground wall system

The ground and lower ground floor external wall system comprises the original RC structure which has been painted at some point in time. No combustible render systems or similar have been found on this block. The painted RC is not considered to pose a risk.

Figure 34. Location 5 penetrations in bin store roof – the RC roof has fresh air above.

6.8 Internal survey

The common areas in the building were reviewed internally on each level. The block is served by a single stair and there were four flats per upper floor level.

There were service risers in the protected stair. The stair should be kept sterile and remain free of fire load, the riser is not considered to prevent a significant risk.

The flats opened into a lobby with ventilation via an AOV. It is presumed that the AOV works on detection which was identified in the lobby. The sprinkler stop valve was noted in the lift motor room and a tanked water supply was identified.

At ground floor, there was residential storage accessed from the lobby serving the stair. The storage was provided with a fire door and kept locked.

The bin store is accessed from the lift lobby via a ventilated lobby separated with double door fire protection. The doors inspected appeared to be solid and robust with working self-closers. The bin store is provided with a wall mounted sprinkler and a fusible link damper at the base of the bin chute which will limit potential fire size and spread. This is shown in the following figure.

Figure 35. Bin store fusible link and sprinkler

Dry riser outlets were provided on all even floors. There was also what appeared to be an auto-dial system which was assumed to automatically call the Fire Service on detection in the common area or link to a monitoring station who then call them. The final exit at ground floor is provided by a double glazed UPVC lobbied approach.

6.9 Fire Risk Assessment

No Fire risk assessment has been provided and BB7 would recommend one is carried out at the earliest convenience to establish if any significant defects in the buildings general fire safety precautions exist.

7. Fire Service Access & Facilities

This section has been added to demonstrate the availability for a pump appliance to gain access to each elevation to fight a fire.

Figure 36. Site Plan

The buildings are bounded on three sides by Morland Road, Gordon Crescent and the car park access.

This is considered to provide reasonable Fire Service access within sufficient proximity to the majority of the elevations on the development.

The Fire Service can reach the building within 18m and the car park provides access to the rear within 18m. The main concern would be access for high reach equipment to all the elevations of the property.

Where access cannot be achieved by an appliance directly to the façade, there are pedestrianized routes with paved pathways which would enable them to reach the façade and apply water without delay to the lower levels without undue delay. However, a high reach appliance would struggle to reach the full elevations. Furthermore, the response time for high reach appliances in London is likely to be delayed and, as such, they cannot be relied upon.

Internal Provisions

There are dry riser outlets provided on even floor levels within the lobby serving the stair. The riser inlet is provided in the lobby on the ground floor. Both lobbies and stair are provided with ventilation.

The building is provided with a firemans lift and the stairs are approx. 1100mm, which is sufficient width for a firefighting stair.

The building is also provided with sprinkler protection which is likely to reduce the potential fire size and spread.

8. Analysis

8.1 Overview

Analysis of the build-up behind the original concrete construction was not carried out on site as removing large panels could be potentially damaging to the building. It is also suspected that the LPS system would have been provided with a flammable insulation internally, but this is likely to be encapsulated within the construction of the building.

The over cladded system was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system.
- 130mm horizontal (floor level) and vertical (party wall) reinforced mineral wool cavity barrier. The cavity barrier sat on top of the insulation (i.e. did not break the insulation) and was under compression.
- 60-70mm clear cavity.
- 130mm mineral wool insulation with metal fixings.
- 100mm+ solid concrete / masonry. A hole was drilled through to determine the thickness; however, it could not be further determined what was behind without potentially compromising the integrity of the structure and causing damage internally.

It was noted that the panels on the rear elevation adjacent to the bin chute have found to be constructed of flammable material on other similar buildings. So, it is suspected they are also flammable on this building also.

The main entrance to the building also appears to be constructed from UPVC panels and double glazed windows, which provide no fire resistance.

8.2 Background issues

There are some items which should be addressed before the analysis of each system, these items will feed into each analysis.

Large Panel System (LPS)

It was not possible to intrusively review or definitively identify what type of LPS structure was used, however, based on the dates of construction the typical composition of the external wall is expected to be as Figure 5 of this report. This was expected to include a thin insulation layer, typically a form of EPS or XPS, within the panel itself and there is a path to this cavity from outside.

This form of insulation is a highly combustible substance; however, it is encapsulated between two >100mm leaves of RC which means it is offered a significant degree of protection.

Based on making drill holes at the building it was found that the cavity was within the 20-25mm range.

Although there is a route for fire spread via the joint between panels, the silicone sealant used is of a substantial volume and will offer some fire resistance into the panel system, however, a period of time cannot be determined. Furthermore, it was typical for a dry pack to be present which is expected to aid in preventing fire re-entry into the building.

The risk of a fire breaking into this cavity is also significantly reduced due to the mineral wool insulation included in the over cladding system.

Therefore, although there is potentially combustible insulation in the LPS, it is not likely to contribute to uncontrolled fire spread and based on the justification in Section 3 of this report, the risk has been acknowledged but omitted from the external wall assessment.

Cavity barriers

Based on the contractor's knowledge of the building the re-clad occurred in the mid-late 90's, it is likely that the cladding system would be designed to Approved Document B: 1992 (ADB). Section 9 of ADB 1992 requires that cavity barriers should be provided at compartment floors and walls, the period of fire resistance which should be achieved by products are:

- Cavity barrier – 30 minutes integrity and 15 minutes insulation; and
- Fire barrier (i.e. fire stopping) – the integrity and insulation time should be the same as the fire resistance time for the compartment it serves in line with compartment floors only evidenced by Diagram 27 and Table 13

Diagram 27 and Table 13 of ADB: 1992 provide the guidance requirements for the placement of cavity barriers. Diagrams 39 and 40 below show the requirements at the time of construction, and that no cavity barriers are required around openings.

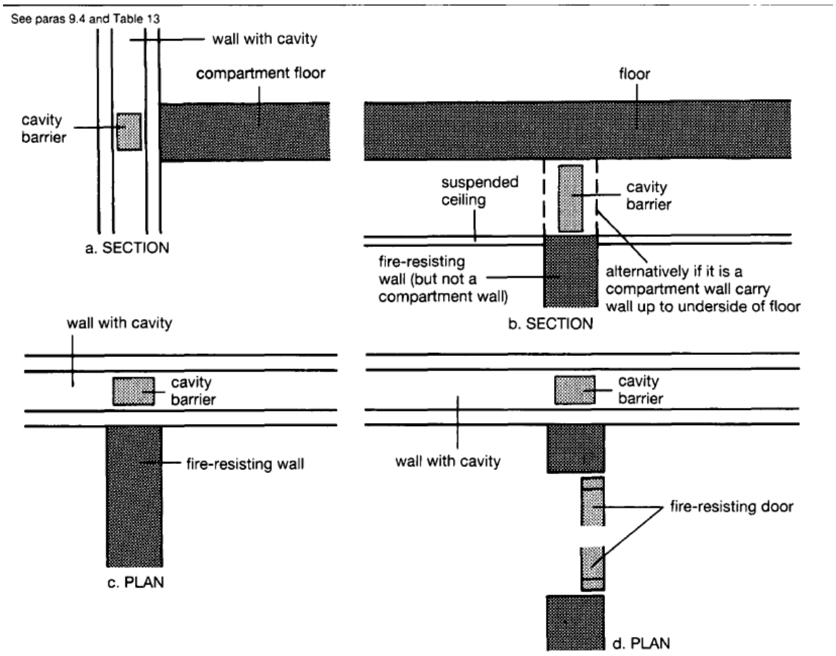

Figure 37. Diagram 27 ADB1992

B3

Openings in cavity barriers

9.14 Any openings in a cavity barrier should be limited to those for:

a. doors which have at least 30 minutes fire resistance (see Appendix B, Table B1, item 8(a)) and are fitted in accordance with the provisions of Appendix B;

b. the passage of pipes which meet the provisions in Section 10;

c. the passage of cables or conduits containing one or more cables;

d. openings fitted with a suitably mounted automatic fire shutter; and

e. ducts which (unless they are fire-resisting) are fitted with a suitably mounted automatic fire shutter where they pass through the cavity barrier.

Table 13 **Provision of cavity barriers**

Cavity barriers to be provided:	Purpose group to which the provision applies(3)			
	1b & c dwelling houses	1a Flat or maisonette	2 Other residential and institutional	3-7 Office, shop & commercial, assembly & recreation, industrial, storage & other non-residential
1. At the junction between an external cavity wall, which does not comply with Diagram 28, and a compartment wall that separates buildings; and at the top of such an external cavity wall.	x	x	x	x
2. Above the enclosures to a protected stairway in a house of three or more storeys (see Diagram 29a). (1)	x	-	-	-
3. At the junction between an external cavity wall which does not comply with Diagram 28, and every compartment floor and compartment wall.	-	x	x	x
4. At the junction between a cavity wall which does not comply with Diagram 28 and every compartment floor, compartment wall, or other wall or door assembly which forms a fire resisting barrier.	-	x	x	x
5. In a protected escape route, above any fire resisting construction which is not carried full storey height, or (in the case of a top storey) to the underside of the roof covering.(1)	-	x	x	x
6. Above any bedroom partitions which are not carried full storey height, or (in the case of the top storey) to the underside of the roof covering.(1)	-	-	x	-
7. Above any corridor enclosures which are not carried full storey height, or (in the case of the top storey) to the underside of the roof covering, where the corridor (which is not a protected corridor) should be sub-divided to prevent fire or smoke affecting two alternative escape routes simultaneously (see paragraph 3.21 & Diagram 30).(2)	-	-	x	x
8. To sub-divide any cavity (including any roof space) so that the distance between cavity barriers does not exceed the dimensions given in Table 14.	-	-	x	x
9. Within the void behind the external face of rainscreen cladding at every floor level, and on the line of compartment walls abutting the external wall, of buildings which have a floor more than 20m above ground level.	-	x	x	-

Key x provision applies
\- provision does not apply

Notes
1. The provisions in items 2,5 and 6 do not apply where the cavity is enclosed on the lower side by a fire resisting ceiling (as shown in Diagram 31) which extends throughout the building, compartment or separated part.

2. The provision of item 7 does not apply where the storey is sub-divided by fire resisting construction carried full storey height and passing through the line of sub-division of the corridor (see Diagram 30), or where the cavity is enclosed on the lower side as described in Note 1.

3. The classification of purpose groups is set out in Appendix D, Table D1.

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Figure 38. Table 13 - ADB1992

Cavity barriers should be provided in the outer cavity in line with all compartment walls and floors based on the guidance at the time of construction. The outer cavity is considered to exist between the RC/brick substrate and the rear of the Aluminium cassette panel.

Double skin masonry systems

Cavity barriers can be omitted from certain types of construction such as construction comprising two leaves of masonry >75mm thick. The reason for this is due to the robustness offered by the masonry. This exemption is not relevant to the re-clad element of the building, it would only be applicable to the existing structure.

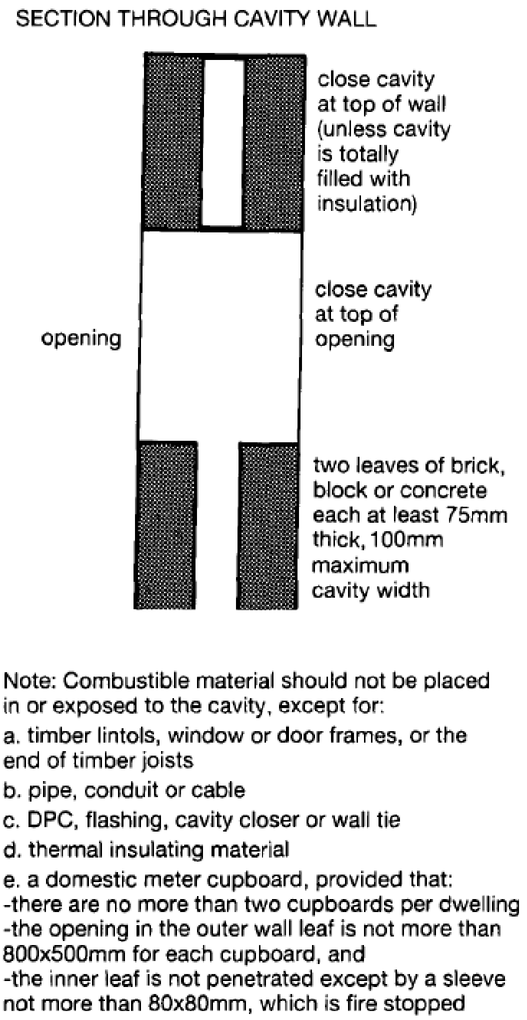

Figure 39. Diagram 28 – ADB 1992

It should be noted that all other construction types require cavity barriers to be fitted. Furthermore, any cavity existing outside of the masonry cavity will also require barriers.

8.3 System Analysis

8.3.1 System 1: Aluminium panel with mineral wool insulation

System 1 was the cladding system on the building and comprised of the materials in the table below:

Material	Combustibility	Volume	Comments
>100mm concrete / masonry (Existing construction)	Euroclass A1 to BS EN 13501-1	All locations	Due to the non-combustibility BB7 consider that this item is low risk in terms of uncontrolled fire spread. Please note that there is likely a thin EPS insulant between two >100mm layers of RC in the structure which is Euroclass E. Due to the encapsulation of this layer and the protection offered by the mineral wool this layer has been discounted as it is very unlikely to contribute to fire.
130mm mineral wool insulation	Typically, Euroclass A1 /A2 to BS EN 13501-1	All locations	Non-combustible, low risk of fire spread in the cavity.
60-70mm clear cavity	N/A	All locations	No combustible components.
100-130mm reinforced mineral wool cavity barrier	Typically, Euroclass A1 /A2 to BS EN 13501-1	Compartment floors, party walls	Locations of cavity barriers not strictly in accordance with ADB, however, generally adequate provision
Aluminium cassette panel fixed to steel/ aluminium railing	Typically, Euroclass A1/A2 to BS EN 13501-1	All locations	Due to the non-combustibility BB7 consider that this item is low risk in terms of uncontrolled fire spread.

Behind the solid aluminium cassette panel was a 60-70mm cavity and 130mm mineral wool insulation mechanically fixed to the concrete panel system. In the majority of cases, the mineral wool insulation was tightly fitted and abutted. Any gaps between the insulation were kept to a minimum and generally the installation was considered adequate. The non-combustible insulation is considered to reduce the possibility of uncontrolled fire spread.

Cavity barriers were typically found at compartment floors. Where the cavity barriers were present, they were reinforced with wire (typical) and, where they were folded over, they were compression fixed on top of the insulation (i.e. it was not broken). As the insultation is non-combustible, this is considered to be adequate as it is unlikely that a fire could flank the barrier and spread on the façade. Both materials are non-combustible and unlikely to contribute to fire spread. Although the cavity barrier does not go back to the substrate, the risk is considered to be low as the insulation is also non-combustible and is unlikely to degrade during fire exposure.

There were no cavity barriers around the flat windows, however, if a fire were to break out of a window, then it is unlikely to rapidly spread through the cavity and up the building due to the lack of combustible materials and the flame front will not have a substrate to continue the fire spread. Furthermore, when fitted properly the fire spread will be inhibited by the horizontal cavity barriers at floor level. It was found in numerous locations that the cavity barriers were not fitted under compression meaning that there is potential for fire to bypass the cavity barriers. Whilst this would be considered to be low risk if limited instances were found, on this building BB7 did not find evidence of compartment floor barriers being folded and fully filling the cavity to the rear of the cassette panels. On that basis BB7 recommend that the cavity barriers are upgraded to ensure that they will inhibit the unseen spread of fire and smoke. This can be done in one of two ways:

1. Fold the existing barriers such that they are under compression; or
2. Provide new barriers.

BB7 would be satisfied with either option and would consider that the requirement of the Building Regulations to inhibit the unseen spread of fire and smoke in concealed spaces would be achieved.

Fixing brackets located at the ends of cladding panels are not considered to present a significant concern. Primarily because the 'C' shape of the bracket is open to external air and the rails sit against the insulation. However, the fixing brackets that are located centrally of wider panels between windows are of greater concern, as they would allow fire and smoke to bypass the horizontal cavity barriers. The brackets are 100mm wide and pass through the horizontal cavity barriers, meaning that the barriers are not continuous. The risk of this is considered to be low as the gap is small. It is also more likely that fire will spread from one dwelling to another externally, rather than through this gap in the cavity barrier, especially considering the channel in the bracket is isolated. The bracket is solid aluminium and there is no combustible insulation to potentially fuel fire spread. Furthermore, the flats are sprinklered which is likely to reduce the potential fire size and spread.

PD 7974 recognises the benefits sprinklers and states that they are likely to reduce the potential fire size and spread, along with limiting compartment temperatures to approximately 100°C (CIBSE Guide E, Section 6.6.4). The reduction in severity of a fire within the flat will be substantially less than a flashover fire and, ultimately, the severity of a fire on the façade, if it spreads that far, will also be reduced.

The risk of a fire within the bin store is higher than that from a flat. There is a side mounted sprinkler installed within the ground floor bin store and the base of the bin chute was provided with a fire shutter activated by a fusible link. Therefore, the sprinklers would reduce the size of a potential fire and the shutter would reduce the spread of fire vertically. If a fire were to spread vertically, it would be contained to the bin chute as the elevation containing flats is stepped forwards and it is unlikely that there would be enough combustibles to fuel a fire to spread from this area to the adjacent cavity due to non-combustible elements within wall system.

8.3.2 Infill panels

The infill panels are situated on the final escape route, as per the table below they are highly combustible. On that basis BB7 recommend that they are replaced for non-combustible alternatives.

Material	Combustibility	Volume	Comments	Recommendations
Thermo plastic infill between two layers of steel.	Typically Euroclass E - F to BS EN 13501-1	All locations	Combustible thermo plastic sandwiched within two layers of steel between windows.	All window infill panels are to be replaced for non-combustible alternatives on the common area sections.

9. Conclusions and recommendations

9.1 Conclusions

BB7 have been appointed to provide an EWS1 form for 133-176 Gordon crescent in Croydon, South London. This report has outlined BB7's intrusive survey findings, analysis of the external wall systems, and conclusions. BB7 intrusively surveyed the building on 25th March 2021; the survey was conducted by James Groves, Steven Golding and Lee Wilson of BB7.

Due to the recommendations that are to follow, the building will have a B2 designation on the EWS1 certificates that will be issued in conjunction with this report.

This report and EWS1 forms issued are valid for a period not exceeding five years.

9.2 Recommendations

BB7 make the following interim and long-term recommendations regarding the building:

9.2.1 Interim recommendations

Although the building has a B2 rating due to the recommendations made, it does not necessarily mean that the buildings evacuation strategy needs to change, it just means that we consider remedial works are necessary to bring the external walls up to a point where they need to be for the purposes of the form and government advice.

Section 11 of the Governments Consolidated Advice Note provides guidance on this issue. There are a number of factors which can be considered:

1. Although the buildings are greater than 30m, they are provided with a sprinkler system which can reduce the severity of a fire within a flat and the bin store area.
2. Fire Service access to the building is generally good to the permitter and the Fire Service would not experience an undue delay in getting water onto a façade fire at low level. However, a high reach appliance would struggle to reach the full elevations. Furthermore, the response time for high reach appliances in London is likely to be delayed and, as such, they cannot be relied upon. A report produced by London Fire Bridge (LFB) 'Fire Facts Incident Response Times 2020' highlights first and second appliance average response times for 2020. They are 5.03 mins and 6.14 mins, respectively.
3. The outer face is solid aluminium, and the insulation is non-combustible mineral wool throughout the main external wall system. This is unlikely to significantly add to fire spread up the external wall.
4. No combustible infill panels are present on the upper levels.
5. The cavity barriers are generally adequate from the inspection locations and are in locations which are broadly in line with the requirements of ADB. Where not compressed they still reduce the cavity width and will slow down the progression of fire spread.

Based on the above, BB7 suggest there is no immediate need to change the current escape strategy. However, there are some things that should be actioned to do to ensure occupant safety:

- An up to date FRA should be carried out considering the new information. We'd recommend that a Type 4 is conducted on the basis of the findings of other similar blocks.
- Replace the infill panels behind the refuse chute

- Consider re
- Residents should be informed of their responsibilities in terms of fire safety.
- Risers in the lobby and stair should be reviewed to ensure fire and smoke spread is limited into the escape routes.
- The local FRS will need to be informed.

8.2.2 Long Term recommendations

BB7 make the following recommendations:

- Any composite panels with infill combustible insulation should be replaced with a non-combustible alternative.
- BB7 recommend that the cavity barriers are upgraded to ensure that they will inhibit the unseen spread of fire and smoke. This can be done in one of two ways:
  - Fold the existing barriers such that they are under compression; or
  - Provide new barriers.

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