EWS1 report

Tonbridge House

30 April 2021

Croydon Borough Council

12125BB

Revision History

Version	Date	Author	Comments
01	30/04/2021	Shauna Jameson / Jonathan Cornelius	Initial issue to client

Document reference
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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 Tonbridge House, Penge Road, Croydon.

This report outlines BB7's intrusive survey findings, analysis of the external wall systems, and conclusions. BB7 intrusively surveyed the building on 9th March 2021; the survey was conducted by James Groves, Jonathan Cornelius and Shauna Jameson.

The full building description is found in Section 2 of this report. The following figures show the original cladding on the building and the building after it was re-cladd.

Figure 1. Existing cladding circa 1960s

Figure 2. Re-cladd. Presumed circa 1990s

This document and the associated EWS1 form are only applicable to Tonbridge House. 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 is 11 storeys (i.e. ground plus 10) and is served by a single stair core. The residential accommodation is from the first to tenth floor with storage at the ground and plant space at the top of the building. There are 39 dwellings in total split over four flats per floor, and it provides general needs housing accommodation.

There is also a bin chute that runs the height of the building which is accessible from the stair via a ventilated lobby, both the lobby and refuse chute room were ventilated via the same duct with a split plenum. It was noted that the bin store itself was provided with permanent ventilation via louvred doors which vent directly to fresh air. The free area of the vents in both locations could not be confirmed. Furthermore, the construction of the bin cute appeared to be newer than the rest of the building, this may have been an extension at some point. At the base of the bin chute, a fusible link damper was provided to prevent fire spread up the bin chute and there was a sprinkler head to suppress a fire originating in this space.

The single stair core is separated from the common area by Georgian wire glass partitions and there were 2 permanent vents at the head. The common area from the stair was provided with what appeared to be an automatic opening vent (AOV) at every level. Smoke detectors were in the common area and are presumed to activate the ventilation. The travel distance from flat door to stairwell was also restricted below 7.5m which would be in accordance with the current standard design guidance.

There was also a dry fire main noted on every even floor level which would allow the Fire Service to connect at the base and then charge the main with water to the floor of fire origin or several floors below, as per standard practice. This is beneficial in a tall building as it means they do not have to run numerous lengths of hose up the stair. Furthermore, the lift appeared to be usable by the Fire Service (i.e. an override was identified) which will enable them to reach the floor of fire origin quicker.

At the base of the stair, the common area and final escape route were clear and free of obstructions direct to outside. The final exit door had a security access system which is presumed to release on fire detection. It is noted that there are no flats at ground floor, therefore, occupants need to escape past ancillary accommodation

The fire alarm panel was identified in the ground floor common area with what appeared to be a 'redcare' style autodial system along with the sprinkler stop valve. Sprinkler flow switches were noted on all upper floor levels, the system appeared to be a very recent addition to the building. There is a clear route to access the building from outside from the main road.

The building is provided with sprinkler protection, but it is not known to what extent they are provided as the internal flats were not reviewed. It is possible that some flats may not have them or they may be disconnected.

The Fire Service would have good hose access to the lower levels of the building and an appliance could reach the lower part of the façade from a public road or the car park at the rear. Although good access is provided to enable the Fire Service to get water onto the lower areas of the façade, 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.

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

Since the building was constructed, the entire façade has been overclad with a 5mm aluminium cassette panel system with mineral wool insulation directly onto the original structure and a ventilated cavity. It is presumed the over cladding was carried out in the mid-late 1990s based on conversations with the contractor.

The bin chute extension appeared to be of a different construction, the cladding consisted of a metal composite material with a thermoplastic infill on the outer face. This was also found on the section of façade connected to the common area serving the protected stair and AOV windows. On the side elevations of the bin chute were 5mm aluminium cassette panels with mineral wool insulation directly onto engineered brick and steel beams.

BB7 have been provided with a Type 4 Fire Risk Assessment for Tonbridge House dated 27th November 2019 which was conducted by Ridge and Partners LLP.

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

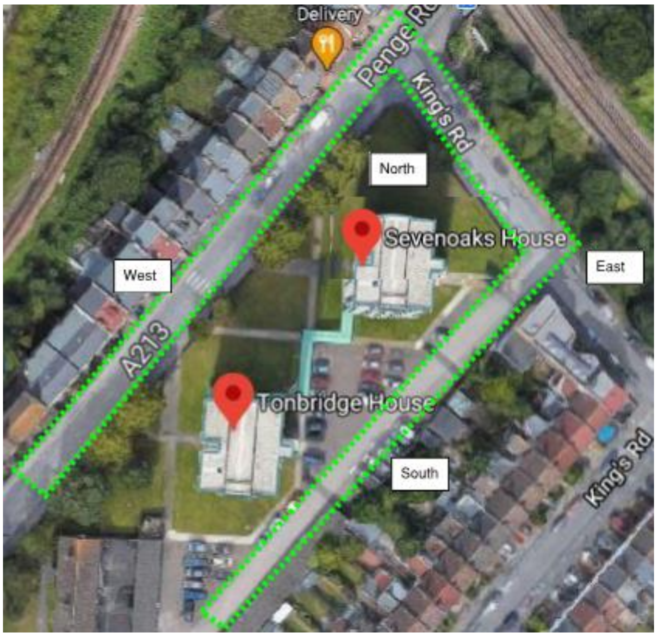


Figure 3. Ariel view of the development

3. LPS Construction

Large Panel System (LPS) construction is a form of construction where large, storey height, pre-cast Reinforced Concrete panels are assembled together 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 Tonbridge House is substantially lower than this.

Figure 4. 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 Tonbridge House 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.

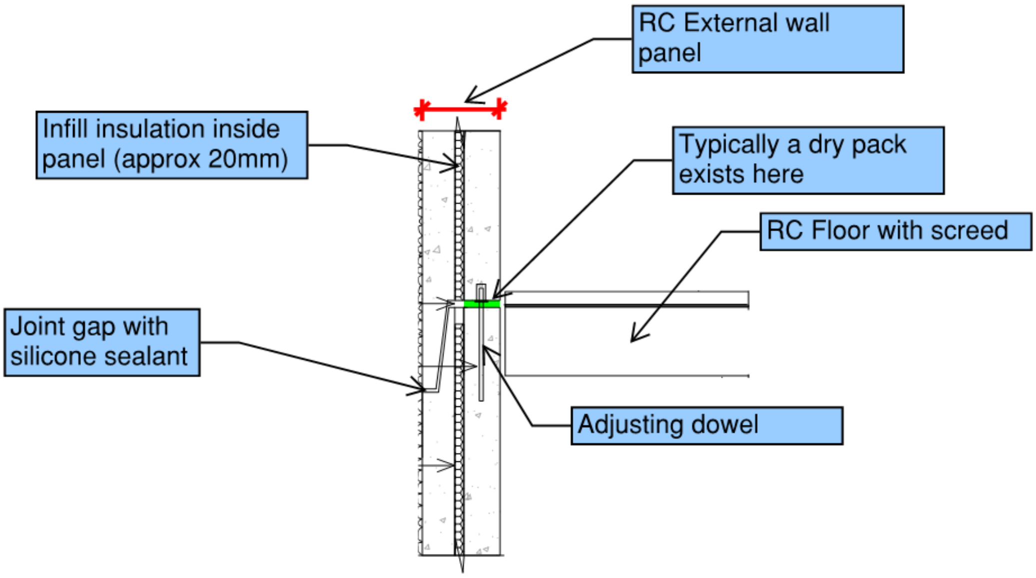


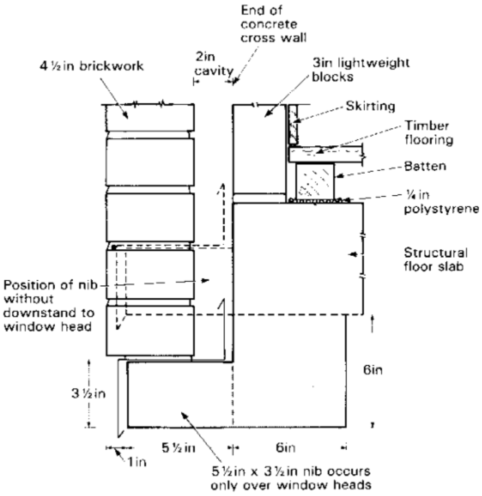
Figure 5. Typical composition of external walls

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 vary 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 likely be 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 to 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.



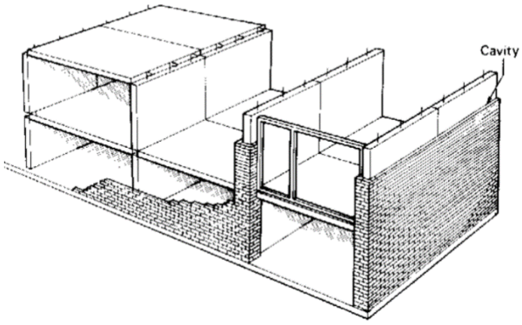


Figure 6. Typical brick on RC downstand **Figure 7.** Typical brick façade to LPS

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.

4. Assumptions, scope & liabilities

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.

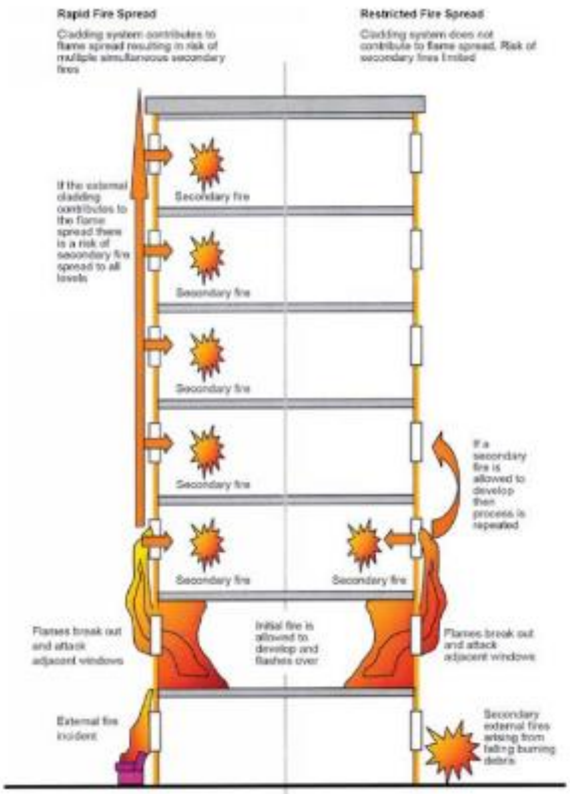


Figure 8. Mechanism for fire spread

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 8: Analysis.

6. Survey findings

6.1 Survey

BB7 intrusively surveyed the building on 9th March 2021. The survey was conducted by James Groves, Jonathan Cornelius and Shauna Jameson. 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 11 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.

6.2 Location 1

Location 1 on the South elevation, facing the car park.

The system was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system. The panel was approximately 50mm deep due to it being a cassette.
- 100mm horizontal (floor level) and vertical (party wall) mineral wool cavity barrier reinforced with wire. The cavity barrier sat on top of the insulation (i.e. did not break the insulation) and was under compression in all instances surveyed.
- 60-70mm clear cavity.
- 110mm mineral wool insulation with metal fixings.
- >100mm RC structure. 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. Please refer to Section 3 for further details.

The same build up was identified at each of the following locations, however, they have been separated into four for the review.

Figure 9. Location 1 areas inspected

Location 1.1

Location 1.1 was on the South elevation at fourth floor slab level. No horizontal or vertical cavity barriers were identified.

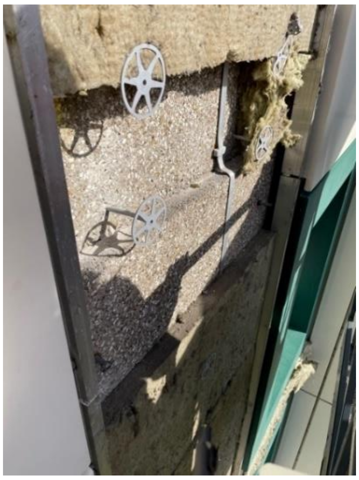


Figure 10. Location 1.1 no horizontal or vertical cavity barrier

Figure 11. Location 1.1 100mm mineral wool insulation

Figure 12. Location 1.1 gap identified behind existing infill panel

The concrete infill panel, as shown in the figures, appears to be a feature band that runs around the building which is integral to the existing large panel system based on the picture in Figure 1.

The infill panels were noted between windows on each floor level. It can be seen that there was a large gap behind the old concrete infill panel. A very small amount of expanded polystyrene (EPS) was also identified behind the panel in some locations. This supports the style of panel referenced in section 3. The text in section 3 assumes that the EPS is well encapsulated and not readily accessible by fire. This stands true for the insulation potentially contained in the main part of the structural panel. The EPS insulation found appears to form part of a feature banding which sits proud of the main panel as seen in Figure 1. Due to the low volume, it being significantly vertically broken and hidden behind mineral wool insulation. BB7 consider its presence to be relatively low risk.

Location 1.2

Location 1.2 was on the South elevation at second floor slab level. There was no cavity barrier identified at this location.

Figure 13. Location 1.2 there was no horizontal cavity barrier identified at floor level.

Location 1.3

Location 1.3 was at 2^{nd} floor below a flat window. The horizontal cavity barrier under the window was not continuous due to the aluminium rails and it was not folded back on itself, so unlikely to be under compression fit.

Figure 14. Location 1.3 horizontal cavity barrier under flat window

Figure 15. Location 1.3 existing window frame behind aluminium cladding

No cavity barriers were identified around the window. There was one below at floor level in line with the compartment floor but nothing above. Based on the time of the re-clad it is unlikely that cavity barriers around openings were designed for, this was an addition to the standard fire guidance from the year 2000 onwards.

The windows have been installed into the original structural openings and, therefore, have not been moved to suit the cavity. It was also noted that a high degree of silicone sealant had been used around the openings which, as discussed in Section 3, is a risk however is considered to be mitigated.

Location 1.4

Location 1.4 was at the third floor party wall and floor level.

Figure 16. Location 1.4 vertical cavity barrier in place

Figure 17. Location 1.4 gap identified behind concrete infill panel

Figure 18. Location 1.4 horizontal cavity barrier at floor level – not folded over completely

Figure 19. Location 1.4 horizontal cavity barrier under window

Location 1.5

Location 1.5 was at the third floor slab between flat windows. No cavity barriers were identified around the window, there was one below at floor level but nothing above.

The windows have been installed into the original structural openings and, therefore, have not been moved to suit the cavity. It was also noted that a high degree of silicone sealant had been used around the openings which, as discussed in Section 3, is a risk however is considered to be mitigated.

Although there are no cavity barriers around the windows, as the overcladding was carried out in the mid-late 1990s, they were not required under the guidance in Approved Document B, 1992.

Figure 20. Location 1.5 horizontal cavity barrier

Figure 21. Location 1.5 gap identified behind concrete infill panel above window

The concrete infill panel, as shown in the figures 17 and 21, appears to be a feature band that runs around the building which is integral to the existing large panel system based on the picture in Figure 1.

The infill panels were noted between windows on each floor level. It can be seen that there was a large gap behind the old concrete infill panel.

Location 1.6

Location 1.6 was at the third floor kitchen extract. Reinforced mineral wool was identified around the opening to form a cavity barrier, furthermore, there was a steel 'letterbox' enclosing the cavity on the inside of the panel. .

Figure 22. Location 1.6 extract ductwork

Figure 23. Location 1.6 cavity barrier enclosing ductwork (reinforced mineral wool

Figure 24. Location 1.6 cavity behind adjacent panel

Location 1.7

Location 1.7 was at fourth floor level. The aluminium panels run the full height of the building in this location forming a continuous strip of cladding up the building that is not broken up by windows.

Vertical and horizontal cavity barriers were identified

Figure 25. Location 1.7 vertical cavity barrier between window and continuous strip of cladding

Figure 26. Location 1.7 horizontal cavity barrier at floor level

6.3 Location 2

Location 2 was on the East elevation, facing the car park.

The system was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system.
- 100mm horizontal (floor level) and vertical (party wall) mineral wool cavity barrier reinforced with wire. The cavity barrier sat on top of the insulation (i.e. did not break the insulation) and was under compression.
- 60-70mm clear cavity.
- 110mm mineral wool insulation with metal fixings.
- 100mm masonry. A hole was drilled through the masonry 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. Please refer to Section 3 for further details.

Figure 27. Location 2 areas inspected

Location 2.1

Location 2.1 was on the continuous strip of cladding that stretched the height of the building and is not naturally broken up by windows.

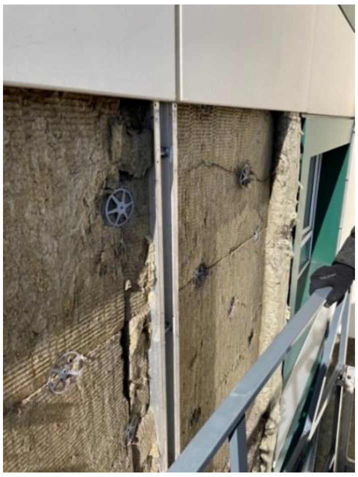


Figure 28. Location 2.1 vertical cavity barrier between window and continuous strip of cladding.

Figure 29. Location 2.1 full fill vertical cavity barrier within 100mm cavity

Figure 30. Location 2.1 damaged vertical cavity barrier unlikely to be under compression

Figure 31. Location 2.1 damaged vertical cavity barrier not full fill and unlikely to be under compression

Although a compartment line does not exist here, the vertical cavity barriers on either side provide an additional lateral break.

Location 2.2

Location 2.2 was below the flat windows on the East elevation. Under the window, horizontal cavity barriers were identified; however, they did not form a continuous horizontal fire break due to the aluminium rail system. It can however be noted that the Aluminium frame sits tight against the mineral wool insulation which is unlikely to degrade during a fire.

There were also no cavity barriers around the window opening.

Figure 32. Location 2.2 horizontal cavity barrier

Figure 33. Location 2.2 100mm gap between cavity barriers

6.4 Location 3

Location 3 was on the East elevation where the bin chute projects from the building. The bin chute is expected to have been added to the building as the construction differs from the remainder of the building. The use of steel beams and engineered brick would not likely have formed part of the original construction based on practices in that era, but also Figure 1 does not show evidence of a bin chute.

The system on the side was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system.
- 60-70mm clear cavity. No cavity barriers were identified.
- 110mm mineral wool insulation with metal fixings.
- Engineered brick and steel beams. A hole was drilled through the blockwork to determine the thickness.

The system on the outer face was found to be:

- Metal composite material with a thermoplastic infill

This system was also found on the section of façade connected to the common area serving the protected stair and AOV windows. However, it could not be reviewed intrusively due to limited access.

Location 3.1

Location 3.1 was on the side elevation of the bin chute structure where a continuous strip of the aluminium cladding runs the full height of the building. No cavity barriers were found in this location.

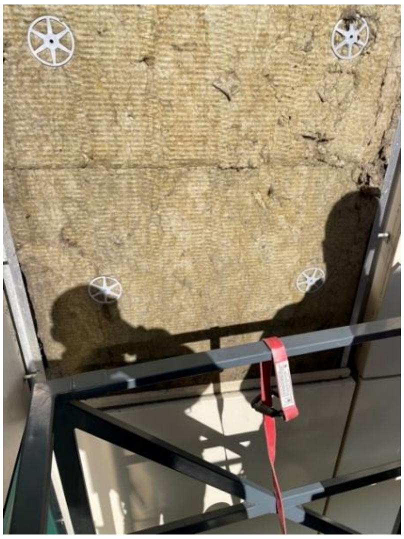


Figure 34. Location 3.1 no horizontal cavity barrier at floor level

Figure 35. Location 3.1 100mm insulation with blockwork behind

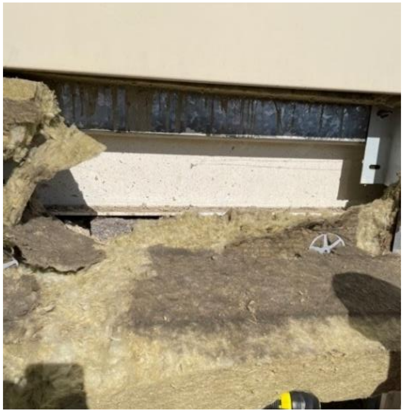


Figure 36. Location 3.1 steel beam behind mineral wool insulation

Figure 37. Location 3.1 steel beam (left) with insulation and panel (right) and unbroken cavity

Location 3.2

Location 3.2 was between two windows on the outer face of the bin chute.

Figure 38. Location 3.2 single course of brickwork

Figure 39. Location 3.2 open ceiling void

This is where the panels with what appeared to be a thermo plastic infill between two layers of steel were located along with on the façade connected to the common area serving the protected stair and AOV windows.

6.5 Internal survey

The common areas in Tonbridge House were reviewed internally on each level.

The block is served by a single stair and there were four flats per upper floor level. The stairs were provided with two vents at the head (approx. 0.5m²).

There were service risers in the protected stair and lobby. The majority were provided with 'Masterboard with Intumescent sealant' fire stopping and, although 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 what appeared to be an AOV window. It is presumed that the AOV works on detection which was identified in the lobby. There were also service risers located in the lobby with 'Masterboard with Intumescent sealant' fire stopping provided to service penetrations, however, there were some issues identified, including poor fire stopping around cable penetrations. The sprinkler stop valve was noted in the lobby of both buildings, there was no tank identified, however, as per other surveys it is presumed they are served by a water tank on the roof.

The bin store is accessed from the lift lobby on the upper floors via a ventilated lobby separated with double door fire protection. There was external access at ground floor. The doors inspected appeared to be solid and robust with working self-closers. The bin store at ground floor was provided with a side mounted sprinkler head to reduce the potential fire size and a damper on a fusible link was provided at the base of the bin chute to reduce the chance of fire spread. These are shown in the following figures.

Figure 40. Bin store sprinkler

Figure 41. Bin chute fusible link

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

Dry riser outlets were provided on even floors only. There was also what appeared to be an auto-dial system which was presumed to automatically call the Fire Service on detection in the common area or link to a monitoring station who then call them.

6.6 Fire Risk Assessment

The following information has been provided:

- Fire Risk Assessment (RB-XGDYFI) - Assessed 2019-11-27 - For Tonbridge House (RB-PTTSAS)

The following provides a review of the documents and the information provided represents that found in the reports. This was to gain additional understanding of the building and potential risk but does not endorse or influence the findings of the documents.

A Type 4 Fire Risk Assessment dated 27th November 2019 was conducted by Ridge and Partners LLP. The overall risk rating determined is provided in the following figure.

FIRE RISK RATING

LIKELIHOOD **MEDIUM**	SEVERITY **EXTREME HARM**	RISK **SUBSTANTIAL**
Normal fire hazards for this type of occupancy, with fire hazards generally subject to appropriate controls (other than minor shortcomings).	Significant potential for serious injury or death of one or more occupants. Includes high dependency occupants such as a care home or properties with poor compartmentation.	Considerable resources might have to be allocated to reduce the risk. Improvements should be undertaken urgently.

Figure 42. Risk Rating from Ridge & Partners LLP FRA

This rating was based on the assessment findings which were that there was generally poor housekeeping, with some storage in the stair lobby, and there were issues with compartmentation and fire stopping identified. Additionally, although ventilation was identified in the stair and lobby, it could not be confirmed how these operated.

Summary

There are high-risk items detailed in the Type 4 Tonbridge FRA and these should be actioned to reduce the risk.

The findings of the FRA align with the findings of the internal walk round carried out, however, it was not part of the scope of this assessment to review in detail.

Both action plans are extensive and all action points should be completed. Until this is done, the building risk is increased.

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.

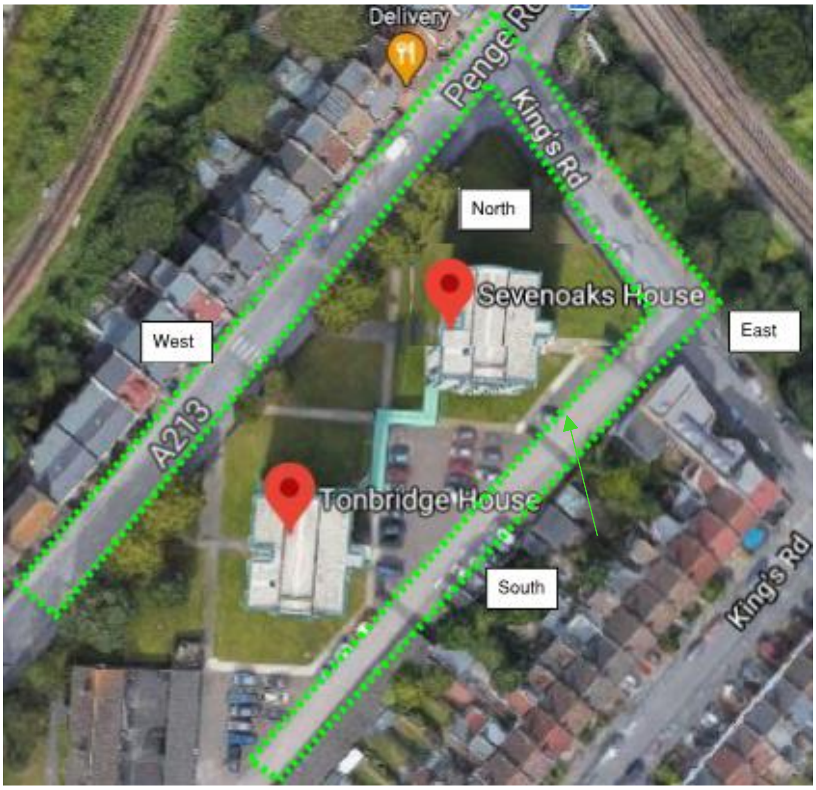


Figure 43. Site Plan

The building is bounded on two sides by Penge Road and the car park access. This is considered to provide good Fire Service access to the perimeter within sufficient proximity to the majority of the elevations on the development.

From Penge Road, the Fire Service can reach the front within 18m and the car park provides access to the rear within 18m.

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. 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 every second floor level (i.e. even floors) within the lobby serving the stair. The riser inlet is provided in the lobby on the ground floor. Both flat lobbies and stair are provided with ventilation.

The building is presumed not to be provided with a firefighting shaft however the lift appeared to be usable by the Fire Service (i.e. an override was identified) which will enable them to reach the floor of fire origin quicker. The stairs are approx. 1100mm, which is sufficient width for a firefighting stair.

There is also an auto-dial system identified in the ground floor lobby which is expected to automatically call the Fire Service on detection within the common area. This is a benefit as it removes the reliance on the resident calling in the event of a fire.

The building is also provided with sprinkler protection which is likely to reduce the potential fire size and spread, although it is not known the extent of the provision or if all flats have working sprinklers.

8. Analysis

8.1 Overview

There were three systems present due to the original construction and the over cladding. Analysis of the build-up behind the original concrete construction was not carried out on site as intrusively surveying large structural panels could be potentially damaging to the building.

The overcladded system was found to be:

- 5mm solid aluminium cassette panel attached to aluminium rail system.
- 100mm horizontal (floor level) and vertical (party wall) mineral wool cavity barrier reinforced with wire. The cavity barrier sat on top of the insulation (i.e. did not break the insulation) and was under compression.
- 60-70mm clear cavity.
- 110mm 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. Please see Section 3 for further detail.

Other systems comprise the infill panels on two elevations, and the engineered brick system forming the structure of the refuse chute lobbies.

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.

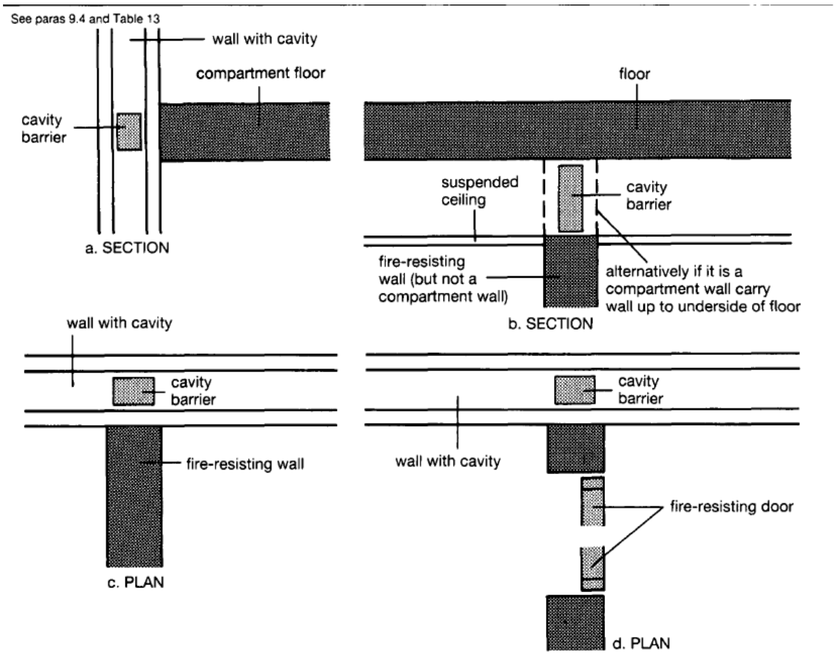


Figure 44. Diagram 27 ADB1992

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.

Internal fire spread (structure) Approved Document
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Figure 45. 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.

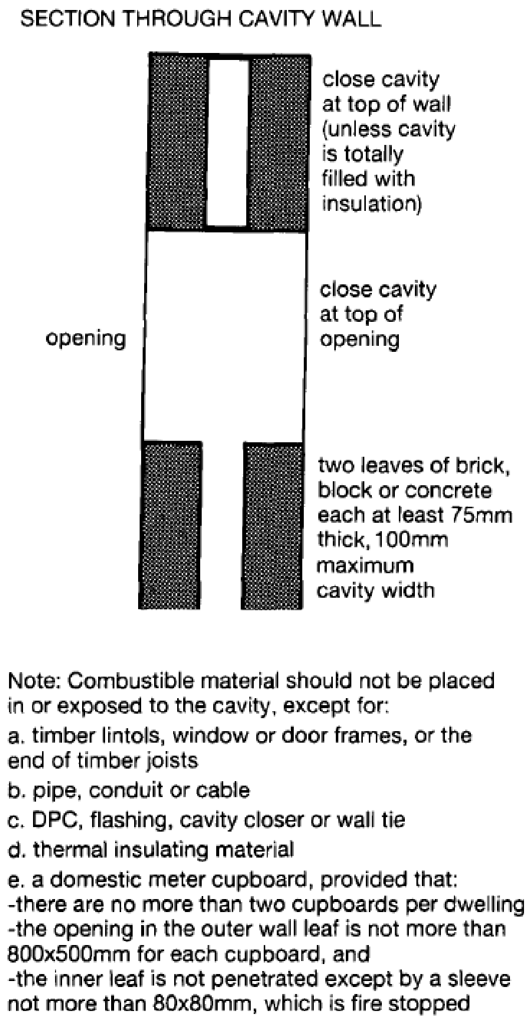

Figure 46. Diagram 28 – ADB 1992

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

System 1: Aluminium panel with mineral wool insulation

System 1 was the predominant cladding system on the building and comprised of the materials in the table below. It should be noted that this is from the original substrate outwards and behind the LPS was not reviewed.

Material	Combustibility	Volume	Comments
100mm concrete / masonry	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.
100mm 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.
100-110mm 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
5mm Solid aluminium cassette panel fixed to 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 110mm 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, party walls and vents (kitchen extract). However, they were not provided around window openings and, due to the steel rail system, they were not continuous horizontally at floor level.

The reinforced mineral wool cavity barriers (typical) were compression fixed on top of the insulation (i.e. it was not broken), however, 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.

Although the full aluminium panel around the kitchen vent could not be removed, the small vent panel was removed and it was identified that adequate cavity barriers were around the opening and ductwork from the kitchen extract.

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 fact that the flame front will not have a substrate to continue the fire spread. Furthermore, the fire spread will be inhibited by the cavity barrier at floor level. The functional requirement of the building Regulations is to inhibit the unseen spread of fire and smoke in concealed spaces, which the barriers at compartment lines are considered likely to achieve.

It can be seen in location 2 of the survey findings that the continuous strips of large aluminium panels stretch the height of the building. However, they have also been 'boxed in' with vertical cavity barriers in most locations to separate it from the windows and there are horizontal cavity barriers at floor levels.

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.

System 2.1: Engineered brick and steel

System 2.1 formed the side elevations of the bin chute extension to the building and the cladding system is comprised of the materials in the table below:

Material	Combustibility	Volume	Comments
Engineered brick and steel beams	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. The beam appeared to be painted, however, it could not be determined if it was intumescent paint.

Material	Combustibility	Volume	Comments
110mm 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.
5mm Solid aluminium cassette panel fixed to 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 panel was a 60-70mm cavity and 100mm mineral wool insulation mechanically fixed to the brick which is the same as that covering the RC structure.

In the majority of cases, the mineral wool insulation was tightly fitted and abutted. Any gaps in the insulation were kept to a minimum and generally the installation was considered adequate. The non-combustible insulation and cladding is considered to prevent the possibility of uncontrolled fire spread.

There were no cavity barriers or breaks identified at floor level or vertically in the continuous strips of cladding that ran the full height of the building. BB7 recommend that barriers are provided in these locations to prevent the unseen spread of fire and smoke.

System 2.2: Infill panel

System 2.2 formed the outer part of the bin chute extension and the to the building and the cladding system is comprised of the materials in the table below.

The system was also found on the section of façade connected to the common area serving the protected stair and AOV windows.

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. Presumed to be typical on each floor.	All window infill panels are to be replaced for non-combustible alternatives on the common area sections.

The system contains a small amount of combustible insulation within the infill panels and there were no cavity barriers identified.

The risk of a fire within the bin store is significantly less than that from a flat and, when inspected, this area was largely sterile on all levels and provided with ventilation. Therefore, there is unlikely to be uncontrolled fire spread.

Furthermore, there were two side mounted sprinklers 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 extension as the elevation containing flats is stepped back 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 1 & 2.

The bin store is accessed internally by way of two fire doors and ventilation is provided within the bin chute. The fire doors were inspected and appeared to be solid and robust so it is unlikely that the flat/ lobbies would be compromised for residents to escape through.

With regards to the panels on the section of façade connected to the common area serving the protected stair and AOV windows, although this is recessed from the elevation with flats, it is still connected to the area serving the single protected escape stair and escape routes.

It is recommended that 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 Tonbridge House located on 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 9th March 2021; the survey was conducted by James Groves, Jonathan Cornelius and Shauna Jameson 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:

Interim recommendations

The B2 designation is based on there being combustible materials present in the infill panels on the façade connected to the common area serving the protected stair and AOV windows along with the bin chute extension. Furthermore, cavity barriers are required to the extension section of the building.

The B2 designation does not, however, 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.

These are small areas of the façade which are either stepped back or stepped out from the main elevation which predominantly consists of mineral wool insulation and adequate cavity barrier provision. The risk of the combustible material is low as the infill panels are generally away from the fire source and it is unlikely that a fire will spread due to the non combustible materials on the remainder of the façade.

Furthermore, the flats are provided with sprinkler protection which is considered to significantly lower the severity of a fire and reduce the risk of a fire actually breaking onto the façade. This reducing the risk even further.

Also, with regards to the bin chute extension, the risk of a fire spreading from the ground floor bin store is reduced due to the provision of a sprinkler head and a fusible link damper which will limit the size and spread of fire and prevent a fire from reaching the infill panels or the continuous strip of cladding that runs the height of the building.

As such, the risk is considered to be low, however, there is still a risk present to warrant remedial works.

Section 11 of the Governments Consolidated Advice Note provides guidance on this issue. As per this report the building is generally well managed but there are actions on the FRAs which should be actioned, if not done so already.

There are a number of factors which can be considered:

1. Although the building is slightly more than 30m, it is provided with a sprinkler system which can reduce the severity of a fire within a flat.

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. The cavity barriers are generally adequate on the vast majority of the building from the inspection locations and are in locations which are broadly in line with the requirements of ADB.

On the basis of the above, BB7 suggest there is no immediate need to change the current escape However, there are some things that should be actioned to do to ensure occupant safety:

- All action points on the FRA's will need to be actioned and closed.
- 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.

There were no cavity barriers or breaks identified at floor level or vertically in the continuous strips of cladding that ran the full height of the building, however, the risk of fire spread is considered to be low due to the blockwork substrate and non-combustible insulation. Furthermore, there are no openings on this elevation and the cavity barriers on the adjacent elevation are expected to reduce the risk of a fire spreading laterally on to the bin chute elevation.

Long term recommendations

BB7 make the following recommendations:

- Any infill panels with thermo plastic insulation should be replaced with a non-combustible alternative.
- Cavity barriers should be provided at floor level to the bin chute external wall build up.
- The fusible link on the damper serving the bin chute should be serviced regularly.
- All points raised on the Fire Risk Assessment should be adhered to.

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