



RIDGE

**ST JUDE'S RESIDENTIAL BLOCKS
BRISTOL CITY COUNCIL
BUILDING SAFETY RISK ASSESSMENT**

April 2025



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Prepared for

Bristol City Council

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Where fire models have been used, these have been for indicative and illustrative purposes only. The models have not been prepared to represent a realistic fire development scenario – they have been ramped-up instantly to peak heat release rate (5MW for un-sprinklered fires and 1MW for sprinkler-controlled simulations). They are not a guarantee of conditions or performance of the building, but are merely to provide comparative visual and illustrative information to support the commentary within the Building Safety Risk Assessment.

Whilst the report may contain recommendations or information which are useful in improving property protection or business continuity, the purpose of the report is to assist with meeting the life safety requirements of legislation. No liability is intended or accepted for any loss of property, business or other operations in case of fire.

1. EXECUTIVE SUMMARY

The investigations that have been carried out in relation to the structural robustness and the safety case reporting at the St Jude's blocks have highlighted a number of faults within the buildings that are detailed in the reporting and outlined below.

From the inspections, investigations and testing work carried out the team have outlined a number of recommendations within the reporting and risk matrices; the key items are highlighted below that will have the greatest impact in reducing risk for the residents in the blocks:

1. Installation of fire detection and alarm system (BS5839 - 1 Cat L5) to replace waking watch in accordance with NFCC guidance that will be converted to an evacuation alert system once sprinklers are installed.
2. Installation of sprinkler systems Installation of sprinkler protection to BS 9251 Category 4 and conversion of existing detection system, or enhancement of the fire protection of the structure to increase the fire resistance.
3. Remedial works to the external concrete balconies and walkways to prevent spalling concrete from falling.
4. Remedial works to the external balustrades for fall prevention.
5. Works to the external wall in relation to the lack of ties to the main structure and consequential failure thereof.

1.1. Fire Recommendations and Key Findings

Below are the recommendations to account for the low likelihood high consequence disproportionate collapse scenarios that have developed subsequent to the investigative works.

Table 1 Recommendations resulting from the Fire Strategy

Area	Recommendation	Criticality	Timescale
Temporary fire alarm to replace waking watch	We recommend that a full fire alarm is installed, with heat detectors in all flats in which structural deficiencies identified by structural engineers may cause collapse scenarios. The intention of the alarm would be to provide warning to potentially affected areas, to enable occupants to evacuate prior to collapse in fire, and to summon the fire and rescue service.	Medium	Immediate
Targeted resident engagement and person-centred fire risk assessments	We recommend that the Council continue to engage with residents, to identify residents who may require assistance in an emergency, so that the Council can formulate plans for these residents. Engagement should also raise awareness regarding avoidance of special hazards, including e-mobility devices, gas canisters, and other hazards that could result in fast fire growth, hoarding practices, etc.	Medium	Immediate
Remedial work to structure, where lower than R60 or prone to	Address points raised in the Ridge structural reports to ensure that the performance of the structure meets the requirements of the fire strategy – the loadbearing	High	Short

failure, and/or sprinkler system installation	capacity in case of fire issues identified can be mitigated by sprinkler protection as the future strategy. In any case, we strongly recommend retrofitting sprinklers at St Jude's to cover these blocks.		
Protection of Stair 3 (and, in the longer term, review Stairs 1 and 2, although this is low priority)	We recommend that current unprotected apertures to Stair 3 are upgraded with fire-resisting construction or fire-resisting glazing, to protect against fire and smoke entering the stair from a fire in Haviland or Charleton, which could compromise escape from Langton. Stairs 1 and 2 are open, but are low priority to fully enclose, and indeed this may create secondary issues.	Medium	Short
Review of secure information box and wayfinding signage	Review contents of SIB, as well as wayfinding signage, and update as necessary.	Medium	Short
Implement resident engagement strategy and Mandatory Occurrence Reporting	Finalize resident engagement strategy and processes for Mandatory Occurrence Reporting in accordance with requirements made in secondary legislation under the Building Safety Act.	Medium	Short
External wall – combustible materials	Given the recorded presence of combustible materials, a full FRAEW should be carried out, followed by any required remedial work.	Medium	Medium
Review fire-stopping issues and address any outstanding items	Review findings from previous Type 4 fire risk assessment and ensure that these have been addressed globally throughout the blocks.	Medium	Medium
Domestic alarms	Upgrade existing internal alarms within flats to Grade D1 Category LD1 in accordance with BS 5839-6.	Low	Medium
Internal flat doors	Upgrade doors within flats to minimum of E30 fire doors at time of refurbishment, as well as transom panels above doors, or, more ideally, E30-Sa doors (which would be above minimum standard). The need to replace doors could be reduced through installation of sprinklers.	Low	Long
Fire lift	Upgrade in accordance with the guidance in BS 8899, at the time of future lift refurbishment.	Low	Long
Emergency voice communication system	As part of any upgrade, provide an EVCS in accordance with BS 9991 and BS 5839-9.	Low	Long
Evacuation alert system	Following completion of sprinkler system installation and/or structural remediation, change common fire alarm to EAS to BS 8629.	Low	Long
Channelling screens	At the time of structural repairs to walkways, we recommend that 500mm channelling screens are provided between individual dwellings, suspended from the walkways.	Low	Long

1.2. Structural Recommendations and Key Findings

The key findings of the intrusive structural investigations against BRE 511 are detailed in the table below, Langton has been assessed against approved document A only as the structure differs. Further summaries of the assessment criteria for fire, external walls, balustrades, Balconies, chemical resistance to attack and foundations are listed in table 3:

Table 2 - Summary of the LPS Robustness Criteria for the St Judes Blocks.

LPS CRITERION	ASSESSMENT		COMMENTS
	Charleton House, Haviland House, and John Cozens House	Langton House	
			St Judes contains class 2B buildings that require both vertical and horizontal ties.
Criterion 1 Adequate ties within joints	Insufficient	Sufficient	Haviland, John Cozens and Charleton Houses The horizontal ties were found to be insufficient to withstand the required imposed forces due to inconsistencies in their installation. Investigations also found no adequate vertical ties between wall panels.
Criterion 2 Adequate strength to resist Accidental Loads without the steel frame	Insufficient	Doesn't apply	The floors cannot resist the overpressure requirement for non-piped gas supply of 17kPa. The wall panels appear to be satisfactory up to level 2.
Criterion 2 Adequate strength to resist Accidental Loads with the steel frame	Partially Insufficient	Doesn't apply	The floors can resist the overpressure requirement for non-piped gas supply of 17kPa, due to the steel frame strengthening being utilised. The wall panels pass up to level 2 given the additional weight of vertical loads above them; above this level the vertical load is insufficient to assist in resisting the flexure they experience.
Criterion 3 Ability to mobilise alternative load paths	Insufficient	Doesn't apply	The use of alternative load paths is not considered to be feasible, as each element is deemed critical to the system's integrity. The connections between elements are best described as flexible, with joint stiffness playing a role rather than functioning as true pin connections. Consequently, any failure within the system is likely to trigger a mechanism, leading to disproportionate collapse.

Table 3 – Building Safety Assessment criteria summary for the St Judes Blocks.

ASSESSMENT CRITERIA	ASSESSMENT	COMMENT
Fire Resistance Without the steel frame	Insufficient	A load bearing capacity of 60 minutes is calculated for the structure; the critical element considered is the floor which has a low reinforcement cover. A 90-minute requirement is needed as set out in current guidance.
Fire Resistance With the steel frame assuming fire protection	Sufficient	A load bearing capacity of 90 mins can be achieved provided the steel frame is fireproofed to a similar effect. (Not applicable to Langton House & Charleton House)
Carbonation Depth of carbonation into concrete	Insufficient	Carbonation testing indicates that, in some areas, the passivity front has surpassed the reinforcement, and the concrete is at risk of spalling due to the corrosion and expansion of the steel reinforcement.
External Walls External masonry wall support and tie details	Insufficient	The external masonry walls on the building, consisting of two layers of blockwork, were found to be inadequately tied to the primary concrete walls and floors. With improper ties the masonry panels pose a risk of collapse in high wind loads.
Balustrades Condition of metal balconies	Insufficient	Balustrades around the building, particularly along the shared access walkways, were noted to be severely corroded with several instances of temporary propping being used to support the balustrades. The condition of the balustrades requires replacement of the full system.
Balconies	Insufficient	The visual condition of the concrete balconies, combined with carbonation results indicate that carbonation level is high increasing the risk of spalling. The increased risk category of the nursery below should be considered as part of any following risk workshops.

In addition to the inspection and assessment of the concrete frame, visual surveys of the overall building condition was carried out. Areas reviewed include the external wall cladding, handrails and balconies. It was found through the intrusive investigations that the masonry infill panels that span between the structural concrete frame have very few walls ties both between the cavities and back to the structural frame. The balconies to the south side of John Cozens were noted to have spalling concrete with incidences noted where sections of the balconies had collapsed.

The foundations have not been specifically intrusively investigated, but no adverse movement has been noted during the investigation and therefore this suggest the foundations are performing adequately at this point in time. To mitigate any long-term risks of the foundations degrading primarily against chemical attack, further investigations of the footings could be completed.

Recommendations

Considering the above results of the assessment & the general condition of the block, our recommendations for risk reduction measures, for Langton House these are incorporated from the taller Haviland House as it shares the lift core and stair structure with Haviland House:

Immediate Term (0-6 Months)

1. Continuation of the updated building evacuation strategy to a simultaneous evacuation, with the continued waking watch across St Jude's. This is a short-term measure in line with Government guidance (Evacuation guidelines for fire and rescue services (accessible))
2. Installation of fire detection and alarm system (BS5839 - 1 Cat L5) to replace waking watch in accordance with NFCC guidance
3. Regular inspections for and immediate ban on:
 - a. any gas canister/bottles/cylinders being used or stored within the dwellings, along with a complete ban on any other potentially explosive substances (including high-capacity batteries which may be found in items including e-scooters/e-bikes and some newer models of mobility scooters).
 - b. Portable gas cookers – viewed as high risk as they have the potential to be left on whilst unignited, causing a leak that may then be unintentionally ignited, causing an explosion and excessive pressures being applied on the structures.
 - c. To limit hoarding to minimise fire loads in flats
4. Removal of gas supply generally, in particular to the laundry rooms and presence of diesel generators near the building that could increase the risk of an accidental loading scenario.
5. Full condition survey of the balustrades around St Judes, temporary support provided to those in a critical condition with a design and programme developed to replace all the balustrades.
6. Detailed condition surveys of the balconies and walkways due to carbonation of the concrete to identify deteriorated and degraded areas or the structure to enable repairs as necessary.
7. Erection of the non-combustible scaffold fan to the base of the block to prevent falling concrete.
8. Detailed wind analysis of the block to be undertaken to assess peak forces on the external masonry wall with remedial design / strengthening options.

Medium Term (6 months -2 Years)

6. Installation of sprinkler protection to BS 9251 Category 4 and conversion of existing detection system, or enhancement of the fire protection of the structure to increase the fire resistance.
7. Repairs to concrete on residential balconies and communal walkways and Removal of residential balconies.
8. Carry out an options appraisal to understand the cost benefit of upgrading the structure to resist disproportionate collapse then (Not applicable to Langton House):
 - a. Upgrade the structure through ties or strengthening to resist disproportionate collapse forces and provide a robust structure.
 - b. If strengthening works are unviable re-assess the risk measures in place and determine any further measures that will enable the block to remain in service over a short term until decant can be undertaken for demolition.
9. Repairs and or replacement of the residential balconies due to deterioration from carbonation.
10. Remedial repairs to the escape walkways following detailed surveys.
11. Remedial repair works to the external masonry wall, or overclad the existing envelope.
12. If the block is to be retained investigate and assess the foundations for deterioration and chemical attack.

Long Term (3-5 years+) Continued Inspections

Considering the buildings type and height the following recommendations are made, which align with BRE recommendations:

- a) A programme of visual inspections at intervals of 1 year, 2 years and 5 years following this initial appraisal, and then every 5 years subsequently to the external envelope (including parapets and balconies) to identify potential hazards from falling debris.

- b) Visual inspections at 10-year intervals to structural joints which are vulnerable to water penetration; locations such as flank walls and roofs.

- c) Full appraisal of the whole building at 20-year intervals

Should the risk reduction measures fail to effectively control the risk of disproportionate collapse to acceptable levels, and investment into strengthening works prove uneconomically viable, demolition of the block might be considered as a final long-term approach for the block. However, we would recommend that this decision should only be taken following the completion of a remedial strengthening design review, supported by the risk and cost benefit analyses recommended above to ensure that demolition is the best approach.

2. INTRODUCTION

This report records the Building Safety Risk Assessment (BSCRA) for four residential blocks at the St Jude's site, central Bristol.

"Building safety risk", as considered within this report, means (according to Section 62 of the Building Safety Act 2022:

a risk to the safety of people in or about a building arising from any of the following occurring as regards the building:

- a) The spread of fire;
- b) Structural failure;
- c) Any other prescribed matter.

Section 83 of the Act requires the Accountable Person to assess building safety risks:

(1)An accountable person for an occupied higher-risk building must as soon as reasonably practicable after the relevant time assess the building safety risks as regards the part of the building for which they are responsible.

(2)Further such assessments must be made—

(a)at regular intervals,

(b)at any time that the accountable person has reason to suspect that the current assessment is no longer valid, and

(c)at the direction of the regulator, within a period specified in the direction.

(3)An assessment under subsection (1) or (2) must be suitable and sufficient for the purposes of enabling the accountable person to comply with their duties under section 84.

(4)In this section "the relevant time" means—

(a)the time when the building becomes occupied, or

(b)if later, the time when the person becomes an accountable person for the building.

Section 84 of the Act requires the Accountable Person to manage building safety risks:

(1)An accountable person for an occupied higher-risk building must take all reasonable steps for the following purposes—

(a)preventing a building safety risk materialising as regards the part of the building for which they are responsible;

(b)reducing the severity of any incident resulting from such a risk materialising.

(2)Those steps may in particular involve the accountable person carrying out works to the part of the building for which they are responsible.

(3)When taking the steps the accountable person must act in accordance with prescribed principles.

(4)The steps must be taken promptly.

(5)The accountable person must make and give effect to arrangements for the purpose of ensuring the effective planning, organisation, control, monitoring and review of steps taken under this section.

2.1. Details of the building

The buildings are interconnected by means of shared staircases and therefore can essentially be considered as a single Higher Risk Building (HRB), by virtue of The Higher-Risk Buildings (Descriptions and Supplementary Provisions) Regulations 2022.

In total, there are five St Jude's housing blocks, owned and managed by Bristol City Council: Charleton House, Haviland House, Langton House, John Cozens House and Tyndall House. Four of these blocks have some level of physical connection to each other (Charleton House, Haviland House, Langton House, John Cozens House), and the remaining block is an isolated building, separate from the larger blocks on the estate (Tyndall House, which is outside the scope of this report).

The building(s) to which this BSRA relates are the four connected blocks, listed above. Ridge have undertaken fire risk assessments, produced a retrospective fire strategy, and carried out structural assessments throughout the four blocks, supporting the production of a Building Safety Case (BSC) for the Building Safety Regulator (BSR). They share a number of common physical fire safety control measures and also several management protocols.



Figure 1 St Jude's site, Bristol, taken from internet search

We are not aware of any original staircase designations, and therefore we numbered the staircases as above, which are:

13. Stair 1 – Jonh Cozens.
14. Stair 2 – John Cozens and Haviland.
15. Stair 3 - Haviland, Langton and Charleton.
16. Stair 4 – Charleton.

Haviland House and John Cozens House have been registered as being higher-risk buildings (HRB) providing general needs housing apartments over nine storeys. The premises have been registered because they meet the criteria of being over 18m and seven storeys or more; the storey height is approximately 22.5m, with a total height of 25m for Haviland House, which is marginally taller.

Additionally, there are two other blocks which have a shared stair core (Stair 3) with Haviland House, (including a passenger lift, waste chute system (in a fire-resisting enclosure) and means of escape stair), which have also been registered, given their connection. The Ridge structural reports have identified certain conditions under which collapse scenarios could affect more than one of the blocks.

The two lower blocks are Charleton House and Langton House. John Cozens House is linked to the other side of Haviland House, with a similar arrangement of a shared stair and associated features.

The buildings contain the following principal areas:

17. Residential apartments.
18. Private balconies for flats.
19. Plant rooms.
20. Bin chute enclosures (upper floors).
21. Refuse rooms.
22. Risers and store cupboards.
23. Laundry.
24. Children's nursery.
25. Lift motor rooms.
26. Semi-open staircases.
27. Deck access walkways.

2.2. Resident profile

We have been advised that Bristol City Council have been engaged in attempting to identify vulnerable residents, so that appropriate plans are formulated, where necessary. From information provided during the workshops at the time of this BSRA, we understand that no significant vulnerabilities have been identified amongst the resident population, although efforts to identify residents should be an ongoing task undertaken by the Council.

The resident profile is essentially 'general needs' for St Jude's, although this should be maintained under review.

2.3. Fire safety

The fire strategy is described, in detail, in the accompanying retrospective fire strategy report. Further relevant details are contained in the Type 4 fire risk assessments. These documents have been produced by Ridge and Partners.

At high level, the building originally operated 'stay put' procedures, but has been changed to temporary simultaneous evacuation, using waking watch fire wardens, based on concerns around the existing structure (which is non-traditional and has inherent weaknesses).

A longer-term recommended strategy, involving initial installation of a temporary common alarm, followed by structural remediation and installation of sprinkler protection, is set out in the fire strategy, to revert the blocks to 'stay put' with confidence.

The Council is responsible for managing fire safety, in accordance with the requirements of legislation.

Some of the key precautions set out in the fire strategy are detailed as follows:

Table 4 Key fire strategy precautions and considerations – see fire strategy report

Precaution	Bristol City Council fire strategy maintenance key points
Sprinkler protection	Not in place currently, and we recommend design and installation is progressed.
Flat entrance door	Critical feature in Langton and Charleton (the latter of which where the doors are recessed in the stairs) that require minimum of annual check.
Staircase door	Critical feature of Stair 3 that requires minimum of quarterly check.
Other communal fire doors	Critical features that require minimum of quarterly check – these include chute room doors, doors to risers and cupboards, etc.
Internal compartmentation	Critical feature that may have some noted outstanding remediation raised in the Type 4 fire risk assessment, and thereafter maintenance through careful control of building work.
External wall fire performance	Critical feature, with some current inherent deficiencies identified in external wall inspections. The findings should be further reviewed and updated to full FRAEWs, and any required remedial works progressed.
Domestic alarms	Critical feature for resident safety, which could be improved by upgrade to LD1 coverage.
Common fire detection and alarm system	Currently limited coverage of certain areas. Given that fires in certain locations have been identified by structural engineers as having the potential to bring about disproportionate collapse, we recommend that a bespoke common fire alarm is designed and installed at this site, to achieve the objective of initiating warning prior to significant collapse of areas or sections of the building.
Dry rising fire main	Critical feature for fire-fighting that requires minimum of monthly check and routine maintenance.
Fire lift	Important feature for fire-fighting that requires minimum of monthly check and routine maintenance.
Hydrant(s)	Critical feature for fire-fighting which are public hydrants and understood to be outside of the control of Bristol City Council.
Wayfinding signage	Critical feature for fire-fighting wayfinding during an incident, which could be improved by reviewing against the guidance set out in Approved Document B Volume 1, and thereafter subject to regular checks.
Secure information box	Critical feature for fire-fighting operations, the contents of which should be checked regularly and reviewed against guidance – see relevant parts of fire strategy report.
Person-centred fire risk assessments	Critical feature for identifying vulnerable residents and catering for their needs on a tailor-made basis – see Section 8 of this report.
Resident engagement	Critical feature for two-way reporting of issues relating to fire and building safety – see Section 8 of this report.
Fire risk assessments	Critical feature for ensuring that risks are assessed and addressed on an ongoing and regular basis – see relevant parts of Section 8 and Section 17.
Information to the fire and rescue service	Critical feature for ensuring that the fire and rescue service are aware of any specific relevant challenges in the blocks.
Control of building work	Critical feature for ensuring that work does not compromise the fire strategy, with specific approvals processes relevant to Higher Risk Buildings.

These are discussed, in respect of their role regarding building safety risks, later in this report.

2.4. Structural Safety

The structural safety system is set out in detail in Ridge's accompanying structural reports. The surveys have identified non-traditional structural systems, similar to LPS systems, for Haviland, John Cozens and Charleton, although Langton is cast-in-situ reinforced concrete. The non-traditional systems comprise pre-cast concrete systems for both walls and floors, as well as the private balconies and walkways

Intrusive investigations were conducted on the dwelling blocks to verify their condition and construction. An assessment of their robustness against accidental loading and susceptibility to progressive collapse has also been carried out. The investigations showed that the building is a cross-wall system consisting of precast internal concrete walls with cast in-situ flank walls for stability. The floor slab consists of precast concrete gothic beams. The findings from intrusive investigations suggested that the building may be susceptible to disproportionate, progressive collapse and does not currently meet the disproportionate collapse requirements set out in Approved Document A. The building has been assessed as a consequence class 2b (upper risk group) because the building exceeds 4 storeys.

A select number of flats were subjected to intrusive and non-intrusive investigative methods, including visual inspection, concrete testing, opening up works and Ground Penetrating Radar (GPR) Scanning. The results of the investigations were documented and used as the basis of the structural assessment.

The building was assessed against BRE Report 511 which states that LPS blocks can be assessed under three criteria, of which a block needs only pass one. The criteria and results relating to John Cozens are detailed within each of the structural reports for which a number of inherent weaknesses have been identified with the non-traditional systems, which are discussed in detail in the dedicated structural reports.

Whilst Langton is a tradition RC-framed building, its connection to Stair 3, and the other buildings, presents a challenge.

2.5. Use of non-residential areas

There are a number of non-residential areas in the building, including the Council's CCTV room, the laundry, the nursery and plant rooms.

These interact with the residential building and require their own fire risk assessments to be carried out by the responsible person.

Given the interaction of these spaces, they have some bearing on the potential creating of building safety risks, albeit that some mitigation is afforded by the overall design and compartmentation strategy.

2.6. Maintenance regimes

Maintenance of the building is governed by relevant legislation, including the Regulatory Reform (Fire Safety) Order 2005 (as amended) and the Fire Safety (England) Regulations 2022.

Recommendations regarding maintenance are set out in the accompanying retrospective fire strategy report.

Failure to carry out maintenance could result in the realization of building safety risks.

2.7. Bristol City Council's safety management system

The Council is responsible for implementing a safety management system for St Jude's. Guidance on certain aspects of the safety management system is contained in the accompanying retrospective fire strategy report, although the Council should assure themselves that an appropriate safety management system is implemented.

This includes the need for clear roles and responsibilities, and planning, implementing, monitoring, reviewing and improving the management system over time.

The safety management system should include detailed arrangements for the following:

28. Resident engagement strategy.
29. Mandatory Occurrence Reporting.
30. Ongoing assessment of building safety risks.
31. Maintenance, inspection and remediation.
32. Keeping records.
33. Clear procedures for employing contractors and checking competence.
34. Taking appropriate and proportionate action on matters that require attention, such as those identified in the course of maintenance work or surveys and inspections.
35. Managing change.
36. Planning for emergencies.
37. Reviewing the performance of safety management at the affected site.

Further guidance is available from the Building Safety Regulator: [Safety management systems for high-rise residential buildings - GOV.UK](https://www.gov.uk/government/publications/safety-management-systems-for-high-rise-residential-buildings)

2.8. The realization of building safety risks

The realization of building safety risks can occur through a number of failure conditions.

A fire that grows to the extent that the loadbearing capacity of the structure is of concern, as it could bring about disproportionate collapse. The likelihood of such a long duration fire may be relatively low, but the consequences are extreme.

Fire and smoke that spreads beyond the enclosure of origin could impact on escape, as well as presenting challenges for emergency response. Whilst there are some positive features in respect of mitigating the building safety risk associated with the existing building, there are improvements that can be made to the strategy.

Likewise, residents failing, or being unable, to evacuate could give rise to building safety risks materializing.

There are a range of conditions that could lead to such scenarios. In principle, the hazards are normal for this type of mixed use building, but the likelihood and consequences of a major accident scenario are required to be considered under the Building Safety Act 2022.

In terms of structural failures, again, there are a range of scenarios that could result in realization of building safety risks. These are identified in detail in Ridge's accompanying structural reports, with some of the scenarios set out, at high level, within this Building Safety Risk Assessment report.

3. INSTRUCTION

3.1. Ridge and Partners' instruction

Ridge and Partners LLP are instructed by Bristol City Council to document the fire and structural risks, in the form of a Building Safety Risk Assessment, for the four residential blocks at the St Jude's site (Haviland House, John Cozens House, Charleton House and Langton House).

3.2. Author competence statement

The fire elements of this report are jointly authored by Bob Birtles MEng(Hons), FIFireE, Senior Associate of Ridge and Partners LLP, and Keith Todd BEng (Hons) CEng FIFireE MCABE C-Build.E, Partner of Ridge and Partners.

Bob is registered with the Engineering Council, through the Institution of Fire Engineers, as an Interim Chartered Fire Engineer, and is a Fellow of the Institution of Fire Engineers. Bob holds a first-class Master's degree with Honours in Fire Engineering.

Bob has worked in fire safety since 2011, following 15 years working for the fire and rescue service, and has been involved with fire risk management in residential buildings, including buildings defined as Higher Risk Buildings, in which the author has undertaken fire risk assessments, as well as documenting fire strategy reports in HRBs. This includes high-rise student halls of residence, high-rise purpose-built residential buildings and specialised housing.

Keith has worked in fire safety since 2006 and has been directly responsible for management of fire safety in buildings now defined as Higher Risk Buildings, including carrying out fire risk assessments, preparing fire strategies, peer reviewing fire strategies, and preparing building safety cases. This includes Higher Risk Buildings of a similar age and condition to those within scope of this project. Keith is a registered fire risk assessor and a chartered engineer.

The structural elements of this report are authored by Rob Hurley GIStructE, Senior Engineer of Ridge and Partners LLP and James McCulloch CEng MICE, Partner of Ridge and Partners LLP.

Both Rob and James are experienced structural engineers, who have assessed numerous buildings of a similar nature to the blocks at St Jude's.

These Ridge personnel have input to the Building Safety Risk Assessment, through the course of a number of HAZID workshops, held jointly with representatives of the Council.

3.3. Accountable person role in the Building Safety Risk Assessment

As noted above, the Council have participated in a number of dedicated building safety workshops held in relation to the blocks at St Jude's.

Key Council representatives include:

TBC Bristol City Council

4. RELEVANT LEGISLATION

4.1. The Building Safety Act 2022

It is our interpretation that St Jude's falls within the definition of a Higher Risk Building, by virtue of The Higher-Risk Buildings (Descriptions and Supplementary Provisions) Regulations 2023.

The principles of the Building Safety Act were based around the introduction of the Building Safety Regulator and putting in place the foundation for fundamental changes to the way that Higher Risk Buildings are designed, constructed, and managed.

It defined Higher Risk Buildings (albeit this definition can be changed by secondary legislation), set up the new Regulator, and set out some of the overarching principles, which have been brought into effect by the secondary legislation.

The Building Safety Act introduced the requirement to conduct a Building Safety Risk Assessment, by virtue of Section 83 of the Act.

4.2. The Higher Risk Buildings (Management of Safety Risks etc.) (England) Regulations 2023

The key components of the Regulations are:

- Applying for a Building Assessment Certificate to occupy the building, which must be displayed in the building.
- Managing safety risks according to the prescribed principles.
- Documenting and presenting a safety case report.
- Having in place a suitable system for mandatory occurrence reporting to the Regulator.
- Providing information to stakeholders including residents and the Regulator.
- Notifying relevant stakeholders upon change of an Accountable Person.
- Having in place an effective resident engagement strategy.
- Having appropriate complaint handling procedures as prescribed.

In accordance with Regulation 5(1)(c), the safety case report needs to reference a description of the possible scenarios of building safety risks that have been identified through the Section 83 building safety risk assessment process, as well as the likelihood and consequences of those risks, the existing control measures and all reasonable steps.

5. FIRE RISK SCENARIOS

The fire risk scenarios covered by the Building Safety Act 2022 relate to scenarios in which fire spreads.

Non-building safety risk spread scenarios include:

- 38. Fire spread beyond the item first ignited.
- 39. Fire spread to entire room.
- 40. Fire spread beyond the room to involve the entire flat.

The above scenarios may not represent the realization of building safety risks, except in the case where the fire is so significant as to bring about structural failure.

Building safety risk spread scenarios include:

- 41. Fire spread externally (either lateral or vertical, to involve other flats or areas).
- 42. Fire spread internally, via failures in compartmentation, including cable runs, wet room downpipe system, compartment walls or floors.
- 43. Fire spread via means of escape (i.e. via the walkways) or staircase enclosure, during escape – noting that fire-fighting is a different set of conditions).

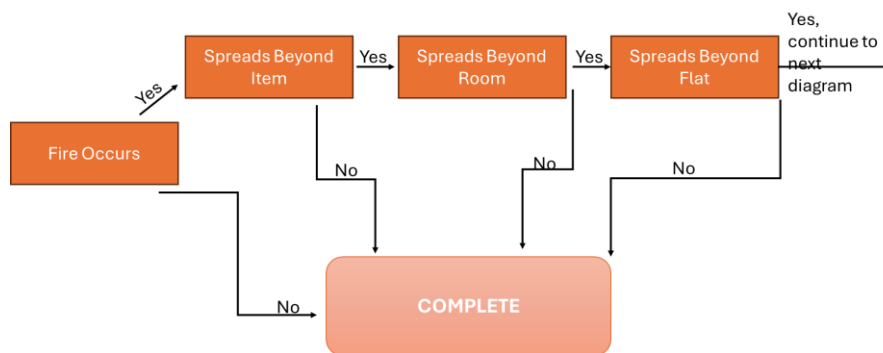


Figure 2 Initial fire spread diagram

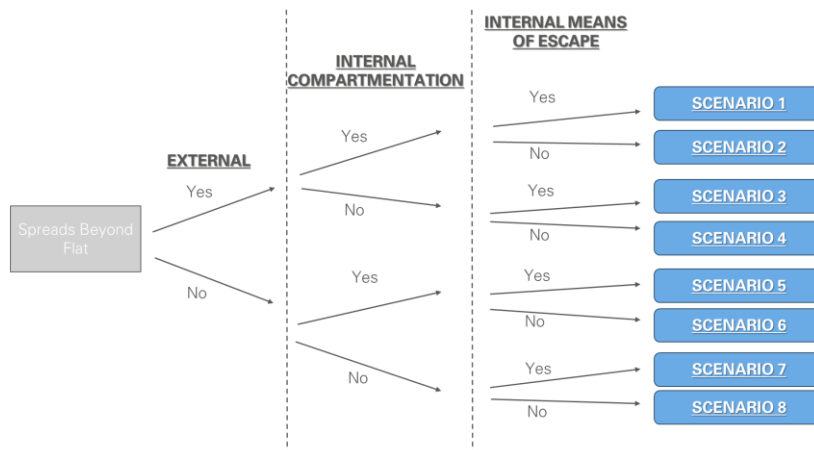


Figure 3 Building safety risk fire spread scenarios

The scenarios above are therefore relevant to the BSRA required by the Building Safety Act, and to the safety case required by Regulation 5 of the Management of Safety Risks Regulations.

5.1. Scenario 1

- Worst-case scenario relating to fire spread, deck access design reduces the likelihood.
- Some potential for occurrence at St Jude's blocks due to external wall and internal compartmentation issues.
- Fire spreads by multiple routes, to involve multiple parts of the building.
- Increased likelihood of structural failure due to multiple areas affected by fire.
- For occupants within the building, there are multiple potential outcomes (A-H), depending on the evacuation scenarios and associated effectiveness.
- Evacuation Scenario A is the essential aim for avoidance of building safety risk in Scenario 1.
- For a safe outcome, evacuation would have to be effectively completed prior to the realization of all fire spread conditions.

5.2. Scenario 2

- Scenario 2 is similar to Scenario 1, although fire / smoke spread does not occur via means of escape routes (more likely than Scenario 1 as the main escape routes are in open air).
- In this scenario, again, evacuation scenarios will affect outcome in terms of realization of harm.
- If means of escape routes remain relatively tenable, there are potentially more viable opportunities for Scenarios A, C, E and G, which are reliant on occupant evacuation being effective.
- In scenarios in which occupants failed or were unable to respond and evacuate, there is potential for multiple fatalities within dwellings affected by fire and smoke spread.

5.3. Scenario 3

- Scenario 3 represents a situation where a fire spreads via the external wall (risk from timber cladding, flammable infill panels) and internally via the means of escape (less likely considering the deck access layout).
- Whilst fire does not spread internally via compartmentation, external spread routes could lead to multiple units being affected and harm being realised within flats other than the flat of fire origin, and where extensive spread occurs, making escape routes untenable, there is arguably greater risk posed prior to evacuation scenarios leading to favourable outcomes.
- Safety in Scenario 3 will be dependent on evacuation scenarios A, C, E and G being completed prior to loss of tenability, (the situation is improved due to the deck access design).

5.4. Scenario 4

- Scenario 4 represents fire spread only by the external wall.
- In such a situation, multiple flats could be affected (both laterally and vertically), although the means of escape being unaffected would afford a safe route out of the building, providing a greater range of favourable outcomes in terms of a broad range of evacuation scenarios.
- Higher risk external wall components do not form a continuous bridge around the whole premises, limited to smaller areas of timber cladding and infill panels.

5.5. Scenario 5

- Scenario 5 represents fire spread internally via failures in compartmentation and internal means of escape.

- This scenario represents significant failure and realisation of building safety risk, albeit that if evacuation scenarios A, C, E and G are effective prior to loss of the escape route, there could be avoidance of harm.
- This would require warning of fire prior to loss of the escape route.
- Most flats have access to two stairs via two escape routes, the deck access areas are in the open air.

5.6. Scenario 6

- Scenario 6 represents fire spread via failures in compartmentation, conditions could be made worse if there is a partial, structural failure affecting the fire separation between flats.
- Such a scenario could involve failure of wet room down pipes or passive protection between the flats.
- A small number of minor services penetrations have been identified as part of the intrusive works.
- In this case, flats other than the flat of fire origin may become affected, although if the means of escape remains usable, there are a broader range of safe outcomes that could be achieved within the spectrum of evacuation scenarios.

5.7. Scenario 7

- Scenario 7 represents fire and smoke spread via the internal means of escape.
- Relatively low risk as the escape routes are in the open air and should be free from any fire loading.
- The enclosed stair cores have a range of permanent, natural ventilation which would help maintain tenable conditions should smoke and heat affect them.

5.8. Scenario 8

- Scenario 8 is a best-case scenario, where fire does not spread within the building, and is effectively contained within the flat (or area) of fire origin.
- Evacuation scenarios remain relevant to safe outcomes for residents, although these would be outside of the consideration of 'building safety risk'.
- i.e., evacuation scenarios B, D, F and H could lead to harm within the flat, but not harm associated with fire spread, and we would encourage that these risks are not discounted from the overall safety management considerations for the block.

5.9. Single room scenarios

As noted previously, a single room scenario, where only the room (or indeed flat, where the fire spreads beyond the room of origin, but is contained within the compartment of the flat) is involved in fire, and does not lead to significant impact on the structure, would not represent realization of a building safety risk, as defined by the Building Safety Act.

There are scenarios in which the fire intensity and duration could, theoretically, present a risk to the loadbearing capacity. Those matters are considered within the structural reports, but are most likely related to situations where there is excessive hoarding or storage of hazards such as compressed flammable gas cylinders.

To mitigate this risk, the Council should implement robust controls to reduce the likelihood of such hazards within dwellings and other areas.

5.10. Single floor scenarios

Fire spread between individual flats is mitigated by concrete walls separating the flats. Sample intrusive surveys have not identified significant issues in the compartmentation between flats on the same floor.

As the flats are located off open deck walkways, with unprotected windows, there are possible scenarios in which fire breaks out of the window, or the window or front entrance door are left open, leading to smoke existing the flat. Some simple computational fluid dynamics models indicates that there may be some lateral smoke spread, underneath the overhanging walkway (if the fire is in one of the lower floors), but, principally, such a scenario would be more likely to impact the walkways above, rather than on the same level.

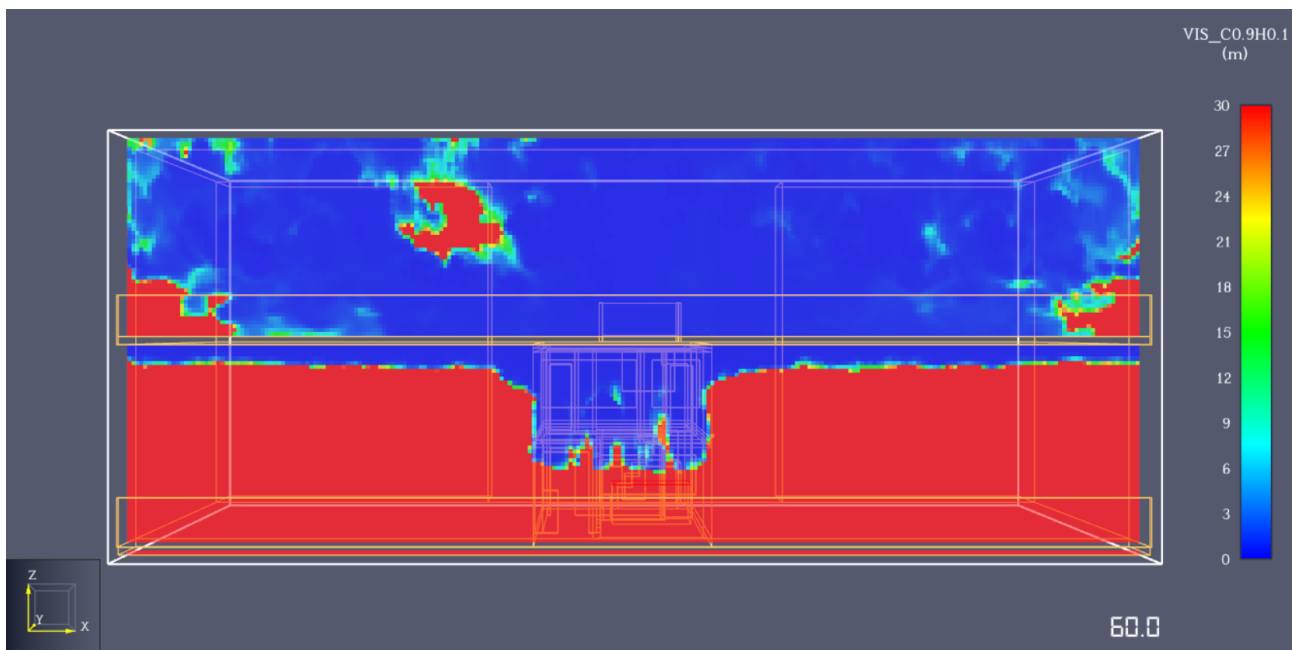


Figure 4 Visibility on walkway deck in case of uncontrolled post-flashover fire in kitchen

There could be some lateral fire spread via the decorative timber cladding on the front elevation, albeit that the likelihood of vertical fire spread would be likely to be limited by the continuous overhanging walkway, which acts as an inherent fire break.

The likelihood of significant charring of the timber would be expected to principally affect the individual residential unit, rather than spreading to adjacent units, although this possibility cannot be discounted.

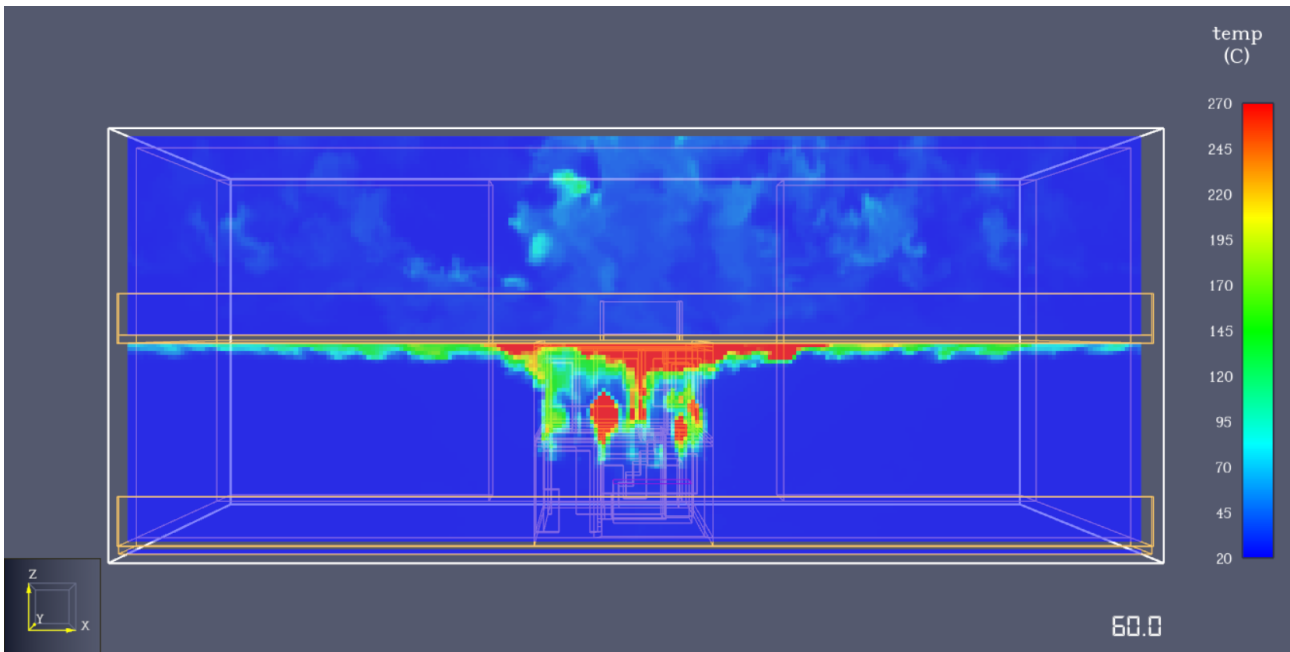


Figure 5 Walkways temperatures associated with a serious kitchen fire

5.11. Vertical fire spread between floors scenarios

As above, there is some potential for external fire and smoke spread between floors. Some scenarios that may lead to this include failure of the boxing to the wet rooms (particularly the kitchen, which is more likely to have a significant fire than the bathroom), leading to internal fire spread between flats. The likelihood of such failure depends on the nature of the fire, but it is foreseeable in the case of the kitchen that this could occur. The consequences could be mitigated by domestic alarm coverage in all flats, enabling warning followed by escape using the walkways.

The walkways themselves could have improved protection through the installation of sprinklers to all flats and channelling screens, both of which in isolation are estimated to have a beneficial effect on visibility conditions on the walkways above a flat with a serious fire.

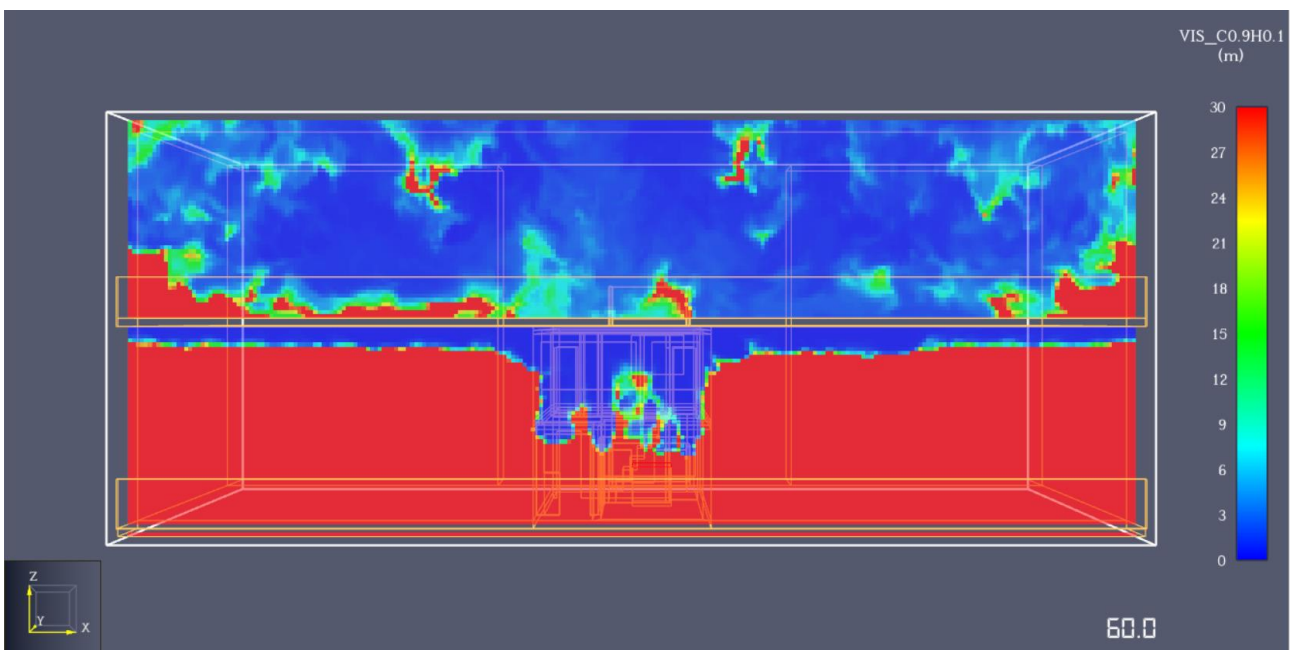


Figure 6 Visibility on walkway deck in case of sprinkler-controlled kitchen fire

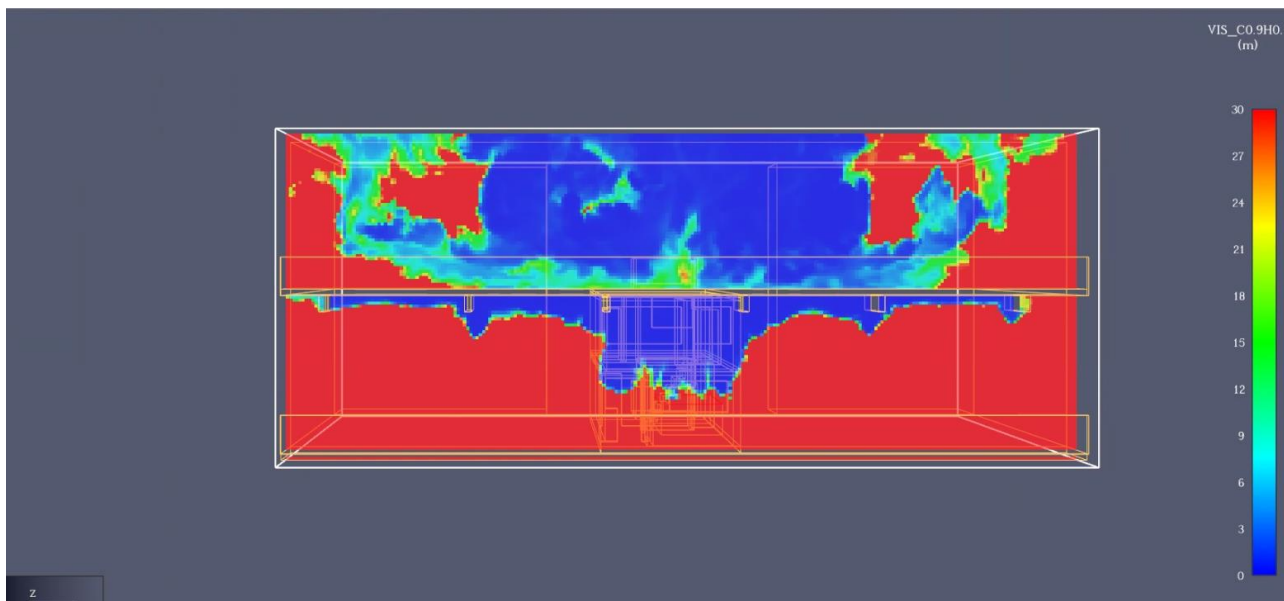


Figure 7 Un-sprinklered walkway visibility with channelling screens in case of kitchen fire

To the rear elevation, the presence of combustible spandrel panels cannot be discounted as a route for vertical fire spread, and this could result in vertical fire spread between individual residential units in certain conditions. The consequences of such a fire could be mitigated through comprehensive domestic alarms within flats, supported by the open deck walkway escape arrangements. Sprinkler protection is likely, in certain scenarios, to achieve significant improvements in terms of risk reduction.

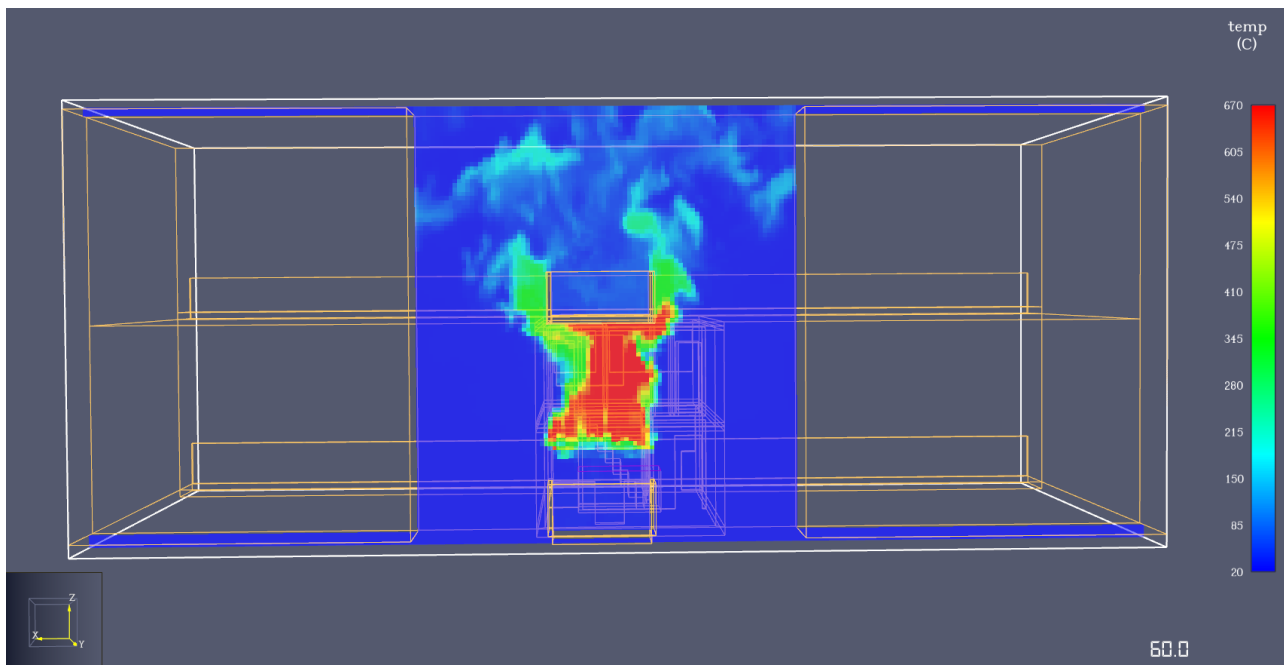


Figure 8 External rear elevation temperatures in case of uncontrolled living room fire

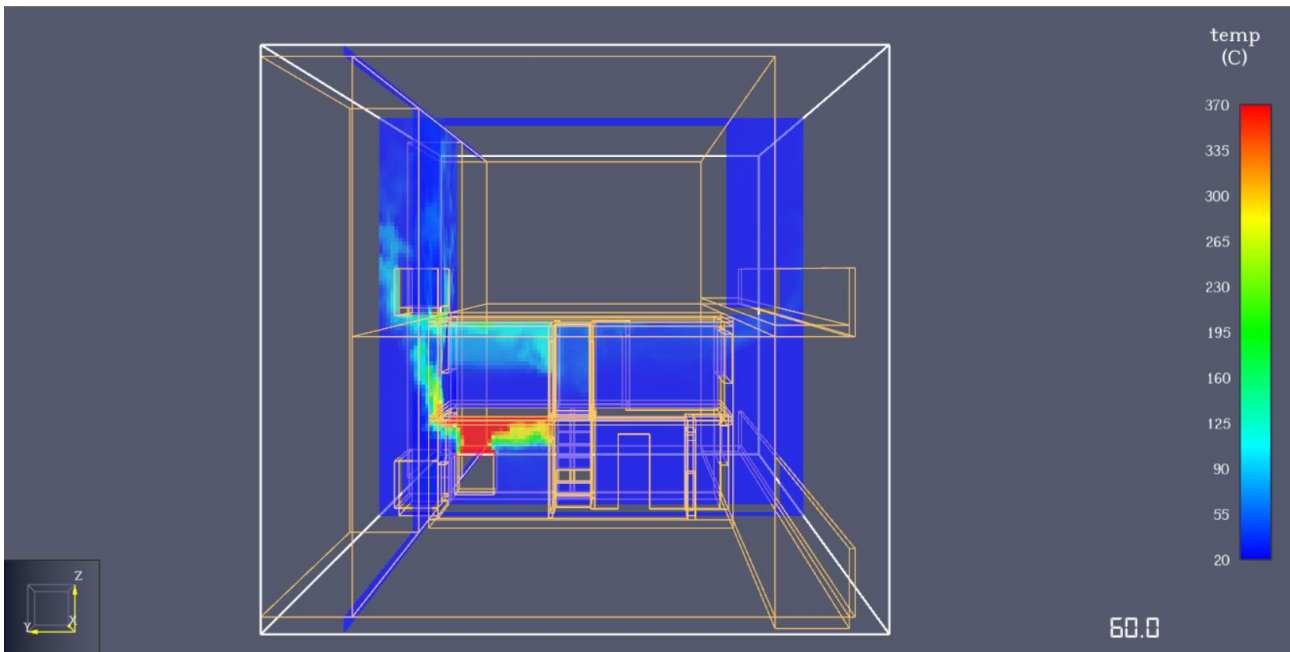


Figure 9 Living room temperatures in case of sprinkler-controlled living room fire

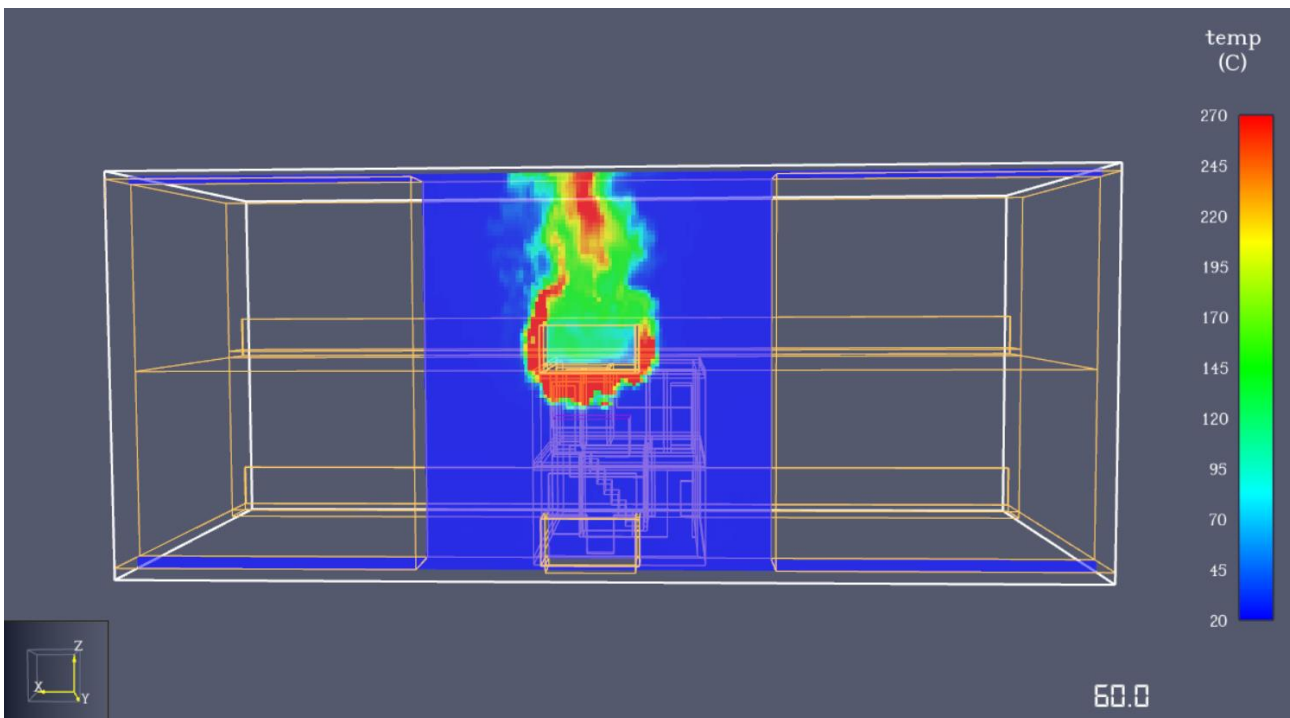


Figure 10 External temperatures associated with uncontrolled rear bedroom fire

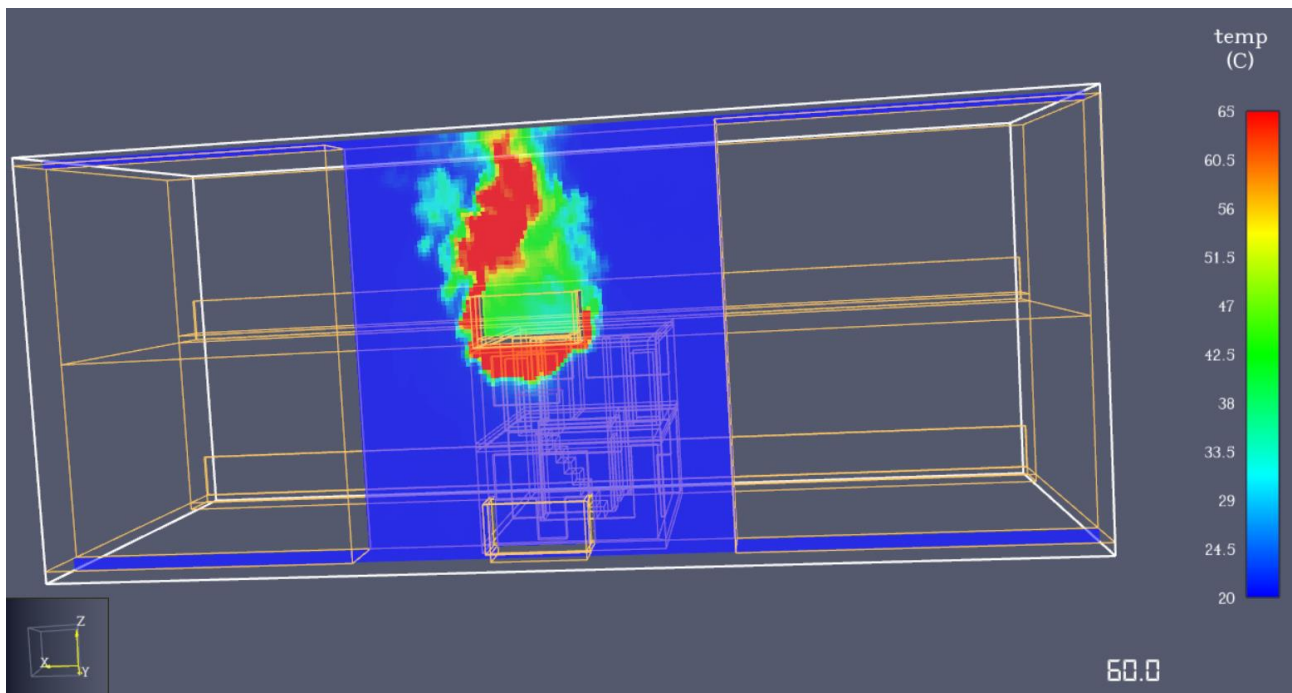


Figure 11 External temperatures associated with sprinkler-controlled rear bedroom fire

Fires within areas such as the nursery, risers or other areas could spread vertically, either externally, or via internal routes, such as the semi-open staircase. Such scenarios could arise in uncontrolled fire situations.

The bin chute, being housed in fire-resisting enclosures, with a non-combustible chutes, and town mains sprinklers in the refuse room, provides compensation, and the availability of multiple escape routes via partially open stairs again reduces the risk in the case of Stairs 1, 2 and 4.

Stair 3 is a critical single escape route for Langton and this warrants some attention, as set out in the fire strategy.

The likelihood of significant failure is arguably reduced through the package of fire safety measures associated with protection of the refuse chute, although failure of multiple controls could lead to smoke spread via the staircase. The consequences would be controlled physically by the availability of alternative routes from most areas.

5.12. Multi-floor and whole building scenarios

Multi-floor and whole building scenarios are considered to be low likelihood, extreme consequence events.

Theoretically, leapfrogging of fire could occur between multiple flats on multiple floors. The likelihood of this would be reduced by the anticipated fire and rescue service response, i.e., it would be expected to take considerable time for such an event to occur. Such an event would therefore, in essence, relate to a failure in emergency response scenario. Again, sprinkler protection would be expected, in the vast majority of incidents, to substantially reduce the likelihood of such an event occurring.

The proximity of the flats (which have unprotected windows) to the staircase enclosures does present the risk of smoke spreading from a failed or open window into the staircase enclosure (which in the case of Stairs 1, 2 and 4 are open to the flats). In the case of Stair 3, non-fire-resisting glazing encloses the stair near to the flats.

There are scenarios in which a fire in a flat adjacent to the stair could lead to smoke-logging of the stair, and the likelihood of this is somewhat dependent on the size to which a fire grows in the adjacent flat. The consequences in the case of this occurring next to Stairs 1, 2 and 4 are mitigated by the availability of two-way escape, with the alternative escape routes being remote from one another.

In the case of Stair 3, the consequences could be worse, given the criticality of this route, as the single escape route for occupants of Langton.

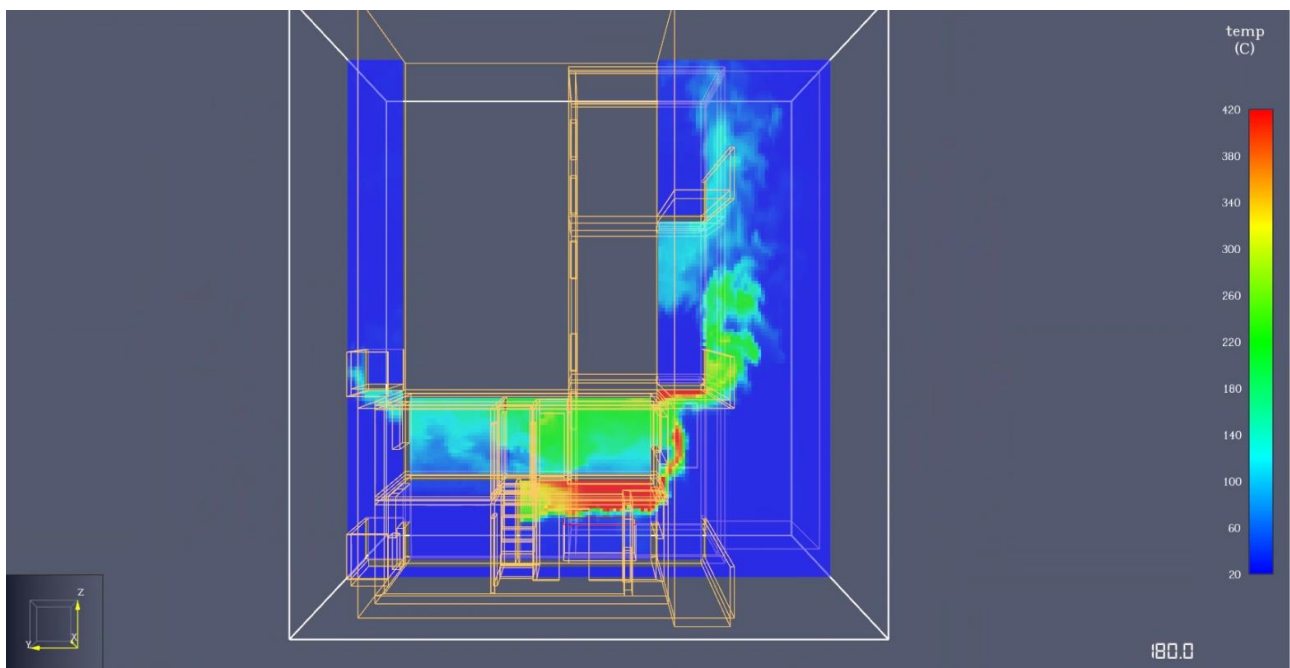


Figure 12 External temperature conditions next to Stair 3 in case of uncontrolled fire in adjacent flat

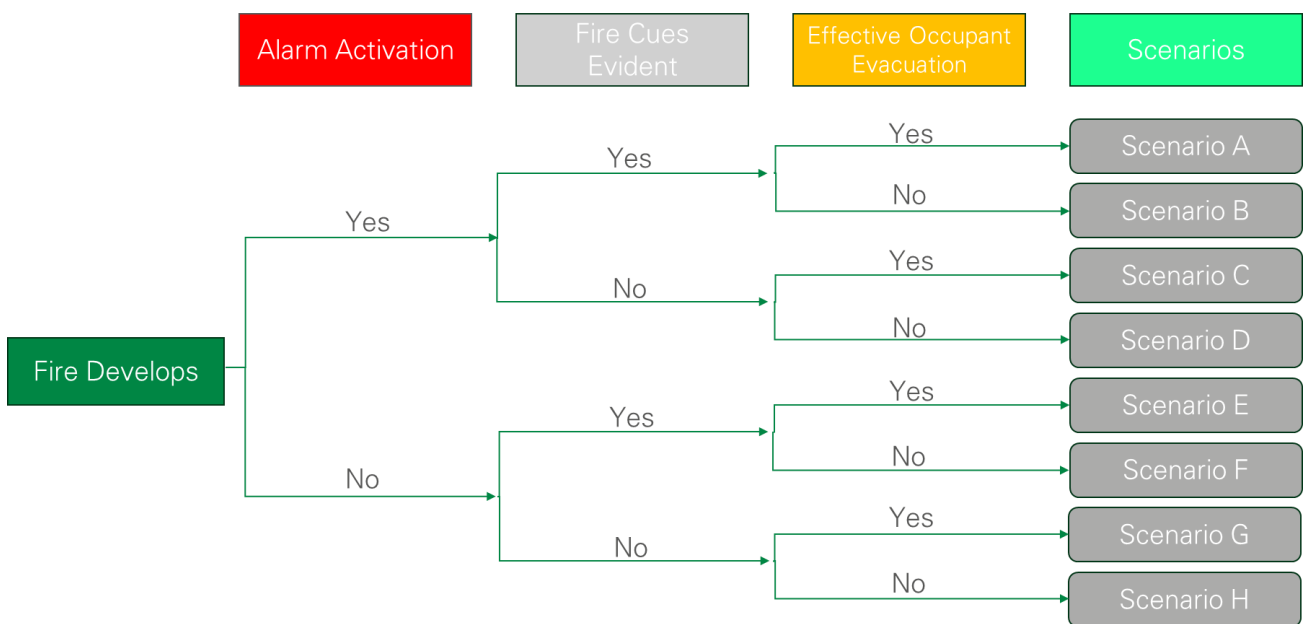
Again, the recommendations of the fire strategy to retrospectively install sprinkler protection, and to upgrade the existing windows to the stair, adjacent to the flats, with either fire-resisting glazing or fire-resisting construction, would provide further mitigation.

5.13. Evacuation scenarios

There are multiple scenarios that could occur in respect of evacuation of the building in a serious fire spread scenario.

Even where a common fire alarm system is installed (which should only be an interim measure whilst more permanent remedial work is completed), occupant response is a known uncertainty. The effectiveness of waking watches in raising the alarm and initiating evacuation can also be problematic, and is only viable as an immediate intervention until such time that the alarm is in place to initiate general warning.

The consequences of significantly delayed evacuations, or, worse-still, non-evacuation, where evacuation is indeed required for the safety of occupants, depend on the fire spread scenarios.



Reverting the blocks in the longer-term to 'stay put' arrangements is a strategic objective, when appropriate controls are in place to provide greater assurance as to the safety of such a strategy at St Jude's.

However, even with a 'stay put' strategy, there may, in serious failure and fire spread scenarios, be the need to initiate evacuation of occupants outside the flat of fire origin.

The recommended approach of the fire strategy, to retrospectively install sprinklers may reduce the consequences of a building safety risk materializing insofar as occupant evacuation outside of the flat of fire origin may become unnecessary.

The recommendation to provide an evacuation alert system would facilitate a means for fire-fighters to provide warning to escape, if necessary, although this does not guarantee that the delayed or non-evacuation situations would be avoided, as it would be dependent on resident trust in the alarm and suitable response.

Effective resident engagement would therefore be an additional critical control, to each stage of the development of the fire strategy, to attempt to encourage an effective evacuation performance. Additionally, identifying residents who may require assistance to evacuate, and planning to facilitate such assistance where necessary, is a key component of an effective strategy.

5.14. Emergency response scenarios

There are scenarios in which the effectiveness of emergency response could be affected. Such scenarios could arise where there is a delay in summoning the fire and rescue service to an incident, leading to fire spread scenarios materializing, making operations more difficult upon arrival.

There could be delays in identifying people who require assistance, if, for example, information in the Secure Information Box is inaccurate or missing, which would relate to the safety management system scenarios. Likewise, if fire-fighters do not have the correct keys to access the block, even if they are summoned, there could be resulting delay in achieving access, necessitating either break-in or assistance by residents in obtaining access. This could have an impact on both the fire spread scenarios and the evacuation scenarios.

There could be challenges associated with equipment for use during an emergency, if this was malfunctioning, or if fire-fighters were not familiar with its location or operation.

If there was inadequate water supply via the hydrants, there could be challenges in obtaining suitable water for fire-fighting. This is arguably a low likelihood high consequence event.

The likelihood of failure of a dry rising fire main is relatively low, given the simplicity of the equipment, but would be dependent on adequate maintenance (which is a safety management system scenario). Failure of a dry rising fire main could result in delays in getting water to the fire, which could lead to fire spread scenarios materializing.

The existing fire lifts, being located within the unprotected (by virtue of their open nature) staircase enclosures, may lead fire-fighters not to use them in emergency situations. Likewise, the lack of secondary power supplies or water ingress prevention measures could lead to the fire lifts becoming compromised.

Fire-fighter physiology then becomes a factor in the emergency response scenario, and research has indicated that this can be problematic in high-rise buildings, given the amount of equipment that would need to be carried.

Arguably these are low probability high consequence scenarios, although compensation can be afforded by some of the measures set out within the retrospective fire strategy report, such as ensuring robust testing and maintenance via the safety management system, routine liaison with the fire and rescue service, liaison with the water authority to confirm adequacy of the hydrant mains, strategic upgrade of the lift using the guidance in BS 8899, and routinely reviewing the Secure Information Box.

5.15. Safety management system scenarios

Implementation of an effective safety management system is a key duty imposed by legislation on the Council.

Failure to maintain an effective safety management system could give rise to a number of the fire risk, evacuation and emergency response scenarios, and consequently, building safety risks, materializing.

Failure to appoint competent contractors, or to adequately plan and implement building work, could lead to hazards being introduced. This could include breaches to fire-stopping, undermining of systems or equipment, or introduction of fire and explosion hazards. It could also lead to work being undertaken that compromises the structural integrity of the building.

If testing and maintenance of equipment or systems was not carried out effectively, this could give rise to the potential for such equipment to fail to perform its function, again, giving rise to potential for fire spread or compromised emergency response.

If effective resident engagement is not delivered, residents may have a risk perception that does not reflect the material risk in their building. Likewise, the Council may not identify residents for whom additional planning and measures are required, which could all affect the evacuation scenarios.

Liaison with appropriate parties, particularly the fire and rescue service, is also critical, to ensure that fire-fighters are able to implement effective emergency procedures and processes.

In large organizations, having clear safety management systems, with understood roles and responsibilities, is critical to effective and safe outcomes.

The safety management system is therefore the overarching factor that interacts with each part of the fire, evacuation and emergency response scenarios, and a serious failure in the safety management system could have serious consequences in terms of the materialization of building safety risks.

6. STRUCTURAL RISK SCENARIOS

6.1.1. Scenario 1 – Internal Gas Explosion

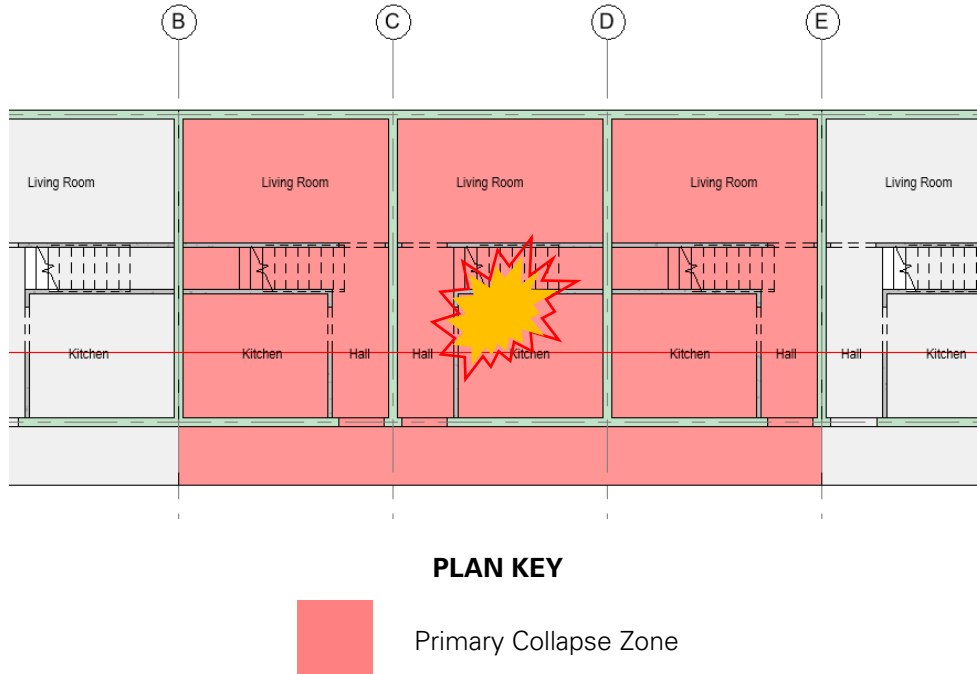


Figure 13 – Indicative internal explosion event location GF Plan

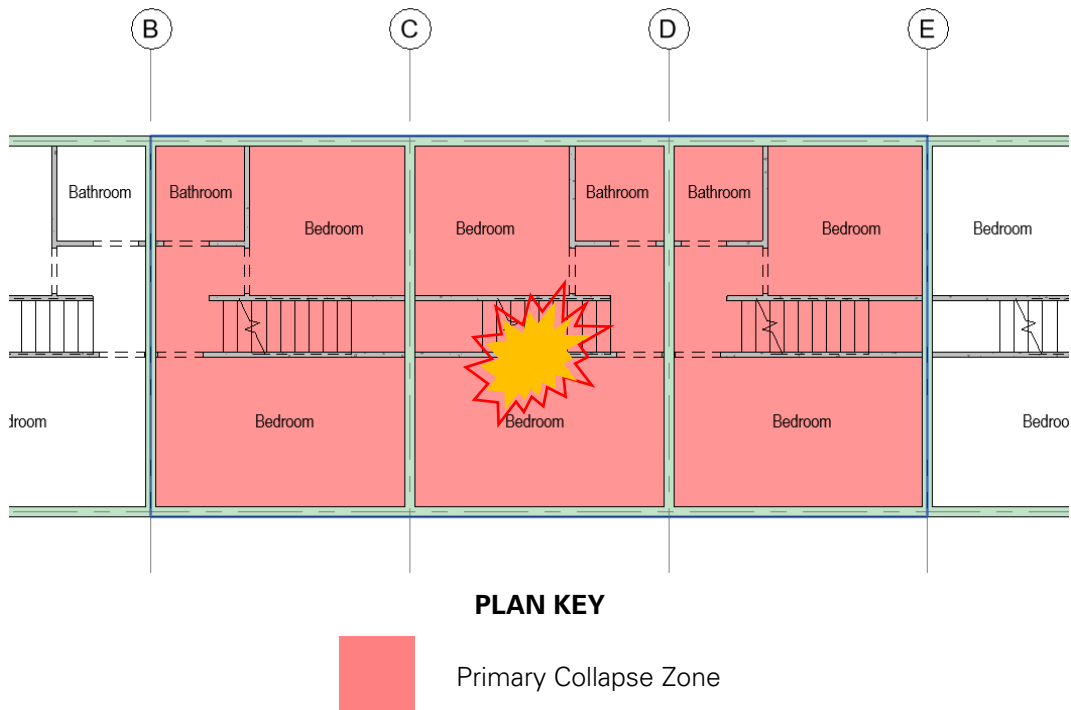


Figure 14 – Indicative internal explosion event location FF Plan

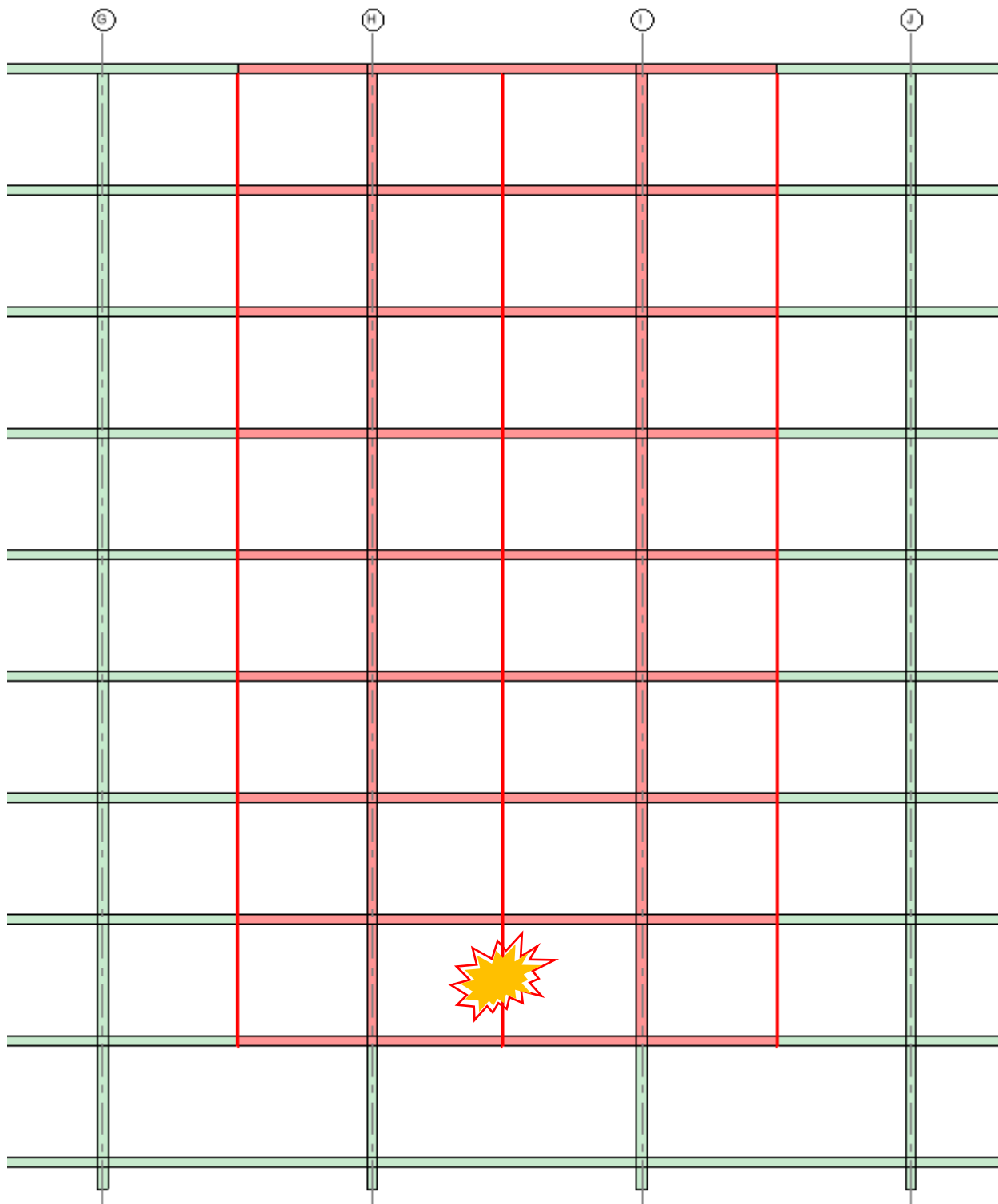


Figure 15 – Collapse mechanism if explosion event occurs within an internal flat, Haviland & John Cozens house (elevation)

An internal gas explosion within any of the blocks at St Judes leads to a failure of the walls and floor slabs above the 2nd floor leading to a disproportionate progressive collapse as shown in Figure 7. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 1 Haviland & John Cozens

The outcome of the assessment has shown that the estimated probability of a 'severe' explosion from a non-piped gas supply (i.e. gas cannister etc.) creating the possibility of a progressive collapse event in one of the blocks is between:

1.0 x 10⁻⁷ and 7.7 x 10⁻⁶ per annum (1 in 1136364)

The probability of an internal gas explosion causing a progressive collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = between 5.0 x 10⁻⁸ and 4.4 x 10⁻⁷ (1 in 2272727)

2-year Remaining Life = between 2.0 x 10⁻⁷ and 1.76 x 10⁻⁶ (1 in 568182)

5-year Remaining Life = between 5.0 x 10⁻⁷ and 4.4 x 10⁻⁶ (1 in 227273)

The consequence of a collapse event, assuming the block is fully occupied at accounting for a full school class of 30 at the time of explosion, has been estimated as (upper bound):

60 People (2.3 residence per flat)

80 People (4 residence per flat)

The total risk of death of a resident, has been estimated as between:

3.0 x 10⁻⁵ and 2.64 x 10⁻⁴ per annum (2.3 residence per flat) (1 in 3788)

4.0 x 10⁻⁵ and 3.52 x 10⁻⁴ per annum (4.0 residence per flat) (1 in 2841)

Outcome of Quantitative Risk Assessment Scenario 1 Charleton & Langton

The outcome of the assessment has shown that the estimated probability of a 'severe' explosion from a non-piped gas supply (i.e. gas cannister etc.) creating the possibility of a progressive collapse event in one of the blocks is between:

4 x 10⁻⁷ and 2.4 x 10⁻⁶ per annum (1 in 416667)

The probability of an internal gas explosion causing a progressive collapse event in the proposed remaining life spans of the block:

6-month Remaining Life = between 5.0 x 10⁻⁸ and 1.8 x 10⁻⁷ (1 in 5555556)

2-year Remaining Life = between 2.0 x 10⁻⁷ and 7.2 x 10⁻⁷ (1 in 1388889)

5-year Remaining Life = between 5.0 x 10⁻⁷ and 1.8 x 10⁻⁶ (1 in 555556)

The consequence of a collapse event, assuming the block is fully occupied at the time of explosion, has been estimated as (upper bound):

30 People (2.3 residence per flat)

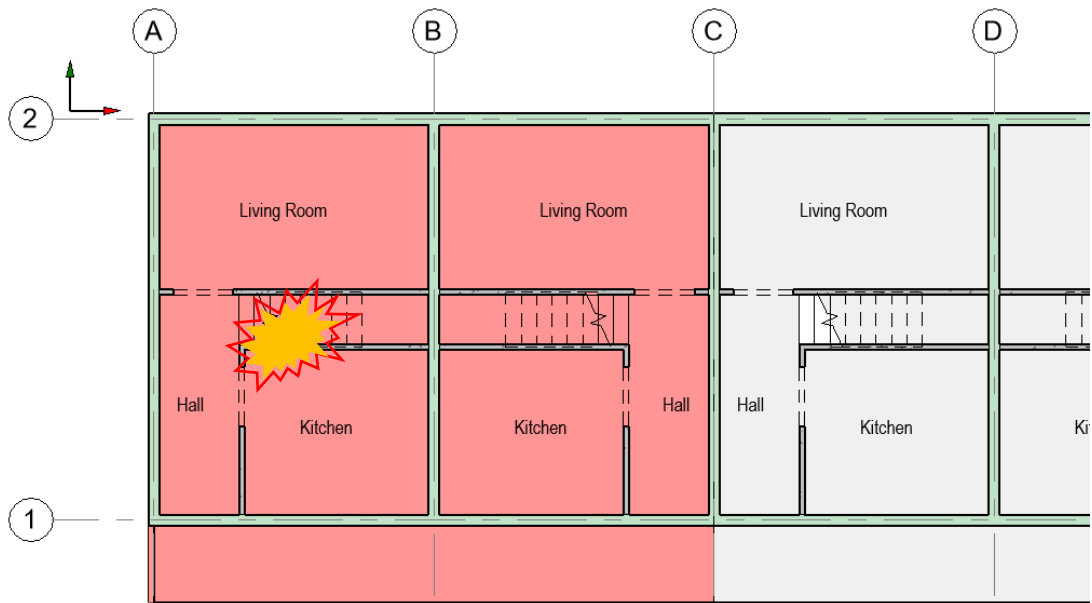
40 People (4 residence per flat)

The total risk of death of a resident, has been estimated as between:

1.0 x 10⁻⁵ and 5.4 x 10⁻⁵ per annum (2.3 residence per flat) (1 in 18519)

2.0 x 10⁻⁵ and 7.2 x 10⁻⁵ per annum (4.0 residence per flat) (1 in 138890)

6.1.2. Scenario 2 – Flank Wall Explosion



PLAN KEY

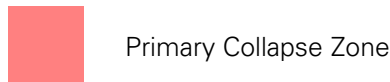
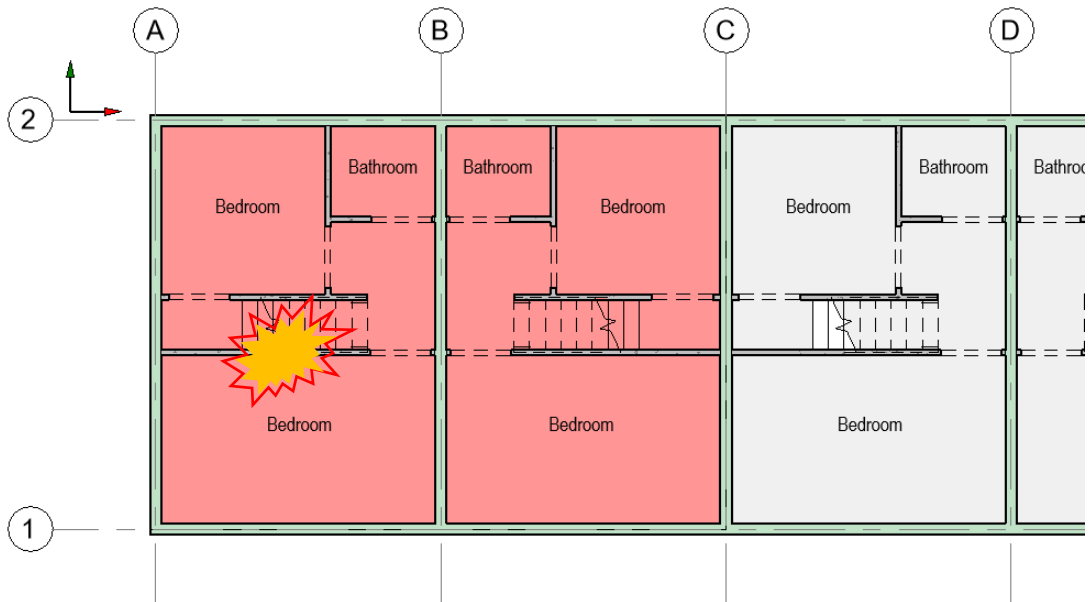


Figure 16 – Indicative flank wall explosion event location GF Plan



PLAN KEY



Figure 17 - Indicative flank wall explosion event location FF Plan

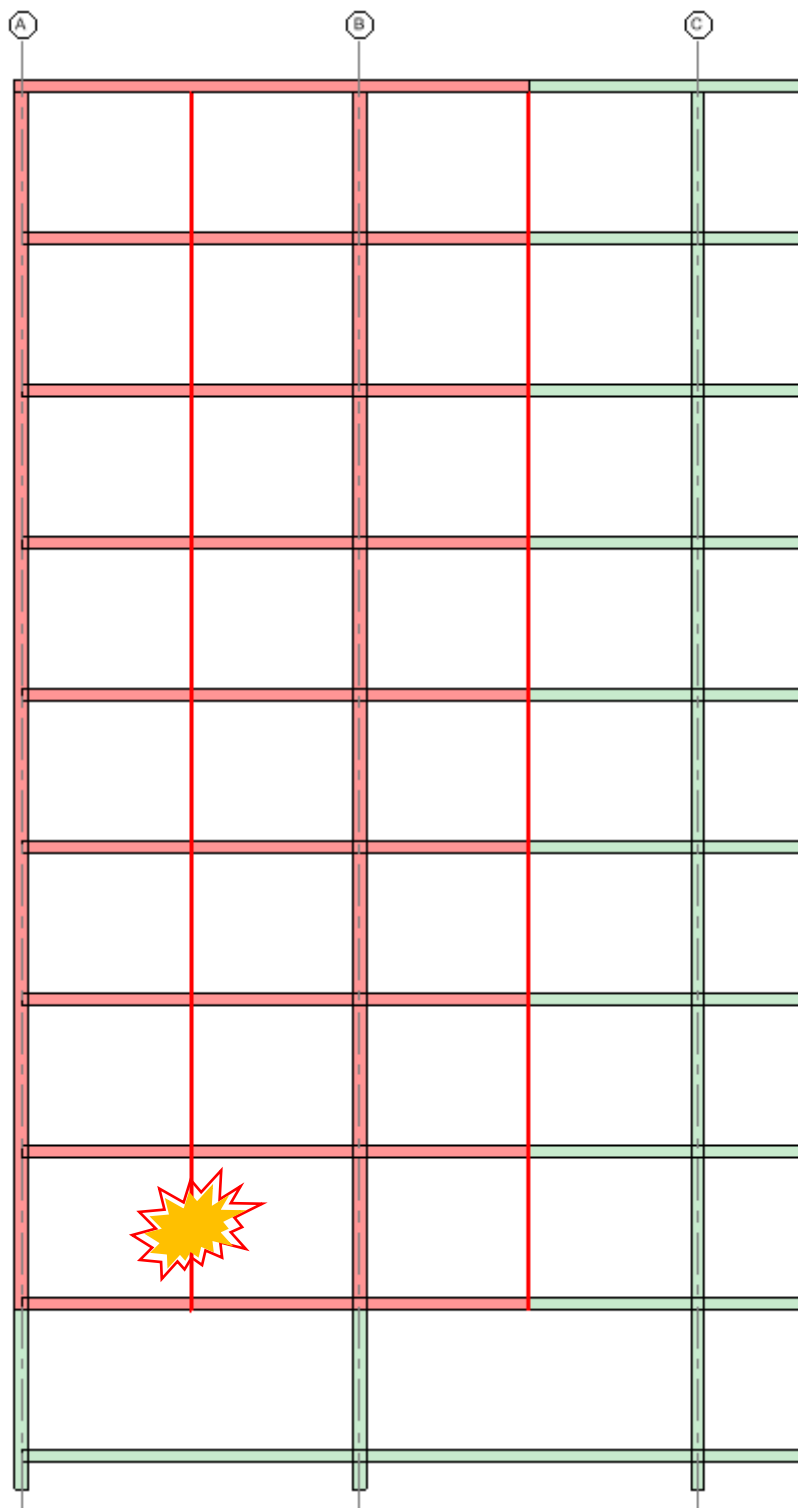


Figure 18 - Collapse mechanism if explosion event occurs within a flank wall flat, Haviland & John Cozens house (elevation)

A gas explosion within any of the flank wall flats of the blocks at St Judes would lead to a failure of the walls and floor slabs above the 2nd floor leading to a disproportionate progressive collapse as shown in Figure 10. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 2 Haviland & John Cozens

The outcome of the assessment has shown that the estimated probability of a 'severe' explosion from a non-piped gas supply (i.e. gas cannister etc.) creating the possibility of a progressive collapse event in one of the blocks is between:

8.0 x 10⁻⁸ and 8.0 x 10⁻⁷ per annum (1 in 2500000 – 1 in 227273)

The probability of an internal gas explosion causing a progressive collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = between 4.0 x 10⁻⁸ and 4.4 x 10⁻⁷ (1 in 2500000)

2-year Remaining Life = between 1.6 x 10⁻⁷ and 1.76 x 10⁻⁶ (1 in 6250000)

5-year Remaining Life = between 4.0 x 10⁻⁷ and 4.4 x 10⁻⁶ (1 in 2500000)

The consequence of a collapse event, assuming the block is fully occupied at the time of explosion, has been estimated as (upper bound):

10 People (2.3 residence per flat)

20 People (4 residence per flat)

The total risk of death of a resident, has been estimated as between:

4.0 x 10⁻⁶ and 4.4 x 10⁻⁵ per annum (2.3 residence per flat) (1 in 250000)

8.0 x 10⁻⁶ and 8.8 x 10⁻⁵ per annum (4.0 residence per flat) (1 in 125000)

Outcome of Quantitative Risk Assessment Scenario 2 Charleton & Langton

The outcome of the assessment has shown that the estimated probability of a 'severe' explosion from a non-piped gas supply (i.e. gas cannister etc.) creating the possibility of a progressive collapse event in one of the blocks is between:

6.0 x 10⁻⁸ and 3.6 x 10⁻⁷ per annum (1 in 16666667 – 2777778)

The probability of an internal gas explosion causing a progressive collapse event in the proposed remaining life spans of the block:

6-month Remaining Life = between 3.0 x 10⁻⁸ and 1.8 x 10⁻⁷ (1 in 5555556)

2-year Remaining Life = between 1.2 x 10⁻⁷ and 7.2 x 10⁻⁷ (1 in 1388889)

5-year Remaining Life = between 3.0 x 10⁻⁷ and 1.8 x 10⁻⁶ (1 in 555556)

The consequence of a collapse event, assuming the block is fully occupied at the time of explosion, has been estimated as (upper bound):

10 People (2.3 residence per flat)

20 People (4 residence per flat)

The total risk of death of a resident, has been estimated as between:

3.0 x 10⁻⁶ and 1.8 x 10⁻⁵ per annum (2.3 residence per flat)(1 in 55556)

6.0 x 10⁻⁶ and 3.6 x 10⁻⁵ per annum (4.0 residence per flat)(1 in 27778)

6.1.3. Scenario 3 – Flank Wall Fire

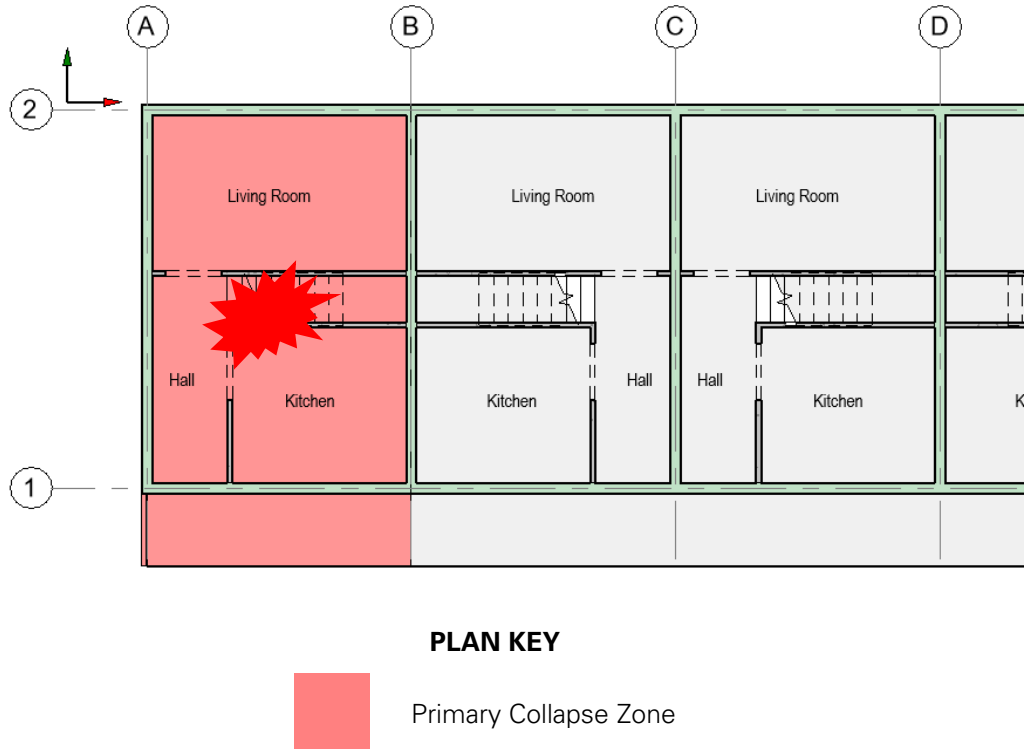


Figure 19 – Indicative flank wall fire event location GF Plan



Figure 20 – Indicative flank wall fire event location FF Plan



Figure 21 – Collapse mechanism if fire event occurs within a flank wall flat, Haviland & John Cozens house (elevation)

A fire event within any of the flank wall flats of the blocks at St Judes would lead to a failure of the floor slabs due to the low cover to reinforcement, this leaves the flank wall unrestrained and would therefore lead to a

collapse of the full flank wall and floor supported by this as shown in Figure 13. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 3 Haviland & John Cozens

The outcome of the assessment has shown that the estimated probability of a 'severe' flank wall fire creating the possibility of a progressive collapse event in one of the blocks is:

1.12 x 10⁻⁴ per annum (1 in 8929)

The probability of a flank wall fire causing a progressive collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = 5.60 x 10⁻⁵ (1 in 17857)

2-year Remaining Life = 2.24 x 10⁻⁴ (1 in 4464)

5-year Remaining Life = 5.60 x 10⁻⁴ (1 in 1786)

The consequence of a collapse event, assuming the block is fully occupied at the time of a fire, has been estimated as (upper bound):

11.5 People (2.3 residence per flat)

20 People (4 residence per flat)

The total risk of death of a resident, has been estimated as:

6.44 x 10⁻³ per annum (2.3 residence per flat) (1 in 155)

1.12 x 10⁻² per annum (4.0 residence per flat) (1 in 89)

Outcome of Quantitative Risk Assessment Scenario 3 Charleton & Langton

The outcome of the assessment has shown that the estimated probability of a 'severe' flank wall fire creating the possibility of a progressive collapse event in one of the blocks is:

8.40 x 10⁻⁴ per annum (1 in 11905)

The probability of a flank wall fire causing a progressive collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = 4.20 x 10⁻⁵ (1 in 23810)

2-year Remaining Life = 1.68 x 10⁻⁴ (1 in 5952)

5-year Remaining Life = 4.20 x 10⁻⁴ (1 in 2381)

The consequence of a collapse event, assuming the block is fully occupied at the time of a fire, has been estimated as (upper bound):

7 People (2.3 residence per flat)

12 People (4 residence per flat)

The total risk of death of a resident, has been estimated as:

2.94 x 10⁻³ per annum (2.3 residence per flat) (1 in 340)

5.04 x 10⁻³ per annum (4.0 residence per flat) (1 in 198)

6.1.4. Scenario 4 - Internal Fire at level 1 Haviland & John Cozens



PLAN KEY

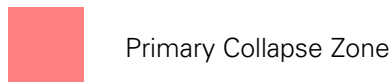
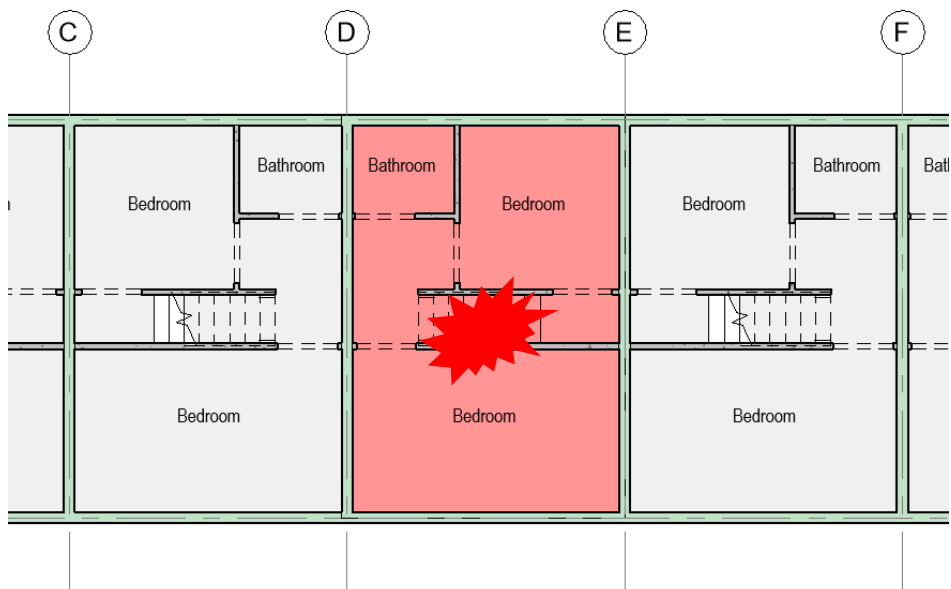


Figure 22 - Indicative Internal flat fire event location GF Plan



PLAN KEY



Figure 23 - Indicative Internal flat fire event location FF Plan

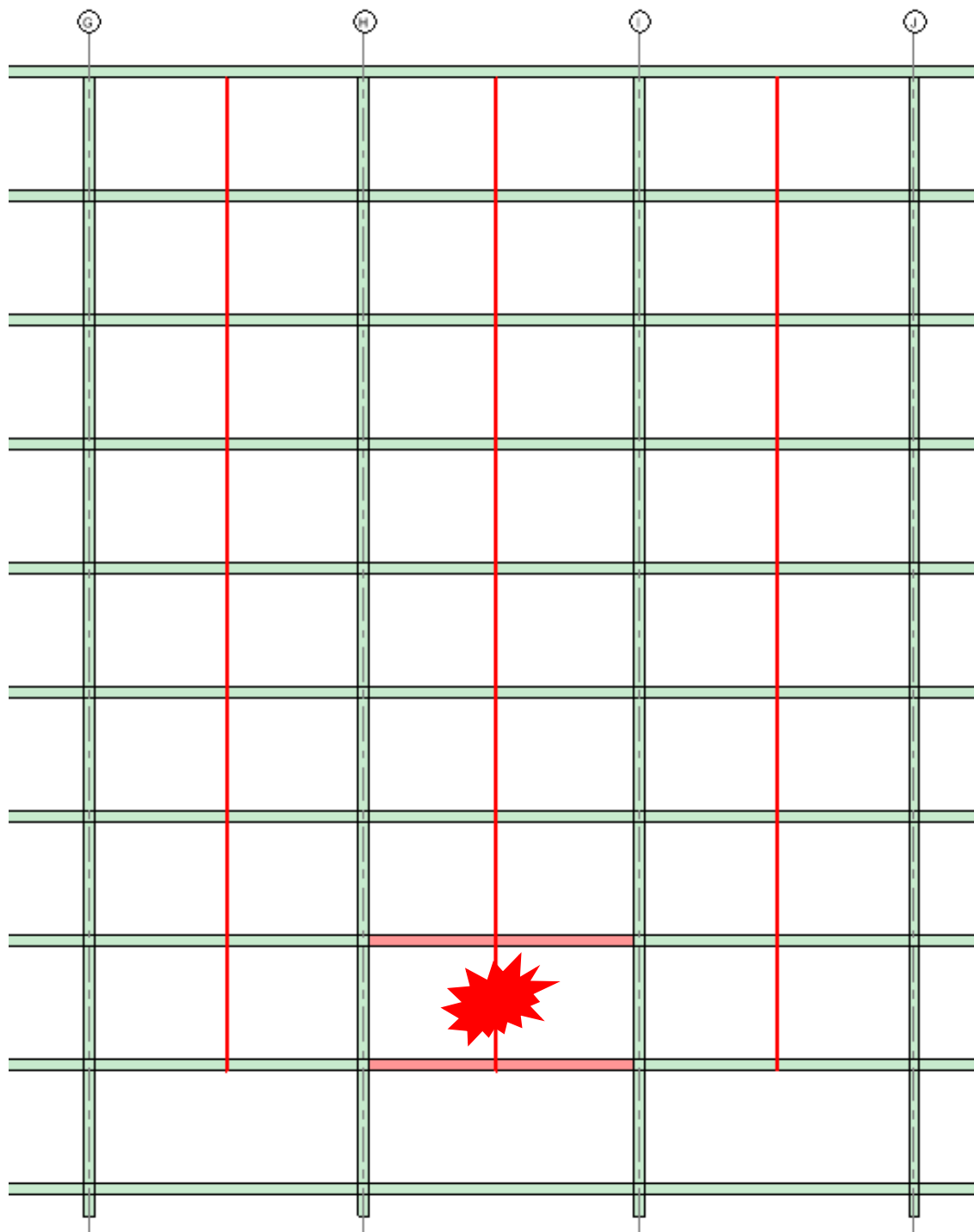


Figure 24 - Collapse mechanism if fire event occurs within an internal flat at level 1, Haviland & John Cozens house (elevation)

A fire event within any of the level 1 flats within Haviland house would lead to a failure of the floor slab above due to the low cover to reinforcement, this would then lead to the collapse of the floor below due to the overloading of the floor and collapse into the nursery below as shown in Figure 16. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 4 Haviland & John Cozens

The outcome of the assessment has shown that the estimated probability of a 'severe' internal flat fire creating the possibility of a collapse event in one of the flats above the nursery is:

1.40 x 10⁻⁵ per annum (1 in 71429)

The probability of an internal flat fire causing a collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = 7.00 x 10⁻⁶ (1 in 14)
2-year Remaining Life = 2.80 x 10⁻⁵ (1 in 35714)
5-year Remaining Life = 7.00 x 10⁻⁵ (1 in 14286)

The consequence of a collapse event, assuming the block is fully occupied at the time of a fire and accounting for a full classroom of 30 within the nursery, has been estimated as:

32.3 People (2.3 residence per flat)
34 People (4 residence per flat)

The total risk of death of a resident, has been estimated as:

2.26 x 10⁻³ per annum (2.3 residence per flat) (1 in 442)
2.38 x 10⁻³ per annum (4.0 residence per flat) (1 in 420)

6.1.5. Scenario 5 - Internal Fire above level 1 – Haviland & John Cozens



PLAN KEY

 Primary Collapse Zone

Figure 25 - Indicative Internal flat fire event location GF Plan

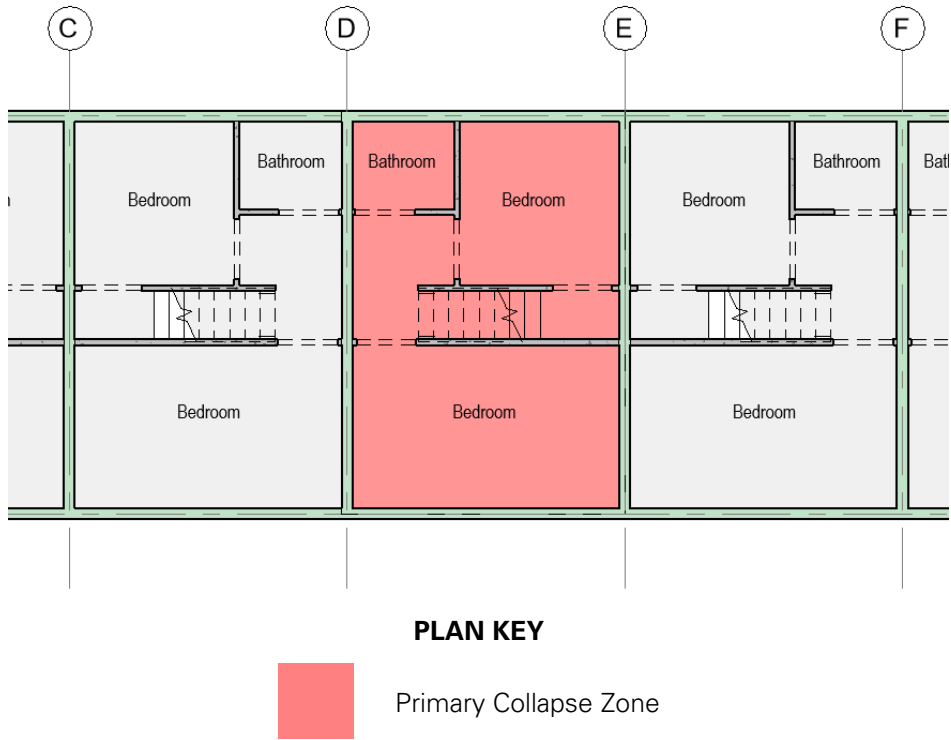


Figure 26 - Indicative Internal flat fire event location FF Plan

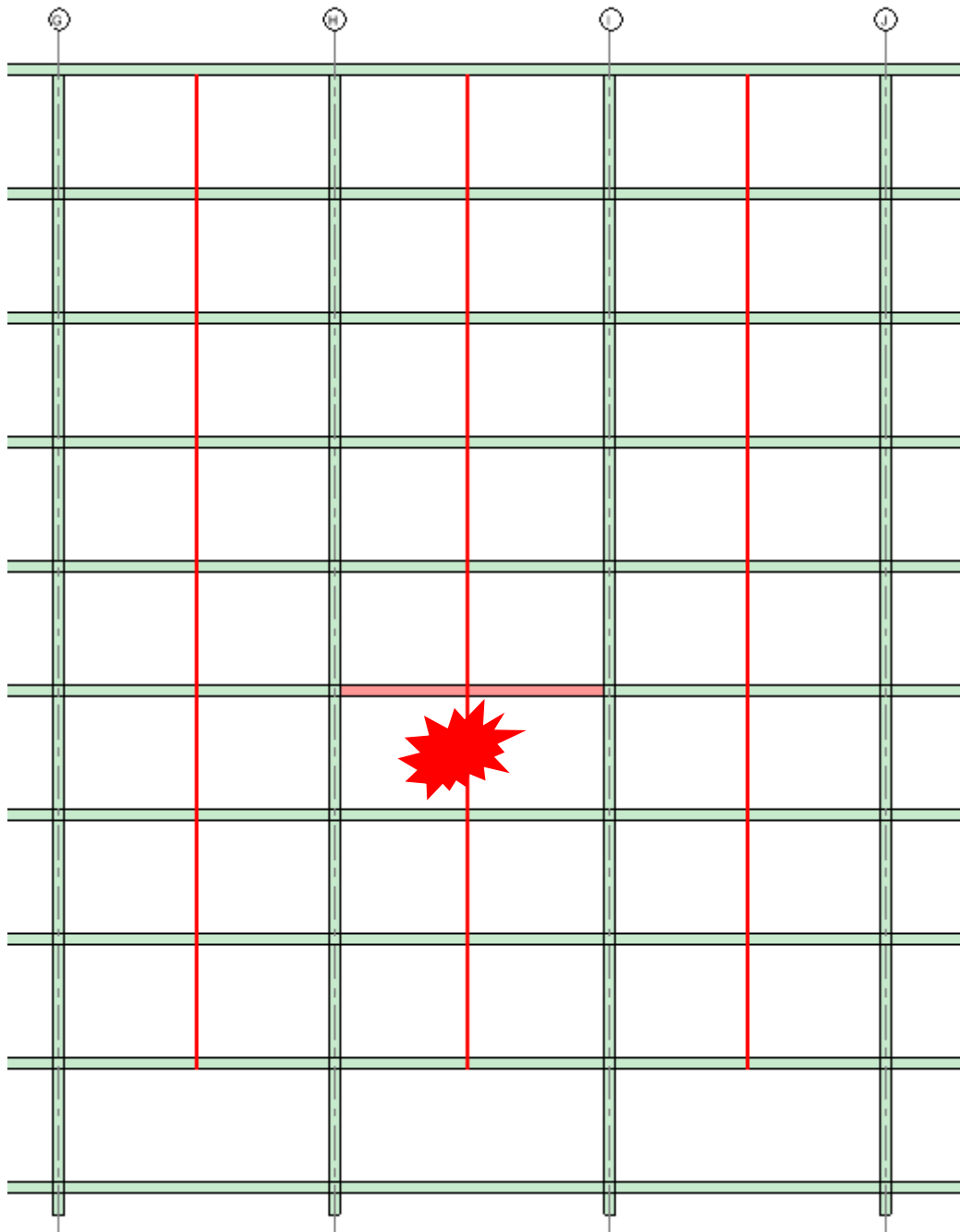


Figure 27 - Collapse mechanism if fire event occurs within an internal flat, Haviland & John Cozens house (elevation)

A fire event within any of the flats of the Haviland & John Cozens blocks at St Judes, above level 1 would lead to a failure of the floor slab above due to the low cover to reinforcement. Due to the existing strengthening frame the collapse in this scenario would be limited to only one floor as shown in Figure 19. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 5 Haviland & John Cozens

The outcome of the assessment has shown that the estimated probability of a 'severe' internal flat fire above level 1 creating the possibility of a collapse event in one of the blocks is:

4.20 x 10⁻⁵ per annum (1 in 23810)

The probability of a flank wall fire causing a progressive collapse event in the proposed remaining life spans of the blocks is:

6-month Remaining Life = 2.10×10^{-5} (1 in 47619)

2-year Remaining Life = 8.40×10^{-5} (1 in 11905)

5-year Remaining Life = 2.10×10^{-4} (1 in 4762)

The consequence of a collapse event, assuming the block is fully occupied at the time of a fire, has been estimated as:

2.3 People (2.3 residence per flat)

4 People (4 residence per flat)

As the collapse event only leads to a single floor collapse the consequence is only the occupants of one flat.

The total risk of death of a resident, has been estimated as:

4.83×10^{-4} per annum (2.3 residence per flat) (1 in 2070)

8.40×10^{-4} per annum (4.0 residence per flat) (1 in 1190)

6.1.6. Scenario 6 - Internal Fire above level 1 – Charleton House

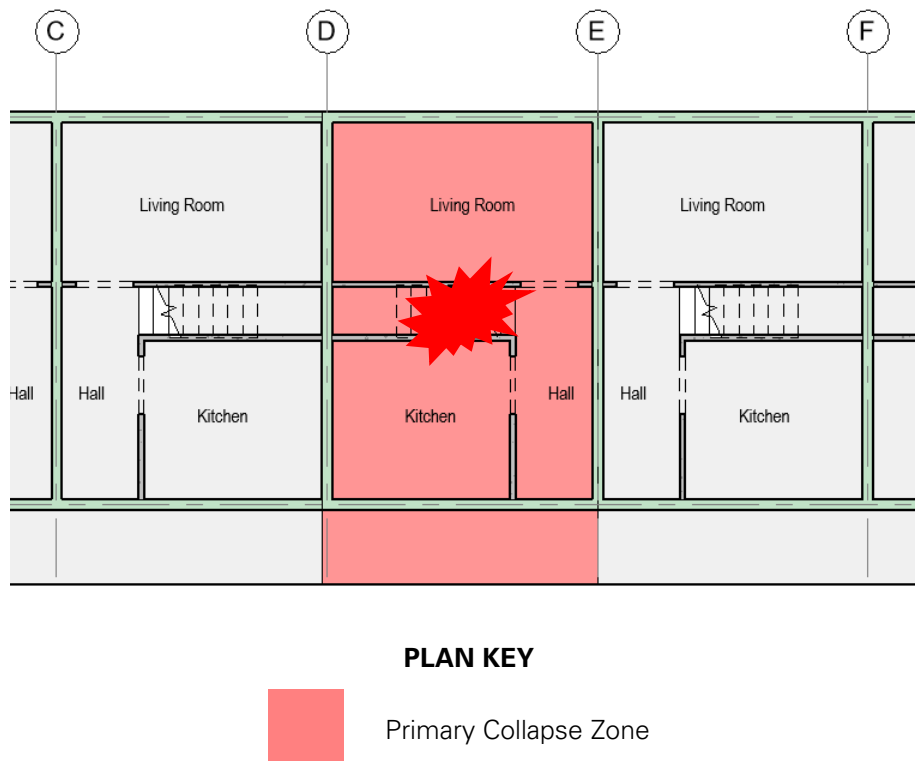


Figure 28 - Indicative Internal flat fire event location GF Plan

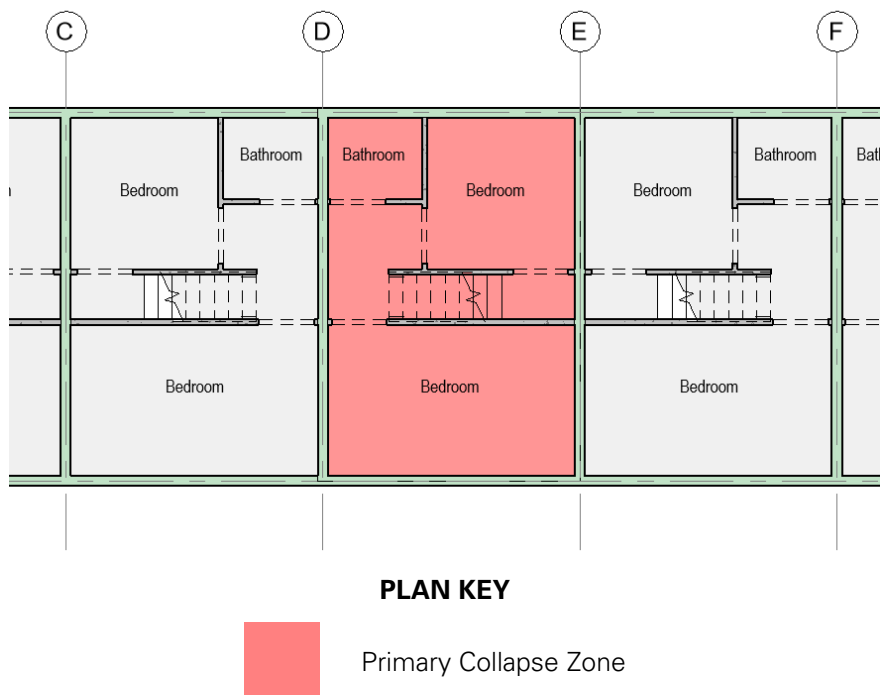


Figure 29 - Indicative Internal flat fire event location FF Plan

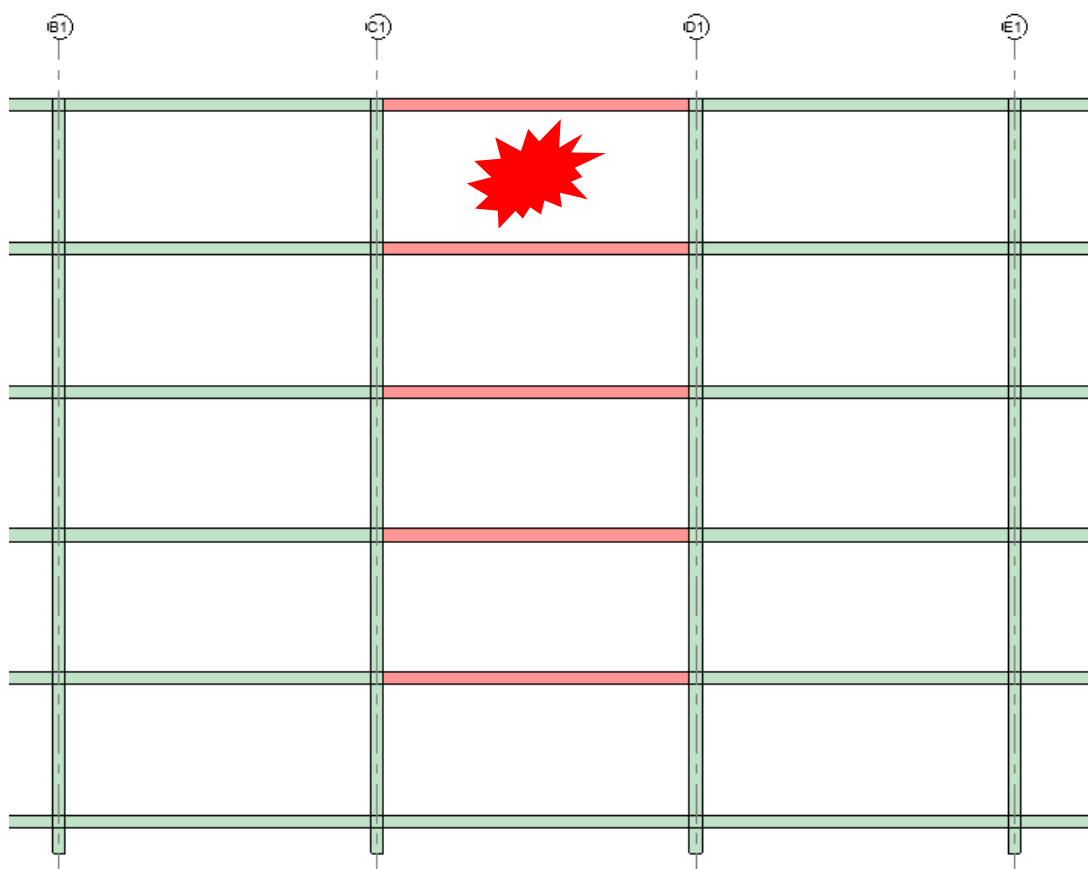


Figure 30 - Collapse mechanism if fire event occurs within top flat, Charleton house (elevation)

A fire event within any of the flats of Charleton House at St Judes, would lead to a failure of the floor slab above due to the low cover to reinforcement. Due to there being no strengthening frame in this block a pancaking effect would occur where the collapse of the slab above leads to the collapse of the slab below due to the weight of collapsed floor as shown in Figure 22. The associated number of potential fatalities and the probabilities can be seen below.

Outcome of Quantitative Risk Assessment Scenario 6 Charleton & Langton

The outcome of the assessment has shown that the estimated probability of a 'severe' internal flat fire creating the possibility of a collapse event in Charleton House is:

2.52 x 10⁻⁴ per annum (1 in 3968)

The probability of an internal flat fire causing a progressive collapse event in the proposed remaining life spans of Charleton House is:

6-month Remaining Life = 1.26 x 10⁻⁴ (1 in 7937)

2-year Remaining Life = 5.04 x 10⁻⁴ (1 in 1984)

5-year Remaining Life = 1.26 x 10⁻³ (1 in 794)

The consequence of a collapse event, assuming the block is fully occupied at the time of a fire, has been estimated as (upper bound):

7 People (2.3 residence per flat)






12 People (4 residence per flat)





The total risk of death of a resident, has been estimated as:

8.82 x 10⁻³ per annum (2.3 residence per flat) (1 in 113)

1.51 x 10⁻² per annum (4.0 residence per flat) (1 in 66)

6.1.7. Summary

TOTAL RISK SUMMARY HAVILAND & JOHN COZENS HOUSE						
Scenario	Risk of death (Lower Limit)	Risk of death (Upper Limit)	Probability (6 months)	Probability (2 years)	Probability (5 years)	ALARP
1	2.64×10^{-4}	3.52×10^{-4}	4.4×10^{-7}	1.76×10^{-6}	4.4×10^{-6}	
2	4.00×10^{-5}	8.80×10^{-5}	4.40×10^{-7}	1.76×10^{-6}	4.40×10^{-6}	
3	6.44×10^{-3}	1.12×10^{-2}	5.60×10^{-5}	2.24×10^{-4}	5.60×10^{-4}	
4	2.26×10^{-6}	2.38×10^{-3}	7.00×10^{-6}	2.80×10^{-5}	7.00×10^{-5}	
5	4.83×10^{-4}	8.40×10^{-4}	2.10×10^{-5}	8.40×10^{-5}	2.10×10^{-4}	

TOTAL RISK SUMMARY CHARLETON & LANGTON HOUSE						
Scenario	Risk of death (Lower Limit)	Risk of death (Upper Limit)	Probability (6 months)	Probability (2 years)	Probability (5 years)	ALARP
1	5.40×10^{-5}	7.2×10^{-5}	1.80×10^{-7}	7.20×10^{-7}	1.80×10^{-6}	
2	1.80×10^{-5}	3.60×10^{-5}	1.80×10^{-7}	7.20×10^{-7}	1.80×10^{-6}	
3	2.94×10^{-3}	5.04×10^{-3}	4.20×10^{-5}	1.68×10^{-4}	4.20×10^{-4}	
6	8.82×10^{-3}	1.51×10^{-2}	1.26×10^{-4}	5.04×10^{-4}	1.26×10^{-3}	

Comparison to UK Standard Benchmarks:

- The notional limit for the 'tolerable' limit of risk at work is set at 1×10^{-3} per annum (HSE, 1992)
 - The risk of death from progressive collapse in the event of a gas explosion or fire within the St Jude's Estate Blocks which has been calculated is therefore lower than this notional limit.
- The notional limit for the 'tolerable' limit of risk to any member of the public is set at 1×10^{-4} per annum (HSE, 2002)
 - The risk of death from progressive collapse in the event of a gas explosion or fire within St Jude's Estate Blocks which has been calculated is therefore lower than this notional limit.

6.2. ALARP

The values obtained from the quantitative assessment (based on the blocks being retained) have been compared against the ALARP graphs to determine which region the risks fall under.

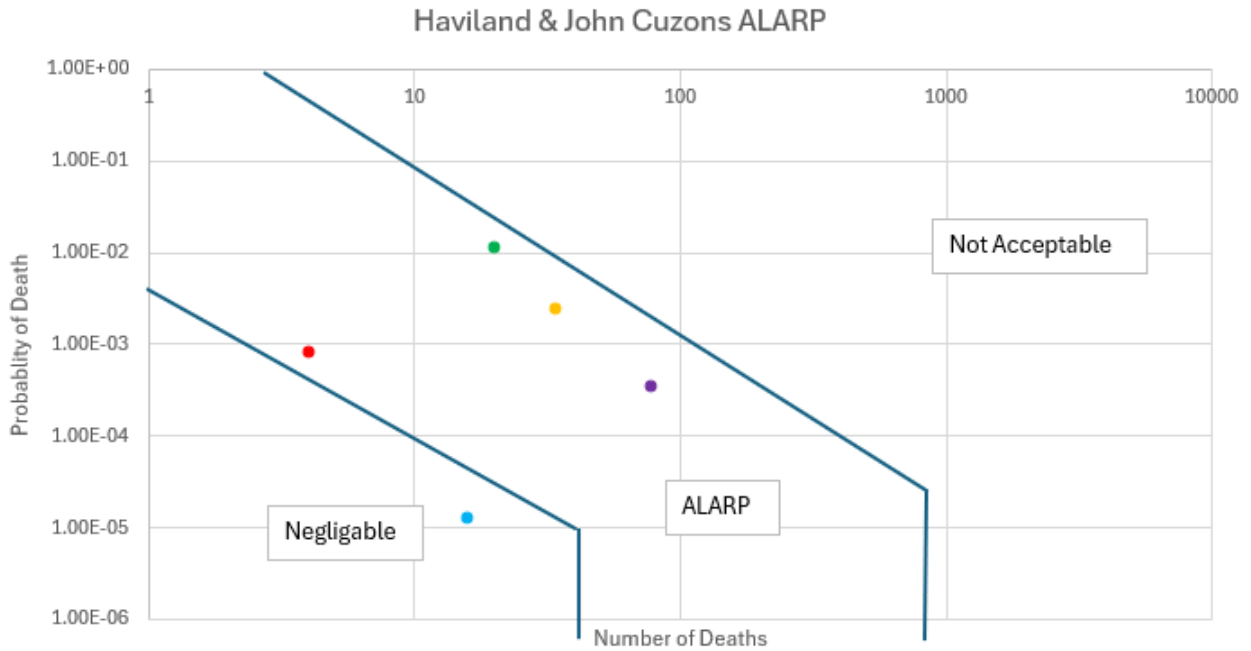


Figure 31 – ALARP analysis for the risk of ‘severe’ explosion causing progressive collapse to Haviland & John Cozens House

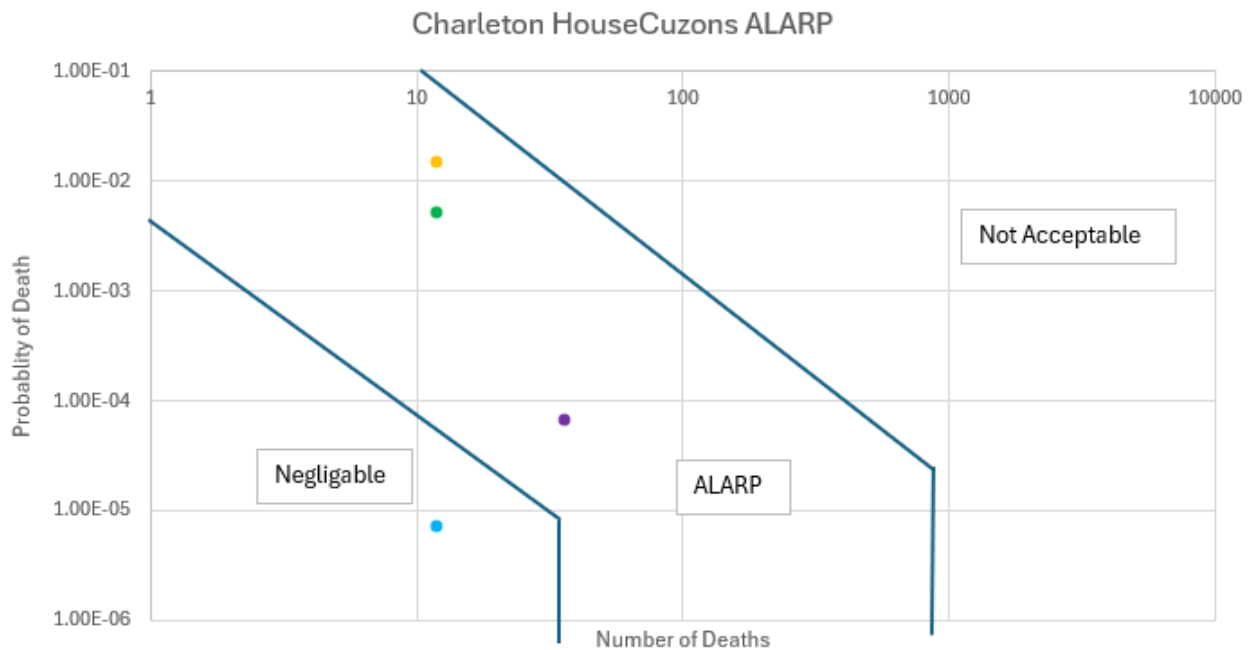


Figure 32 - ALARP analysis for the risk of ‘severe’ explosion causing progressive collapse to Charleton & Langton House

The ALARP analysis using either of the two graphs above shows that the risk of a of a ‘severe’ explosion from a non-piped gas supply (i.e., gas cannister etc) creating the possibility of a progressive collapse event in one

of the blocks lies within the region denoted as 'ALARP'. This outcome suggests that risk-reduction measures should be considered, judged on an economic basis. This appraisal is required under the HSE's requirements, where the duty holder has a responsibility to reduce risks wherever reasonably practical to do so. Strengthening measures should therefore be considered, with a cost-benefit analysis on the risk-reduction works to ensure the amount of expenditure deemed reasonable and cost-effective.

The ALARP analysis using either of the two graphs above also shows that the risk of a of death from a fire event creating the possibility of a progressive collapse event in one of the blocks lies within the region denoted as 'ALARP'. This outcome suggests that risk-reduction measures should be considered, judged on an economic basis. This appraisal is required under the HSE's requirements, where the duty holder has a responsibility to reduce risks wherever reasonably practical to do so. Fire protection measures should therefore be considered for installation.

6.3. Balconies and walkways

The walkways and balconies are prone to aggressive chemical conditions given the exposed nature of the reinforced concrete. The balconies and walkway connections and failure thereof has been noted as a concern due to the potential corrosion of the reinforcement and consequential failure of the material due to its age and exposed nature to weathering and chlorides.

The worst-case scenario of the walkway would obstruct or completely remove the escape route of the building concerned, into the public carpark below, building escape exit/entrance or nursery entrance.

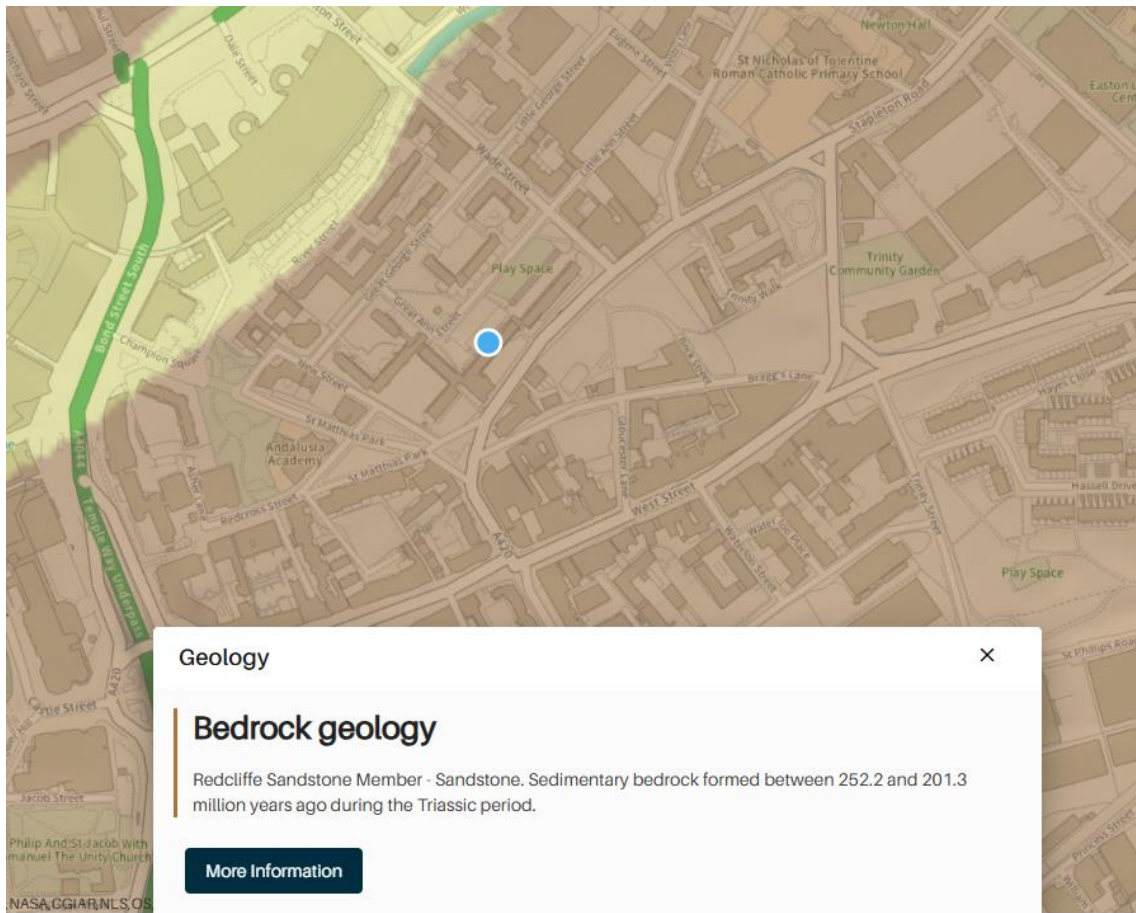
The worst case of balcony failure would be the failure of the top floor which impacts subsequently on the balconies below presenting an external collapse into either the nursery below or open space.

Monitoring and maintenance of these elements is therefore paramount to reduce the risk to an acceptable level.

In relation to fire and building collapse both elements are reliant on the main structural load bearing elements and will follow these collapse mechanisms should they occur.

6.4. Undermining or Compromise of Foundations

The existing record information for the St Judes blocks shows that the buildings are founded on a ground bearing concrete strip and pad regime, BGS data for the area shows that the founding strata is likely to be sandstone. The visual inspection of the block showed no signs of movement or settlement with regard to the footings. Based on this a foundation undermining scenario is unlikely through movement of the sub strata. A scenario of undermining due to adjacent construction is plausible however this should be mitigated through the party wall act, and requirements to prevent undermining thereof.



6.5. Aggressive conditions due to chemical or biological processes

Carbonation of the external concrete was noted throughout the St Judes blocks, this will eventually lead to corrosion of the reinforcement and spalling of the concrete as further detailed within our reporting. This will lead to a scenario whereby spalling concrete is highly likely to fall from height presenting a risk to the residents and public walking below. Whilst not expressly a building safety risk this scenario is considered to present a high degree of risk due to the significant weight of the objects and subsequent injury that can occur.

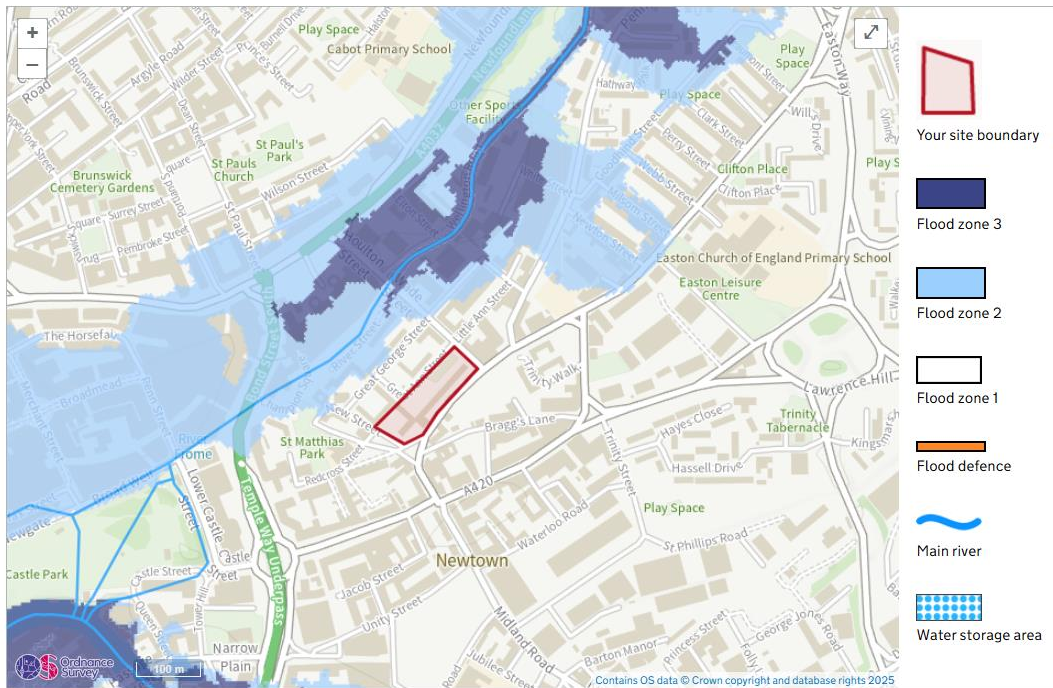
6.6. External Wall

The construction of the external wall was found to be improperly tied back to the main structural frame and the ties between skins were found to be inadequately provided. It is therefore plausible for a scenario to occur whereby the external wall is sucked off the building in an extreme 1:60-year occurrence. The most likely location for this is to the edge and corners of the building where the largest negative pressures can occur thereby sucking the external wall away from the building. The worst location identified for this is Haviland House where it would impact the nursery building in addition to the public that have access to the area below.

6.7. Flooding Incident through Rivers and Sea

Flood map showing the flood zone your site is in

The map shows the flood risk to your site and the surrounding area.



► [What the flood map shows](#)

The map above based on the environment agency flood map data shows that the risk from flooding is considered to be low to the site given the flood zone 1 allocation.

6.8. Gas Explosion

Gas fired dryers at ground floor and a boiler to the basement were noted to the St Jude's development. A piped gas supply presents a significant risk to any building however this is more so for LPS type structures given their inherent construction weaknesses.

The location of the dryers at ground floor leads to a full building collapse scenario should a gas leak occur and be ignited.

6.9. Vehicle Impact damage

The St Jude's Blocks are set back from the street scene in general. Both St Ann and Wade Street to the side and rear of the development are low speed roads with traffic calming measures or where areas of impact could occur have bollard protection. Therefore, vehicle impact from these highways is considered unlikely.

Lamb Street presents a greater risk, however the orientation, setback of the building and steel fence lor brick wall and in places treif kerbing and raised nature of the ground floor within places all provide further protection for the building in the unlikely event a vehicle was to veer off the road by accident

7. EXISTING CONTROL MEASURES

The existing control measures, in respect of fire, are some of those listed in Table 4 Key fire strategy precautions and considerations.

As noted earlier in our report, it is essential that the Council formulates and implements a robust safety management system, which meets the needs of the specific condition of the blocks at St Jude's.

Our benchmarking of physical fire safety control measures, as set out in the fire strategy, has been considered against the guidance in PAS 79 Parts 1 and 2, using the following process:

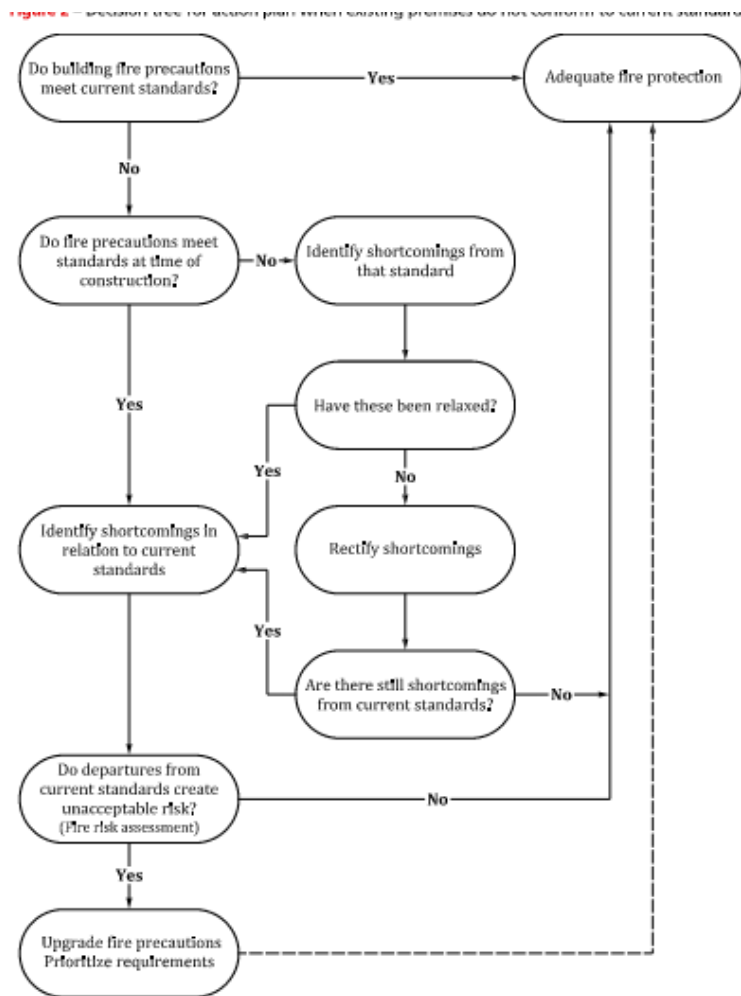


Figure 33 Decision tree for assessing fire precautions, taken from PAS 79

We have carried out a benchmarking exercise as part of preparing the retrospective fire strategy, replicated within this Building Safety Risk Assessment report for ease.

Table 5 Fire strategy benchmarking

Feature	On site condition	Design principle at time of construction	Current design philosophy (BS 9991)	Risk level	Mitigation and evaluation
Fire alarm in flats	Part 6 LD2 alarm generally, Part 1 L5.	Public telephone within vicinity of block.	Part 6 LD1 alarm, Part 1 L5.	Low	Potential to upgrade domestic alarms to LD1, which is reasonably practicable.
Common fire alarm system	None.	None.	None (other than L5) – although evacuation alert system to BS 8629 for HRBs.	Medium	As interim measure, until such time that sprinklers are installed and structural issues are remediated, a common alarm is recommended (to replace the full 'waking watch', which is compensating for risk currently).
Internal flat escape protection	Notional (original) fire door to lounge and kitchen.	Protected stairway, although noted that bedroom doors were sometimes omitted in practice.	Fully protected stairway (all habitable rooms with fire doors).	Low	Upgrade of internal doors as part of refurbishments, although less critical if sprinkler protection is installed and alarms are upgraded.
Compartmentation	Some limited unstopped penetrations behind boxing in wet room, identified in Type 4 fire risk assessment.	Flats as fire-resisting compartments.	REI60 compartments.	Medium	Carry out fire-stopping as part of flat refurbishments. The installation of sprinkler protection would provide some compensation.
Sprinkler protection	Town mains sprinklers in refuse store only.	Not required.	BS 9251:2021 Category 4.	High	Recommendation of fire strategy is to retrofit sprinkler protection in line with current guidance, to alleviate structural concerns (see point below).
Horizontal routes – design and protection	Dispersal via open walkways. Dead-end in Langton has fire-resisting construction above 1100mm and upgraded self-closing FD30S entrance doors.	Dispersal via open walkways. Dead-ends with 1100mm fire-resisting construction and fire doors.	Dispersal via open walkways. Dead-ends with 1100mm fire-resisting construction and fire doors.	Acceptable under guidance	Some potential to use channelling screens, representative of improvement, as part of necessary walkway refurbishment (needed due to concrete degradation).
Vertical route design	Multi-stair (other than for Langton, which is single stair, shared with 2x other blocks).	Multi-stair.	Multi-stair.	Acceptable under guidance	By design, the provision of vertical escape routes is reasonable.
Vertical escape route protection	Staircases generally partially open (permanently-ventilated), although Stair 3 has been enclosed with u-PVC windows (non-fire-resisting).	Permanently-ventilated stairs.	Enclosed, protected stairs.	Medium	Replace or overboard non-fire-resisting windows to Stair 3, given that this is a critical single escape route for residents of Langton House. In the longer-term, consider enclosing all staircases, although the priority is Stair 3 given the criticality of this route.
Vertical route – persons with restricted mobility	Original fire lifts.	Original fire lifts.	Fire-fighting lift and evacuation lift (separate lifts), with temporary waiting space and emergency voice communication system.	Low	Potential to upgrade lifts to the extent that is reasonably practicable, using BS 8899 guidance. Provision of EVCS.
Loadbearing capacity in case of fire (structure)	R60 generally, but with areas of identified weakness within the Ridge structural reports.	Assumed 60-minute, but pre-Ronan Point, without measures to prevent disproportionate collapse.	R60 with sprinklers.	High	Our principal fire strategy recommendation is to retrofit sprinkler protection, which will mitigate many of the failure scenarios in fire (although other structural deficiencies will still need to be addressed, in accordance with Ridge structural reports). Alternatively, structural deficiencies could be addressed.
External wall	Combustible timber over-cladding to front blockwork walls. Combustible spandrel panels under windows have been retrofitted historically.	Non-combustible walls, although historically decorative timber cladding is known to have been used.	A2-s1, d0 for all wall materials within scope of the amended Building Regulations.	Medium	Some investigation carried out, but not currently full FRAEW, which should be updated and remediation carried out as considered necessary by that report.
Fire-fighting shaft	Fire lift and original fire stairs, with dry risers.	Fire lift and original fire stair, with dry riser.	Modern fire-fighting shaft with fire-fighting lift and REI120 protection.	Low	Potential to upgrade lifts to the extent that is reasonably practicable, using BS 8899 guidance.

8. ASSESSMENT OF CURRENT RISK

We have assessed the current risk level, based on the considerations within this report, and as discussed with relevant stakeholders in the Building Safety Workshops.

We have adapted the risk matrix contained in PAS 79 to illustrate the risk level associated with building safety risks, as follows:

Likelihood of Building Safety Risk	Classification of Building Safety Risk		
	Likely consequences of Building Safety Risk		
	Slight harm	Moderate harm	Extreme harm
Low	Trivial risk	Tolerable risk	Moderate risk
Medium	Tolerable risk	Moderate risk	Substantial risk
High	Moderate risk	Substantial risk	Intolerable risk

Figure 34 Adapted risk matrix from PAS 79

The likelihood of a major accident scenario is considered to be low to medium.

The consequences of a major accident scenario are extreme.

We would therefore assess the overall risk as moderate to substantial, principally due to the structural engineering concerns relating to structural integrity and, potentially, loadbearing capacity in case of fire.

Our recommendations are therefore formulated with the intention of reducing the likelihood of building safety risks materializing, and providing additional protection against the consequences, should such risks materialize.

9. ALL REASONABLE STEPS

In formulating what, in our opinion, are reasonable steps, we have paid consideration to our interpretation of proportionality. This is, to great extent, subjective, and is subject to a degree of interpretation based on risk perception.

The intention is to provide guidance to the Council, which has been discussed in the Building Safety Workshops, as to steps that can be taken to bring the risk to a tolerable level, to enable continued long-term occupation of the blocks at St Jude's.

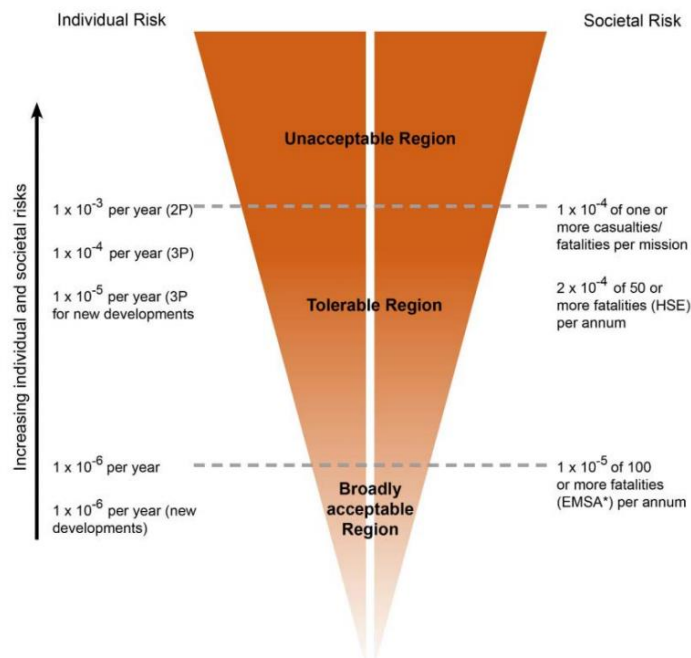


Figure 35 As low as is reasonably practicable diagram, taken from the Health and Safety Executive

We have set out our recommendations in both the fire strategy report, the associated fire risk assessments, and the structural reports, to assist with the Council's decision making.

Ultimately, as the Principal Accountable Person, proceeding with recommendations is a decision for the Council.

For completeness, our high-level recommendations are set out on the following pages.

Table 6 Recommendations set out in the fire strategy

Area	Recommendation	Criticality	Timescale
Temporary fire alarm to replace waking watch	We recommend that a full fire alarm is installed, with heat detectors in all flats in which structural deficiencies identified by structural engineers may cause collapse scenarios. The intention of the alarm would be to provide warning to potentially affected areas, to enable occupants to evacuate prior to collapse in fire, and to summon the fire and rescue service.	Medium	Immediate
Targeted resident engagement and person-centred fire risk assessments	We recommend that the Council continue to engage with residents, to identify residents who may require assistance in an emergency, so that the Council can formulate plans for these residents. Engagement should also raise awareness regarding avoidance of special hazards, including e-mobility devices, gas cannisters, and other hazards that could result in fast fire growth, hoarding practices, etc.	Medium	Immediate
Remedial work to structure, where lower than R60 or prone to failure, and/or sprinkler system installation	Address points raised in the Ridge structural reports to ensure that the performance of the structure meets the requirements of the fire strategy – the loadbearing capacity in case of fire issues identified can be mitigated by sprinkler protection as the future strategy. In any case, we strongly recommend retrofitting sprinklers at St Jude's to cover these blocks.	High	Short
Protection of Stair 3 (and, in the longer term, review Stairs 1 and 2, although this is low priority)	We recommend that current unprotected apertures to Stair 3 are upgraded with fire-resisting construction or fire-resisting glazing, to protect against fire and smoke entering the stair from a fire in Haviland or Charleton, which could compromise escape from Langton. Stairs 1 and 2 are open, but are low priority to fully enclose, and indeed this may create secondary issues.	Medium	Short
Review of secure information box and wayfinding signage	Review contents of SIB, as well as wayfinding signage, and update as necessary.	Medium	Short
Implement resident engagement strategy and Mandatory Occurrence Reporting	Finalize resident engagement strategy and processes for Mandatory Occurrence Reporting in accordance with requirements made in secondary legislation under the Building Safety Act.	Medium	Short
External wall – combustible materials	Given the recorded presence of combustible materials, a full FRAEW should be carried out, followed by any required remedial work.	Medium	Medium
Review fire-stopping issues and address any outstanding items	Review findings from previous Type 4 fire risk assessment and ensure that these have been addressed globally throughout the blocks.	Medium	Medium
Domestic alarms	Upgrade existing internal alarms within flats to Grade D1 Category LD1 in accordance with BS 5839-6.	Low	Medium
Internal flat doors	Upgrade doors within flats to minimum of E30 fire doors at time of refurbishment, as well as transom panels above doors, or, more ideally, E30-Sa doors (which would be	Low	Long

	above minimum standard). The need to replace doors could be reduced through installation of sprinklers.		
Fire lift	Upgrade in accordance with the guidance in BS 8899, at the time of future lift refurbishment.	Low	Long
Emergency voice communication system	As part of any upgrade, provide an EVCS in accordance with BS 9991 and BS 5839-9.	Low	Long
Evacuation alert system	Following completion of sprinkler system installation and/or structural remediation, change common fire alarm to EAS to BS 8629.	Low	Long
Channelling screens	At the time of structural repairs to walkways, we recommend that 500mm channelling screens are provided between individual dwellings, suspended from the walkways.	Low	Long

Structural Key Findings and recommendations

The key findings of the intrusive structural investigations against BRE 511 are detailed in the table below along with further assessment criteria for fire, external walls, balustrades, balconies, chemical resistance to attack and foundations:

Table 7 - Summary of the LPS Robustness Criteria for the St Judes Blocks.

LPS CRITERION	ASSESSMENT		COMMENTS
	Charleton House, Haviland House, & John Cozens House	ASSESSMENT Langton House	
Criterion 1 Adequate ties within joints	Insufficient	Sufficient	St Judes contains class 2B buildings that require both vertical and horizontal ties. Haviland, John Cozens and Charleton Houses The horizontal ties were found to be insufficient to withstand the required imposed forces due to inconsistencies in their installation. Investigations also found no adequate vertical ties between wall panels.
Criterion 2 Adequate strength to resist Accidental Loads without the steel frame	Insufficient	Doesn't apply	The floors cannot resist the overpressure requirement for non-piped gas supply of 17kPa. The wall panels appear to be satisfactory up to level 2.
Criterion 2 Adequate strength to resist Accidental Loads with the steel frame	Partially Insufficient	Doesn't apply	The floors can resist the overpressure requirement for non-piped gas supply of 17kPa, due to the steel frame strengthening being utilised. The wall panels pass up to level 2 given the additional weight of vertical loads above them; above this level the vertical load is insufficient to assist in resisting the flexure they experience.
Criterion 3 Ability to mobilise alternative load paths	Insufficient	Doesn't apply	The use of alternative load paths is not considered to be feasible, as each element is deemed critical to the system's integrity. The connections between elements are best described as flexible, with joint stiffness playing a role rather than functioning as true pin connections. Consequently, any failure within the system is likely to trigger a mechanism, leading to disproportionate collapse.

Table 8 – Building Safety Assessment criteria summary for the St Judes Blocks.

ASSESSMENT CRITERIA	ASSESSMENT	COMMENT
Fire Resistance Without the steel frame	Insufficient	A fire resistance of 60 minutes is estimated for the structure; the critical element considered is the floor which has a low reinforcement cover. A 90-minute requirement is needed.
Fire Resistance With the steel frame assuming fire protection	Sufficient	An estimated fire resistance of 90 mins can be achieved provided the steel frame is fireproofed to a similar effect. (Not applicable to Langton House & Charleton House)
Carbonation Depth of carbonation into concrete	Insufficient	Carbonation testing indicates that, in some areas, the passivity front has surpassed the reinforcement, and the concrete is at risk of spalling due to the corrosion and expansion of the steel reinforcement.
External Walls External masonry wall support and tie details	Insufficient	The external masonry walls on the building, consisting of two layers of blockwork, were found to be inadequately tied to the primary concrete walls and floors. With improper ties the masonry panels pose a risk of collapse in high wind loads.
Balustrades Condition of metal balconies	Insufficient	Balustrades around the building, particularly along the shared access walkways, were noted to be severely corroded with several instances of temporary propping being used to support the balustrades. The condition of the balustrades requires replacement of the full system.
Balconies	Insufficient	The visual condition of the concrete balconies, combined with carbonation results indicate that carbonation level is high increasing the risk of spalling. The increased risk category of the nursery below should be considered as part of any following risk workshops.

In addition to the inspection and assessment of the concrete frame, visual surveys of the overall building condition was carried out. Areas reviewed include the external wall cladding, handrails and balconies. It was found through the intrusive investigations that the masonry infill panels that span between the structural concrete frame have very few walls ties both between the cavities and back to the structural frame. The balconies to the south side of John Cozens were noted to have spalling concrete with incidences noted where sections of the balconies had collapsed.

The foundations have not been specifically intrusively investigated, but no adverse movement has been noted during the investigation and therefore this suggest the foundations are performing adequately at this point in

time. To mitigate any long-term risks of the foundations degrading primarily against chemical attack, further investigations of the footings could be completed.

Recommendations

Considering the above results of the assessment & the general condition of the block, our recommendations for risk reduction measures, for Langton House these are incorporated from the taller Haviland House as it shares the lift core and stair structure with Haviland House:

Immediate Term (0-6 Months)

9. Continuation of the updated building evacuation strategy to a simultaneous evacuation, with the continued waking watch across St Jude's. This is a short-term measure in line with Government guidance (Evacuation guidelines for fire and rescue services (accessible))
10. Installation of fire detection and alarm system (BS5839 - 1 Cat L5) to replace waking watch in accordance with NFCC guidance
11. Regular inspections for and immediate ban on:
 - a. any gas canister/bottles/cylinders being used or stored within the dwellings, along with a complete ban on any other potentially explosive substances (including high-capacity batteries which may be found in items including e-scooters/e-bikes and some newer models of mobility scooters).
 - b. Portable gas cookers – viewed as high risk as they have the potential to be left on whilst unignited, causing a leak that may then be unintentionally ignited, causing an explosion and excessive pressures being applied on the structures.
 - c. To limit hoarding to minimise fire loads in flats
12. Removal of gas supply generally, in particular to the laundry rooms and presence of diesel generators near the building that could increase the risk of an accidental loading scenario.
13. Full condition survey of the balustrades around St Judes, temporary support provided to those in a critical condition with a design and programme developed to replace all the balustrades.
14. Detailed condition surveys of the balconies and walkways due to carbonation of the concrete to identify deteriorated and degraded areas or the structure to enable repairs as necessary.
15. Erection of the non-combustible scaffold fan to the base of the block to prevent falling concrete.
16. Detailed wind analysis of the block to be undertaken to assess peak forces on the external masonry wall with remedial design / strengthening options.

Medium Term (6 months -2 Years)

44. Installation of sprinkler protection to BS 9251 Category 4 and conversion of existing detection system, or enhancement of the fire protection of the structure to increase the fire resistance.
45. Repairs to concrete on residential balconies and communal walkways and Removal of residential balconies.
46. Carry out an options appraisal to understand the cost benefit of upgrading the structure to resist disproportionate collapse then (Not applicable to Langton House):
 - c. Upgrade the structure through ties or strengthening to resist disproportionate collapse forces and provide a robust structure.
 - d. If strengthening works are unviable re-assess the risk measures in place and determine any further measures that will enable the block to remain in service over a short term until decant can be undertaken for demolition.
47. Repairs and or replacement of the residential balconies due to deterioration from carbonation.
48. Remedial repairs to the escape walkways following detailed surveys.
49. Remedial repair works to the external masonry wall, or overclad the existing envelope.

50. If the block is to be retained investigate and assess the foundations for deterioration and chemical attack.

Long Term (3-5 years+) Continued Inspections

Considering the buildings type and height the following recommendations are made, which align with BRE recommendations:

- d) A programme of visual inspections at intervals of 1 year, 2 years and 5 years following this initial appraisal, and then every 5 years subsequently to the external envelope (including parapets and balconies) to identify potential hazards from falling debris.

- e) Visual inspections at 10-year intervals to structural joints which are vulnerable to water penetration; locations such as flank walls and roofs.

- f) Full appraisal of the whole building at 20-year intervals

Should the risk reduction measures fail to effectively control the risk of disproportionate collapse to acceptable levels, and investment into strengthening works prove uneconomically viable, demolition of the block might be considered as a final long-term approach for the block. However, we would recommend that this decision should only be taken following the completion of a remedial strengthening design review, supported by the risk and cost benefit analyses recommended above to ensure that demolition is the best approach.



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