

173-175 FRIAR STREET, READING

FIRE ENGINEERING REVIEW

ES1652/zf/01nor
19th October 2020

INTRODUCTION

173-175 Friar Street will be a new hotel building which will have eight storeys of hotel accommodation above ground, with back-of-house and staff areas at Level -01. The top storey height of the building will be 23.1m above the adjoining ground; and Level -01 will be 3.5m below ground.

This technical note summarises a fire engineering review of the proposals and is based on the guidance in the Approved Document B (ADB). Unless otherwise noted below, the fire strategy should be designed in line with this guidance document.

The technical note does not consider the implications of any particular hotel brand standards. This should be confirmed as hotel brand standards can vary significantly from the Building Regulations and could affect the fire strategy.

ACTIVE FIRE SAFETY SYSTEMS

Sprinklers

On the basis that the building height is less than 30m, the building could be designed without sprinklers.

However, to support the fire engineering solutions outlined below; the hotel building should be provided with an automatic sprinkler system throughout. The sprinkler system should be designed, installed, and maintained in accordance with BS EN 12845.

Automatic Fire Detection and Alarm

The building should be provided with a Category L1 automatic fire detection and alarm throughout. The automatic fire detection and alarm should be designed, installed, and maintained in accordance with BS 5839-1.

Smoke Venting

Smoke venting will be required in the Basement and fire fighting shaft. This is discussed further in the relevant sections.

MEANS OF ESCAPE

Travel Distances

Bedrooms

Travel distances should be within 9m measured from the furthest point of the bedroom to the entrance door. This is achieved as drawn.

Bedroom Corridors

Travel distances within the bedroom corridors should be limited to 9m in a single direction and 18m where more than one direction of travel is available. These travel distances should be achieved after fitout.

As drawn, there are the following travel distance extensions:

- Levels 01-04:
 - Up to 12.5m in a single direction from the southeasternmost bedrooms;
 - Up to 11m in a single direction from the northeasternmost bedrooms; and,
 - Up to 10m in a single direction from the northwesternmost bedrooms.
- Level 05:
 - Up to 12.5m in a single direction from the southeasternmost bedrooms.
- Level 06:
 - Up to 11m in a single direction from the southeasternmost bedrooms.

JGA can develop a fire engineering solution to support these extended travel distances based on the provision of an automatic sprinkler system and a Category L1 automatic fire detection and alarm system throughout the hotel building.

Ancillary Areas

Travel distances elsewhere within the hotel building should be limited to 18m in a single direction and 35m where more than one direction of travel is available. These travel distances should be achieved after fitout.

These travel distances are achieved as drawn with the exception of the Female WC at Level 00, where there is a single direction travel distance of up to 22m. To resolve this, an additional door should be provided from the WC lobby into the Foyer.

Places of Special Fire Hazard

Travel distances within places of special fire hazard, e.g. some plant areas, should be limited to 9m in a single direction and up to 18m where more than one direction of travel is available. These travel distances should be achieved after fitout. Places of special fire hazard should be confirmed by the M&E Engineer.

Stair Design

Stair 01

The ADB recommends that occupants should not need to escape through one stair to reach another stair; however, it is acceptable for occupants to pass through one stair lobby to reach another stair.

As drawn, occupants within the northern bedrooms will need to escape via Stair 01 to reach Stair 02 at Levels 01 to 05; and, occupants within the back-of-house areas at Level -01 will need to escape via Stair 01 to reach Stair 03. To resolve this, Stair 01 should be provided with a protected lobby as shown indicatively in Figures 1-3 below.

If any of the plant rooms at Level -01 accessed from the stair lobby are regarded as places of special fire hazard; the lobby should be provided with a minimum 0.4m² of permanent ventilation, or be protected by a mechanical smoke control system.

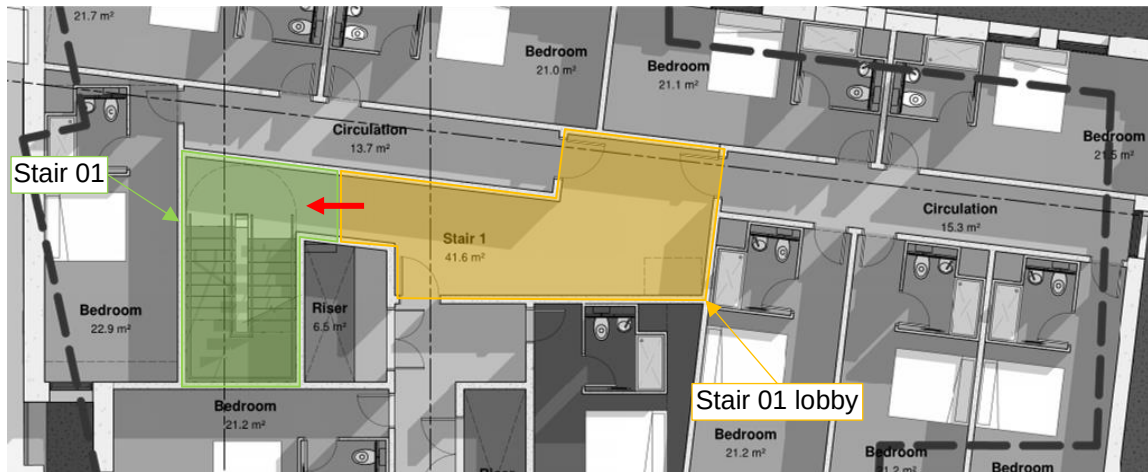


Figure 1 – Stair 01 arrangement at Levels 01 to 04

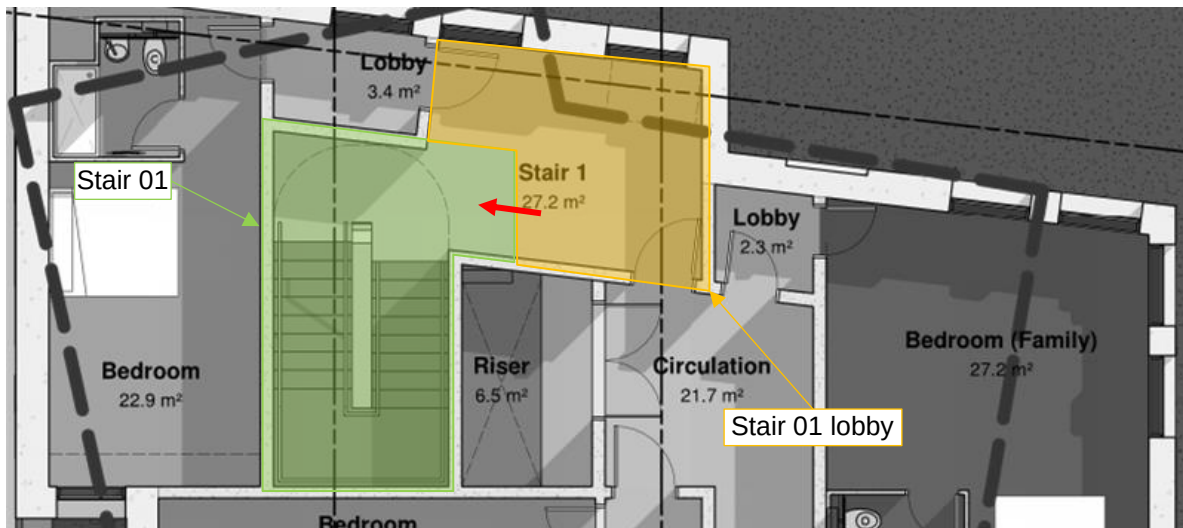


Figure 2 – Stair 01 arrangement at Level 05

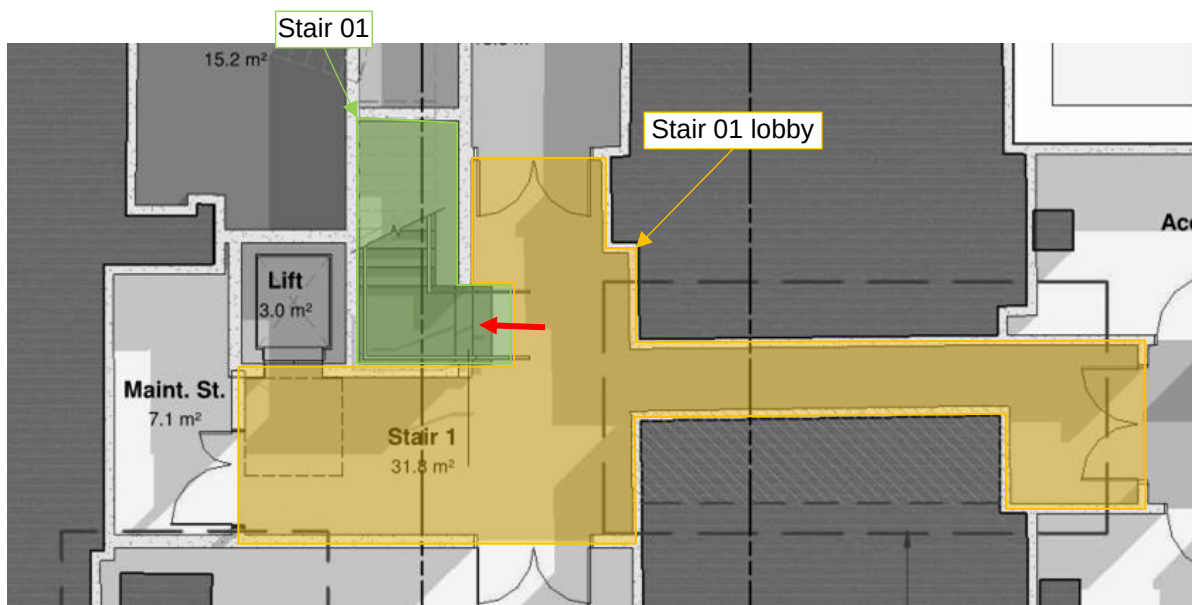


Figure 3 – Stair 01 arrangement at Level-01

Stair 03

The ADB recommends that each protected stair should be discharged directly to a final exit, or by a way of a protected passageway to a final exit.

As drawn, Stair 03 terminates at Level 05 and discharges into a circulation corridor which leads to Stair 01. Therefore, to meet code guidance, Stair 03 should be extended down and discharge to outside at Level 00. Alternatively, JGA can develop a fire engineering solution to support this arrangement based on the following fire safety provisions:

- Automatic sprinkler system throughout the building;
- The circulation corridor providing access from Stair 03 to Stair 01 enclosed with construction achieving 60 minutes fire resistance; and,
- All bedrooms separated from Stair 03 and the circulation corridor with protected lobbies.

This is shown indicatively in Figure 4 below.



Figure 4 – Stair 03 configuration

Stair Lobbies

The ADB recommends that in buildings with a top storey height more than 18m above the adjoining ground, all protected stairs should be provided with protected lobbies on each floor level. As drawn, Stair 01 is open to the accommodation at Levels -01 and 00; and, Stair 02 is open to the accommodation at Level 00. Therefore, these stairs should be provided with protected lobbies separating the stairs from the accommodation.

Escape through a Pend

It is proposed that Stair 03 and occupants escaping via the Foyer exit discharge into an enclosed courtyard with ultimate escape via covered pends. This includes north and south escape routes from the enclosed courtyard; and, the route via Market Way onto Market Place. JGA will need to develop a fire engineering solution to support this arrangement based on the external walls and ceiling within the pend achieving at least 60 minutes fire resistance and being constructed from European Classification A1/A2 materials.

Occupancy

The occupancy of the proposed hotel has been calculated as follows using the ADB's floor space factors where appropriate:

- Bedroom 2 occupants per bedroom;
- Restaurant/Bar/Staff Room 1m²/person;
- Office/Reception/Foyer/Gym 6m²/person;
- Kitchen 7m²/person;
- Back-of-House/Storage/Plant 30m²/person.

Based on the above, the total building occupancy will be approximately 805 persons:

Floor Level	Occupancy
Level -01	71 persons
Level 00	363 persons
Level 01	63 persons
Level 02	71 persons
Level 03	71 persons
Level 04	61 persons
Level 05	45 persons
Level 06	37 persons
Level 07	23 persons

Table 1 – Proposed hotel occupancy breakdown

Stair Widths

To provide sufficient escape capacity for occupants on the upper floors, each stair should be at least 1m wide (note fire fighting stairs should be at least 1.1m between walls or balustrades).

Stairs serving Level -01 should achieve a clear width of at least 1m.

The final exits to the escape stairs should be at least as wide as the escape stairs they serve.

Level 01 Escape Capacity

There could be up to 363 occupants at Level 00 of the proposed hotel. To provide sufficient escape capacity, the revolving doors from the Restaurant/Breakfast and the Foyer (and connecting ramp) should each achieve a clear width of at least 1.3m. The revolving doors should be designed for escape and should open automatically upon fire alarm activation or power failure.

Door Swing and Locking Strategy

Doors from rooms occupied by more than 60 persons should swing in the direction of escape. The doors may need to be recessed so that they do not obstruct the escape routes in the corridors into which they open.

Doors on escape routes from rooms occupied by more than 60 persons should not be locked or should be provided with panic exit devices.

Electric locks should only be fitted in staff only areas, i.e. areas occupied by awake and familiar occupants only.

Bedrooms can be provided with locks that are operated from the outside by a key and from the inside by a handle, as specified in BS EN 179.

Cross Corridor Fire Doors

Every corridor more than 12m long which provides connects two or more storey exits should be subdivided with 30 minute fire rated construction, including 30 minute smoke-sealed self-closing fire doors, positioned approximately in the middle of the corridor.

Every dead-end corridor exceeding 4.5m in length should be separated from any part of the corridor which provides escape in more than one direction or continues from one storey exit to another with 30 minute fire rated construction, including 30 minute smoke-sealed self-closing fire doors.

As drawn, cross-corridor doors are provided within the main corridor providing escape in more than one direction at each storey with the exception of Level 07. Cross-corridor doors should be provided at Level 07 as shown indicatively in Figure 5 below.

Cross-corridor doors should be provided within the dead-end corridors past the lobby door to Stair 02 at Levels 01-06 as shown indicatively in Figure 6 below.



Figure 5 – Provision of cross-corridor doors at Level 07

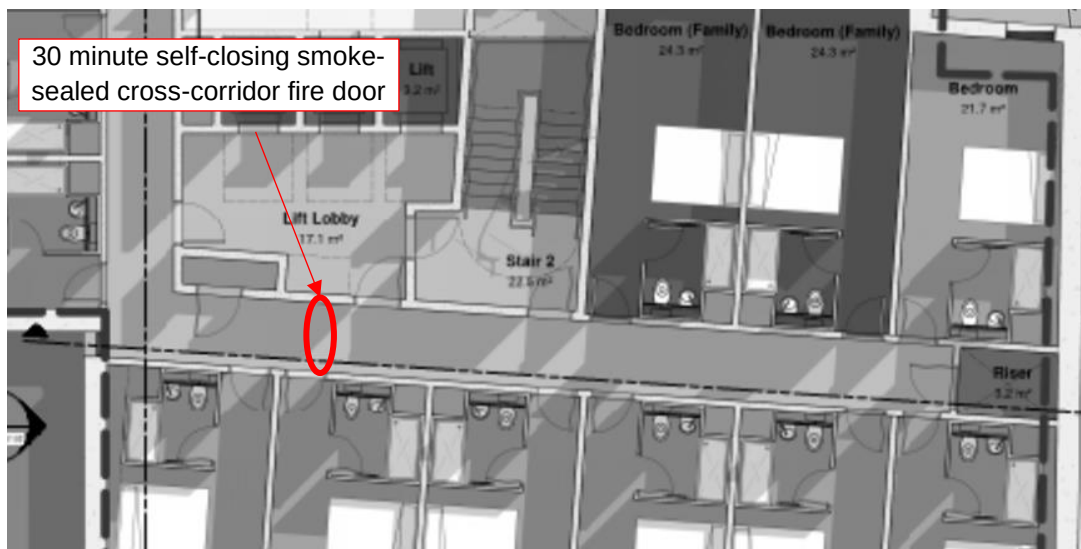


Figure 6 – Provision of smoke control cross-corridor doors to dead-ends at Levels 01-06

Refuges

Refuges measuring at least 900mm x 1400mm should be provided within each stair/lobby enclosure serving the hotel building. Each refuge should be provided with a two-way emergency voice communication system. This appears to be achieved with the exception of Level -01.

FIRE FIGHTING

Fire Fighting Shafts

Fire Fighting Facilities and Number of Fire Fighting Shafts

As the building is over 18m, Stair 02 should be designed as a fire fighting shaft comprising the following:

- Fire fighting stair;
- Fire fighting lobby at each storey;
- Dry fire main, with outlets located at each storey within the fire fighting lobbies; and,
- A fire fighting lift accessed from the fire fighting lobbies.

The fire fighting stair should have a clear width of at least 1.1m.

On the basis that a sprinkler system will be provided throughout the building, hose coverage should be achieved within 60m of a fire main outlet; and within 60m of a fire fighting shaft. This is achieved as drawn.

The ADB recommends that at least two fire fighting shafts should be provided where a storey area is greater than 900m². Therefore, as the area of Levels 00 to 04 exceeds 900m², two fire fighting shafts would be required within the hotel building to meet code guidance. This would require either Stair 01 or Stair 03 to be designed as a fire fighting shaft with the provisions outlined above, with access to the fire fighting shaft available from every storey.

However, it should be possible for JGA to develop a fire engineering solution to support only one fire fighting shaft based on the provision of sprinklers throughout the building; hose coverage achieved within 60m of the dry fire main within the fire fighting shaft at all upper storeys and each storey subdivided by compartment walls so that the area of each compartment does not exceed 900m². This is shown indicatively in Figure 7 for Level 00.

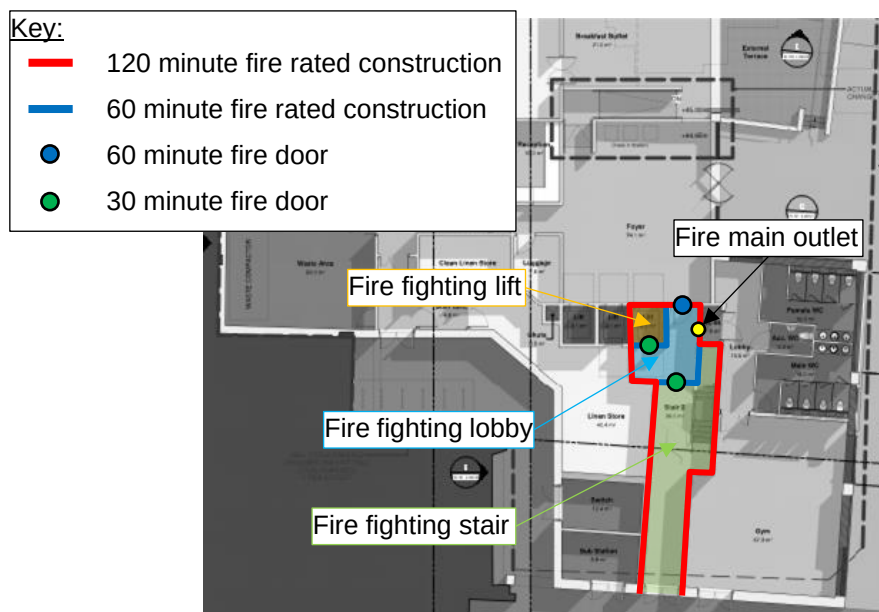


Figure 7 – Fire fighting shaft arrangement at Level 00

Fire Fighting Shaft Design

The fire fighting stair should be provided with either an openable vent achieving an aerodynamic free area of at least 0.7m² on the external wall at each storey level; or, an openable vent achieving an aerodynamic free area of at least 0.7m² at the head of the stair.

The corridor providing access to the fire fighting stair (Stair 02) from Market Way should be at least 1.6m wide.

The fire fighting lobbies should be provided with either a mechanical or natural smoke shaft. If a natural smoke shaft is provided, the cross-sectional area of the smoke shaft should be at least 3m², with a minimum dimension of 1m. The vents into the smoke shaft at each level should have a cross-sectional area of at least 1.5m². If a mechanical smoke extract shaft is provided, it should provide equivalent performance to the natural smoke shaft. Mechanical smoke shafts typically have a cross-sectional area of 0.6-0.8m² and an extract rate of 3-5m³/s. This should be confirmed by a smoke shaft designer/supplier.

The ADB recommends that the fire fighting stair should be only accessed via a fire fighting lobby. Therefore, the door accessing Stair 02 from the circulation corridor at Levels 01-07 should be removed; or, the circulation corridor providing access to the fire fighting stair should be provided with the same smoke venting provisions as a fire fighting lobby.

Fire fighting lobbies should have a clear floor area of at least 5m².

The ADB recommends that any storey served by a single fire fighting lift should not be served a dual-entry fire fighting lift. Therefore, the hotel building should be served by a fire fighting lift which has single doors opening into the fire fighting lobby only. If it is proposed for the passenger lifts located within the fire fighting lobby to be dual entry; JGA can develop a fire engineering solution to support this arrangement based on the following fire safety provisions:

- An automatic sprinkler system throughout the hotel building;
- 60 minute fire shutters over the door lifts opening into the Back of House areas;
- The fire fighting lift provided with single doors opening into the fire fighting lobby on each storey, including Ground Floor (as drawn, the fire fighting lift opens into both the Foyer and the Stair); and,
- The Back of House areas enclosed in construction achieving at least 30 minutes fire resistance.

Clear signage should be provided on the landings in the fire fighting stair to identify the storey level.

Fire Vehicle Access

Fire vehicle access should be available to the building within 18m of the dry riser inlet and the inlet should be visible from the fire vehicle. We recommend this be located on the external elevation close to the reception entrance. However, this will need to be discussed with the fire service who may request it be located along Market Place as this would provide the more direct access route to the fire fighting shaft.

Fire Hydrants

Where there are no existing hydrants within 100m of the building, new fire hydrants should be provided within 90m of the fire main inlet connection point. Therefore, the existing fire hydrant provisions should be confirmed.

BASEMENT SMOKE CONTROL

Level -01 should be provided with smoke ventilation.

Natural smoke vents outlets should be sited at high level in the space they serve and have a combined clear cross-sectional area of at least 2.5% of the floor area of Level -01. The smoke outlets should be:

- Sited at high level in the space they serve;
- As evenly distributed as possible around the perimeter of the building;
- No less than half the total vent area should be provided on two opposite walls, with the remaining half provided equally wherever possible;
- Discharge into the open air outside the building; and,
- Not be placed where they would prevent the use of escape routes from the building.

A mechanical smoke extract system could also be provided as an alternative to natural venting on the basis that sprinklers are provided at Level -01. The smoke extract system should achieve at least 10 air changes per hour, be capable of handling gas temperatures of 300°C for at least 60 minutes, and come into operation automatically either upon the activation of the automatic fire detection and alarm system, or the automatic sprinkler system.

STRUCTURE AND COMPARTMENTATION

All elements of structure should achieve at least 90 minutes fire resistance.

To support the fire engineering solution for a single fire fighting shaft, Levels 00-04 should be subdivided with compartment walls achieving at least 90 minutes fire resistance so that the area of each compartment does not exceed 900m².

Each floor should be designed as a compartment floor achieving at least 90 minutes fire resistance, including the floor separating Level -01 from Level 00.

The wall between the Foyer and Lobby providing access to the WC's should be 60 minute fire rated to assist with external fire spread.

All escape stairs should be enclosed with construction achieving at least 90 minutes fire resistance. The flights and landings of every escape and fire fighting stair should be constructed from materials of limited combustibility. The upper flights of escape/fire fighting stairs which continue down to Level -01 should be separated from Level -01 with construction achieving at least 90 minutes fire resistance at Level 00. This applies to Stair 01 and Stair 03.

Construction separating the fire fighting shaft from the accommodation should achieve at least 120 minutes fire resistance, including 60 minute fire doors. Construction separating the fire fighting stair, fire fighting lobby, and the fire fighting lift should achieve at least 60 minutes fire resistance including, 30 minute fire doors.

Circulation corridors should be separated from the bedrooms with construction achieving at least 30 minutes fire resistance.

Lift wells should be enclosed with construction achieving at least 90 minutes fire resistance.

Places of special fire hazard should be enclosed with construction achieving at least 30 minutes fire resistance. Places of special fire risk should be confirmed by the M&E Engineer.

The Waste Storage area should be enclosed with construction achieving at least 60 minutes fire resistance. The Waste Storage area should be accessed via protected lobbies provided with 0.2m² permanent ventilation; therefore, the north door to the Waste Storage area should be removed and, the Receiving Area should be enclosed with construction achieving at least 60 minutes fire resistance and provided with 0.2m² permanent ventilation or a suitable mechanical alternative.

The chute should be enclosed with construction achieving at least 90 minutes fire resistance.

The hotel building should be separated from any adjoining buildings with construction achieving at least 90 minutes fire resistance.

Where ventilation ductwork pass through fire resisting construction, these should be provided with automatically actuated fire and smoke dampers triggered by smoke detectors.

Where ductworks, or ductwork enclosures, pass through fire resisting construction, these should be fire stopped for the full thickness of the enclosure so that the level of fire resistance of the joint is equivalent to the fire resisting construction.

Service risers should be enclosed within construction achieving at least 90 minutes fire resistance or fire stopped at each level to achieve 90 minutes fire resistance. Service risers should not be accessed from within stairwells.

EXTERNAL FIRE SPREAD

Fire Spread to Opposing Buildings

Some of the external façades of the hotel building should be fire protected to address external fire spread, as shown indicatively in Figures 8-14 below. The boundary distances have been measured as follows:

- From the edge of the west elevation to the edge of the adjoining building;
- From the edge of the recessed part of the east elevation to the mid-point of the pends within the external courtyard;
- From the edge of the north part of the east elevation to the edge of the adjoining building at Levels 04-07;
- From the edge of the south part of the east elevation to the edge of the adjoining building at Levels 06-07; and,
- From the edge of the south elevation to the mid-point of Market Way.

The boundary distances should be confirmed by the architect and discussed and agreed with the Approved Inspector. Where protection to the external walls is required, this should achieve at least 60 minutes fire resistance. The allowable percentage of unprotected areas would change if the boundary distances are altered or sprinklers are not provided throughout the hotel building.

Where the escape/fire fighting stair makes a right angle with the external wall of the adjoining accommodation; the external wall of either the stair or the accommodation should achieve 60 minutes fire resistance for a distance of 1.8m from the junction, as shown indicatively in Figure 15 below.

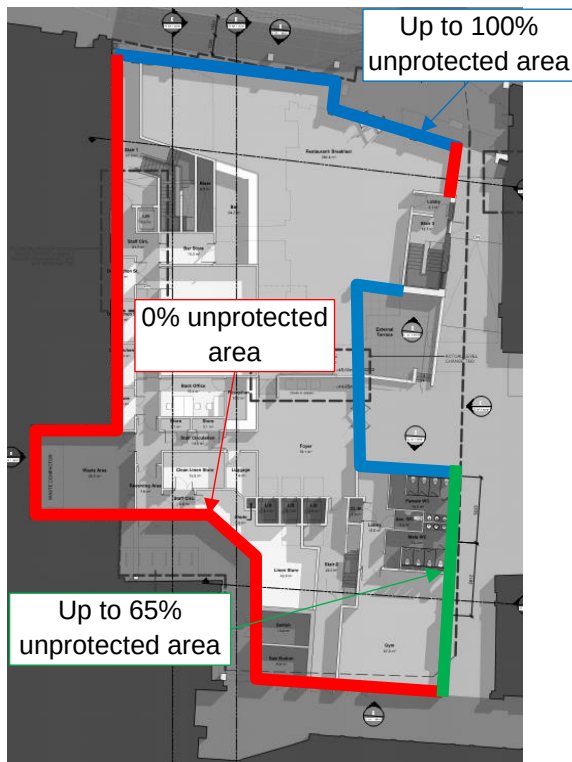


Figure 8 – Protection to the external walls at Level 00 to address external fire spread

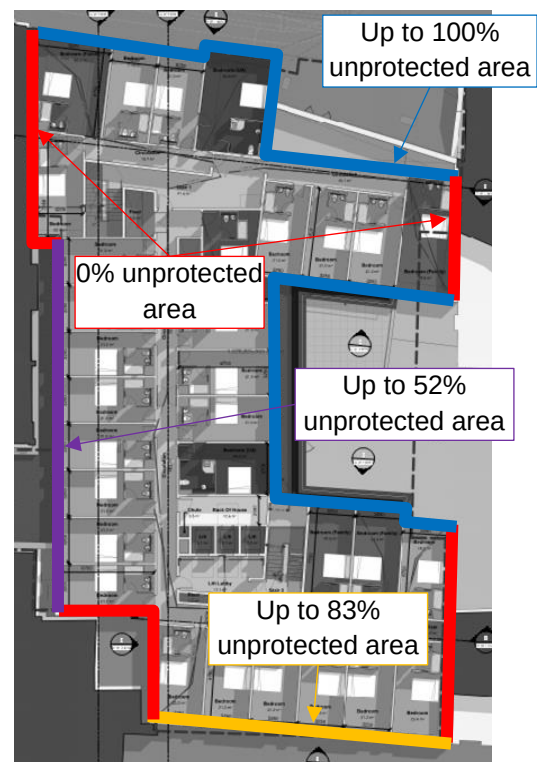


Figure 9 – Protection to the external walls at Level 01 to address external fire spread



Figure 10 – Protection to the external walls at Levels 02-03 to address external fire spread

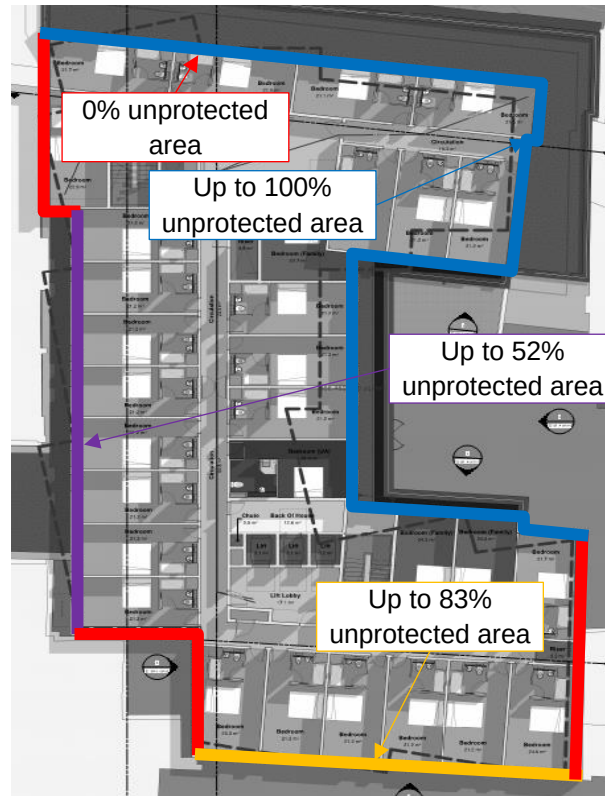


Figure 11 - Protection to the external walls at Level 04 to address external fire spread

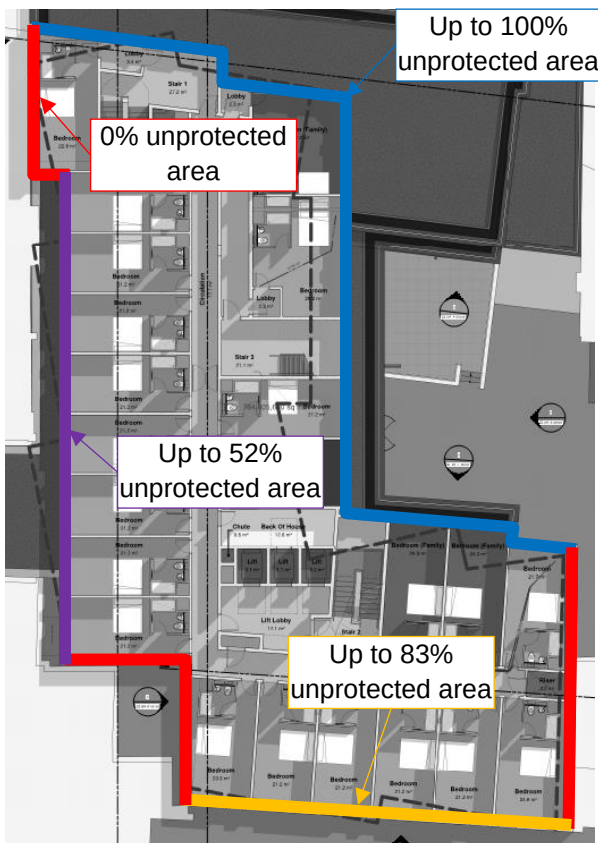


Figure 12 – Protection to the external walls at Level 05 to address external fire spread

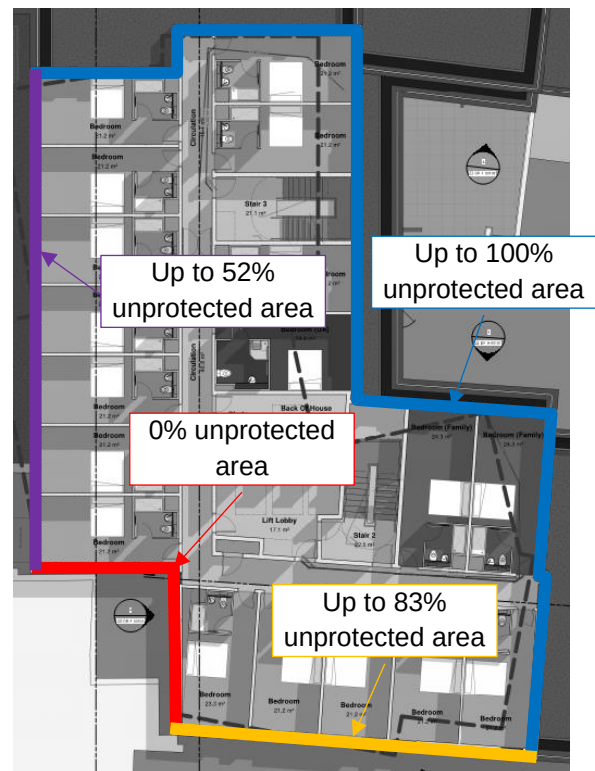
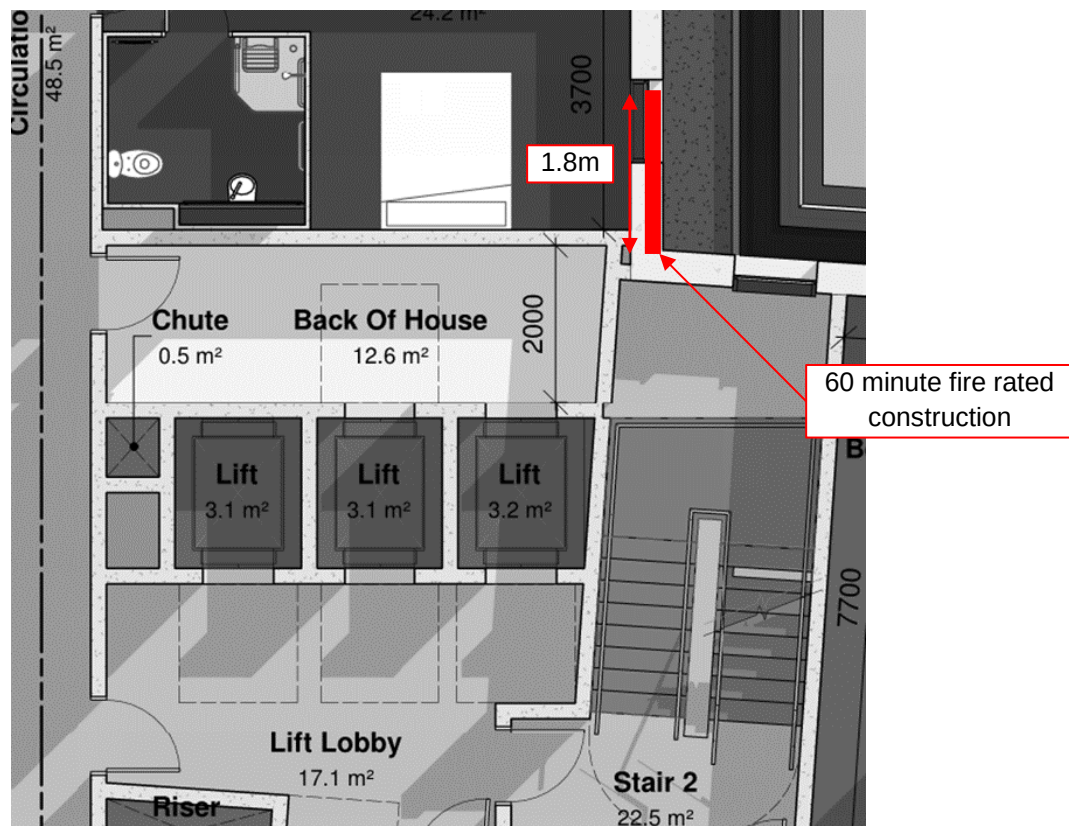
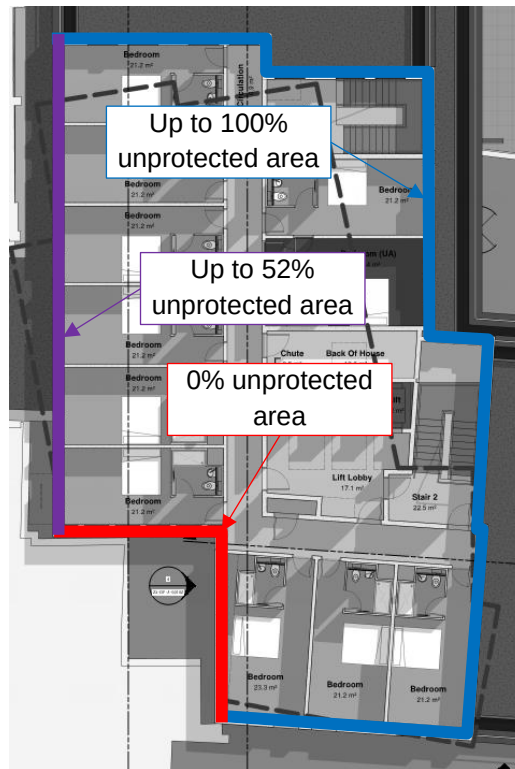


Figure 13 – Protection to the external walls at Level 06 to address external fire spread



External Cladding

The materials used in the construction of the external wall should achieve at least European Class B-s3, d2, with the exception insulation products and filler materials. Insulation products and filler materials (such as the core materials of metal composite panels, sandwich panels and window spandrel panels) should achieve at least European Class A2-s3, d2.

However, for futureproofing, we recommend all materials used in the construction of the external walls should achieve European Class A2-s1, d0 or Class A1, with the exception of sealants, gaskets, doors and windows (including frames); (see regulation 7(3) for the full list of exemptions).

APPENDIX A FURTHER INFORMATION

This Fire Engineering Review is intended to inform design development and is not suitable for submission to the approving authorities.

This Fire Engineering Review should be read in conjunction with the ADB. Unless otherwise noted, the fire strategy should be designed in line with the prescriptive recommendations of the ADB.

We have identified where the proposals do not follow the code guidance. We have identified the necessary measures for these areas to comply and have outlined potential fire engineering solutions to support these where appropriate. As with any departure from the code's recommendations, the fire engineering solutions outlined represent an approvals risk. Therefore, we recommend that the preferred solutions to address non-compliant issues be confirmed and discussed with the approving authorities at the earliest opportunity. We recommend that code compliant fallback solutions be allowed for until fire engineering solutions have been agreed with the approving authorities.

This report is based on the drawings by NORR issued to us on 29th September 2020. Dimensions have been taken from these drawings.