



Fire Engineering Consultants

Report

Project	Hotel Building, Broadway 2 Glasgow
Report Title	Fire Engineering Report
Our Ref	CGS331/R2 Issue 2

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Glasgow

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Report No. CGS331/R2
Issue No. Issue 2
Issue Date. 07 May 2019

	Issue 1	Issue 2	Issue 3	Issue 4	Issue 5	Issue 6
Date	25/10/18	07/05/19				
By	RM	BS				
Checked	BS	EJT				
Approved	NM	EJT				

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1.0 INTRODUCTION

1.1 Description of Building

It is proposed to construct a new 13 storey hotel building at Broadway 2, Glasgow. The building will consist of 300 bedrooms on the upper floors, a bar/restaurant area at Ground Floor, and office and meeting rooms at First Floor. An enclosed plant room will be located at roof level. The building will be fully fire separated from the adjacent new office building; and will be served by three escape stairs.

1.2 Aim of the Report

The aim of this report is to summarise the fire strategy and to present fire engineering solutions where the proposals do not follow the prescriptive recommendations of the Technical Handbook. This report is intended for submission to Glasgow City Council's Building Standards and the Scottish Fire and Rescue Service in support of alternative means of compliance applications.

2.0 FIRE STRATEGY SUMMARY

2.1 Technical Handbook Recommendations

The hotel building will be designed in accordance with the prescriptive recommendations given in Section 2 of the Non-Domestic Technical Handbook for residential buildings, with the exception of the fire engineering solutions presented in Sections 4.0 to 6.0 of this report.

2.2 Means of Escape

2.2.1 Evacuation Strategy

A simultaneous evacuation strategy is proposed for the building. Therefore, the stairs will be designed to accommodate all occupants escaping simultaneously.

2.2.2 Stair Widths

The building will be served by three escape stairs. The two escape stairs that serve the bedroom occupants on the First to Twelfth Floors will be at least 1,700mm wide, when measured between the handrails, and will be separated from the accommodation with protected lobbies at every floor. The west escape stair will reduce to a width of at least 1,100mm between the handrails at Floors 10 to 12. This is reasonable as this will provide sufficient stair width for occupants at these floors. The final exits from these stairs will achieve a clear opening width of at least 1,550mm. Based on the number of bed spaces within the bedrooms, the total number of occupants in the upper floor bedrooms accommodation would be 800. The proposed stairs provide capacity for up to 802 occupants; therefore, the stairs will provide sufficient capacity for the 800 occupants in the bedroom accommodation.

The third escape stair serves the First Floor office and meeting room spaces only, and will be at least 1,100mm wide when measured between the handrails, and will be separated from the accommodation with a protected lobby at First Floor with two exits into the stair at First Floor. The number of occupants within the First Floor office and meeting room spaces will be within 225 (i.e. within the capacity of the First Floor stair) based on the Technical Handbook's recommended occupancy load factors. The final exit from this stair will be via the Hotel Service Access route which is shared as an escape route from the Ground Floor. The final exit width is discussed in Section 2.2.3.2 below. Any accommodation accessed from the Hotel Service Access route will be lobbied.

2.2.3 Storey Exits

2.2.3.1 Upper Floors

The entire building will have access to at least two escape stairs. All the bedroom accommodation at the upper levels have access to both stairs. All doors leading into the stairs will achieve a clear opening width of at least 800mm.

The alternative escape route from the First Floor bedrooms is through the office accommodation. The suitability of this is assessed in Section 6.

The office and meeting rooms at First Floor will have access to all three stairs with doors leading into each stair achieving a clear opening width of at least 850mm. Two storey exits will be available into the 1,100mm stair which will provide sufficient escape capacity for the First Floor occupants.

2.2.3.2 Ground Floor

The occupancy at Ground Floor has been assessed as follows:

Accommodation	Area	Calculation Method	Occupancy
Reception	107m ²	6m ² /person	18
Restaurant	408m ²	1m ² /person	408
Kitchen	115m ²	7m ² /person	17
Reception/managers Office	37m ²	6m ² /person	7
Switch Room	8m ²	30m ² /person	1

Bar Store	21m ²	30m ² /person	1
Luggage	10m ²	30m ² /person	1

Table 2.1 – Occupancy breakdown at Ground Floor

Based on the above, the occupancy at Ground Floor will be limited to 448 occupants. Sufficient exit capacity for these occupants will be provided by the following clear opening widths (after discounting the largest exit):

- 1,600mm escape route via Hotel Entrance (discounted);
- 1,350mm escape route at southwest corner of Restaurant area; and
- 850mm escape route at northeast corner of Restaurant area.

After discounting the Hotel Entrance, there could be $448 - 225 = 223$ occupants escaping the corridor at the northeast corner of the Restaurant area. This corridor will be at least 1200mm wide (the stair at least 1100mm). Occupants will be escaping via the Service Access Route. The final route to outside will be at least 1.2m + 1.1m (office stair) = 2.3m. The final exit doors will be at least 2.15m clear opening width.

2.2.4 Travel Distances

Travel distances will generally be limited to within 15m in a single direction and 32m where more than one direction of travel is available throughout the building (including the Restaurant and office accommodation at Ground and First Floors). However, there are travel distances of up to 18m in a single direction proposed from the northeast bedrooms on each of the upper floors. The suitability of the travel distance extensions from these bedrooms is assessed in Section 4.0.

Travel distances within plant areas will be limited to 18m in a single direction and 45m where more than one direction of travel is available. Travel distances in the open air across the roof will be limited to 60m in a single direction and 100m where more than one direction of travel is available.

Travel distances within a room defined as a place of special fire risk will be limited to 9m in a single direction, and 18m where more than one direction of travel is available.

2.2.5 Door Swing and Number of Exits

Where a room/space has an occupancy of more than 60, at least two exits from the room/space, which opens in the direction of escape, will be provided. Doors serving places of special fire risk will open in the direction of escape.

2.2.6 Temporary Waiting Spaces

Temporary waiting spaces measuring at least 700mm x 1,200mm will be provided within the northwest escape stair and the northeast fire fighting lobby on each of the upper floors. A temporary waiting space will also be provided in the Ground Floor stair providing access to the Service Access Route. A temporary waiting space will not be provided to the steps leading from the restaurant to Renfrew Street as these will serve a level difference less than 1.8m. Management will put in place suitable management procedures to address mobility-impaired occupants.

Two-way emergency voice communication systems will be provided in the designated temporary waiting spaces.

2.2.7 Cross-Corridor Doors

Cross-corridor fire doors achieving at least 30 minutes fire resistance will be provided in the middle third of the corridors which are longer than 12m and provide more than one direction of escape.

Cross-corridor fire doors achieving at least 30 minutes fire resistance will be provided where there exists a dead-end corridor with a length greater than 4.5m. These will be provided at the point where occupants will have at least two directions of escape.

2.3 Structure & Compartmentation

Elements of structure will achieve at least 120 minutes fire resistance and each floor will be constructed as a compartment floor achieving at least 120 minutes fire resistance.

Where escape routes from the plant room at roof level are across the roof; these escape routes will be fire rated to achieve at least 60 minutes fire resistance, from the underside, for the width of the escape route (1.2m) and 3m to either side of the escape route.

The hotel building will be separated from adjoining buildings (including the new office building) with construction achieving at least 120 minutes fire resistance.

The stair cores, including the stair lobbies, the final escape routes from the stairs to outside, the lobbies to the final escape routes to outside, and fire fighting lifts where applicable will be enclosed in construction achieving at least 120 minutes fire resistance. The additional protected lobby separating the fire fighting lobby from the accommodation will be enclosed in construction achieving at least 60 minutes fire resistance.

Construction separating the fire fighting stair, fire fighting lobbies, smoke shafts, and lifts (within the protected zone) will achieve at least 60 minutes fire resistance. Construction separating the southwest escape stair and the lobbies serving the escape stair will achieve at least 30 minutes fire resistance.

Passenger lifts accessed from the restaurant and circulation corridors will be enclosed in construction achieving 120 minutes fire resistance with 60 minute lift doors.

Corridors serving the bedroom accommodation will be enclosed in construction achieving at least 30 minutes fire resistance. Part of the northeast corridor will be enclosed in construction achieving 60 minutes fire resistance, including 60 minute cross-corridor fire doors to support the travel distance extensions from the northeast bedrooms.

Bedrooms in the northeast wing will be separated from each other with construction achieving at least 30 minutes fire resistance.

The office accommodation (including meeting rooms) at First Floor will be separated from the bedroom accommodation with construction achieving at least 60 minutes fire resistance.

Service risers will either be enclosed with construction achieving at least 120 minutes fire resistance or fire stopped at every floor with construction achieving the same fire resistance.

Places of special fire risk, as defined in Appendix A of the Technical Handbook, will be enclosed in construction achieving at least 60 minutes fire resistance.

Some external walls will be fire rated to protect escape routes from the building. This is described in Section 2.6 of this report.

2.4 Fire Fighting

2.4.1 Fire Fighting Facilities

As the top storey height of the building is greater than 18m, the following fire fighting facilities will be provided to the northeast fire fighting stair:

- Fire fighting lobby at each floor with a minimum area of 5m² with principle dimensions of at least 1.5m;
- Fire fighting lift accessed from within fire fighting lobby;
- Ventilation to the fire fighting lobby provided via a 1.5m² automatic vent opening into a mechanically assisted smoke shaft;
- Ventilation to the stair via an automatically openable vent with a free area of 1m² at the head of the stair; and
- Dry rising fire main with outlets located in the fire fighting lobbies to achieve 45m hose coverage.

Manual overrides for the smoke vents will be located near the fire fighters access point.

It is proposed to provide an additional protected lobby between the fire fighting lobbies and the accommodation. This lobby will be enclosed in construction achieving 60 minutes fire resistance. The suitability of this is assessed in Section 5.0.

2.4.2 Fire Appliance Access

Fire appliance access will be provided via Renfield Street and Renfrew Street. These access routes will be suitable for high reach appliances. The dry riser inlet will be located within 18m of the fire appliance parking position on Renfield Street.

2.4.3 Fire Hydrants

Fire hydrants will be provided around the perimeter of the building; adjacent to the fire vehicle parking positions; at least 6m from the building's elevations, and so that all elevations are within 60m of a hydrant.

2.5 Active Fire Safety Systems

2.5.1 Automatic Fire Detection and Alarm

The building will be provided with a Category L1 automatic fire detection and alarm system. An evacuation signal in the hotel building will not necessitate the evacuation of the office building, and vice versa.

2.5.2 Smoke Venting

The fire fighting lobbies provided on every upper floor to the northeast stair will be provided with smoke venting via a 1.5m² automatically opening vent opening into a mechanically assisted smoke shaft achieving at least an equivalent performance to a Technical Handbook compliant natural smoke shaft. The detailed design will be confirmed by the supplier/designer of the smoke shaft system.

The fire fighting stair and the escape stair serving each of the upper floors will each be provided with an automatically opening smoke vent with a free area of at least 1m² at their heads.

The escape stair serving the First Floor office accommodation will be provided with a manually openable vent on the external wall at First Floor with a free area of at least 0.5m².

The mechanical smoke shaft and vents described above will be provided with manual overrides at the Ground Floor near the fire fighters access point.

2.6 External Fire Spread

2.6.1 Fire Spread to Opposing Buildings

The façades of the building do not need to be fire rated to address external fire spread to opposing buildings except where noted below in Figures 2.1 and 2.2. Calculations are presented in Appendix A.

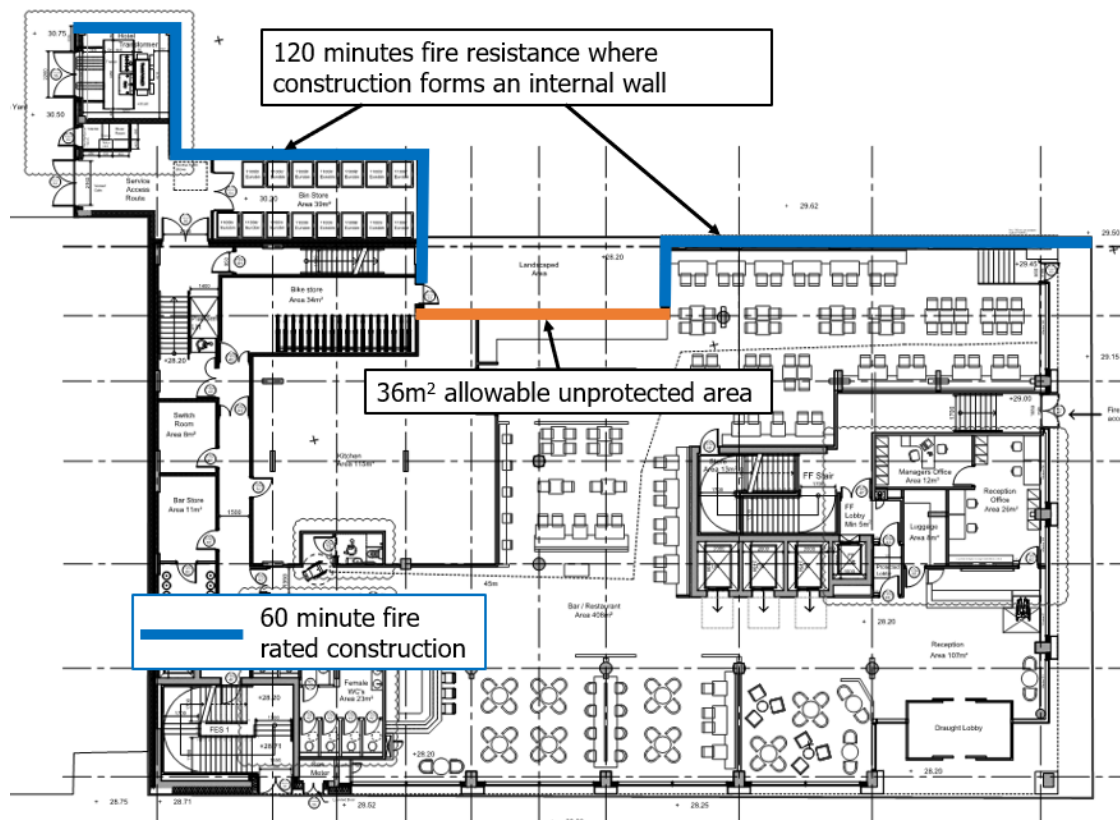


Figure 2.1 – Extent of protection required to the external façades of the hotel building at Ground Floor

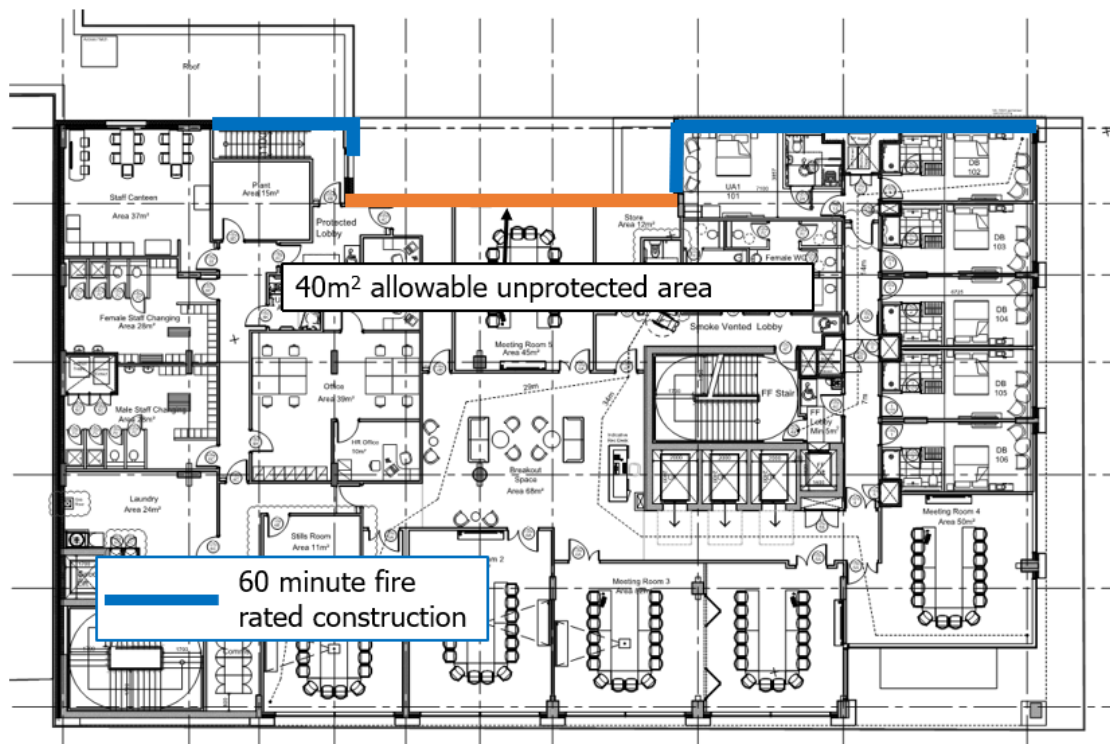


Figure 2.2 – Extent of protection required to the external façades of the hotel building at First Floor

2.6.2 Protection to Escape Stairs

Where the external wall of the fire fighting stair forms a right angle with the bedroom accommodation, the external wall of the stair enclosure will be fire rated to achieve 60 minutes fire resistance for a distance of 2m from the junction.

2.6.3 External Wall Cladding

External wall cladding less than 1m from the relevant boundary for external fire spread will be non-combustible. External wall cladding more than 1m from the relevant boundary will be non-combustible or achieve a low risk reaction to fire classification as described in Annex 2.E of the Non-Domestic Technical Handbook.

Any insulation material will be non-combustible.

3.0 BUILDING STANDARDS

3.1 Technical Handbook's Functional Standards

The functional standards given in the Technical Handbook describe the mandatory requirements to comply with the Building Standards.

The functional standard 2.9 for escape states the following:

"Every building must be designed and constructed in such a way that in the event of an outbreak of fire within the building, the occupants, once alerted to the outbreak of the fire, are provided with the opportunity to escape from the building, before being affected by fire or smoke."

The functional standard 2.14 for fire fighting states the following:

"Every building must be designed and constructed in such a way that facilities are provided to assist fire-fighting or rescue operations."

The functional standards can be met by following the guidance of the Technical Handbook in the design of a building. However, the Technical Handbook's prescriptive recommendations are just one way of complying with the functional building standards. The Technical Handbook notes that alternative approaches to meeting the functional building standards based on fire engineering are also possible.

3.2 Fire Engineering

3.2.1 BS 7974

The Technical Handbook guidance provides one way of complying with the functional building standards, however, other approaches are possible. The Technical Handbook refers to BS 7974, stating the following:

"Fire safety engineering can provide an alternative approach to the fire safety measures contained in this Technical Handbook. It may be the only practical way to achieve a satisfactory level of safety in some large and complex buildings, and building containing different uses such as airport terminals."

"Fire engineering designs can be complex and may require extensive use of engineering judgement. The following documents are cited to ensure that the guidance given encompasses best practice worldwide:

- *BS 7974:2001 Application of fire safety engineering principles to the design of buildings; or,*
- *International Fire Engineering Guidelines 2005 (IFEG)"*

For most buildings, the prescriptive guidance of the Technical Handbook will be adequate. However, for any building, BS 7974 can be used to develop and assess a fire safety engineering solution.

In BS 7974 Part 0, Section 6.6.2, the following is stated:

"Where there are limited departures from the prescriptive code, the acceptability of a particular design may be evaluated by comparing the level of performance achieved in a notional code compliant building with that of the non-compliant building under consideration. Often this comparison can be made without recourse to calculation."

In BS 7974 Part 0, Section 4.2, the following is stated:

"A fire safety approach that takes into account the total fire safety package can often provide a more fundamental and economical solution than more prescriptive approaches to fire safety."

The fire engineering solutions proposed for the hotel building at Broadway 2, Glasgow follow the principles given in BS 7974.

3.2.2 A Simplified Approach to Alternative Fire Safety Strategies

A Simplified Approach to Alternative Fire Safety Strategies is a document published by the Building Standards Division of The Scottish Government. This document provides a common framework to develop or assess alternative approaches to the guidance provided in Section 2: Fire of the Technical Handbooks. The document states the following:

"A comparative study can be carried out against the guidance provided in the Technical Handbooks. The objective is for verifiers and designers to agree that the design solution achieves at least, the equivalent level of safety, as the guidance in the Technical Handbooks."

4.0 TRAVEL DISTANCES

4.1 Technical Handbook's Recommendations

The Technical Handbook recommends that travel distances in a hotel should be limited to 15m in a single direction and 32m where more than one direction is available.

In areas where only a single direction of travel is available, travel distances should be measured to the nearest protected door giving direct access to an escape stair or a place of safety, or to a point where at least two directions of travel are available.

4.2 Proposals

Travel distances within the building will generally be achieved within the above recommended limits. However, occupants within the northeast bedrooms on the First to 12th Floors will need to travel up to approximately 18m in a single direction to reach the fire fighting lobby.

The proposed arrangement is shown indicatively in Figure 4.1 below.



Figure 4.1 – Travel distance extensions proposed from the northeast bedrooms

The suitability of the proposed arrangement is assessed below.

4.3 Technical Assessment

4.3.1 Intention of Technical Handbook's Recommendations

The intention of the Technical Handbook's recommended travel distance limitation is to minimise the distance occupants need to travel in potentially hazardous conditions. The recommendations for travel distances in a single direction are also to allow occupants to escape past a fire to reach a storey exit/point of divergence.

However, the Technical Handbook's recommendations for travel distances do not consider the additional fire safety measures that may be present within a building. The maximum recommended travel distance remains the same regardless of provisions such as automatic fire detection that will alert

occupants to a fire at an early stage, and fire rated construction that will limit the size of a fire and smoke affected area.

4.3.2 Comparison of Fire Safety Features

A comparison between the fire safety measures in the proposed hotel building and those that could be found in a notional Technical Handbook compliant residential building are summarised in Table 4.1 below. Comparisons between the individual fire safety measures are discussed in Sections 4.3.3 to 4.3.7.

Feature	Notional Technical Handbook Compliant Building	Proposed Building
Maximum single direction of travel	15m	17.2m
Maximum single direction travel distance within affected area	15m in the room of fire origin	A maximum of 7.7m within the bedroom; and then a further 5.5m within the corridor enclosed with 30 minute fire rated construction to reach a 60 minute fire door and a further 4m to reach a point of divergence
Automatic Fire Detection and Alarm System	Category L2 automatic fire detection and alarm system	Category L1 automatic fire detection and alarm system
Extent of Fire Separation	Corridor (if provided) enclosed in construction achieving 30 minutes fire resistance; with no fire separation between bedrooms or sub-division within corridor in a corridor less than 12m long	Corridor enclosed in construction achieving 30 minutes fire resistance; bedrooms in the northeast wing will be separated from each other with 30 minute fire rated construction; and a 60 minute protected lobby within the corridor after bedroom occupants travel less than 15m in a single direction
Maximum Compartment Size	2000m ²	Each bedroom in the northeast wing forms a 30 minute compartment; with an area of approximately 20m ²

Table 4.1 – Comparison with a Technical Handbook compliant residential building

4.3.3 Extension to Travel Time

The consequence of an extended travel distance is an increase in the travel time. BS 7974: PD6 *Human Factors: Life safety strategies – Occupant evacuation, behaviour and condition* recommends an average horizontal travel speed of 1.2m/s. However, to allow for any mobility-impaired occupants and to incorporate a margin of safety, a horizontal travel speed of 0.6m/s has been considered. Based on this, the maximum single direction travel distance extension of 2.2m should approximately take an additional 5 seconds to travel.

$$\text{Extension to travel time} = \frac{2.2\text{m}}{0.6\text{m/s}} = 4 \text{ seconds}$$

The fire safety measures in the proposed building will result in conditions within the bedrooms and the common corridor remaining tenable for significantly longer than the additional 4 seconds of travel time when compared to a notional Technical Handbook compliant building. This is discussed further below.

4.3.4 Automatic Fire Detection and Alarm

A Category L1 automatic fire detection and alarm system will be provided, which will offer the highest standard of detection in the proposed building. Therefore, occupants will be alerted of a fire at the earliest possible stage of the fire's development.

4.3.5 Affected Areas

4.3.5.1 Travel within Room of Fire Origin

In a notional Technical Handbook compliant residential building, occupants could potentially have to travel up to 15m within the room of fire origin before reaching a point of divergence. This could involve escape in smoke-logged conditions within the room of fire origin. Occupants with travel distance extensions within the proposed building will have to travel a maximum of 7.7m before exiting the room of fire origin. Once having escaped from the room of fire origin, occupants will be separated from the fire by construction achieving 30 minutes fire resistance. Therefore, occupants in the proposed arrangement will spend less time exposed to potentially hazardous conditions within the room of fire origin when compared to a notional Technical Handbook compliant arrangement.

4.3.5.2 Travel Outwith the Room of Fire Origin

For a fire in a bedroom, smoke will build down from the ceiling in the bedroom and eventually generate sufficient buoyancy pressure to begin flowing into the common corridor via the gaps around the bedroom door. Therefore, the Technical Handbook's recommendation to provide a fire door and 30 minute fire resistance construction between a corridor and bedrooms accessed from it is to minimise the amount of smoke affecting the corridor.

Once occupants have escaped from the bedrooms where the extended travel distances exist, they will have a further 5.5m to travel within the protected corridor before reaching a 60 minute protected lobby. Therefore, after travelling less than 15m in a single direction, the occupants will be separated from the fire affected bedroom with two lines of fire rated construction. Beyond the cross-corridor fire door, occupants will have a further 4m to travel within the protected lobby before reaching the fire fighting lobby. Therefore, occupants would not be exposed to fire/smoke for a longer distance/duration than in a notional Technical Handbook compliant building.

4.3.6 Compartment Area

In a notional Technical Handbook compliant residential building, the compartment sizes could be up to 2,000m² per floor with no fire separation between bedrooms. Every floor in the proposed building will be constructed as a compartment floor achieving at least 120 minutes fire resistance, and each bedroom in northeast wing will be enclosed in 30 minute fire rated construction; therefore, a fire in an area with travel distance extensions, the affected compartment area should be limited to approximately 20m² during the evacuation period. Therefore, the area affected by fire and smoke in the proposed building will be limited, and the fire size and amount of smoke produced will be significantly smaller than could be found in a notional Technical Handbook compliant residential building.

4.4 Conclusion

Based on the above technical assessment, the 2.2m extension proposed to the Technical Handbook's recommended limit on travel distance in a single direction, will achieve at least an equivalent standard of safety as a notional Technical Handbook residential building. As a result, the proposals satisfy the functional escape requirement of the Building Standards and are therefore considered reasonable.

5.0 FIRE FIGHTING LOBBIES

5.1 Technical Handbook's Recommendation

The Technical Handbook also recommends that protected lobbies are normally created by fire resisting construction together with at least 2 sets of self-closing fire doors between the fire and the escape stair or fire-fighting lobby.

One way of interpreting this recommendation could be that, where a fire fighting lobby is required by Section 2.14 of the Technical Handbook, a protected lobby should be provided between a fire fighting lobby and the rest of the accommodation.

5.2 Proposal

It is proposed to provide an additional protected lobby between the fire fighting lobbies and the accommodation; however, this additional protected lobby will be enclosed in 60 minute fire rated construction. The suitability of this arrangement is assessed below.

5.3 Technical Assessment

5.3.1 Intention of Technical Handbook's Recommendations

The Technical Handbook recommends that: *"Protected lobbies in non-domestic buildings are used:*

- *to inhibit fire and smoke spread to escape stairs*
- *to help occupants escape past the floor of fire origin*
- *to provide a protected route of escape from the fire floor*
- *to reduce the number or width of escape stairs in a building*
- *to provide a relatively safe space for the fire and rescue services to set up a forward control point and to provide a bridgehead from which to commence operations (see Standard 2.14).*

Therefore, the intention of providing protected lobbies to the fire fighting lobbies is to provide additional protection to the fire fighting bridgehead in tall buildings.

5.3.2 Fire Rated Construction

The fire fighting lobbies will be separated from the adjoining accommodation with an additional lobby achieving at least 60 minutes fire resistance. Each floor will be constructed as a compartment floor achieving at least 120 minutes fire resistance, and each bedroom will be separated from the circulation corridors with construction achieving at least 30 minutes fire resistance.

In the event of a fire in the building, the fire separation will limit fire and smoke spread to other parts of the buildings, and smoke would only be able to enter the fire fighting lobbies from the door leading to the part of the building containing the fire. Therefore, in the event of a fire within the accommodation, smoke will have to flow through at least two sets of 60 minute fire doors before entering a fire fighting lobby. Therefore, smoke would need to flow through the same number of 60 minute fire doors as could be found in a notional Technical Handbook compliant building. Therefore, conditions within the fire fighting lobby will be at least as good as could be found in a notional Technical Handbook compliant building.

5.4 Conclusion

Based on the proposed fire rated construction, smoke from a fire in the accommodation is not expected to compromise the proposed fire fighting lobbies. Therefore, the proposed fire fighting lobby arrangement will meet the Technical Handbook's intention for the provision of protected lobbies, as outlined in Section 5.3.1. Therefore, the proposed fire fighting lobby arrangement meets the Technical Handbook's functional standard for fire fighting and is therefore considered reasonable.

6.0 FIRST FLOOR ALTERNATIVE ESCAPE ROUTE FROM BEDROOM

6.1 Technical Handbook's Recommendation

The Technical Handbook recommends that occupants should not need to make their escape from an inner room through more than one access room. The Technical Handbook also recommends that a bedroom should not be an inner room.

6.2 Proposals

The bedrooms at First Floor will have access to the northeast escape stair from the adjoining circulation corridor as their primary escape route. An alternative route of escape will also be provided via the office Breakout Space leading to the southwest escape stair.

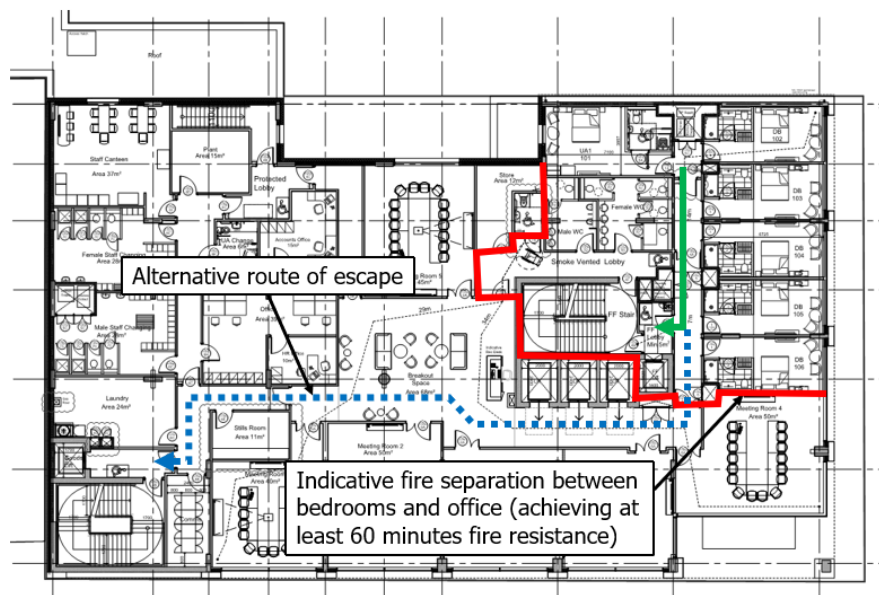


Figure 6.1 – Alternative route of escape

The suitability of this arrangement is assessed below.

6.3 Technical Assessment

6.3.1 Fire Rated Construction

The primary escape route will be from a bedroom into an escape stair via a circulation corridor in line with the Technical Handbook's recommendations. The alternative escape route will be via a further access room (Breakout Space) and circulation corridor as shown in Figure 6.1 above. However, the office accommodation will be fire separated from the bedrooms with construction achieving at least 60 minutes fire resistance. Therefore, in the event of a fire affecting the Breakout Space; occupants in the bedrooms will be in a place of relative safety free from fire/smoke and the primary escape route via the northeast escape stair will be available.

In the event of a fire affecting the bedrooms, if occupants were to continue past the northeast escape stair; they will be escaping into a separate fire compartment and the further access room will be free from fire/smoke.

The escape doors into and through the office will be provided with suitable escape ironmongery for use by guests. The escape route will be provided with suitable fire exit signage.

6.3.2 Comparison with Technical Handbook Compliant Arrangement

A notional Technical Handbook compliant building can have part of the building designed with a single escape route where the top storey height is less than 7.5m. The escape stair would be lobbied in this arrangement.

First Floor has a top storey height less than 7.5m and the escape stair is lobbied. Therefore, the provision of an alternative escape route will provide a higher standard of fire safety than could be found in an equivalent hotel arrangement with a top storey less than 7.5m.

6.3.3 Conclusion

The provision of fire rated construction will provide occupants with the opportunity to escape via a route free from fire/smoke. The proposed alternative escape route will also provide a higher standard of fire safety than an equivalent Technical Handbook compliant arrangement with a top storey less than 7.5m. Therefore, the proposed escape arrangement meets the functional standard for escape and is considered reasonable.

7.0 FIRE SAFETY DESIGN SUMMARY

The requirement for a 'Fire Safety Design Summary' came into effect on 1 October 2013 as a result of amendments to The Building (Procedure) (Scotland) Regulations 2004 and the Building (Forms) Scotland Regulations 2005. This requires a Fire Safety Design Summary document to be submitted for approval as part of the completion certificate application. This requirement is applicable to non-domestic buildings, including extensions and alterations, where the building warrant application has been submitted from 1 October 2013.

The Fire Safety Design Summary document is to assist the operation and maintenance of the building's fire safety systems and with fire risk assessments. For example, it should include:

- number of exits, travel distance, occupancy capacity, compartmentation;
- method of evacuation;
- a description of any alternative approaches / fire engineering solutions;
- a description of any smoke-control system;
- a description of any fire detection and alarm system;
- a description of any sprinkler system;
- a description of any fire-fighting facilities;
- a list of any design assumptions based on the fire safety management of the building;
- list of any commissioning certificates / maintenance schedules;
- reference to any specialist reports, e.g. fire engineering report.

Please note that this report by Jeremy Gardner Associates does not constitute the Fire Safety Design Summary. However, it should be referenced in the Fire Safety Design Summary, as part of the package of information to be provided.

8.0 FIRE SAFETY MANAGEMENT

8.1 General

Once the building is occupied, it is the responsibility of the management to ensure that all fire safety systems are tested and maintained to ensure their continuous effectiveness. The management should:

- Be aware of all the fire safety features provided and their purpose
- Liaise with and seek the advice of the fire authority

8.2 Staff

Staff should be trained by competent persons. The training should be at regular intervals and should ensure that all staff know what to do if a fire is discovered; the correct response on hearing a fire alarm, and the correct escape procedures from every part of the building.

A management structure should be provided to ensure that in the case of fire staff are aware of their responsibilities, which should be clearly defined. A chain of command should be provided with clear lines of responsibility, authority and accountability.

8.3 Fire Safety Manual

Before a building is occupied, a fire safety manual should be completed. The purpose of the manual is to clearly define the nature of the fire safety systems provided for the building. It should include:

- An explanation of the overall fire safety strategy
- Evacuation procedures
- Design documentation to describe the use of each fire safety system
- Staff roles in the event of a fire: their responsibility, authority and accountability
- A detailed maintenance routine

The Fire Safety Manual should be reviewed periodically and when any alterations are made to the building. Details of the suggested contents of the fire safety manual are provided in Annex H of BS 9999 Code of practice for fire safety in the design management and use of buildings.

8.4 Maintenance and Housekeeping

It is the role of management to ensure that maintenance is carried out in accordance with the relevant British Standards, so that all fire safety systems are operational in the event of a fire. It is also important that good housekeeping practices are followed. The building management should be aware of any hazardous substances or practices within the building, which increase the risk of fire.

8.5 The Fire (Scotland) Act 2005

This act came into force in October 2006. It replaced over a hundred pieces of fire safety legislation including the Fire Precautions Act and the Workplace (Fire Safety) Regulations. Fire Certificates are no longer issued or enforced.

This places a duty on the 'responsible person' to ensure, 'as far as is reasonably practical' the safety of his employees and to take such general fire precautions as may be reasonably required to ensure that the premises are safe [i.e. for non-employees].

There is a requirement to carry out and continually update an assessment of the risk of fire to people in and around the premises/building, and to assess and maintain the measures to reduce those risks to an acceptable level. The risk assessment must be recorded.

A Fire Risk Assessment should be carried out:

1. Regularly, particularly where any changes occur such as changes in the use of the building, the number or nature of occupants, or building works.
2. We would recommend that a fire risk assessment is carried out at least annually.

The premises will be subject to the Scottish Fire and Rescue Service's fire safety audit programme and will be subject to continuous assessment, therefore:

- Management and staff with responsibilities related to fire safety in the building should be made aware of the fire safety management plan and strategy for evacuation which is proposed in and forms part of the document.
- The Fire Risk Assessment document will require to be amended to reflect the proposals described in this report.

Other legal duties include:

1. A person must be nominated for any special role identified in an emergency plan.
2. Employees must be consulted about nominations to perform special roles, and about any proposals for improving the fire precautions.
3. Other employers in the building must be informed about any significant risks, which might affect the safety of their employees, and there must be co-operation with them in measures to reduce the risk.
4. Those having control over the workplace have a responsibility to ensure compliance with the regulations in those parts of the building over which they have control.
5. A suitable and readily available method of calling the emergency services must be established.
6. Employees are required to co-operate in ensuring that the workplace is safe from fire.

The Act also adopts 'Principles of Prevention'. These include:

- Avoiding risks;
- Evaluating the risks which cannot be avoided;
- Combating the risks at source;
- Adapting to technical progress;
- Replacing the dangerous by the non-dangerous or less dangerous [particularly with respect to hazardous substances];
- Developing a coherent overall prevention policy which covers technology, organisation of work and the influence of factors relating to the working environment;
- Giving appropriate instructions to employees.

9.0 INFORMATION, LIMITATIONS AND ASSUMPTIONS

The information limitations and assumptions used in the preparation of this report are noted below:

Drawings

This report is based on drawings issued to us 12/04/2019. Dimensions have been taken from these drawings. The following drawings were used:

• Ground Floor Plan	GA-A-A-L100	Revision D
• First Floor Plan	GA-A-A-L101	Revision C
• 2 nd , 4 th , 6 th , 8 th Floor Plan	GA-A-A-L102	Revision C
• 3 rd , 5 th , 7 th , 9 th Floor Plan	GA-A-A-L103	Revision B
• Tenth Floor Plan	GA-A-A-L110	Revision B
• Eleventh Floor Plan	GA-A-A-L111	Revision B
• Twelfth Floor Plan	GA-A-A-L112	Revision B
• Thirteenth Floor Plan	GA-A-A-L113	Revision A

Building Regulations

This report considers building regulations, which deal with life safety. Property protection and insurance issues are not addressed in this report.

Other Limitations

Complying with the recommendations of this report will not guarantee that a fire will not occur.

The detailed design of systems and specification of systems, such as construction, fire alarm, and sprinklers, are specialist areas. Fire Strategy recommendations are given in this report; however, the design and specifications need to be developed at the appropriate stage in consultation with the specialist designers of these systems.

This report has been prepared for the sole benefit, use and information of McAleer & Rushe and the liability of Jeremy Gardner Associates Edinburgh Limited, its directors and employees in respect of the information contained in the report will not extend to any third party.

10.0 REFERENCES

1. The Scottish Building Standards: Technical Handbook (2017). Scottish Government.
2. BS 7974 Application of fire safety engineering principles to the design of buildings – Code of Practice. British Standards Institution.
3. A simplified approach to alternative fire safety strategies. Scottish Government.
4. BS 5839 (2002) Fire detection and fire alarm systems for buildings. British Standards Institution.

APPENDIX A EXTERNAL FIRE SPREAD CALCULATIONS

The calculations presented below are based on the elevation of the accommodation with the largest area and shortest boundary distance. Other elevations (i.e. the upper floors with bedroom accommodation) have smaller compartment heights and/or longer boundary distances; therefore, the unprotected area on these elevations will be as good as the worst case scenarios shown below.

External Fire Spread Between Hotel and New Office Building – Ground Floor

BR187 Table Lookup

ALL VALUES SHOULD BE ENTERED ON THIS SHEET ONLY.

Input values in the yellow boxes

Project : Broadway 2 Hotel Building
Project number: CGS331
Elevation: North Elevation, Ground Floor
Date: 07/05/19

Residential, office or assembly? (Yes/No)	Yes
Sprinklered? (Yes/No)	No

	Input	Enclosing rectangle	
Height of compartment (m)	4.50	6	→ (max 30m)
Width of compartment (m)	11.50	12	→ (max 130m)
Distance to boundary (m)	3.50	3.50	
Area (m2)	51.75	72.00	
Permitted unprotected percentage of area	69.6%	50.0%	
Permitted unprotected area (m2)	36.00		

→ (If no result appears in the green % box then the value should be taken as the minimum value **20%**)

External Fire Spread Between Hotel and New Office Building – First Floor

BR187 Table Lookup

ALL VALUES SHOULD BE ENTERED ON THIS SHEET ONLY.

Input values in the yellow boxes

Project : Broadway 2 Hotel Building
Project number: CGS331
Elevation: North Elevation, First Floor
Date: 07/05/19

Residential, office or assembly? (Yes/No)	Yes
Sprinklered? (Yes/No)	No

	Input	Enclosing rectangle	
Height of compartment (m)	3.75	6	→ (max 30m)
Width of compartment (m)	14.00	15	→ (max 130m)
Distance to boundary (m)	3.50	3.50	
Area (m ²)	52.50	90.00	
Permitted unprotected percentage of area	77.1%	45.0%	
Permitted unprotected area (m ²)		40.50	

→ (If no result appears in the green % box then the value should be taken as the minimum value 20%)

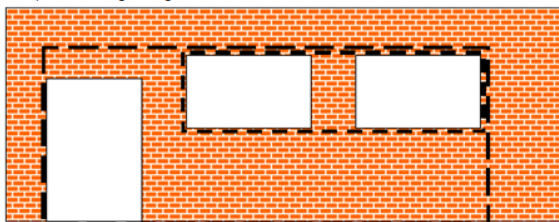
External Fire Spread from Ground Floor Restaurant (South Elevation)

BR 187 Enclosing Rectangle Method

Date: 23/10/2018 Job No: CGS331 Project: Broadway 2 Hotel Building, Glasgow
 Elevation: South Elevation - Ground Floor

Building type: (for Office, Residential, Assembly or Recreation enter Y else enter N)	N	Table List A will be used
Is the Building Sprinklered?: (Y for yes else enter N for no)	n	Unprotected area could be doubled with sprinklers

Example of enclosing rectangle



Height of compartment	Width of the compartment
ER = $\frac{4.2}{6}$ m	ER = $\frac{36.6}{40}$ m

Distance to the boundary
d = 11.20 m

72%	Permitted unprotected area of Enclosing Rectangle
173	Maximum unprotected area (m ²)
100%	Allowable percentage of actual façade unprotected

External Fire Spread from Ground Floor Restaurant (East Elevation)

BR 187 Enclosing Rectangle Method

Date: 23/10/2018

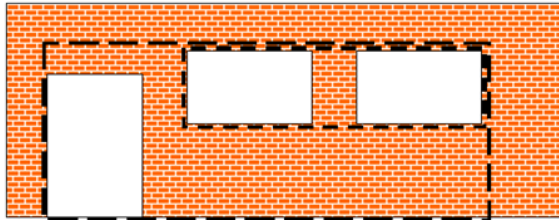
Job No: CGS331

Project: Broadway 2 Hotel Building, Glasgow

Elevation: East Elevation - Ground Floor

Building type: (for Office, Residential, Assembly or Recreation enter Y else enter N)	N	Table List A will be used
Is the Building Sprinklered?: (Y for yes else enter N for no)	n	Unprotected area could be doubled with sprinklers

Example of enclosing rectangle



Height of compartment	4.2 m	Width of the compartment	26 m
ER=	6 m	ER=	27 m

Distance to the boundary	d= 11.30 m
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100%	Permitted unprotected area of Enclosing Rectangle
162	Maximum unprotected area (m ²)
100%	Allowable percentage of actual façade unprotected

External Fire Spread from Bedroom Accommodation (North Elevation)

BR 187 Enclosing Rectangle Method

Date: 23/10/2018

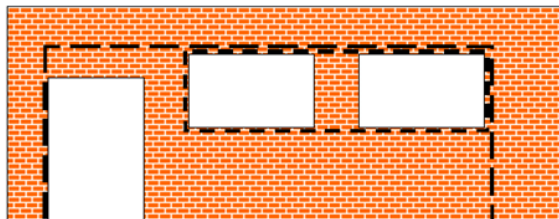
Job No: CGS331

Project: Broadway 2 Hotel Building, Glasgow

Elevation: North Elevation - 2nd to 12th Floor

Building type: (for Office, Residential, Assembly or Recreation enter Y else enter N)	y	Table List B will be used
Is the Building Sprinklered?: (Y for yes else enter N for no)	n	Unprotected area could be doubled with sprinklers

Example of enclosing rectangle



Height of compartment	2.9 m	Width of the compartment	27.5 m
ER=	3 m	ER=	30 m

Distance to the boundary	d= 10.00 m
--------------------------	------------

100%	Permitted unprotected area of Enclosing Rectangle
90	Maximum unprotected area (m ²)
100%	Allowable percentage of actual façade unprotected

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