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Fire Safety Strategy

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Report Details

Project: 4-6 Bligh Street, Sydney, NSW, 2000

Document: Fire Safety Strategy

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Report Revision History

REV	DATE ISSUED	COMMENT	PREPARED BY	REVIEWED BY
01	13/09/19	Draft Issue for comment	**Graham Morris** *MEng (Structural and Fire Safety)* *MIEAust CPEng NER (Fire Safety)*	**Sandro Razzi** *BE (Building)* *Grad Dip (Performance Based Building & Fire Codes)* *Accredited Fire Engineer*
02	14/10/19	Issue for SSDA	**Alexandra Ceccato** *BEng (Civil)*	**Graham Morris** *MEng (Structural and Fire Safety)* *MIEAust CPEng NER (Fire Safety)*
03	16/12/22	Revised Issue for SSDA	**Laurence Kwong** *MEng (Building Fire Safety and Risk Engineering)* *MIEAust, CPEng, NER*	**Graham Morris** *MEng (Structural and Fire Safety)* *MIEAust, CPEng, NER (Fire Safety)*

EXECUTIVE SUMMARY

CORE Engineering Group have been engaged by Holdmark c/o JPY Group to develop a Fire Safety Strategy (FSS) to accompany a detailed State Significant Development Application (SSDA- SSD48674209) for the mixed-use redevelopment proposal at 4-6 Bligh Street. The site is legally described as Lot 1 in Deposited Plan 1244245. The proposed redevelopment will include hotel, commercial, and ancillary retail uses.

This FSS provides an overview of the construction and management requirements considered necessary to achieve an acceptable level of life safety within the proposed hotel and commercial building. Due to the complexity of the building design, a fully prescriptive approach of complying with the Building Code of Australia 2019 Amendment 1 (BCA) [1] Deemed-to-Satisfy (DtS) Provisions for occupant egress, fire resisting construction, fire services, and fire brigade intervention is unlikely to satisfy the desired architectural and client aspirations. As such, Performance Solutions to satisfy the Performance Requirements of the BCA have been proposed to account for various issues which have been identified in the BCA advice by Advanced Building Approvals not to comply with the DtS Provisions. It is noted that the discussion herein is assessed against the currently gazetted building code being NCC 2019 Amendment 1. However, NCC 2022 is due to be implemented in May 2023 such that the commencement of construction after this date will mean NCC 2022 is likely to be the relevant building code.

This FSS provides a holistic summary of the fire and life safety measures anticipated to be necessary in developing the above listed Performance Solutions. These measures include passive and active fire protection systems, egress provisions, occupant first aid firefighting, fire brigade intervention, and future building management provisions.

The fire strategy presented herein concludes that the built form of the proposed mixed-use hotel and commercial development is capable of meeting the Performance Requirements of the BCA.

The complete fire engineering analysis will be included within the Fire Engineering Report (FER), undertaken in accordance with the Australian Fire Engineering Guidelines (AFEG), and as such is not documented herein.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 OVERVIEW

The report has been prepared to accompany an SSDA submission for the mixed-used redevelopment proposal at 4-6 Bligh St, Sydney (SSD-486724209).

The Council of the City of Sydney, as delegate for the Minister for Planning and Public Spaces (the Minister), is the consent authority for the SSDA under an instrument of delegation issued by the Minister on 3 October 2019.

The application seeks consent for the construction of a 59 storey mixed-use hotel and commercial development. The purpose of the project is to revitalise the site and deliver new commercial floorspace and public realm improvements consistent with the City's vision to strengthen the role of Central Sydney as an international tourism and commercial destination.

A separate development consent (D/2018/892) relating to early works for the proposed application was granted for the site on 31 January 2020. Consent was granted for the demolition of the existing site structures, excavation and shoring of the site for three basement levels (to a depth of RL9.38m) to accommodate the proposed mixed-use hotel and commercial development. As such, this application does not seek consent for these components and instead seeks to rely upon and activate D/2018/892 for early works.

Specifically, development consent is sought for:

- Site establishment, including removal of three existing trees along the Bligh Street frontage and de-commissioning and removal of an existing substation (s2041) on the site.
- Construction of a 59-storey hotel and commercial office tower. The tower will have a maximum building height of RL225.88 (205m) and a total gross floor area (GFA) provision of 26,796sqm, and will include the following elements:
  - Five basement levels accommodating a substation, rainwater tank, hotel back of house, plant and services. A porte cochere and four service bays will be provided on basement level 1, in addition to 105 bicycle spaces and end of trip facilities on Basement level 2, and 28 car parking spaces.
  - A 12-storey podium accommodating hotel concierge and arrival at ground level, conference facilities, eight levels of commercial floor space and co-working facilities, and hotel amenities including a pool and gymnasium at level 12.
  - 42 tower levels of hotel facilities including 417 hotel keys comprising standard rooms, suites and a penthouse.
  - Two tower levels accommodating restaurant, bar, back of house and a landscaped terrace at level 57.
  - Plant, servicing and BMU at level 59 and rooftop.
- Increase to the width of the existing Bligh Street vehicular crossover to 4.25m and provision of an additional 4m vehicular crossover on Bligh Street to provide one-way access to the porte cochere and service bays on basement level 1.
- Landscaping and public domain improvements including:
  - Replacement planting of three street trees in the Bligh Street frontage,
  - Construction of a landscape pergola structure on the vertical façade of the north-eastern and south-eastern podium elevations,
  - Awning and podium planters, and
  - Provision of a feature tree at the level 57 terrace.
- Identification of two top of awning building identification signage zones with a maximum dimension of 1200mm x 300mm. Consent for detailed signage installation will form part of a separate development application.
- Utilities and service provision
- Installation of public art on the site, indicatively located at ground level.

This Fire Safety Strategy report has been undertaken to nominate proposed Performance Solutions for assessing compliance with the nominated Performance Requirements of the Building Code of Australia 2019 Amendment 1 (BCA) [10] in accordance with the methodologies defined in the Australian Fire Engineering Guideline IFEG [3].In order to develop and assess the nominated non-compliances the following flowchart process is to be adopted.

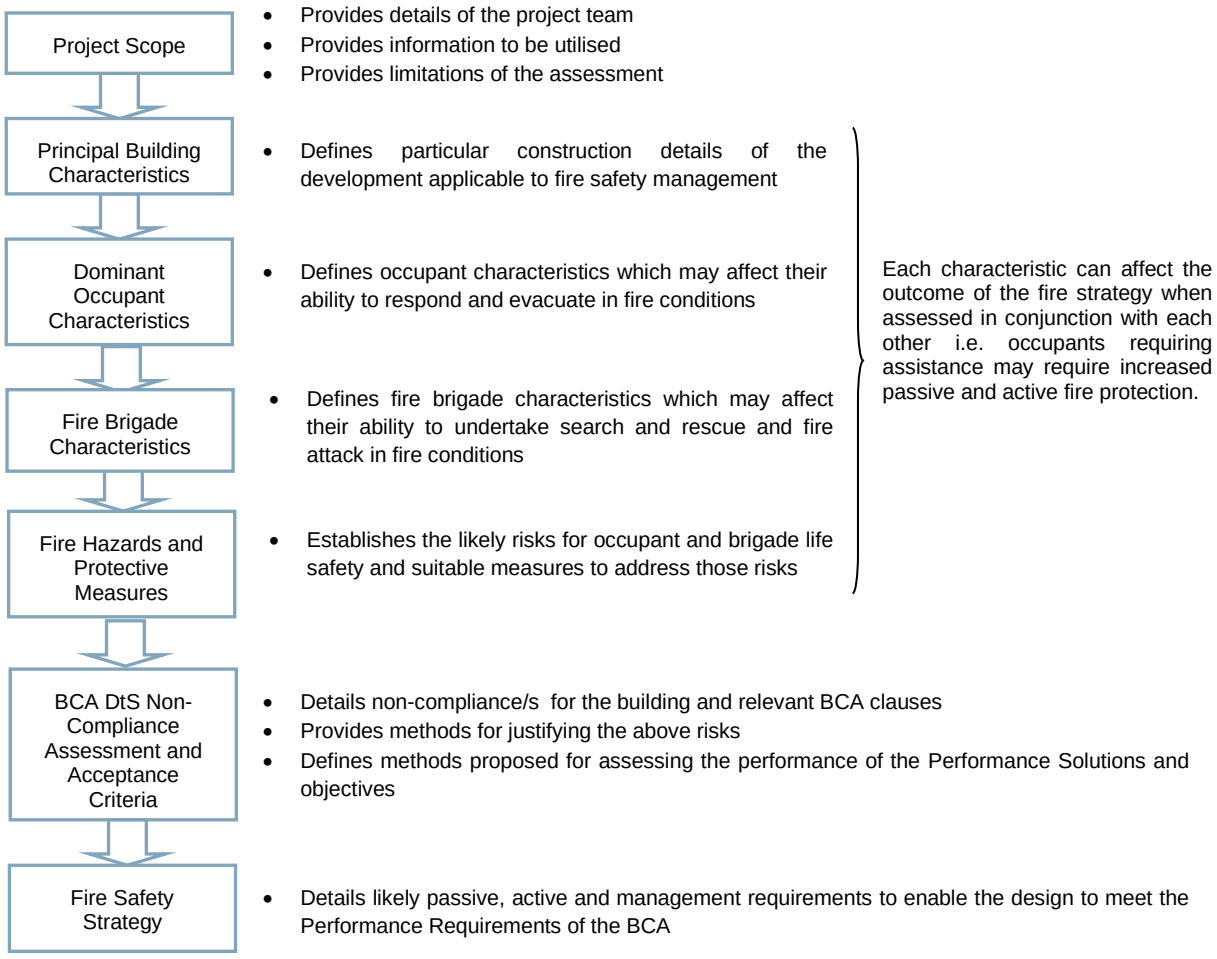


Figure 1-1: Fire Safety Strategy Process

The scope of the FSS is to detail the nominated departures that do not prescriptively meet the Deemed-to-Satisfy (DtS) Provisions of the BCA, assess these in regard to the appropriate Performance Requirements, and provide methodologies for establishing a workable and safe FSS through a trial design.

1.2 FIRE SAFETY OBJECTIVES

This FSS highlights the proposed Performance Solutions to be considered in the fire engineering assessment, for the development of a Fire Engineering Report (FER). This fire engineering assessment is one which will satisfy the performance requirements of the BCA whilst maintaining an acceptable level of life safety, protection of adjacent property, and provide adequate provisions for fire brigade intervention. At a community level, fire safety objectives are met if the relevant legislation and regulations (such as the BCA) are complied with. As stated in the BCA, "*A Building Solution will comply with the BCA if it satisfies the Performance Requirements*". In addition to this, certain non-regulatory objectives exist as detailed below.

1.2.1 Building regulatory objectives

The following items are a summary of the fire and life safety objectives of the BCA:

- **Life safety of occupants –** the occupants must be able to leave the building (or remain in a safe refuge) without being subject to hazardous or untenable conditions. The objective of the Fire Engineering Assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of exposing building occupants to hazardous or untenable conditions in an event of a fire.
- **Life safety of fire fighters –** firefighters must be given a reasonable time to rescue any remaining occupants before the onset of hazardous conditions or building collapse occurs. The objective of the fire engineering assessment is to demonstrate that the proposed building design and fire safety systems would facilitate fire brigade intervention and minimise the risk of exposing firefighters to hazardous or untenable conditions in an event of a fire.
- **Protection of adjoining buildings** – structures must not collapse onto adjacent property and fire spread by radiation should not occur. The objective of the fire engineering assessment is to demonstrate that the proposed building design and fire safety systems would minimise the risk of fire spreading from one building to another.

1.2.2 Fire Brigade objectives

The overall philosophical Fire Brigade objectives throughout Australia are to protect life, property and the environment from fire according to the Fire Brigade Intervention Model (FBIM) [5] as per the Fire Services State and Territory Acts and Regulations.

Over and above the requirements of the BCA, the Fire Brigade has functions with regard to property and environmental protection and considerations regarding occupational health and safety for its employees.

1.2.3 Non-prescribed objectives

Fire Engineering has an overarching benefit to many facets of the built environment where non-prescribed objectives can have an influence on the FSS adopted. Although not assessed within, the following can be considered if requested.

- **Business continuity –** will the loss of a particular facility due to fire / smoke damage result in excessive financial impact on the client? For example, is the facility critical to business continuity?
- **Public perception –** should a fire occur within the facility is there likely to be questionable public perception about the safety and operation of the facility?
- **Environmental protection –** fires of excessive sizes can have significant effects on the environment which may require a detailed risk assessment to minimise such outcomes.
- **Heritage salvation –** buildings can have a heritage value for both cultural and educational purposes which can be destroyed by insufficient fire protection.
- **Risk mitigation / insurance limitations –** are there specific limitations on insurance with respect to risk mitigation and fire safety design? i.e. Does the relevant insurer have concerns with respect to open voids through the building?
- **Future proofing (isolation of systems) –** what flexibility is required in the overall design to allow for future development or changes in building layout?
- **Occupational Health and Safety (OHS) requirements –** buildings may have specific fire safety requirements pertaining to OHS requirements.

1.3 REGULATORY FRAMEWORK OF THE FIRE ENGINEERING ASSESSMENT

1.3.1 Building Code of Australia

One of the goals of the BCA is the achievement and maintenance of acceptable standards of safety from fire for the benefit of the community. This goal extends no further than is necessary in the public interest and is considered to be cost effective and not needlessly onerous in its application.

Section A2.1 of the BCA [1] outlines how compliance with the Performance Requirements can be achieved, being satisfied by one of the following:

(a) A Performance Solution which demonstrates–

  (i) Compliance with all relevant Performance Requirements; or

  (ii) The solution is at least equivalent to the Deemed-to-Satisfy Provisions; or

(b) A Deemed-to-Satisfy Solution; or

(c) a combination of (1) and (2).

Section A2.2 of the BCA provides several different methods for assessing that a Performance Solution complies with the Performance Requirements, through one or a combination of the following Assessment Methods:

(a) Evidence of suitability that shows the use of a material, product, form of construction or design meets the relevant Performance Requirements.

(b) A Verification Method including the following:

  (i) the Verifications Methods in the NCC; or

  (ii) other Verification Methods, accepted by the appropriate authority that show compliance with the relevant Performance Requirements.

(c) Expert Judgement.

(d) Comparison with the Deemed-to-Satisfy Provisions.

Where a Performance Requirement is satisfied entirely by a Performance Solution, the following method must be used to determine the Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Performance Requirement from the Sections or Part to which the Performance Solution applies.

(b) Identify Performance Requirements from other Sections of Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Performance Solution.

Under Section A2.4, the following method must be used to determine the relevant Performance Requirements when using a Performance Solution in combination with a Deemed-to-Satisfy Solution: These methods are summarised as follows:

(a) Identify the relevant Deemed-to-Satisfy Provisions of each Section or Part that are to be the subject of the Performance Solution.

(b) Identify the Performance Requirements from the same Section or Part that are relevant to the identified Deemed-to-Satisfy Provisions.

  (e) Identify Performance Requirements from the other Sections and Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions that are the subject of the Performance Solution.

1.3.2 Australian Fire Engineering Guidelines

The AFEG [3] document has been developed for use in fire safety design and assessment of buildings, and reflects international best practice. The document is intended to provide guidance for fire engineers as they work to develop and assess strategies that provide acceptable levels of safety.

The document is particularly useful in providing guidance in the design and assessment of Performance Solutions against the Performance Requirements of the BCA. The prescribed methodology set out in the AFEG will be generally adopted in the FER.

2 PROJECT SCOPE

2.1 OVERVIEW

CORE Engineering Group has been engaged to develop a FSS for the construction of the proposed mixed-use re-development at 4-6 Bligh Street, Sydney, NSW, 2000. The purpose of this FSS is to outline the fire engineering principles that will be utilised in ensuring that the prescriptive DtS non-compliances identified in the BCA report are resolved in order to conform to the building regulations and permit development approval.

The complete fire engineering analysis will be included within the FER, and as such is not documented herein. This document does however outline the construction and management requirements considered necessary to achieve an acceptable level of life safety within the building as a result of the Performance Solution and to satisfy the Performance Requirements of the BCA.

2.2 RELEVANT STAKEHOLDERS

This Performance Solution has been developed collaboratively with the relevant stakeholders as identified below:

Table 2-1: Relevant Stakeholders

ROLE	NAME	ORGANISATION
Client Representative	Marvin Huang	Holdmark
Project Manager	Paul Yousseph	JPY Group
BCA Consultant	Ian Pickering	Advanced Building Approvals
Architect	Oscar Reyes Tim Davies John Norman	Woods Bagot
Fire Safety Engineer	Laurence Kwong Graham Morris	CORE Engineering Group
Registered Certifier – Fire Safety	Sandro Razzi	

It should be noted that at times some parties may have a vested interest in the outcome of the Fire Engineering assessment. Such parties can include local fire brigades, insurers, Environmental Protection Authority (EPA), project control groups, end users and community representatives. Although not always a legislative requirement, the design team should give due consideration to their inclusion in the Fire Engineering process. Where not required by legislation it is the client's decision to involve such parties, especially local fire brigade, to ensure a transparent and adequate fire safety solution for all. Where we are not notified of the inclusion of such parties it is assumed the client / representative has given due consideration to the above.

2.3 SOURCES OF INFORMATION

The following sources of information have been provided by the design team:

- BCA Advice by ABA via Aconex, reference number WB-GCOR-000157 dated 13 August 2019.
- SSDA Submission plan set by Woods Bagot dated 19 December 2022.

2.4 LIMITATIONS AND ASSUMPTIONS

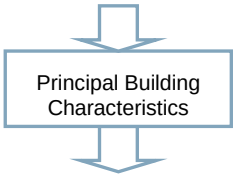
In this instance the FSS is developed based on applicable limitations and assumptions for the development which are listed as follows:

- The report is specifically limited to the project described in Section 3.
- The report is based on the information provided by the team as listed above in Section 2.3.

- Building and occupant characteristics are as per Section 3 and 4 respectively of this report. Variations to these assumptions may affect the FSS and FER, and therefore should be reviewed by a suitably qualified Fire Engineer should they differ.
- As per any building design, DtS or otherwise, the report is limited to the fire hazards and fuel loads as prescribed in the IFEG [3]. The report does not provide guidance in respect to areas which are used for Dangerous Goods (DG) storage, processing of flammable liquids, explosive materials, multiple fire ignitions, or sabotage of fire safety systems.
- The development complies with the fire safety DtS Provisions of the BCA [10] with all aspects in regards to fire and life safety unless otherwise stated in this report. Where not specifically mentioned, the design is expected to meet the BCA DtS requirements of all relevant codes and legislation at the time of construction and/or at the time of issue of this report.
- The assessment is limited to the objectives of the BCA and does not consider property damage such as building and contents damage caused by fire, potential increased insurance liability, and loss of business continuity.
- Malicious acts or arson with respect to fire ignition and safety systems are limited in nature and are outside the objectives of the BCA. Such acts can potentially overwhelm fire safety systems and therefore further strategies such as security, housekeeping, and management procedures may better mitigate such risks.
- This report is prepared in good faith and with due care for information purposes only, and should not be relied upon as providing any warranty or guarantee that ignition or a fire will not occur.
- The FSS and FER is only applicable to the completed building. This report is not suitable, unless approved otherwise, to the building in a staged handover.
- Where parties nominated in Section 2.2 have not been consulted or legislatively are not required to be, this report does not take into account, nor warrant, that fire safety requirements specific to their needs have been complied with.

3 PRINCIPAL BUILDING CHARACTERISTICS

3.1 OVERVIEW



Building characteristics are assessed as part of the fire engineering assessment due to the following:

1. The location can affect the time for fire brigade intervention and potential external fire exposure issues.
2. The structure will impact on the ability to resist a developing fire and support condition to allow occupants to escape the building and the fire brigade to undertake firefighting to the degree necessary.
3. The floor area determines the potential fire size and area required to be evacuated in the event of a fire.
4. BCA details such as Type of Construction, Class and Height will dictate passive and active fire safety systems.

3.2 SITE LOCATION

The site is identified as 4-6 Bligh Street, Sydney (the site) as illustrated in Figure 3-1. The site is comprised of a single allotment and is legally described as Lot 1 DP 1244245 with a total area of 1,128m². As shown in Figure 3-1, the site frontage is on Bligh Street, with all remaining sides bounded by existing buildings ().

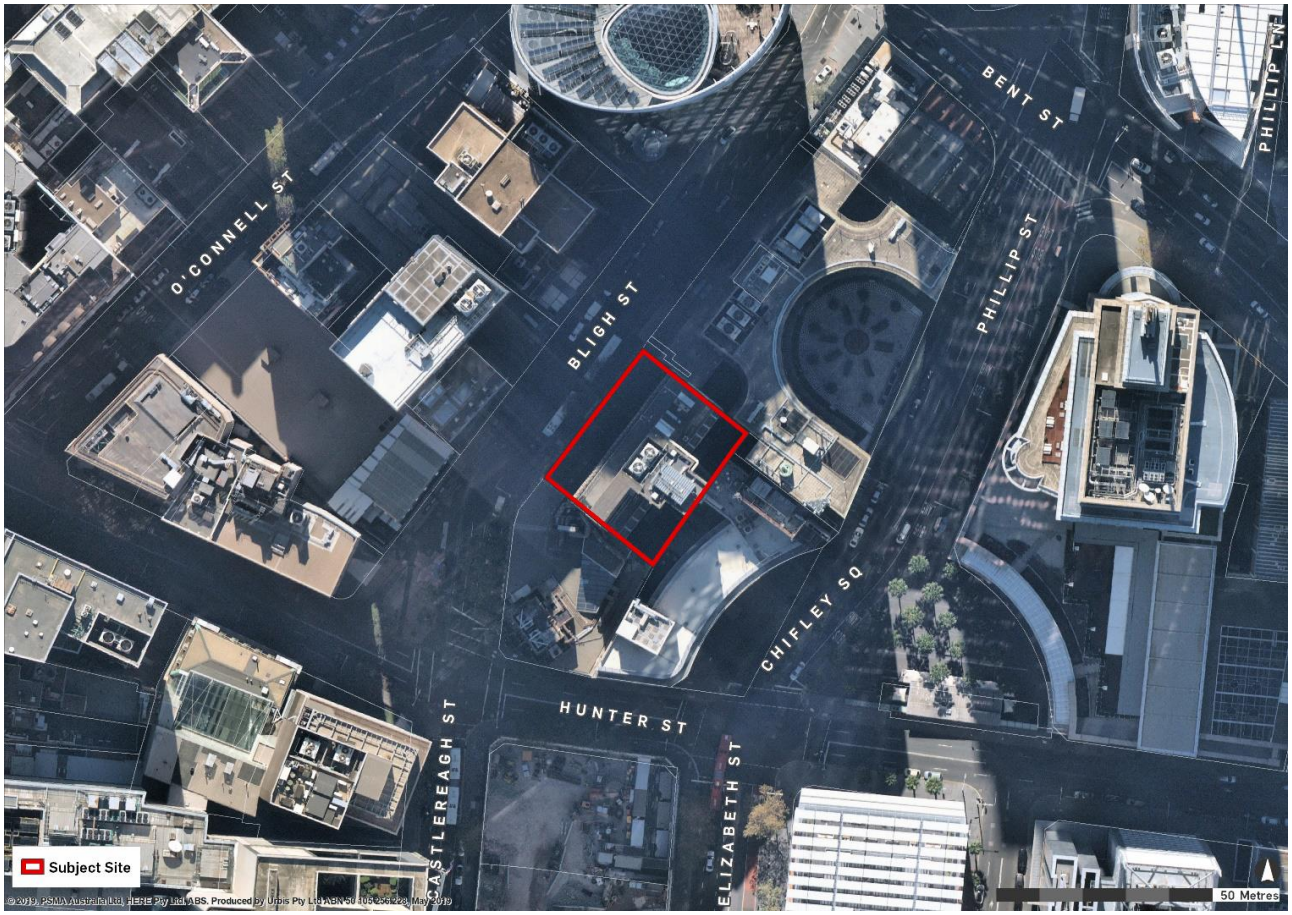


Figure 3-1: Site Location – Site Aerial

Figure 3-2: Building Perspective created by Woods Bagot

The two nearest Fire and Rescue NSW stations provided with permanent staff are within 2 km of the site, being The Rocks Fire Station and City of Sydney Fire Station.

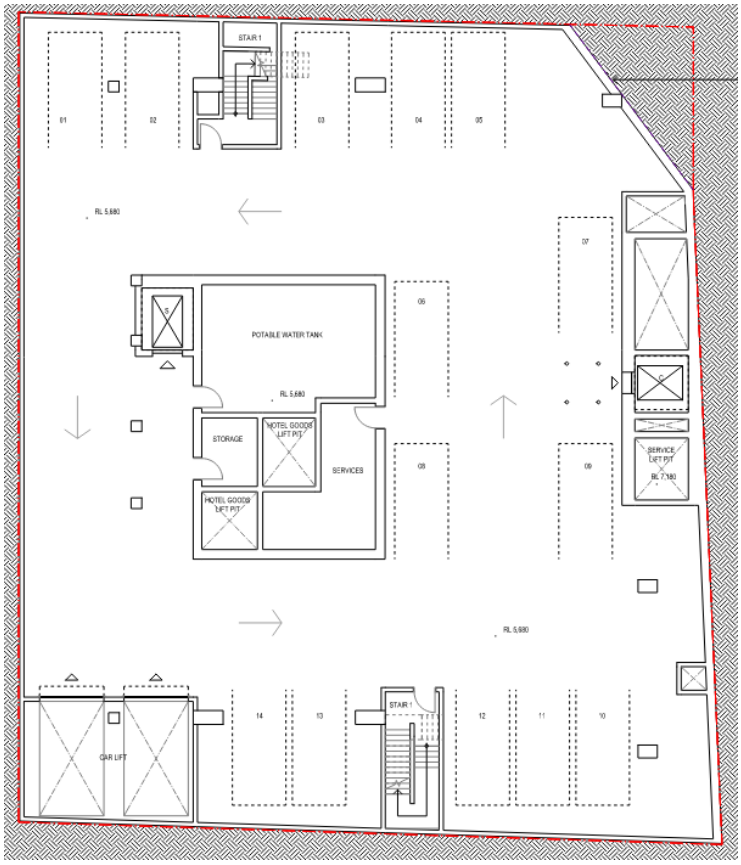


Figure 3-3: Carparking Level – Indicative of Proposed Basement 4 and 5

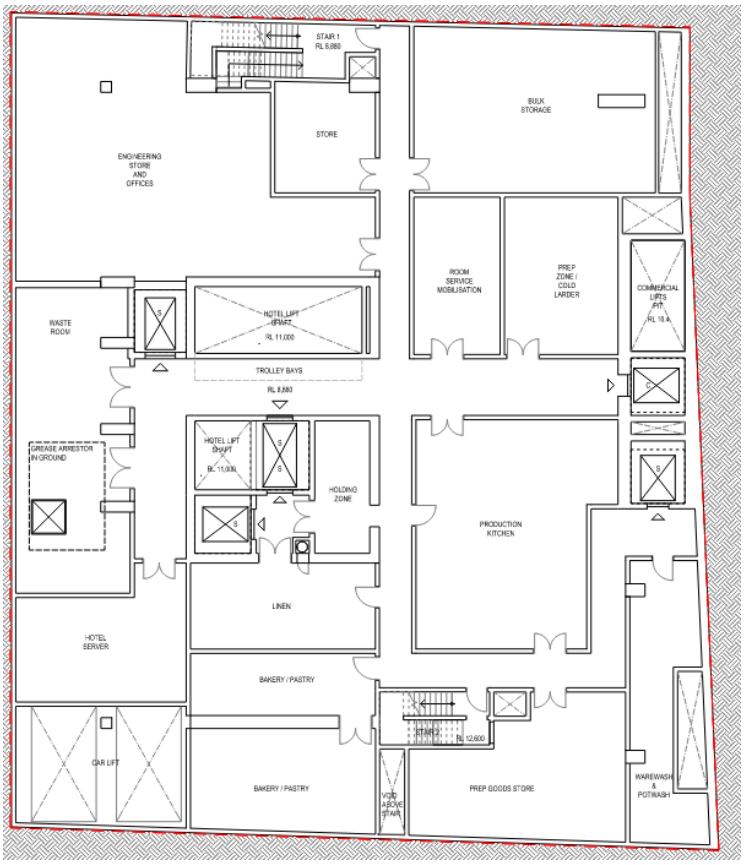


Figure 3-4: Proposed Basement 3 Plan

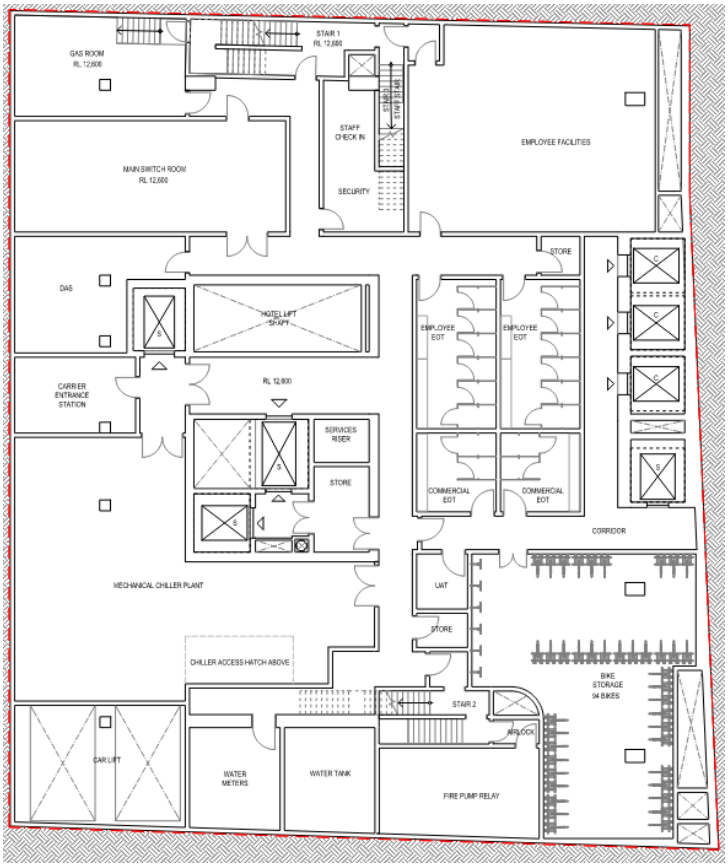


Figure 3-5: Proposed Basement 2 Plan

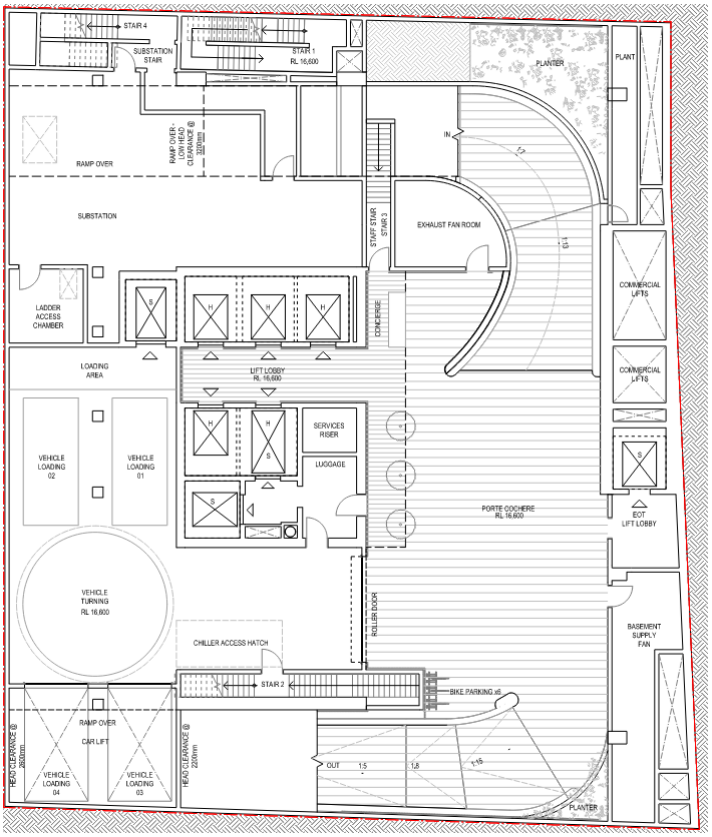


Figure 3-6: Proposed Basement 1 Plan

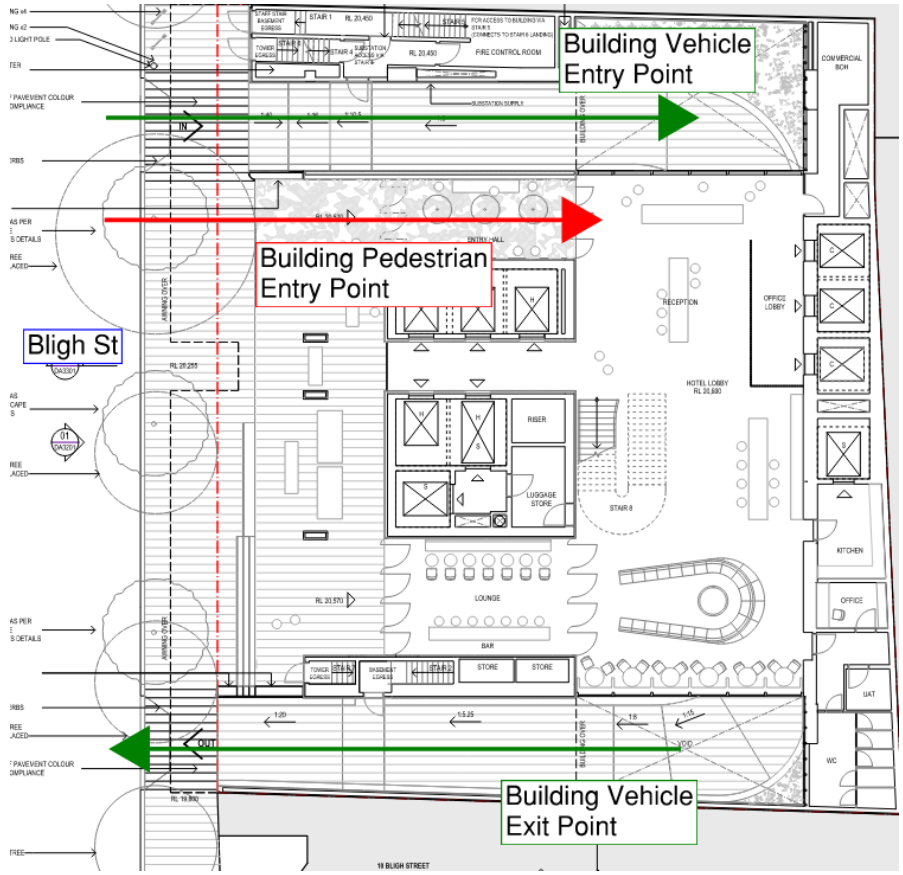


Figure 3-7: Proposed Ground Floor – Showing Bligh Street Entries

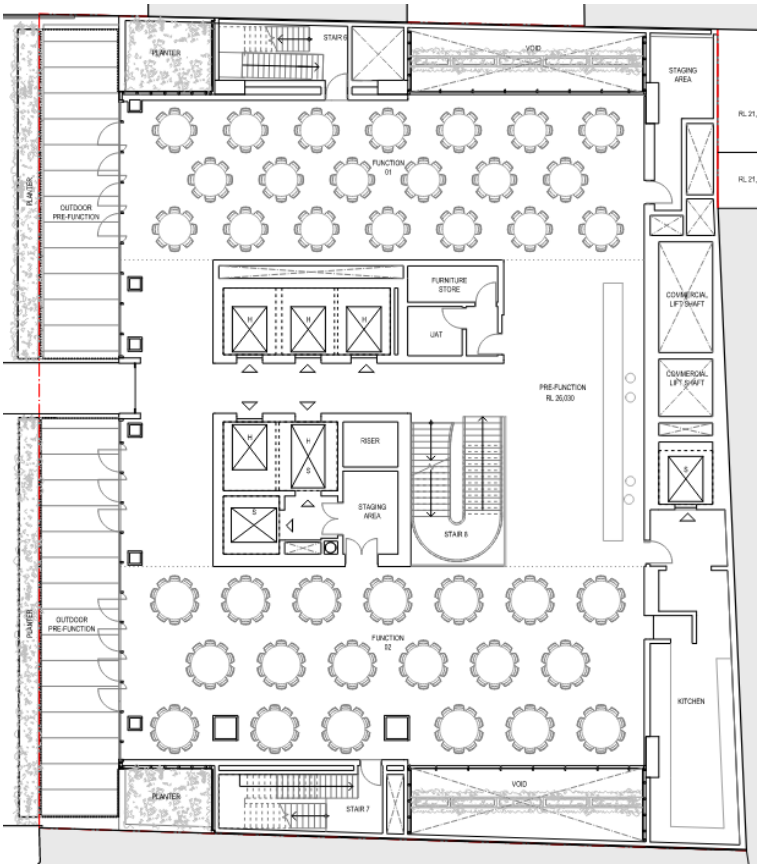


Figure 3-8: Proposed Level 1 Plan

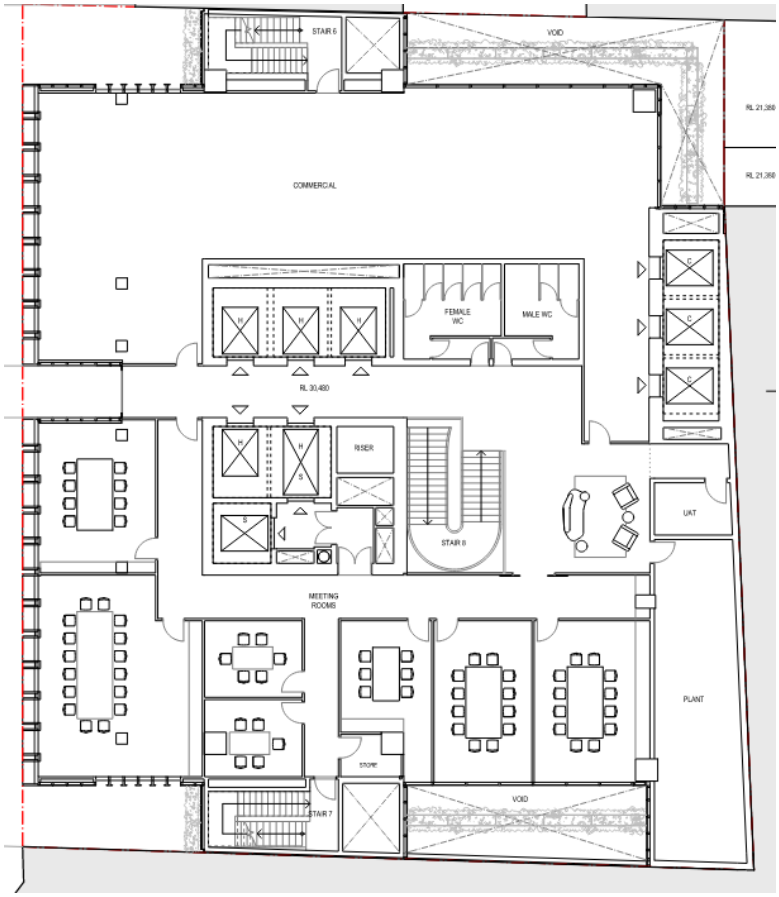


Figure 3-9: Proposed Level 2 Plan

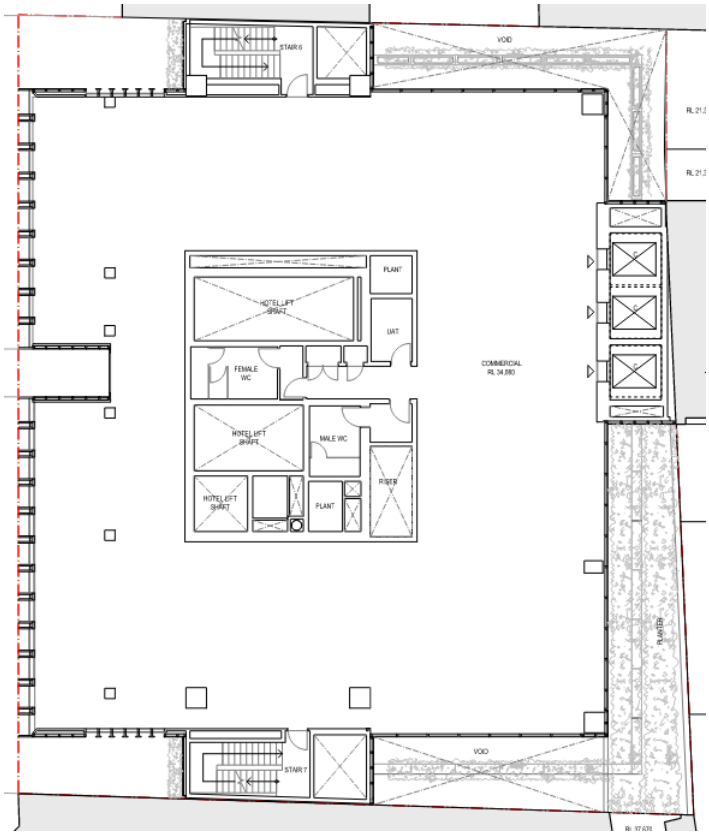


Figure 3-10: Proposed Level 3-10 Commercial Plan

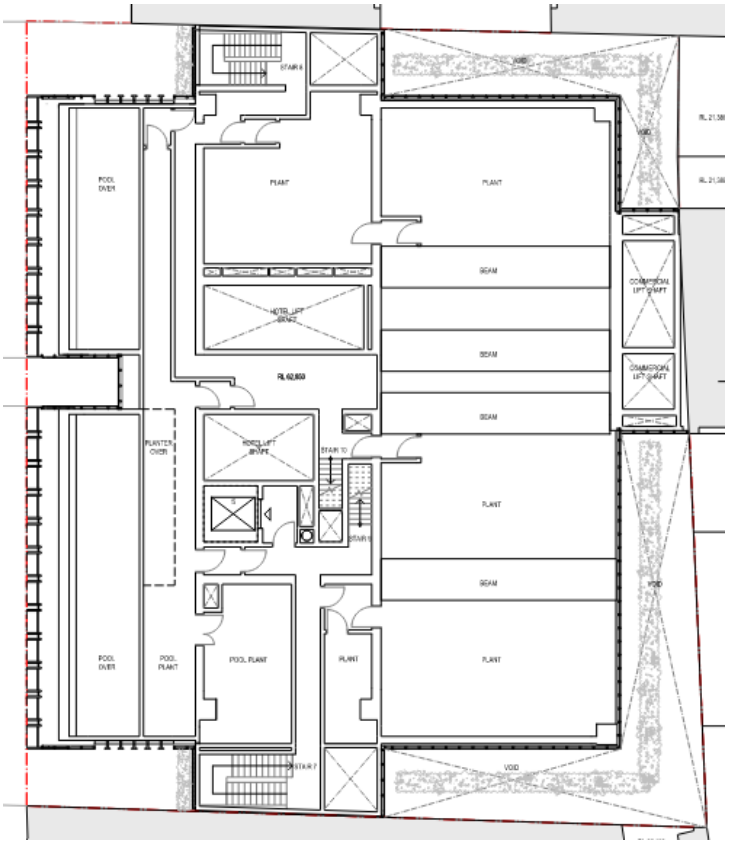


Figure 3-11: Proposed Level 11 Plan – Plant

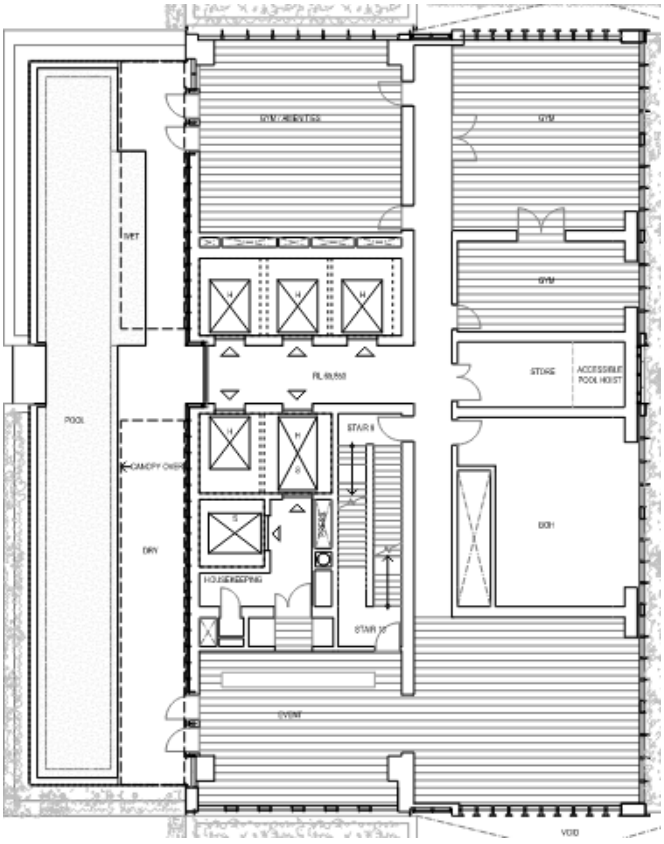


Figure 3-12: Proposed Level 12 Plan – Wellness

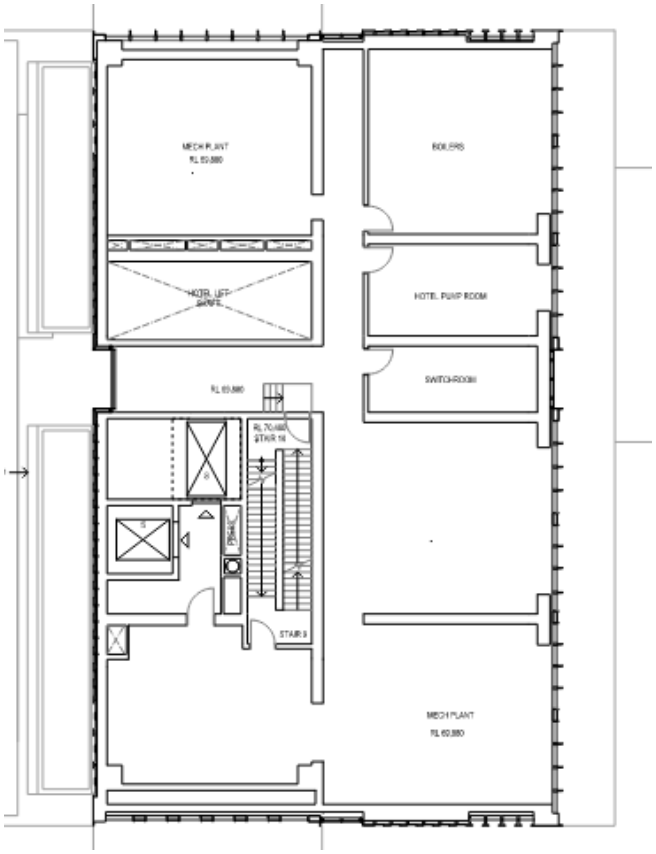


Figure 3-13: Proposed Level 13 Plan – Plant

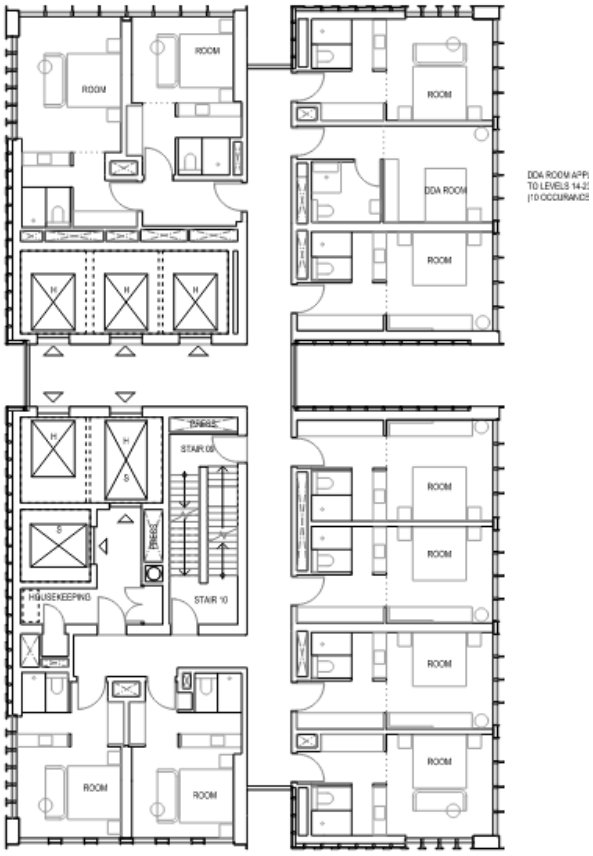


Figure 3-14: Proposed Hotel Plan – Indicative of Level 14-56

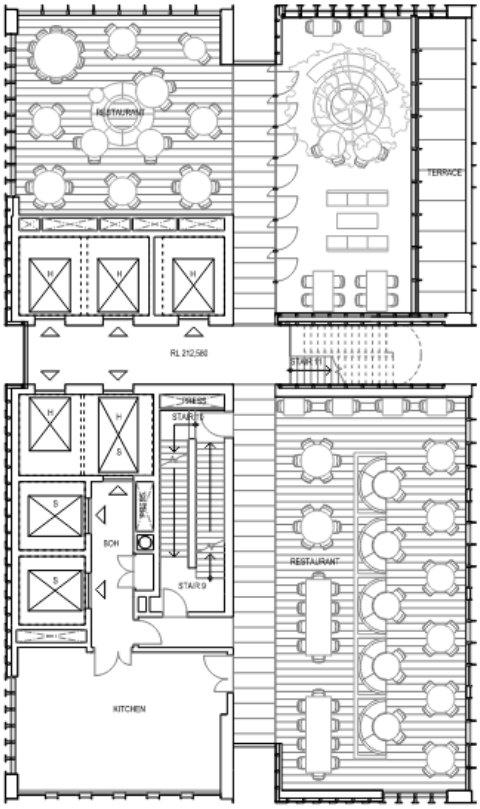


Figure 3-15: Proposed Level 57 Restaurant Plan

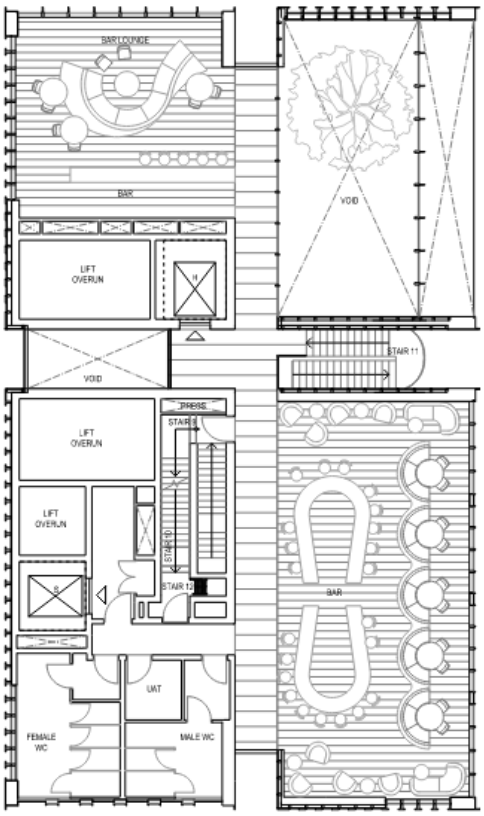


Figure 3-16: Proposed Level 58 Bar Plan

3.3 BUILDING LAYOUT

The tower is proposed to have five basement levels and 60 above ground storeys, inclusive of Ground Floor. The proposed use of each level is shown in Figure 3-17 and summarised in Table 3-1.

Table 3-1: Proposed Use Per Level

LEVEL	USE	CLASSIFICATION (TBC BY PCA)
Basement 05	Carpark	Class 7a
Basement 04	Carpark	Class 7a
Basement 03	Back of House	7b
Basement 02	Back of House, Bike Room, End of Trip	7b
Basement 01	Porte Cochere, Loading Dock, Substation	7a, 7b
Ground	Hotel Lobby, Bar	Class 9b, Class 7a
Level 1	Function Venue	Class 9b
Level 2	Meeting Rooms, Commercial tenancy	Class 5, 9b
Level 3 – 10	Commercial tenancies	Class 5
Level 11	Plant	-
Level 12	Gym, Outdoor pool	Class 9b
Level 13	Plant	-
Level 14 – 56	Hotel Rooms	Class 3
Level 57	Restaurant	Class 6
Level 58	Bar	Class 6
Level 59	Rooftop Plant	-

Generally, each level forms a single fire compartment, with the exception that:

- Ground, Level 1 and Level 2 are connected by an internal stair and therefore constitute a single fire compartment.
- Level 57 restaurant and Level 58 bar are connected by an internal stair

It is noted that the carpark on Basement 4 and 5 are accessed from a car lift located in the Basement 1 loading area. Basement 4 and 5 shall each be provided a fire shutter/curtain to maintain floor by floor compartmentation.

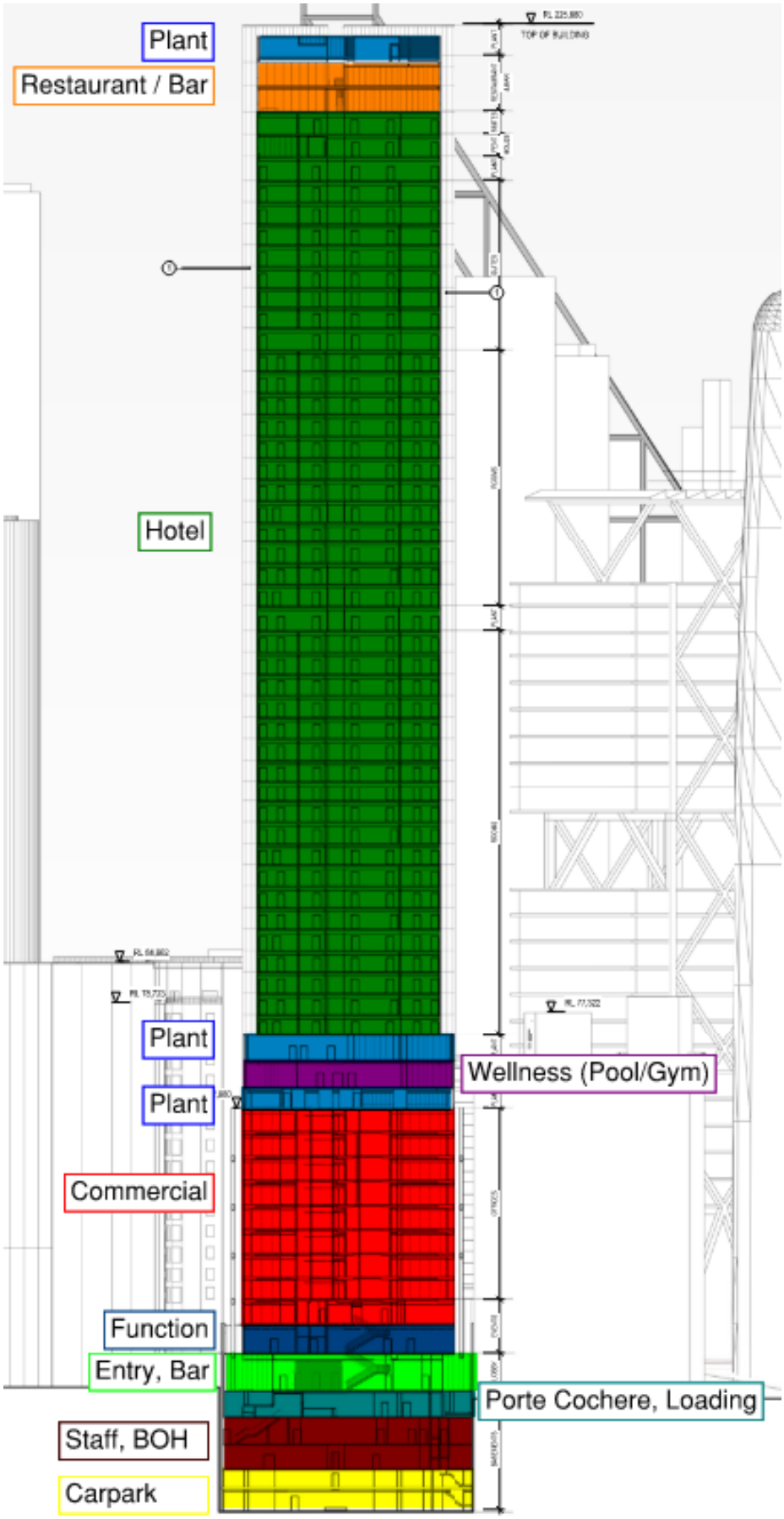


Figure 3-17: Building Use Per Level

3.4 BUILDING STRUCTURE

The building is understood to be designed as a reinforced concrete structure. All materials and elements should achieve the requisite Fire Resistance Levels (FRL) and fire hazard properties associated with Type A construction.

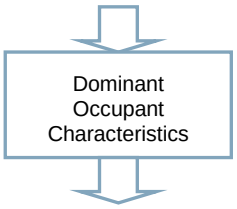
3.5 BCA ASSESSMENT SUMMARY

Table 3-2: BCA Building Characteristics

CHARACTERISTIC	DESCRIPTION
Classification	Class 3, 5, 6, 7a, 7b and 9b
Construction Type	Type A
Rise in Storeys	60
Effective Height	~205 m
Floor Area	Fire compartments well below 5,000m^2 limit.

4 DOMINANT OCCUPANT CHARACTERISTICS

4.1 OVERVIEW



The occupant characteristics are assessed within the Fire Safety Strategy due to the following:

1. Population numbers can dictate the time required to evacuate the building and the required life safety systems to be provided due to evacuation times.
2. Physical and mental attributes affect the occupants' capacity to respond to various fire cues and react accordingly.
3. Familiarity of occupants can affect the time taken to evacuate the building and subsequent active / passive requirements.

4.2 OCCUPANT NUMBERS AND DISTRIBUTION

The BCA assumes the following occupant densities per an area's function and use according to Table D1.13 [10]:

- Carpark: 30 m^2 per person
  - It is noted that carpark areas on Basement 4 and 5 shall be accessed by staff only
- Bar: 1 m^2 per person
- Gym: 3 m^2 per person
- Hotel common areas: 15 m^2 per person
- Kitchen: 10 m^2 per person
- Plant: 30 m^2 per person
- Restaurant: 1 m^2 per person
- Swimming pool: 1.5 m^2 (based on pool area)
- Office: 10m^2 per person

Further to the suggested densities for design in the BCA, for comparison, the ASPAC Hotels guideline for Fire and Life Safety Systems indicate that the following design densities should be allowed for:

- Ballrooms: 0.65 m^2 per person
- Restaurant and bar seating: 1.4 m^2 per person
- Restaurant and bar waiting: 0.65 m^2 per person
- Registration lobbies: 1.4 m^2 per person
- Hotel (residential) areas: 18.6 m^2 per person
- Kitchens: 18.6 m^2 per person
- Office: 9.3 m^2 per person
- Swimming pool: 4.6m^2 per person
- Pool deck: 1.4 m^2 per person

It is noted that these densities are only listed at this stage for information, however, must be confirmed by the client prior to detailed fire engineering analysis. Especially for function spaces, the population density given may underestimate the number of occupants present. However, it is unlikely that each area of the building will be at maximum capacity at any one time. It is still relevant though to understand the maximum number of occupants expected in any one space to test the egress capabilities of the building design.

4.3 OCCUPANT ATTRIBUTES

Occupants throughout the building will vary from alert and able bodied, to occupants who are asleep, affected by drugs and or alcohol and people with significant disabilities.

Specific to hotel residential parts, the occupant group will generally represent the broader population. There will be no factors that draw occupants with dominant features, or influence the physical and mental attributes of the general occupant group. Disabled occupants of any degree cannot be discounted from being present in the building.

Much of the time hotel occupants are present will be spent asleep and therefore recognition and reaction to emergency situations can be assumed to be affected and delayed. Also the influence of medication, alcohol and other drugs must be considered as a factor due to the function and use of the hotel facility.

- ***Hotel Guests*** throughout the building will vary from alert and able bodied, to occupants who are asleep, affected by medication and or alcohol. The occupant group generally represents the broader population, i.e. all age groups, levels of mobility and disability are likely to be present.
- ***Restaurant and Function Attendees*** are expected to be mobile with normal hearing and visual abilities similar to that as evidenced throughout the wider population. This occupant group are expected to be capable of making and implementing decisions independently however may be under the influence of alcohol as expected in such situations.
- ***Staff and Security*** are expected to be mobile with normal hearing and visual abilities, and occupants in this group are considered to take and implement decisions independently. They are expected to be fully conscious and cognisant and able to assist guests and customers in an evacuation given the level of training expected.

4.3.1 Occupant Familiarity

The majority of occupants within the building are expected to be staff and therefore the population in general are likely to react favourably in an emergency situation.

- ***Guests*** – can be expected to have an average familiarity of the areas they frequent, i.e. the path of travel between the main entrance of the building and their respective hotel suites. Further knowledge of the egress provisions cannot be depended upon as they will most likely rely upon the exit and emergency evacuation signage available during a fire emergency.
- ***Staff*** – are expected to have a good familiarity of the building layout and the egress routes in the event of a fire. They are expected to guide customers and guests in the event of an alarm.
- ***Visitors*** – may or may not be familiar with the layout of the building and may require assistance in locating the exits in the event of an emergency. Similar to the guests, they are expected to have a knowledge of the path they entered the building only with limited knowledge of any alternative exit locations.

4.4 EMERGENCY TRAINING

Guests are not expected to have any fire suppression training and as such, training is not relied upon for this building's population. It can be expected that occupants will understand general evacuation principles and the cause and effect relationship of fire alarms. Portable extinguishers are generally provided for occupant use, however, suppression by such means is not relied upon. Detection and occupant warning systems are provided to alert occupants in the event of a fire.

Staff numbers are expected to be low after hours, however, staff are assumed to play a crucial role in a fire scenario. Staff should be familiar with escape procedures through fire drills and designated fire wardens being appointed to mitigate risks under Workplace Health and Safety legislation (AS 3745:2010). Clear escape routes should be maintained with doors unlocked, and no obstructions or rubbish to hinder evacuation.

Staff and visitors are not expected to have fire suppression training and such training is not relied upon for this building population; however, staff may attempt to extinguish a fire or limit fire spread by removing objects in the vicinity of the fire in order to defend their belongings.

5 FIRE BRIGADE CHARACTERISTICS

5.1 OVERVIEW

Fire brigade characteristics are assessed within the FSS as brigade characteristics can dictate the time required for fire brigade intervention including search and rescue, and fire attack.

5.2 FIRE BRIGADE ASSESSMENT

Figure 5-1 illustrates the site plan with fire services provided for the building. These include the Fire Control Room, Combined hydrant/sprinkler booster, pump room, main building entry and fire stair discharge points.

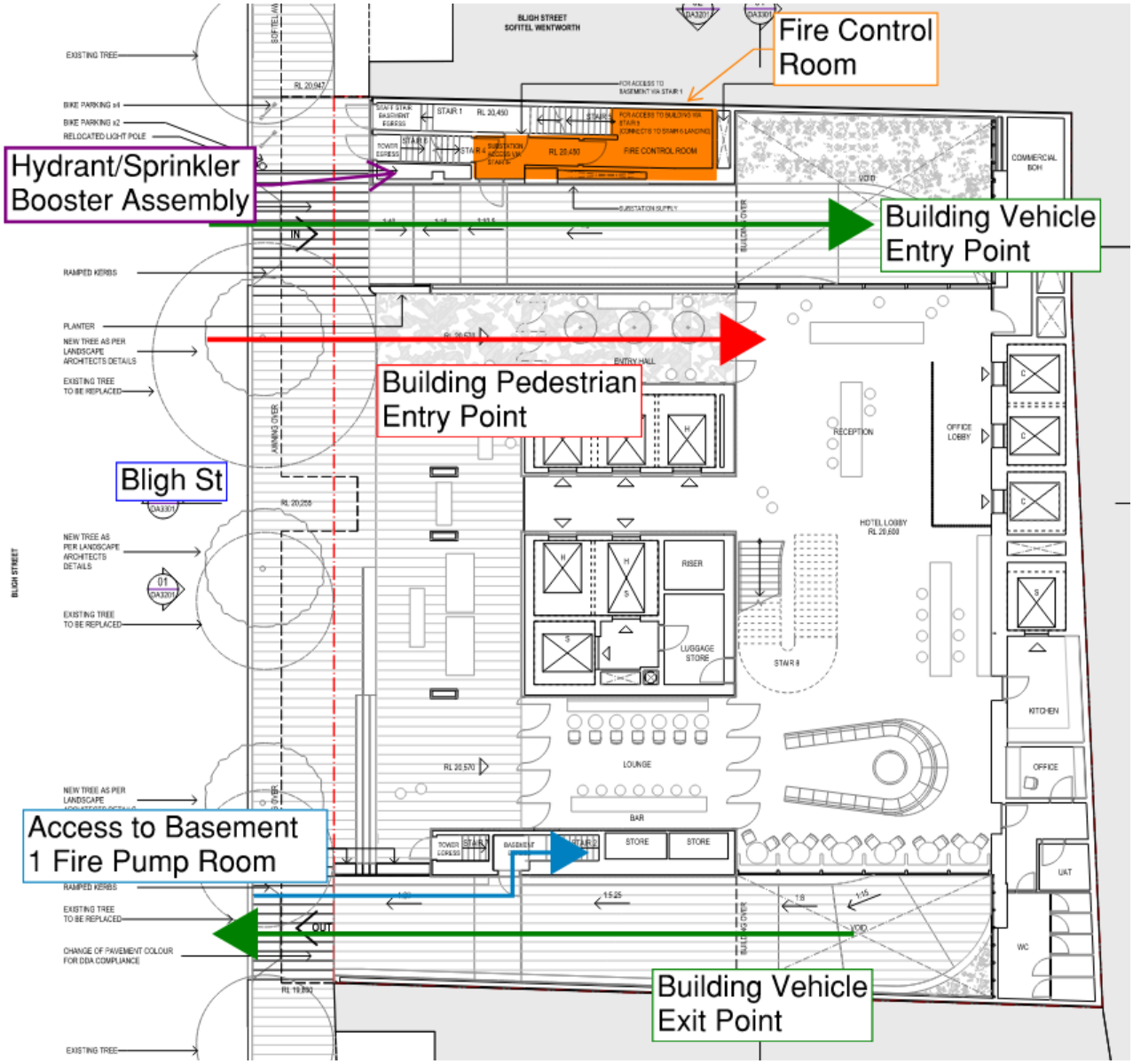


Figure 5-1: Fire Brigade Intervention (Ground Floor)

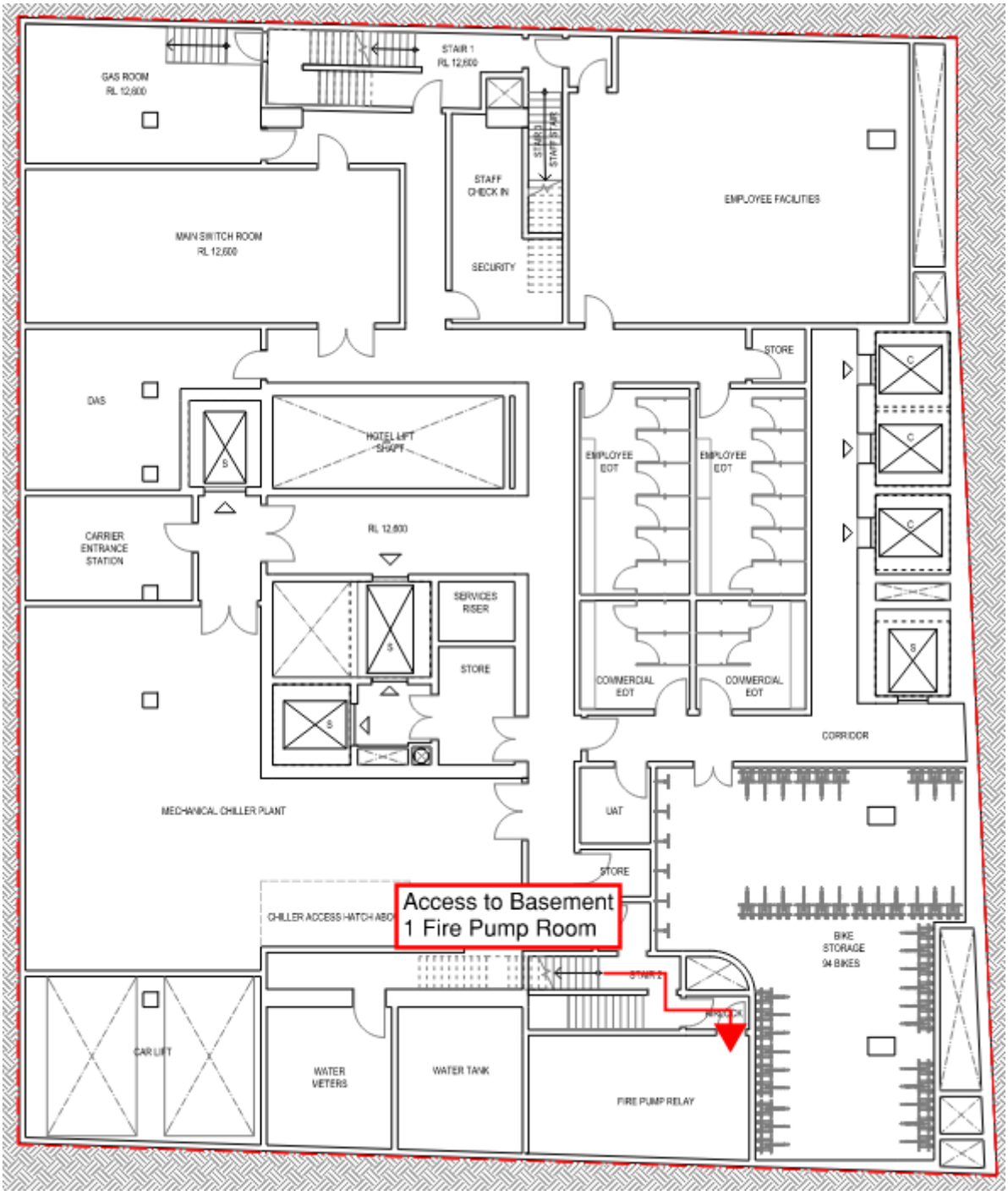


Figure 5-2: Fire Brigade Intervention (Basement 02)

The building is located within the Fire and Rescue New South Wales (FRNSW) jurisdictional turnout area. The two nearest fire brigade stations provided with permanent staff are within 2 km of the site, being The Rocks Fire Station and City of Sydney Fire Station.

6 FIRE HAZARDS AND PROTECTIVE MEASURES

6.1 OVERVIEW

The fire hazard analysis forms the basis for the review of non-compliances within the building. In assessing expected and statistically validated hazards, preventative and protective measures are developed commensurate with those expected risks. The following section reviews applicable hazards and recommends possible measures to address those risks. Furthermore, the hazards identified can form a justified basis for selected scenarios.

6.2 FIRE HAZARDS

Subsequent to a review of the relevant fire statistics and hazards, the fire hazards specific to this building are summarised below.

6.2.1 Combustible External Cladding

The design has not indicated any combustible materials to be used in the external wall of the building. Where green walls, planters and other materials are proposed to be attached to the external wall, these could represent a fire spread risk and as such will require detailed review.

6.2.2 Substation

The substation for the building is located on Basement 1 and is accessed via FS4 via Bligh Street (provided with two access points) and shall be separated from the remainder of the building by fire-rated construction in accordance with the supply authority requirements (anticipated to be 180/180/180 FRL with appropriate blast radii).

6.2.3 Photovoltaic Cells

No PV cells have been identified at this stage, however if any are proposed – the following general design guidance is provided in order to limit any electrical exposure to evacuating occupants or attending fire fighters:

An A4 notice on fade resistant material shall be displayed at the FIP notifying attending fire fighters as to the existence of the Photovoltaic Solar Panel Array on the roof of the building. The notice shall include:

- The location of the panels
- The location of all associated isolation switches, AC and DC isolators for the shut- off of generated electricity
- If the PV automatically isolates on fire trip, a statement advising of the same
- A statement in 8mm font stating (or similar):
  - Photovoltaic (PV) Panels Present
  - PV panels are mechanically fixed to the roof as shown below.

6.2.4 Insulated Sandwich Panels

Where insulated sandwich panels are proposed within the facility (typically kitchen areas, or in basement levels), these shall be installed in accordance with the Code of Practice, IPCA Ltd Code of Practice (CoP) Version 4.3 dated 2017.

- ISPs must have a Group 1 Certificate when tested to AS ISO 9705 2003, or Class 1 to FM 4881 (relevant to PIR) and their fire performance is to be in accordance with the CoP.
- Certification should be provided from the accredited installer (e.g. a Code Compliant Company with the Code of Practice) that the panels (All EPS must meet AS 1366.3 1992, use only 100% FR bead) and the installation comply with the requirements of the CoP.
- The use of ISP's should be identified in accordance with the requirements of the CoP e.g. labels (see Annexure D of CoP for examples) being placed on all doors leading into the rooms that have utilised ISP Systems;
- The key diagram required by the CoP is to be located at the fire indicator panel. The key diagrams shall indicate the locations and specification of all ISPs in the building and can assist firefighters when making operational decisions.

6.2.5 Basement Levels

Basement levels can cause difficulty in fire brigade intervention and access. At this site, Basement 1 is accessible from open space (albeit via the ramp to the porte cochere at the rear of the building). This minimises the evacuation and access risk from this level. The sprinkler system provided throughout the building as well as two fire-isolated pressurised stairs serving each basement level shall offset the risk from Basement 2-5.

6.2.6 Electric Vehicles

There is currently no proposal for electric vehicle charging stations in the proposed development. Given difficult of access to Basement 4 and 5, it is recommended that no electric vehicle charging stations be implemented on these levels.

Notwithstanding this, the presence of electric vehicles cannot be discounted from the basement levels. It is expected that the proposed sprinkler system will provide a level of protection insofar as preventing fire spread and protecting the structure. It is recommended that consideration be provided towards increasing the fire rating on the carparking levels given the potential difficulties of firefighting for EVs and given the accessibility of the space on Level 4 and 5.

6.2.7 Connection of Levels

Generally, each level forms a single fire compartment, with the exception that:

- Ground, Level 1, and Level 2 are connected by an internal stair.
- Level 57 restaurant and Level 58 bar are connected by an internal stair

The connection of levels has the potential to impact on more occupants, dictate mechanical system capacity and modify EWIS cascade design. These connections must be considered through the development of the fire strategy.

6.2.8 High Population Areas

Areas within the building having a potential high population can overwhelm egress systems and the overall fire strategy if not adequately allowed for. In this development, dense populations are expected on:

- Ground Floor
- Level 1
- Level 57
- Level 58

6.2.9 Exposure to Adjoining Buildings

As the building is designed to maximise floor area within the site constraints, various parts are within 3 m of the side and rear boundaries. As a result, the external wall in these locations must achieve a fire rating to prevent fire spread between buildings – with any openings protected appropriately, either in accordance with the DtS Provisions of the BCA or through detailed fire engineering analysis.

6.3 PREVENTATIVE AND PROTECTIVE MEASURES

6.3.1 Fire Initiation and Development and Control (Sub-System A)

To minimise the risk of fires initiating and growing to a size which may impact on the building occupants, fire safety systems are to be utilised within the building as listed in the following sections. The following general advice may also be provided to limit the likelihood of fire initiation and development.

- Flammable materials should be stored away from ignition sources where possible.
- Scheduled maintenance of all electrical equipment / switchboards, inclusive of thermal imaging
- Adhere to safe operating procedures for ‘hot work’ (e.g. welding).
- No smoking policy

6.3.2 Smoke Development and Spread and Control (Sub-System B)

It is recognised that smoke is one of the most serious threats to life safety in the event of a fire. The following are proposed to assist in maintaining egress paths free for evacuation and fire brigade intervention

- Stair pressurisation to each fire-isolated stair (inclusive of those serving the basement levels)
- Zone smoke control system
- Dedicated smoke exhaust to L57 and 58 (TBC).
- Ventilated hotel corridors (acting as relief paths for the pressurisation system)

- Smoke detection system throughout the building.
- Airlocks and smoke lobbies as appropriate to protect fire-isolated stairs and passageways.

6.3.3 Fire Spread and Impact and Control (Sub-System C)

To limit the extent and impact of fire spread through the buildings, the following are to be implemented in the building.

- Type A construction
- SOU bounding construction
- No combustible materials used in the external wall construction
- Protection of external walls within 3 m of the site boundary.
- Sprinkler system

6.3.4 Fire Detection, Warning and Suppression (Sub-System D)

The following active systems are to be used within the buildings to facilitate occupant warning and suppress a potential fire.

- Smoke detection system
- Manual call points
- Emergency Warning and Intercom System (EWIS)
- Sprinkler system
- Fire hose reels
- Fire extinguishers

6.3.5 Occupant Evacuation and Control (Sub-System E)

The building is to be provided with the following systems to assist in the evacuation of occupants:

- Emergency lighting
- Exit signage
- Fire-isolated stairs
- Emergency management plan
- Cascading alarm sequence, coordinated with the EMP
- WIP phones
- Lifts for evacuation (TBC)

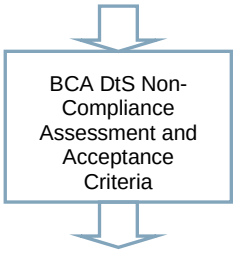
6.3.6 Fire Services Intervention (Sub-System F)

The building is to be provided with the following systems to assist in fire brigade intervention:

- Combined hydrant and sprinkler system
- Ring main
- Automatic link to fire brigade
- Fire control room
- Relay pump
- Emergency lifts
- Dual supply
- Local fire brigades in close vicinity supported by full time staff

7 BCA DTS NON-COMPLIANCE ASSESSMENT

7.1 OVERVIEW



In this instance the BCA DtS non-compliances have been formulated based on the regulatory review as provided by the principal certifying authority. Where not listed herein the building is required to achieve compliance with relevant DtS provisions or if existing, comply with relevant codes, reports and / or Standards approved at the time of consideration.

The following table lists the departures from the DtS provisions of the BCA currently identified and the measures anticipated in order to demonstrate compliance through a performance-based solution. Section 8 indicates additional options for Performance Solutions which may be provided upon further review.

7.2 BCA DTS NON-COMPLIANCE ASSESSMENT

Table 7-1: Summary of Performance Solutions

BCA DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
Rationalised FRL to Class 6 Parts **BCA DtS Provisions** DtS Provision C1.1: Fire resistance levels DtS Provision C2.9: Separation of Classifications in Different Storeys **Performance Requirements** CP1, CP2	**Relevant BCA DtS Provisions** • Class 6 parts are required to achieve an FRL of 180/180/180 • Parts of the building located above one another shall be fire separated as per the FRL required for the part below. **DtS Variation** It is expected that a reduction in FRLs for the Class 6 bar area at Ground Floor, and the Class 6 restaurant and bar at Level 57 and 58 can achieve a reduced FRL of 120/120/120 to the slabs providing compartmentation. **Measures Relied Upon** • Sprinkler protection • Significant area of glazing / openings from compartments affected • Ground Floor columns to achieve minimum 180 min FRL • Design against disproportionate collapse and robustness in design *Note: collaboration with the structural engineer is paramount in achieving an appropriate solution.* *Note: further review of basement level FRLs shall be undertaken in conjunction with the structural engineer and certifier.*
Extended Travel Distance - Basement 2-3 **BCA DtS Provisions** Clause D1.4: Travel distances **Performance Requirements** DP4, EP2.2	**Relevant BCA DtS Provisions** • Travel to a point of choice from Class 5, 6, 7, 8 or 9 parts must not exceed 20 m. **DtS Variation** Distances from store rooms and back of house areas within Basement 2-3 appear to be up to 30 m to a point of choice. **Measures Relied Upon** • Infrequent occupant use • Smoke detection • Sprinklers • Corridors maintained clear of any storage

BCA DTS PROVISIONS	DETAILS OF PERFORMANCE BASED SOLUTION
Extended travel Distance – Hotel **BCA DtS Provisions** DtS Provision C2.14: Public Corridors in Class 2 and 3 Buildings DtS Provision D1.4: Travel distances **Performance Requirements** DP4, EP2.2	**Relevant BCA DtS Provisions** • Travel to a point of choice from the doorway of a SOU in a Class 3 part must not exceed 6 m. • Public corridors must not exceed 40 m without intermediate smoke separation. **DtS Variation** Travel from hotel suites is up to 13 m and corridor lengths are approximately 45 m on some levels. **Measures Relied Upon** • Smoke seals to all doorways opening to the corridor • Stair pressurisation and relief path through the corridor • Sprinklers • Smoke detection • EWIS system
Hydrants on Mid-landings **BCA DtS Provisions** DtS Provision E1.3: Fire hydrants **Performance Requirements** EP1.3	**Relevant BCA DtS Provisions** • Fire hydrants must be provided on the level that they serve. • Note that it is expected that this will become DtS conformant under NCC 22 • Fire hydrants in accordance with AS2419.1 **DtS Variation** • Due to the configuration of the fire stairs on certain levels, hydrant will be located on mid or quarter landings in lieu of the level served. • Where under NCC 22, AS2419.1:2021 will be applied to the building despite exceeding 135 m in effective height and shall be performance based **Measures Relied Upon** • Hydrant coverage of the building achieved from hydrants located within fire stairs • One hydrant located in each stair, dedicated to serve one level only. • Consultation with FRNSW

8 PROPOSED FIRE SAFETY STRATEGY

8.1 OVERVIEW

The FSS outlined below has been proposed to satisfy the fire and life safety objectives specified for this project by the relevant stakeholders. In addition, the FSS is required to adequately address the specific fire and life safety hazards identified for the proposed development, and as such have been generally derived from the preventative and protective measures outlined within the BCA, and fire engineering literature and research. Where items of non-compliance have not been identified by the design team in the concept design phase, it is expected that those items will be DtS solutions.

This section provides guidance for the design and application of fire safety measures. It highlights specific design considerations for a range of fire safety measures that will undergo analysis as part of the FER to ascertain whether the relevant Performance Requirements of the BCA are satisfied. Design guidance (general informative details and specific requirements) for a range of specific fire safety measures is provided. This list is not exhaustive and the use of other fire safety measures including new technologies will require additional review.

It is noted that the below has been formulated on the basis of the currently in-force NCC, being NCC 2019 Amendment 1. As NCC 2022 will come into force in May 2023, it is likely that the subject building will be constructed under the new building code. At this point in time, it is not anticipated that there will be any impacts on the proposed fire strategy herein.

8.2 PASSIVE FIRE PROTECTION

8.2.1 Type of Construction Required

The development shall be building in accordance with the BCA DtS provisions for Type A fire-resisting construction.

Typical prescriptive FRLs for various parts are as follows:

- Class 3 – 90/90/90 (--/60/60 non-loadbearing bounding construction)
- Class 5 – 120/120/120
- Class 9b – 120/120/120
- Class 6 – 180/180/180
  - Note: a review of this requirement may be possible via a Performance Solution. A reduction to 120/120/120 may be possible, however would rely on detailed analysis. Input from a structural engineer would be required relating to the potential for disproportionate collapse and robustness in design (i.e. with regard to failure of a column element with a reduced FRL).
- Class 7b – 240/240/240
  - Note: a review of the classifications of the loading dock and other storage areas within the building is required by the PCA. Consideration of the floor areas on each level to be less than 10% such that they can be treated as ancillary to the main classification of the level.

It is recommended that consideration be provided to increasing the FRL achieved by the structure and fire separating elements no Basement 4 and 5 to assist in mitigating the potential consequence of an EV fire given the location and accessibility of the basement for firefighter intervention.

8.2.2 Separation from Adjoining Buildings

The external walls of the building must be greater than 3 m from the side or rear boundary, or achieve an FRL with openings protected in accordance with DtS Provision C3.2 and C3.4 of the BCA.

This generally appears achievable in all locations, with the following locations to be reviewed to ensure that they are 3 m or more from the side allotment boundaries.

- North-eastern corner to the northern and eastern elevations on Levels 1-11
- South-western corner on Levels 1-11

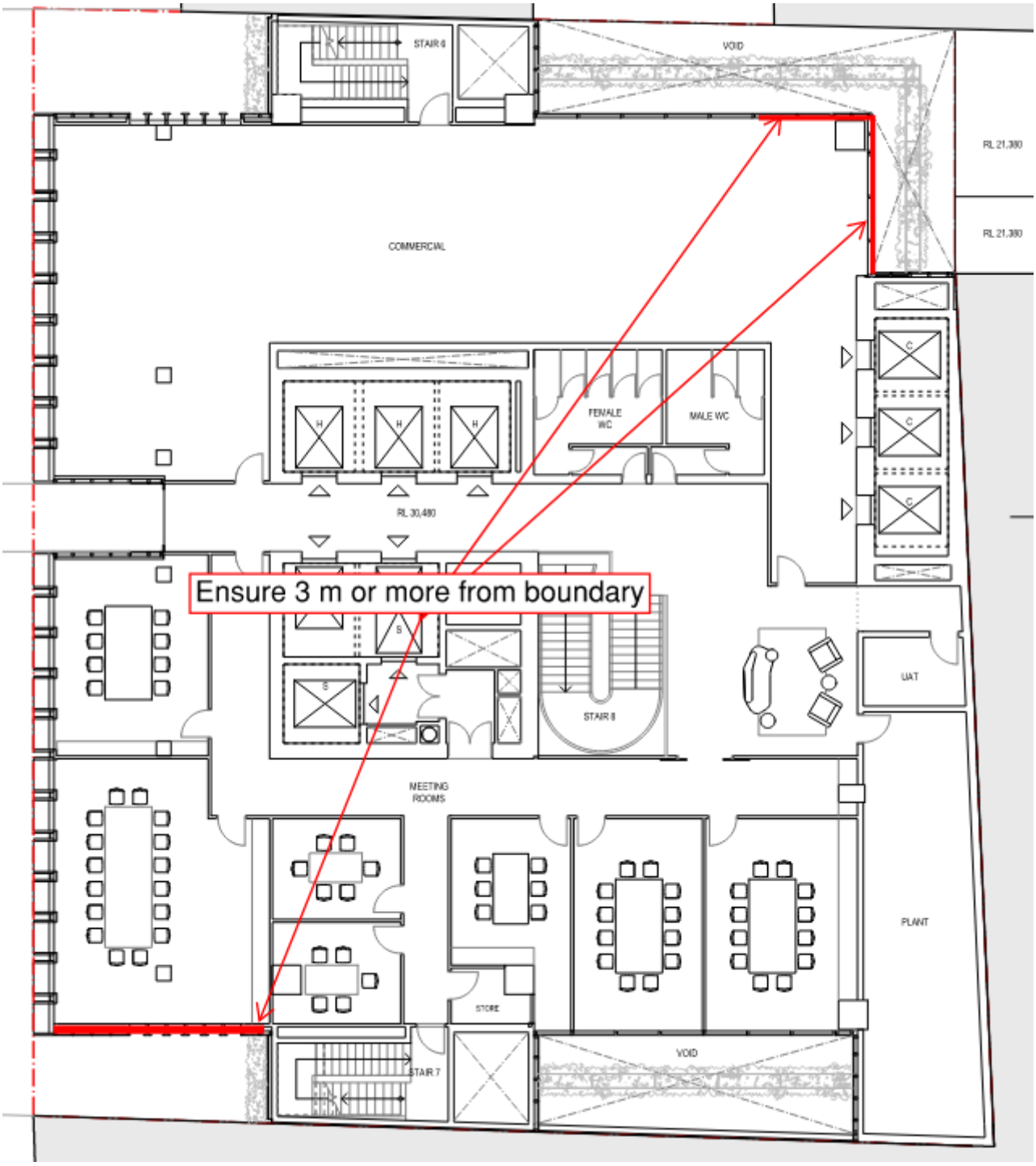


Figure 8-1: External Wall Within 3 m of Side Allotment Boundaries

8.2.3 Façade Detailing at Compartment Boundaries

The details of SOU bounding construction and slab edge construction as they adjoin a curtain wall is not addressed in the DtS Provisions and thereby requires fire engineering input to support the curtain wall design. As such, a detailed review is required of the typical details proposed – with consideration of adequate prevention of fire and smoke spread via the gap between the fire rated slab/wall and the glazing.

It is likely that a combination of steel façade backpans, compressed mineral fibre batts at the slab edge, and firestop joint spray will be required, subject to curtain wall detailed design.

8.2.4 Combustible Materials

DtS Provision C1.9 of the BCA requires external walls to be non-combustible in buildings of Type A construction. Attachments that are not deemed non-combustible have been under heavy scrutiny after the high-profile events of Lacrosse and Grenfell. To this end, the use of any aluminium composite panelling or other combustible materials will not be supported.

A specific review of any plants on the exterior of the building will be required, as although not part of the external wall, have the potential to propagate fire spread if not designed and maintained appropriately.

8.2.5 Smoke Separation

The public corridors in Class 3 hotel parts are prescriptively required to be smoke separated into parts no greater than 40 m in length.

- On some levels, the corridor lengths appear to be up to 45 m, which can be supported through a Performance Solution reliant on smoke sealing to all doors to the corridor in addition to the stair pressurisation system with relief paths for ventilation.
- Medium temperature smoke seals shall be provided to all fire doors opening into the public corridors with exception of lift and fire stair doors. These shall be tested as part of the fire door assembly, tested as per AS1530.7:2007 and achieve the minimum performance requirements of AS6905:2007.

8.3 EGRESS PROVISIONS

8.3.1 Evacuation Strategy

Activation of any sprinklers, smoke detection, or manual call points in the building shall initiate the EWIS system cascade.

The specifics of the cascade sequence shall be programmed as considered appropriate by the emergency planning committee, building owner/operator, fire services contractor and fire engineer. Consideration of delay times and number of floors involved in each stage will need to consider, inter alia, the population anticipated, and number of storeys connected.

8.3.2 Number of Exits Required

A minimum of 2 exits is to be available from all parts of the building. This appears to be achieved, with further review of the following areas needed to ensure compliance:

- The rooftop plant area is served by Stair 09 and a second exit by means of a AS1657 compliant stairway entering to Stair 10.
- Basement 01 has two exit points which shall be reviewed during the Design Development stage. The door swing to Stair 2 on this level is to be reviewed and egress via Stair 3 to Stair 1 appears feasible but requires additional consideration. It is noted that the ramps cannot be considered as egress paths due to their gradient.
- If subdivision of the commercial levels into two or more tenancies is desired, access to two exits must be maintained, from each tenancy and from the main lobby. If this scenario is likely, additional review of possible corridor linking the lifts and fire stairs is needed.

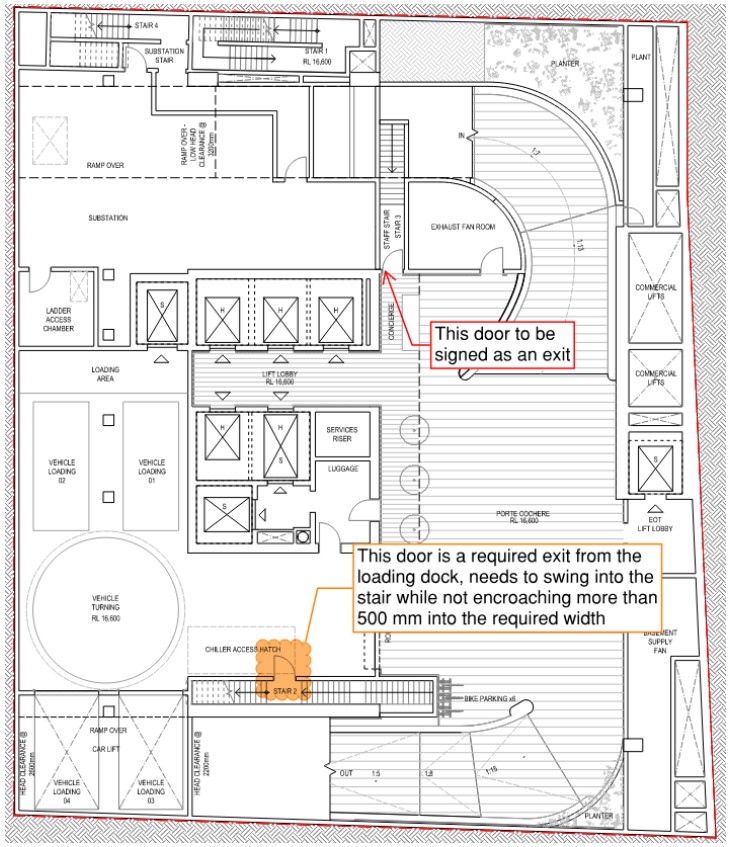


Figure 8-2: Egress from Basement 1

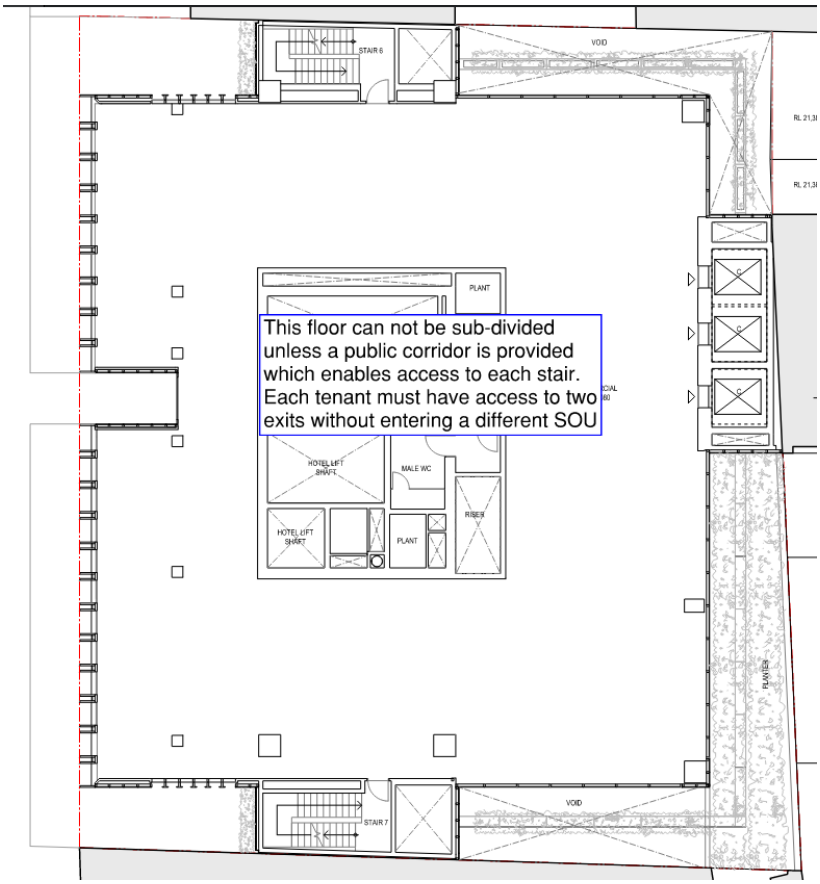


Figure 8-3: Egress from Commercial Levels - Level 3-10 Typical

Notwithstanding the above, the number of exits must ensure aggregate widths provided are sufficient for the populations expected. This will be critical to the following levels:

- Level 1 Function (3.5 m exits, including internal stair, permits 380 prescriptively)
- Level 57 and 58 (2 m exits permits 200 per level prescriptively)

Although these are the DtS limits, fire engineering analysis will be necessary to confirm the appropriateness of these large populations and the impact on the connection of levels, the separation of exits and the mechanical system design in each area.

8.3.3 Travel Distances

Given the small building footprint, travel distances are anticipated to be generally within the DtS limits. Exceptions expected are:

- Travel distances in Basement 2 and 3 may exceed 20 m to a point of choice. In this case, a performance solution is likely to be possible reliant on infrequent use of the area and the sprinklers and smoke detection and EWIS provided.
- Travel distances in hotel corridors appears to be up to 13 m in lieu of 6 m. A Performance Solution is possible (typically for distances up to 12 m) reliant on smoke seals to all fire doors opening to the corridor.

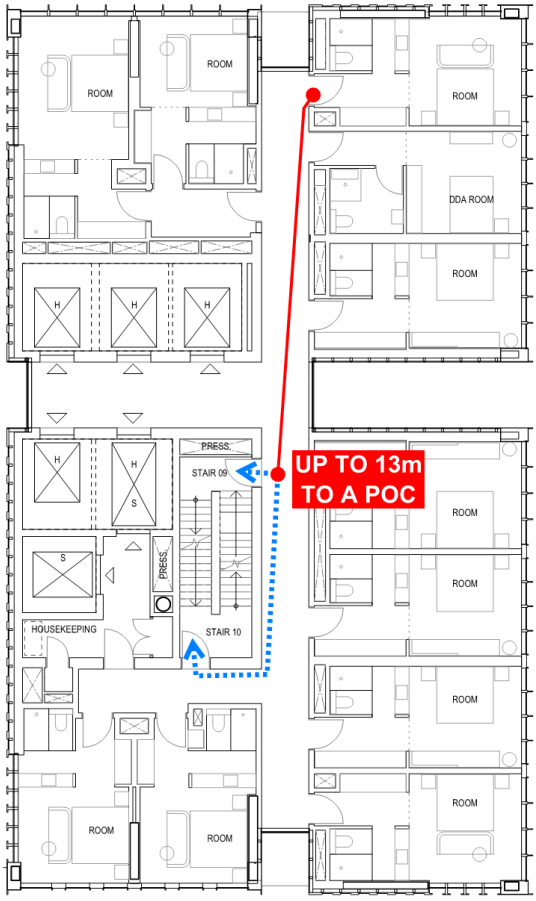


Figure 8-4: Travel Distance Hotel Levels (typical)

8.3.4 Alternative Exits

Alternative exits are to comply with DtS Provision D1.5 with regards to distance between exits and the separation between alternative exits. Notably, the tower from Level 11 upwards will be served by scissor stairs.

Attention is drawn to the separation of alternative exits from Level 14-58 whereby the distance between exits appears to be less than 9 m, currently circa 8.8 m. It is recommended that the stair core be adjusted to ensure a minimum separation distance of 9 m is achieved on all levels.

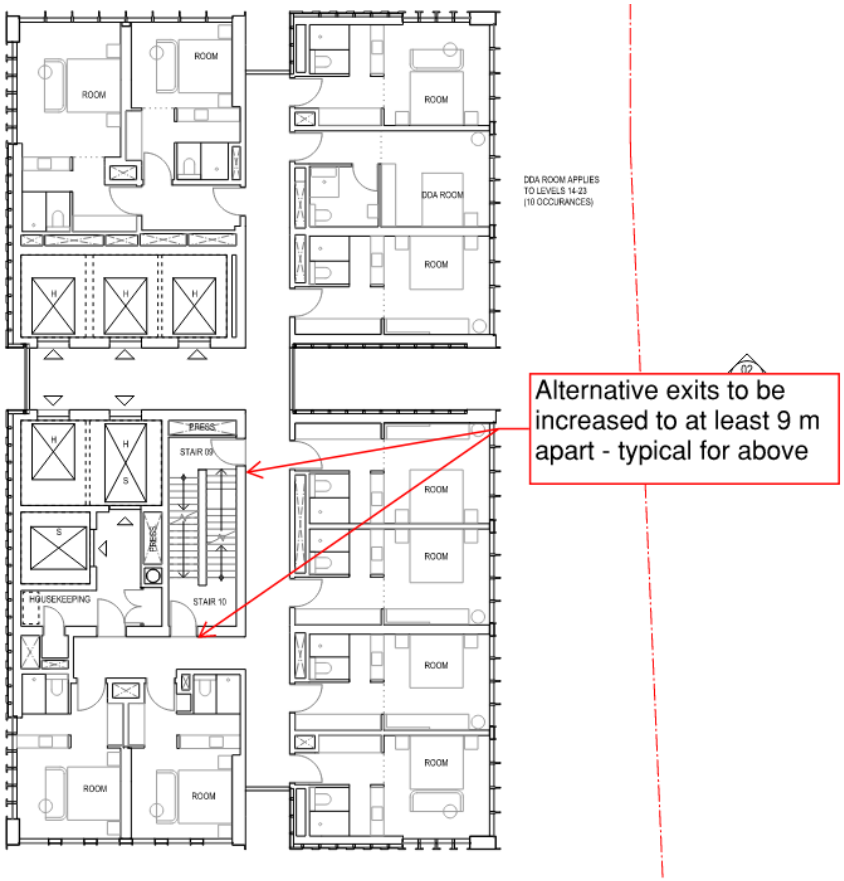


Figure 8-5: Separation of Alternative Exits Required to be Modified on Level 14-58

8.3.5 Fire-Isolated Stairs

All stairs (other than the internal stairs at Ground Floor and L57) are to be constructed as fire-isolated stairs. Specific requirements include:

- No doorways can open directly to the stair unless from a public corridor, airlock or tenancy occupying the entire storey.
  - Specific attention is drawn to plant areas, including the Level 13 plant floor as shown below
- The stairs must discharge directly to open space.
- No combustibles are to be located within the stairs
- No services are to run within the stairs, other than those directly relating to fire services within the stair itself
- Rising and descending stair flights are to discharge independently to open space
- Re-entry is to be provided as per DtS Provision D2.22

Consideration towards Appendix D of AS2419.1:2021 is required, particularly towards maintaining a landing depth of at least 1.4 m in the stair containing the AS2118.6:2012 sprinkler control valve. This is not currently achieved in the scissor stair serving level 13 and above.

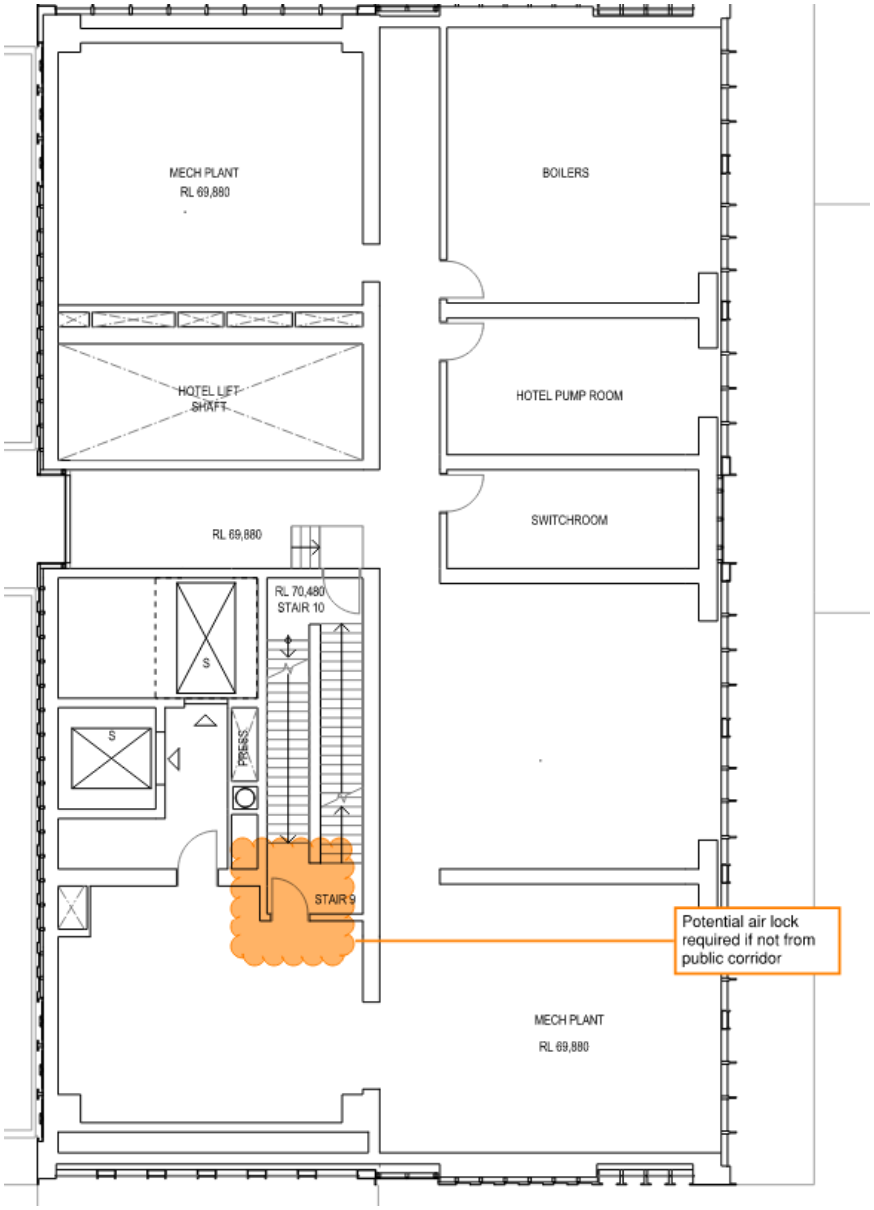


Figure 8-6: Airlock Required – Level 13

8.3.6 Door Hardware, Operation and Mechanisms

All exit doors and doors in a path of travel to an exit are required to be DtS compliant throughout the building. This includes the swing of doors, the applied latching and locking mechanisms and the force required on mechanism used to open sliding doors.

- Note – a review of the door swing into FS2 on Basement 01 is required during the Design Development stage. The doorway must be redesigned to swing inwards without encroaching more than 500 mm on the required egress width.

8.3.7 Evacuation of Disabled Occupants

There is no BCA requirement for consideration of disabled occupants during evacuation. However, the likely presence of disabled occupants within the building, and the height of hotel suites, restaurant and bar areas dictates through safety in design that these occupants should be considered in the evacuation strategy.

Local best practice is to allow for a refuge area on the floor, where disabled occupants can await assistance in a protected place. The design should allow for:

- Fire separation of the refuge area.
- Direct connection to a fire stair (or alternative fire rated lift for evacuation
- Provision of a refuge phone for direct connection to FCR.

- Typical refuge area dimensions from international codes are:
  - NZ code: 800mm wide, 2 m^2
  - ICC: 762mm x 1219mm
  - ADB (UK): 900mm x 1400mm
- Refuge area must not impinge on required 1m egress width within stair.

The availability of these refuge areas is typically established through personal emergency evacuation plans (PEEPs) for hotel guests, and their location displayed on the door within all accessible rooms. Staff training is required to ensure any restaurant and bar occupants can be directed as appropriate in an emergency.

8.3.8 Lifts for Evacuation

It is recommended that the design of lifts to permit evacuation is developed to supplement the provision of refuge areas as above. This will alleviate congestion in the fire stairs caused by slow moving occupants, physically unable to descend up to 58 storeys. This can also be used as a firefighting lift to assist intervening fire brigade personnel.

The lift most suited appears to be the service lift serving all high-rise levels indicated in Figure 8-7.

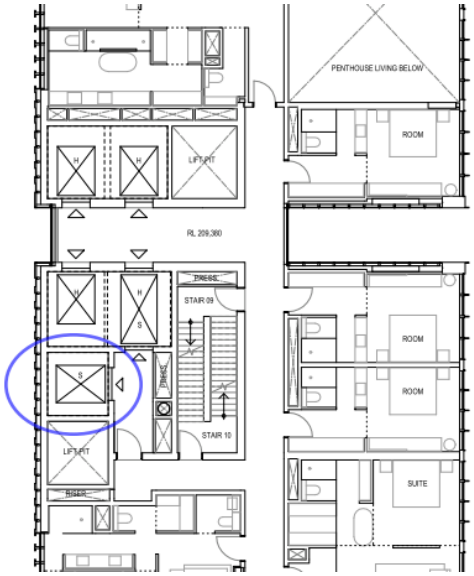


Figure 8-7: Possible Lift for Evacuation

Design considerations include:

- Adhering to DtS requirements for an Emergency Lift
- Fire-rated lift shaft and doors
- Provision of fire separated lobby at each level
- Limitation on combustibles and ignition sources within the lobby
- Lift discharge area on ground floor to be accessible for disabled occupants
- Programming of lift to optimise evacuation and fire brigade operations based on fire detection location
- Zoning of smoke detectors in the lift shaft and connecting lobby to modify lift programming
- Manual control / indication of lift operation from FCR
- Direct communication with lift and lobby from FCR and vice-versa
- Use of CCTV cameras to monitor developing emergency situation
- Use of Level 11 as a potential holding area above or below the fire zone
- Prevention of water ingress to the lift shaft from operating sprinkler system
- Adequate drainage and protection of lift equipment within shaft
- Mechanical design to limit smoke ingress to lift lobby / shaft / car, i.e. pressurised shaft and / or lobby.
- Secondary emergency lifts on each level if fire causes main lift for evacuation to be compromised
- Backup power supply

8.4 FIRE FIGHTING EQUIPMENT

8.4.1 Fire Hydrants

A hydrant system is to be provided in accordance with DtS Provision E1.3 and AS2419.1:2005. As a combined hydrant and sprinkler system, it must also be in accordance with AS2118.6:2012. The following specific requirements apply to the hydrant system:

- The booster is to be located within sight of the main entry, although as a sprinkler protected building, there is no restriction on how close the booster can be located to the building.
  - The proposed location is in the vicinity of the Fire Control Room located perpendicular to Bligh Street (refer to Figure 5-1). Consultation with FRNSW is required in order to gain acceptance of this location as the requirement is for the connection points to be parallel to the street. The design and angle of the connection points will need to be demonstrated such that fire brigade can connect hoses from the carpark entry ramp.
- As the building exceeds 25 m in effective height, a ring main is required.
- A relay pump is to be provided, due to the effective height of the building being over 50 m.
- Hydrant coverage of the building is to be achieved primarily by internal hydrants located within fire stairs.
  - Although unlikely given the small building footprint, if additional on-floor hydrants are required (i.e. not within fire stairs), level specific block plans are to be mounted at each fire hydrant in the stair, clearly indicating the location of each hydrant on that level.
- Hydrants are to be located at the level served – noting that where desired, it may be possible to situate hydrants on a mid or quarter landing depending on the design of the stair. This can be assessed as a Performance Solution pending consultation with FRNSW and will rely on each hydrant on a mid/quarter landing serving a dedicated floor.
- All hose connections in the system are to be fitted in accordance with FRNSW Technical information sheet – FRNSW compatible hose connections (available at firesafety.fire.nsw.gov.au). These couplings should be tested as part of the system when the commissioning tests are undertaken.

Note that as construction of the building is unlikely to commence prior to the implementation of NCC 2022, the newer hydrant standard AS2419.1:2021 is likely to be the relevant design standard. As the building exceeds 135 m in effective height, the hydrant design shall be considered on a performance basis in conjunction with the hydraulic engineer and with consultation with FRNSW. Consideration towards Appendix D of AS2419.1:2021 is required.

8.4.2 Fire Hose Reels

Fire hose reel shall be provided throughout the building in accordance with DtS Provision E1.4 of the BCA and AS2441:2005.

It is noted that fire hose reels are not required (as per NCC 2019 Amendment 1) to Class 3 or Class 5 parts. As such, coverage is required only up to Level 2, on Level 12, Level 57 and Level 58.

A review of fire hose reel coverage to plant areas can be undertaken and documented through a performance-based approach, with anticipated supplementary fire extinguishers provided to alleviate non-compliances resulting from fire hose reels passing through fire doors.

8.4.3 Fire Sprinkler System

A fire sprinkler system shall be provided throughout the development in accordance with the relevant regulatory requirements, being AS2118.1:2017.

- Sprinkler heads are to be fast-response where possible, achieving an RTI no greater than 50 $m^{1/2}s^{1/2}$ and an activation temperature no greater than 68°C.
- The sprinkler pump is located on Basement Level 2, with entry provided via a dedicated fire-isolated stair.
- Being a combined AS2118.6 system, valves will generally be located within the stair on each storey.
- The sprinkler system is to be provided with a dual water supply, as per Clause 7 of Specification E1.5.
  - Note where interpretations differ from AS2118.6:2012 and AS2118.1:2017, the later standard is typically considered to be appropriate.

Upon sprinkler activation the direct brigade notification shall be activated and initiate a cascaded alarm sequence through the building.

8.4.4 Portable Fire Extinguishers

Portable fire extinguishers are to be provided throughout the building in accordance with Table E1.6 of the BCA and selected, located, and distributed in accordance with AS2444:2001.

- This includes within 10 m of each SOU entry door.

8.4.5 Fire Control Room

As the building exceeds 50 m in effective height, a fire control room is required. This is proposed in proximity to the northern fire stairs. General dimensions and location to comply with the following

- 120/120/120 FRL
- Minimum floor area of 10 m², with the length of any internal side being not less than 2.5 m.
- 2 entry points, one provided via the main entry and another direct from outside or via a fire-isolated passageway.
- Door swings into the FCR.
- At the level of open space (within 300mm).
    - Note: A Performance Solution is possible should the level difference be greater than 300 mm, pending consultation with FRNSW.

8.5 SMOKE HAZARD MANAGEMENT

8.5.1 Smoke Detection System

Smoke detection shall be provided in accordance with Clause 4 of Specification E2.2a within the BCA, via the following systems:

- An automatic smoke detection and alarm system is to be provided in accordance with the requirements of BCA Specification E2.2a and AS1670.1:2018.
- To mitigate false alarms, it is possible that an alarm delay facility (ADF) or similar in accordance with AS1670.1 may be implemented to hotel rooms, such that in lieu of the EWIS system initiating immediately upon detection, a local alarm is sounded and building management notified – with a delay period where the detector can resample the environment and clear the alarm.

8.5.2 Stair Pressurisation

Stairs serving a level which exceeds an effective height of 25 m, or basement stairs serving more than 2 levels below ground, are to be provided with stair pressurisation in accordance with AS1668.1:2015.

- This includes all fire-isolated stairs in this development, other than the stair serving the substation.
- The design capacity of the stair pressurisation system will need to consider the connection of levels (all doors to the stair within the fire compartment are to be assumed open) and the complexity of the transfer corridor on L11.
    - Note that Basement 4 and 5 are to be fire separated at the vehicle lift such that these are treated as separate fire compartments.

Given the height of the building, the mechanical engineer should ensure phenomena such as stack effect are considered in the design of the mechanical system. Any assumptions in leakage through SOU doors and the like should note the provision of smoke seals on hotel levels.

8.5.3 Zone Smoke Control and Automatic Smoke Exhaust

A zone smoke control system is required within the building. It is expected that the design will follow the general principles:

- Ground Floor, Level 1: as there are numerous openings in the Bligh Street façade, it is anticipated to be difficult to achieve compliant pressure differentials between compartments. An automatic smoke exhaust system is likely a better option to assist in maintain conditions tenable for occupants.
    - Implication of this proposal on the stair pressurisation design shall also be considered.
- Level 2: As a hybrid between connection to the function level below and a commercial tenancy similar to the levels above, further review of the appropriate mechanical system in this area is required.
- Levels 3-10: Zone smoke control as per AS1668.1 to be provided
- Level 12: further review of the efficacy of any mechanical systems to be reviewed.
- Levels 14-56: Class 3 parts are exempt from the requirements of zone smoke control.

- Level 57 and 58: the restaurant and bar levels should be served by an automatic smoke exhaust system in lieu of a trying to design a DtS zone smoke control system.

8.6 EXIT SIGNS AND WARNING SYSTEMS

8.6.1 Emergency Warning and Intercom System

EWIS (Emergency Warning and Intercom System) should be provided throughout the building. The system should be in accordance with the prescriptive requirements of Clause 7 of Specification E2.2a, DtS Provision E4.9 and AS1670.4:2018.

The occupant warning system shall achieve an A-weighted sound pressure level of 75 dB at the bedhead.

8.6.2 Signage and Lighting

Emergency lighting and exit signage is to be provided throughout the building in accordance with DtS Provisions E4.2 and E4.4 and AS2293.1:2018.

8.7 BUILDING MANAGEMENT PROCEDURES

The ongoing management of the building is as important in maintaining a high level of life safety as the provisions recommended during the design phase of the building.

8.7.1 Maintenance of Fire Safety Equipment

The fire safety systems should be tested and maintained in accordance with Australian Standard AS1851 or other relevant testing regulatory. Specific programmes may need to be developed for critical / complicated items such as lifts or mechanical systems.

8.7.2 Evacuation Plan

An emergency management plan should be developed for the building in accordance with AS3745:2010.

This should be developed in concert between by the emergency planning committee, building owner/operator, fire services contractor and fire engineer.

Consideration of various elements bespoke to the building is required including alarm cascade, lift operation, facilitation of fire brigade operations and security procedures impacting on fire strategy.

9 NOMENCLATURE

ACRONYM	EXPANSION
ABCB	Australian Building Codes Board
ADF	Alarm Delay Facility
AFSS	Annual Fire Safety Statement
BCA	Building Code of Australia
CFD	Computational Fluid Dynamics
DtS	Deemed-to-Satisfy
EPA	Environmental Protection Authority
EPS	Expanded Polystyrene
EWIS	Emergency Warning and Intercom System
FCC	Fire Control Centre
FCR	Fire Control Room
FER	Fire Engineering Report
FIP	Fire Indicator Panel
FRL	Fire Resistance Level
FRNSW	Fire Rescue NSW
FSS	Fire Safety Strategy
IFEG	International Fire Engineering Guidelines
ISP	Insulated Sandwich Panel
NCC	National Construction Code
NFPA	National Fire Protection Association
OHS	Occupational Health and Safety
PIR	Polyisocyanurate
PEEP	Personal Emergency Evacuation Plan
RTI	Response Time Index
SOU	Sole Occupancy Unit

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