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Date: 12/4/2022
MODE Ref: 21192

Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy Street
PARRAMATTA NSW 2150

Project: Tweed Valley Hospital Multideck Carpark
Location: 771 Cudgen Road, Cudgen, NSW
Subject: Green Wall Omission

Dear To Whom It May Concern

RE: Response to Department of Planning, Industry and Environment (DPIE) for the Tweed Valley Hospital Stage 2, Modification 3 – Tweed Shire Council Comments of Green Wall to External Façade.

The Tweed Valley Hospital Multi-Deck Carpark project (TVMDCP) consists of an 8-storey building with capacity for an additional two levels to be added in the future. The building is Classified as a Class 7a structure with an Importance Level of 2.

Basement Level 1 and Basement Level 2 are mechanically ventilated due to the inability to have sufficient open area on two opposite sides of the building. This is driven by the lay of the natural ground resulting in the North and South elevations being partially in-ground and the East elevation being fully in-ground.

Ground Level and Levels 1 to 5 are naturally ventilated and are therefore considered to be "Open Deck". Under the provisions of the BCA a green wall is not permitted as per the following from the Crown Certifier Blackett Maguire + Goldsmith (as per the attached supporting memo);

- *BCA C1. 9 / C1.14 - The building is Type A construction which requires all components of the external wall to be of non-combustible construction. Additionally, any elements attached to external wall either internally OR externally are required to be of non-combustible construction (tested to AS1530.1) or comply with BCA C1.14.*
- *BCA C2.2 - The building is considered open deck carpark which requires a specific amount of unobstructed airflow to be maintained at all times. The fire engineering report has increased this requirement to approx. 60% to permit the extended travel distance. No external elements such as chicken wire/ lockers / green wall or any element is permitted to reduce the airflow. Reduction of minimum required ventilation would be considered a significant fire safety issue*
- *SSD condition A20 - The external walls of the building must comply with the relevant requirements of the BCA.*
- *SSD condition A21 - requires new construction to comply with BAL 12.5 construction in bushfire prone land.*

The TVMDCP project contains a number of Performance Solutions inclusive of a Performance Solution for extended travel distances (applicable DtS Clauses D1.4 & D1.5 and Performance Requirement DP4). The TVMDCP consultant team, inclusive of the project Certifier and Fire Engineer) met with FRNSW on 23/02/22 to present the Fire Engineering Brief Questionnaire (FEBQ), revision 01c dated 7/02/22. During the meeting with FEBQ review meeting, FRNSW verbally advised that a safety factor should be applied the façade open area. Formal return comments from FRNSW were received on 23/03/22.

Page 38 of 46 contains FRNSW return comments in regard to the Performance Solution associated with extended travel distances in which FRNSW note that "the performance solution is heavily-reliant on the natural ventilation provided by the open-deck nature of the above-ground levels of the carpark. Given that this natural ventilation is to be relied upon, the assessment is to quantitatively demonstrate that this will provide/maintain tenable conditions such that safe occupant egress provisions are provided at all times given a worst-case credible fire scenario."

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Rhonan O'Brien
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Peter Bertram
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WA 2143

In order to support the extended travel distances, and satisfy the concern raised by FRNSW, the project has been required to increase the percentage open air above the minimum requirement noted in the BCA to 60% unobstructed airflow plus as safety factor. This safety factor exists to mitigate any likelihood that the façade would fall below the threshold of the BCA should the open area of the façade become obstructed in the future and in turn non-compliant.

To achieve the required unobstructed of 60% as required by the FEBQ the façade panels are required to have perforations of 73% Open on the Ground Floor and Level 1 and 55% for Levels 2 to 5 respectively. There is no opportunity to increase the percentage of openness for the perforations as the integrity of the panels would be compromised and failure from a buildability perspective.

Conclusion

The Tweed Shire Council's commentary for green walls and the like to soften the articulation and massing of the TVMDCP is not permitted under BCA and FEBQ requirements.

The Hospital campus visual amenity the of the Multi-deck carpark maintains its relationship with the Main Hospital through materiality, articulation and colour selections which relate to the site context.

Referring to the Tweed Valley Stage 2 State Significant Development Assessment SSD 10353 dated June 2020, the Department noted its satisfaction the TVMDCP '*...presents as subservient to the new hospital building and incorporates materials and finishes which complement* (the Main Hospital) *building*'.

The Department assessment to introduce additional canopy trees and the additional planting within the building set back areas effectively screens *'the development and mitigation of the visual dominance of the buildings on the public domain areas and viewpoints would occur'.*

Yours faithfully,

Andrew Butcher
Associate
MODE DESIGN Corp. Pty Ltd

Attached supporting documents:

Document	Author	Date of Issue	Revision
Updated BCA Report	Blackett Maguire + Goldsmith (Certifier)	4/03/2022	3
FRNSW Response to FEBQ	FRNSW	23/03/2022	2
Updated FEBQ	Innova (Fire Engineer)	31/03/2022	3
Aconex Memo	Blackett Maguire + Goldsmith (Certifier)	11/04/2022	

Tweed Valley Hospital Multi-Deck Carpark
771 Cudgen Road
Cudgen
NSW 2487 Australia

MAIL TYPE	MAIL NUMBER	REFERENCE NUMBER
General Correspondence	BM+G-GCOR-000061	ADCO Con-RFI-000234

Re: DPIE RFI for SSD2 Mod

From	Mr Peter Keppie - Blackett Maguire + Goldsmith Pty Ltd
▶ To (4)	Ms Holly Ramsay - ADCO CONSTRUCTIONS PTY LIMITED (+3 more...)
▼ Cc (6)	Mr Jack Miller - ADCO CONSTRUCTIONS PTY LIMITED
	Mr Jason Power - ADCO CONSTRUCTIONS PTY LIMITED
	Irena Spasevska - ADCO CONSTRUCTIONS PTY LIMITED
	Ms Tamara Stuttard - ADCO CONSTRUCTIONS PTY LIMITED
	Mr Jake Hofner - Blackett Maguire + Goldsmith Pty Ltd
	Bree Jachin - Blackett Maguire + Goldsmith Pty Ltd
Sent	Monday, 11 April 2022 7:49:28 AM AEST (GMT +10:00)
Status	N/A

MESSAGE

Morning Holly

A green wall on external façade is not permissible for any of the following reasons:

BCA C1. 9 / C1.14 - The building is Type A construction which requires all components of the external wall to be of non combustible construction. Additionally any elements attached to external wall either internally OR externally are required to be of non combustible construction (tested to AS1530.1) or comply with BCA C1.14.

BCA C2.2 - The building is considered open deck carpark which requires a specific amount of unobstructed airflow to be maintained at all time. The fire engineering report has increased this requirement to approx. 60% to permit the extended travel distance. No external elements such as chicken wire/ lockers / green wall or any element is permitted to reduce the airflow. Reduction of minimum required ventilation would be considered a significant fire safety issue

SSD condition A20 - The external walls of the building must comply with the relevant requirements of the BCA.

SSD condition A21 - requires new construction to comply with BAL 12.5 construction in bushfire prone land.

Peter Keppie
Senior Registered Building Surveyor

BLACKETT MAGUIRE+ GOLDSMITH | SYDNEY NEWCASTLE+ WOLLONGONG

M: 0460 420 554 **T:** 02 4047 4955 **E:** peter@bmplusg.com.au **W:** bmplusg.com.au

Fire Engineering Brief Questionnaire (FEBQ)

1 Document control

Applicant reference number 21714 **FRNSW reference number** FRN22/515

Ver.	Author	Organisation	Status	Date
01a	Jason Powell	Innova Services Australia Pty Ltd	Preliminary issue	26/11/2021
01b	Jason Powell	Innova Services Australia Pty Ltd	Draft issue	17/01/2022
01c	Jason Powell	Innova Services Australia Pty Ltd	Issue for FRNSW submission	7/02/2022
02	Paul Diab	FRNSW (BFS22/616 #19703)	Response to V01c	22/03/2022
03	Jason Powell	Innova Services Australia Pty Ltd	Response to V03 Performance Solution 7 added	31/03/2022

2 Applicant

2.1 Agreement

As the applicant, I confirm the following:

- I agree to pay Fire and Rescue NSW (FRNSW) the charges set out in Clause 46 of the *Fire Brigades Regulation 2014* (see Section 10).
- I agree to forward with this application the following documentation for FRNSW to review and provide advice on the assessment methods and acceptance criteria proposed for the given performance solution:

☑ Copy of proposed building plans and specifications
(e.g. relevant floor plans, elevations, site plan, section views, hydrant plan and schematic)
☑ BCA report or letter from an accredited certifier that identifies all non-compliances (if available)
☐ CFD/zone modelling inputs form (if applicable)
☐ Report extract of the trial design requirements/proposed fire safety measures (optional).

FRNSW Comment: FRNSW Comment: FRNSW notes that no architectural plans, hydrant and sprinkler schematics, or BCA report were provided with this FEBQ submission. As a minimum, FRNSW requires this information to be provided. This will assist FRNSW to better understand the building layout/design and the required fire safety provisions, allowing for a holistic review to be undertaken for the building's fire safety strategy and all of its proposed Performance Solutions. Please note that the comments provided throughout this FEBQ document are based on the information/figures provided in this version. FRNSW recommend the requested information above be provided in all future submissions.

Innova: Included with submission V03:

- BCA Assessment Report
- Relevant architectural plans
- Fire hydrant and fire sprinkler design plans

Name of fire engineer	Jason Powell	BPB number	BDC0801
Company name	Innova Services Australia Pty Ltd		
Fire engineer's phone no.	0409 887 929		
Fire engineer's email	jason@innovaservices.com.au		

2.2 Remittance advice information

Invoices will be issued based on the information provided below:

ASIC company name	NSW Health Infrastructure, C/- ADCO Constructions Pty Ltd		
Australian business number	46 001 044 391	Trading name	-
Remittance contact name	Jason Power		
Remittance street address	Level 5, 7 Bay Street, Southport QLD 4215		
Remittance email address	jpower@adcoconstruct.com.au		
Remittance phone number	07 5577 0900	Remittance fax number	-
Purchase order ref. no.	-	Project code ref. no.	-
Project leader contact name	Jason Power		
Project leader contact email	jpower@adcoconstruct.com.au		

3 Consultation

3.1 Stakeholders

Role	Name and BPB number	Organisation and phone	Email address
Client	Tony Jones	NSW Health Infrastructure	
Project manager	Stuart Clarke Levi Harris	TSA Management	
Builder / Construction manager	Holly Ramsay Jason Power	ADCO	
Architect	Andrew Butcher Shaun Miller	MODE	
Building Services	Tom Eldredge Gary Linger	Lucid Consulting Engineers	
Certifier	David Blackett BDC0032	Blackett Maguire + Goldsmith Pty Ltd 02 9211 7777	david@bmplusg.com.au
FRNSW reviewers	SO Chris Brown Paul Diab	Fire and Rescue NSW 02 9742 7434	firesafety@fire.nsw.gov.au

3.2 Meeting details

In conjunction with the written comments provided in response to this FEBQ, FRNSW may at its discretion hold a meeting with the applicant to discuss aspects of the proposed performance solution.

Type of meeting preferred ☐ No meeting ☑ Telephone meeting ☑ Face-to-face meeting

4 Project details

4.1 Premises

Premises name	Tweed Valley Hospital – Multi-Level Car Park
Primary street address	Cudgen Road

Secondary street address	Turnock Street
Premises suburb	Kingscliff NSW 2487
Lot and DP numbers	

4.2 Proposed works

☑ New building
☐ Refurbishment of an existing building
☐ Extension of an existing building
☐ Change in use within an existing building
☐ Other: (provide details)

Applicable NCC: NCC 2019, Amendment 1

For existing buildings:
Approximate year of construction: **Year**
Building code when constructed: **Select**

How many performance solution issues are proposed in this FEBQ? ~~6~~ 7

Note: The number of performance solution issues must address all identified non-compliances.

Have all departures from the deemed-to-satisfy (DtS) provisions of the *National Construction Code* (*NCC*) been identified for this proposed design (i.e. a BCA report or letter from an accredited certifier)? Yes

Note: Any advice given is subject to all non-compliances being identified. Any new DtS departures identified, including any from the certifier determining the application for construction certificate, may affect FRNSW advice in respect to this performance solution.

Identify if any previous performance solution applies to the building:

Nil

Identify if any application has been/will be submitted under Clause 188 of the *Environmental Planning and Assessment Regulation 2000*:

Nil

Identify if the premises is or will be subject to any development application (DA) conditions or special regulatory approvals (e.g. BPB conditions, ministerial conditions, crown building works):

Note: FRNSW will not comment on existing buildings subject to voluntary upgrade or change of use prior to the issuing of any DA conditions of consent, or conditions of an existing consent have been modified (i.e section 4.55 of *Environmental Planning and Assessment Act 1979*). Comment will also not be provided if an order has been issued unless the Council agrees. The Council may seek advice during the DA review.

The project is subject to a Crown Certificate process as per Section 6.28 of the EP&A Act.

Will the premises be subject to a fire safety study, risk assessment or dangerous goods study? No

Note: Any study/risk assessment should be completed prior to submitting this FEBQ and should be attached to this application.

4.3 Description of building occupancy

Main occupancy class	7a	Largest fire compartment (within the building)	Area (m^2)	~ 31,050 m^2 (single fire compartment)
Other occupancy classes	-		Volume (m^3)	-
Type of construction	Type A		Height (m)	-
Effective height (m)	Less than 25 m (24.8 m)	Ground floor area (m^2)		~ 4,206 m^2
Rise in storeys	8	Total floor area (m^2)		~ 31,050 m^2
Levels contained	8	Total volume (m^3)		-

Outline any additional building characteristics:

General Layout and Construction

The subject development relates to the construction of a new multi-level car park for Tweed Valley Hospital, located at Cudgen Road, Kingscliff NSW. The car park will be located on the western side of the site, between the main hospital building and the proposed private hospital.

The car park will comprise of eight (8) levels and will be designed as being open deck, except for basement 1 and basement 2 which will not meet the requirements to achieve open deck status.

Both basement 1 and basement 2 will be fully sprinkler protected. Fire sprinklers will not be provided to the open deck levels of the car park. The omission of fire separation between the sprinkler protected and non-sprinkler protected levels of the car park is subject to a Performance Solution as detailed in this Report.

Egress from the car park is via three (3) dedicated exit stairs, being external stairways in lieu of fire-isolated exits. Egress from ground floor is also available direct to the open space.

The exit travel distances from the car park to the nearest exit and between alternative exits will be subject to a Performance Solution as detailed in this Report.

Access throughout the car park is via three (3) passenger lifts, which will connect through all levels of the building, except basement 2.

Both pedestrian and vehicle entry into the car park is available on the southern side of basement 1, which is dedicated for public access. Basement 2 has its own pedestrian and vehicle entry point on the northern side, which is dedicated for staff and fleet access.

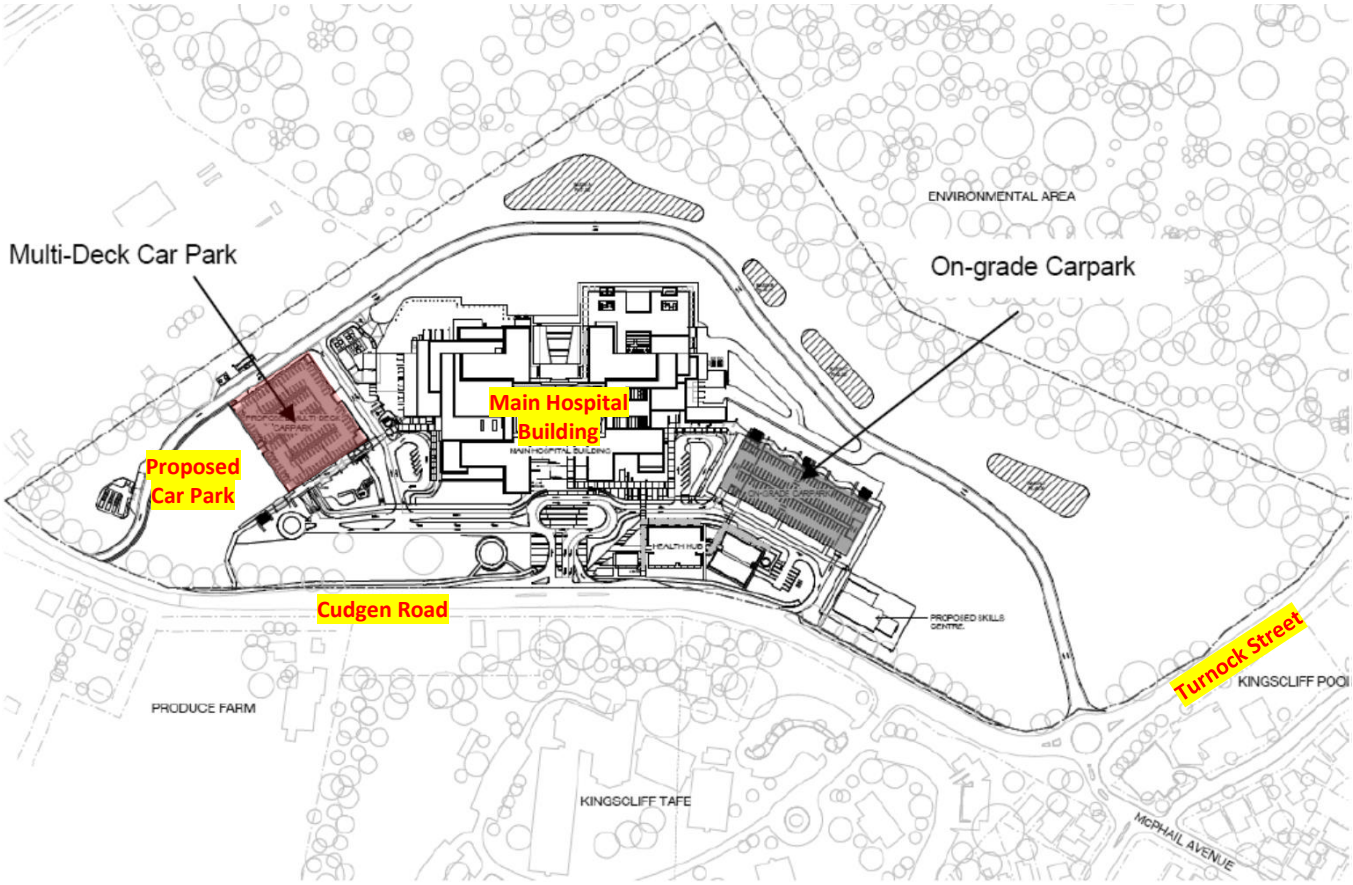


Figure 1: Location Plan (Courtesy BCA SD Report)

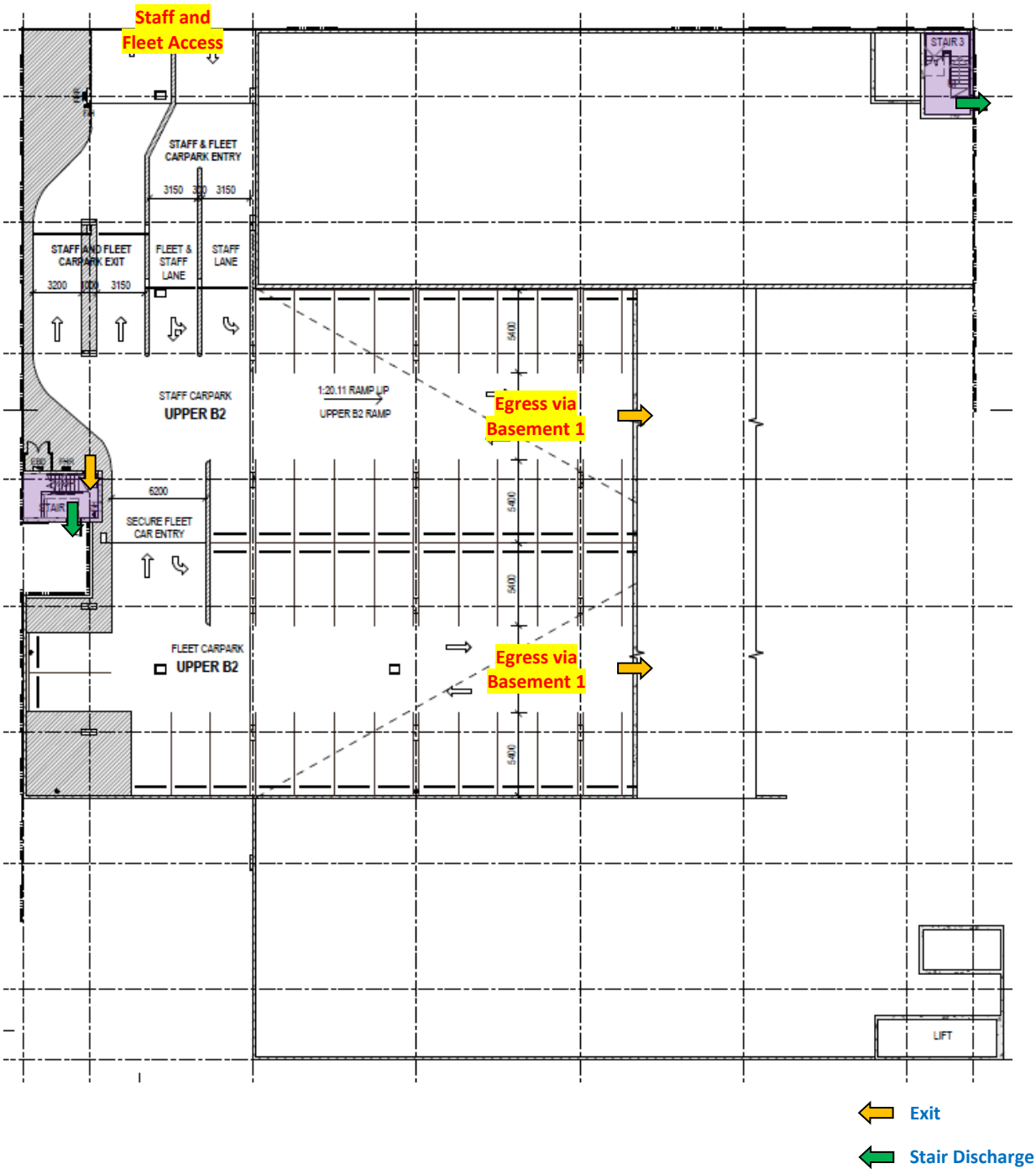


Figure 2: Basement 2 Plan

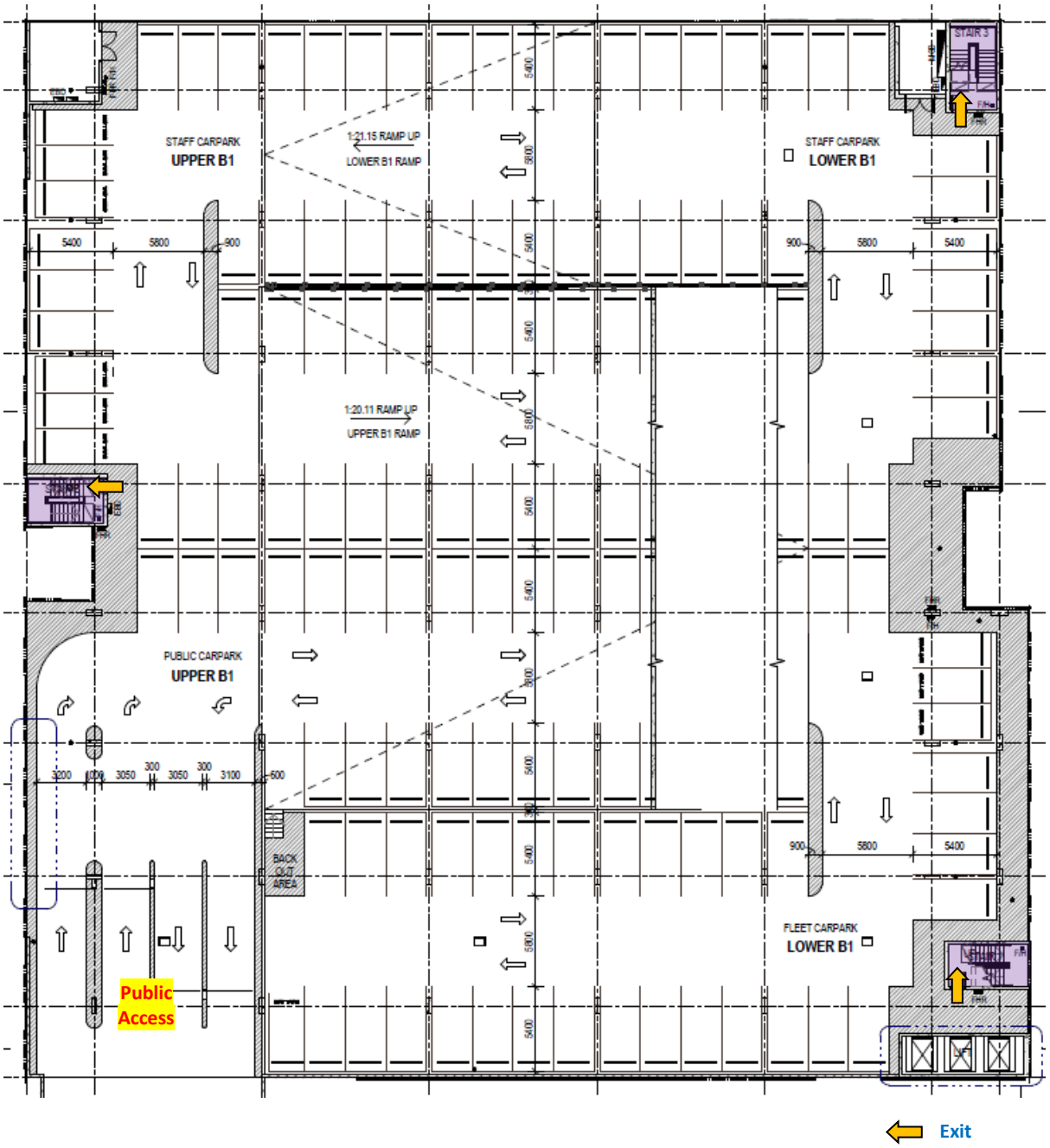


Figure 3: Basement 1 Plan

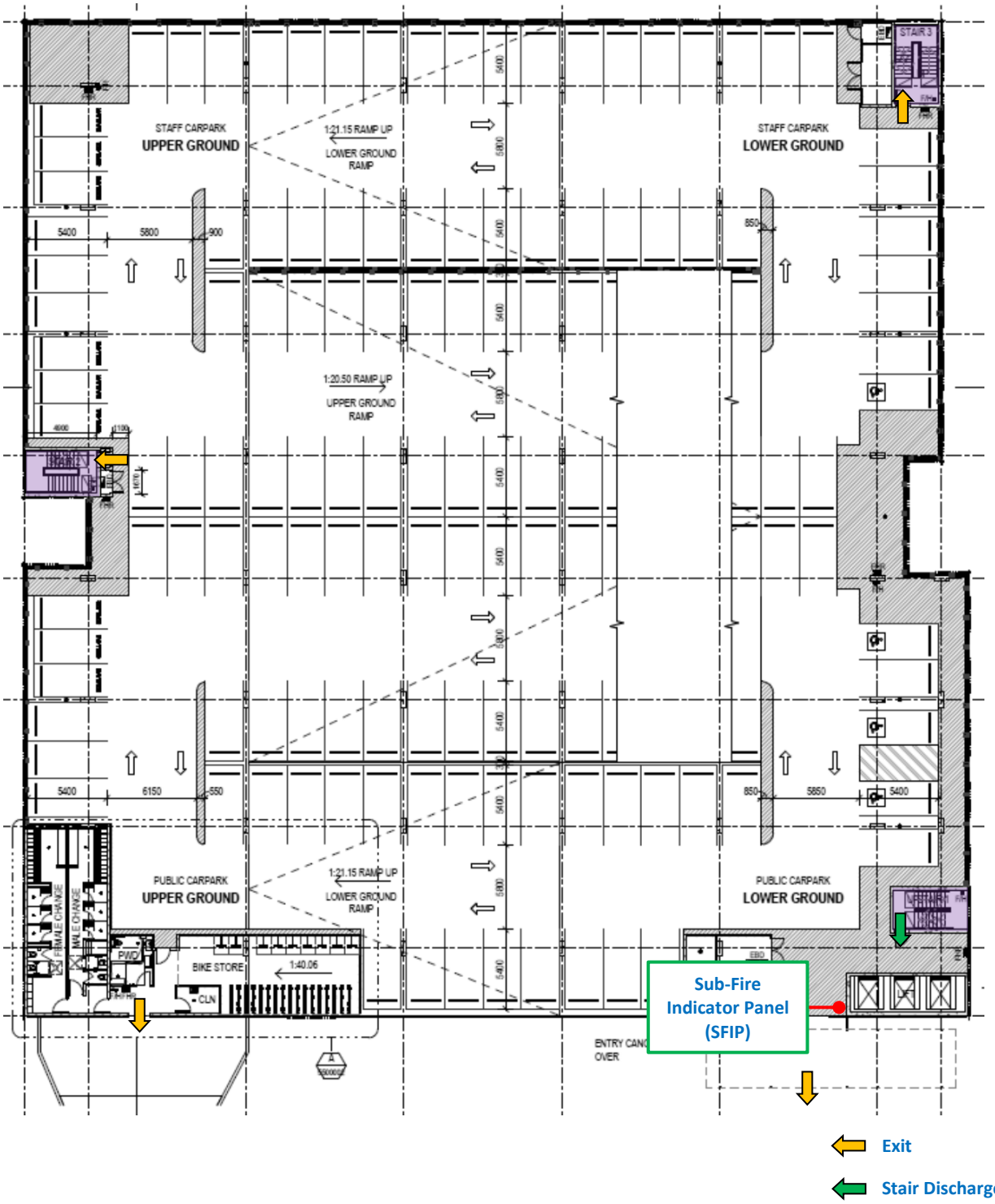


Figure 4: Ground Floor Plan

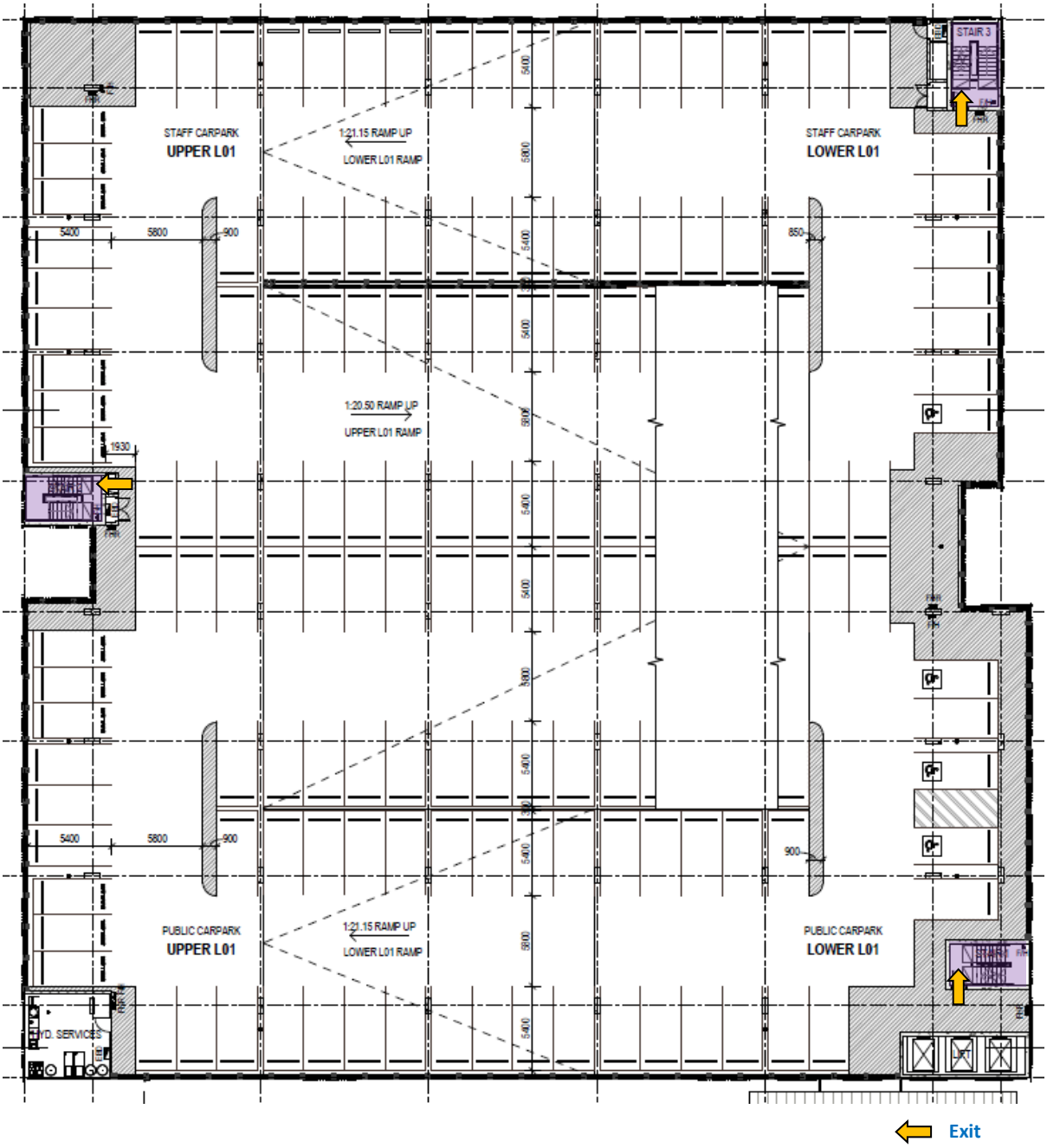


Figure 5: Level 01 Plan

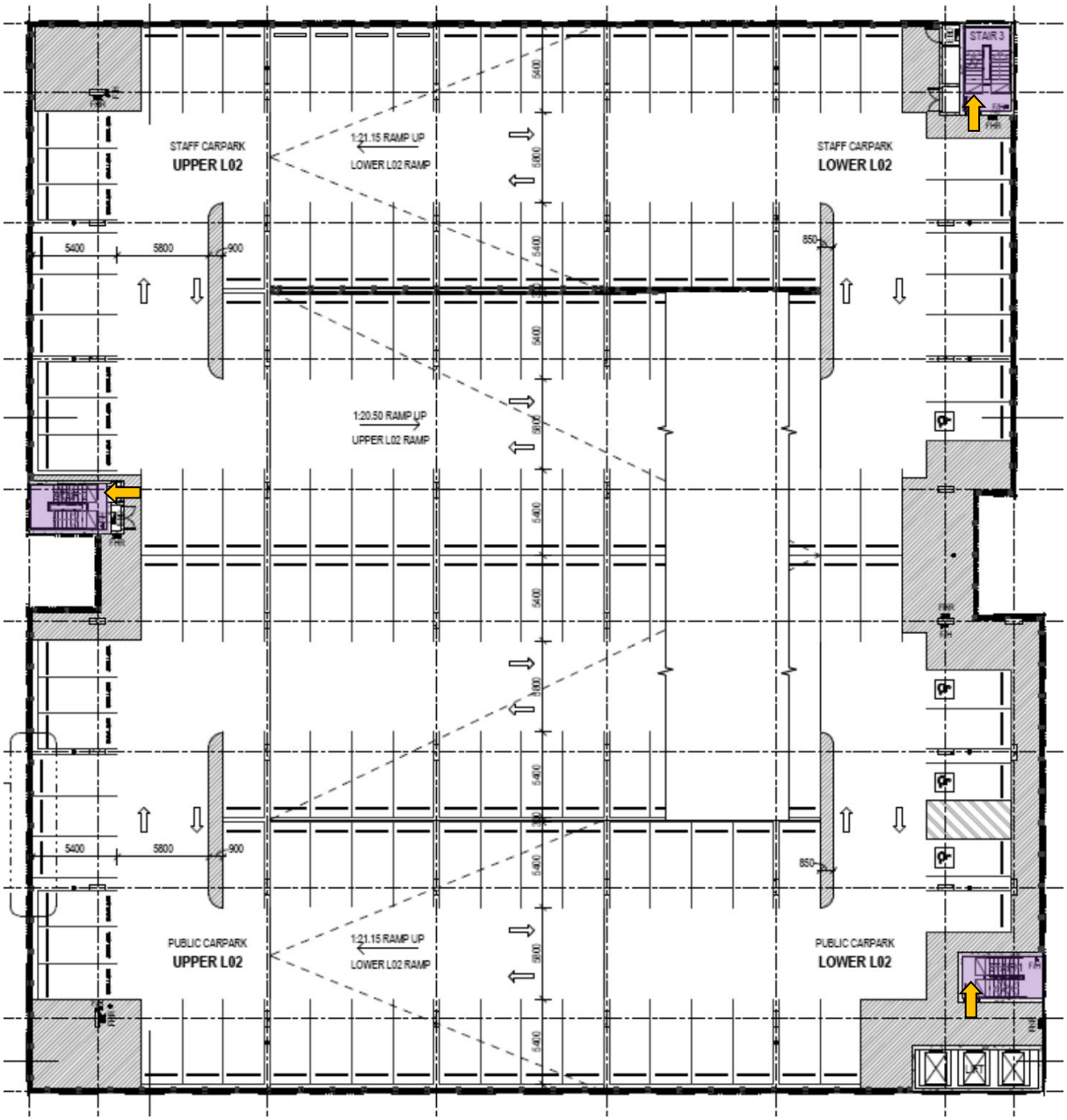


Figure 6: Level 02 Plan

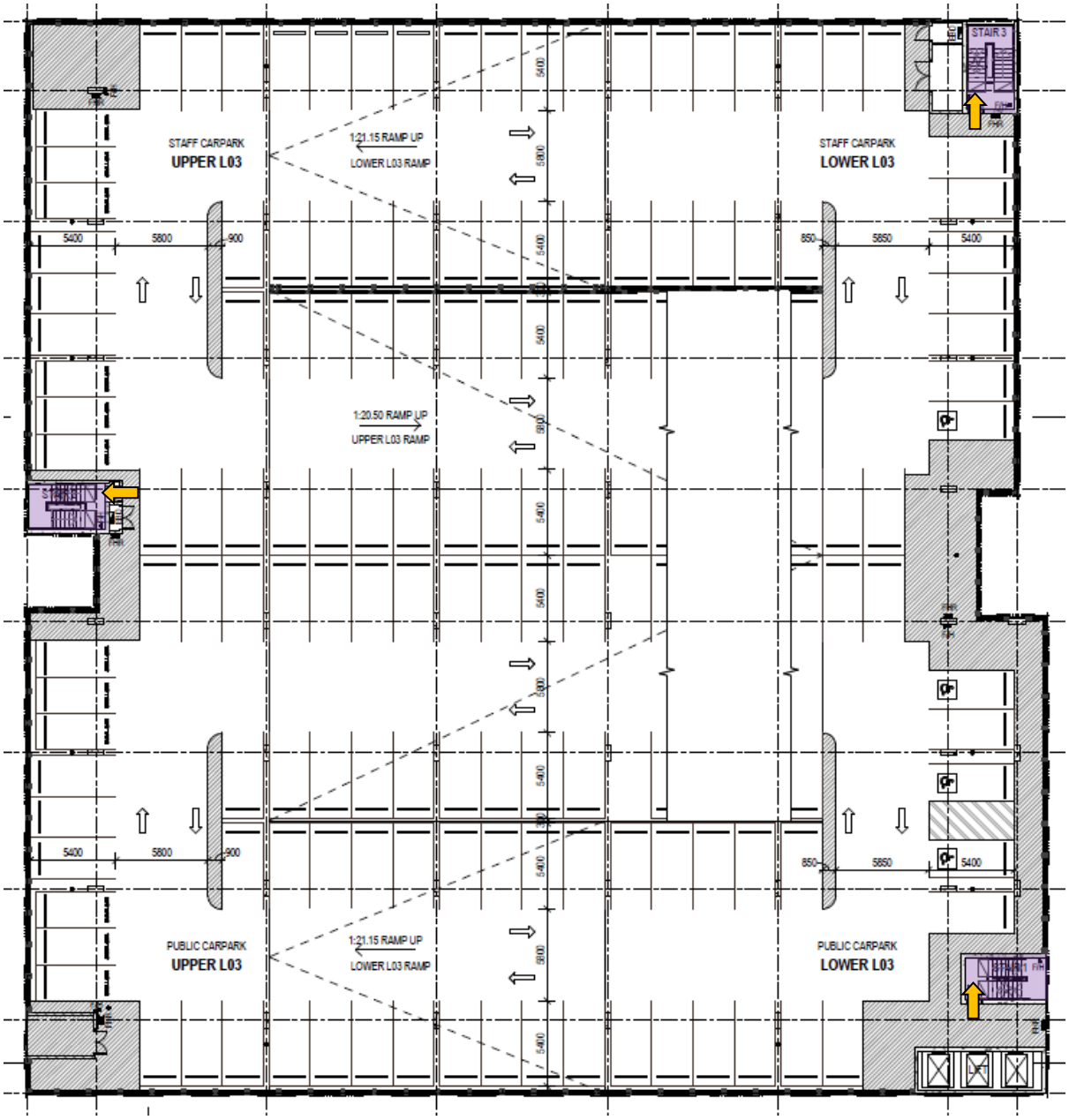


Figure 7: Level 03 Plan

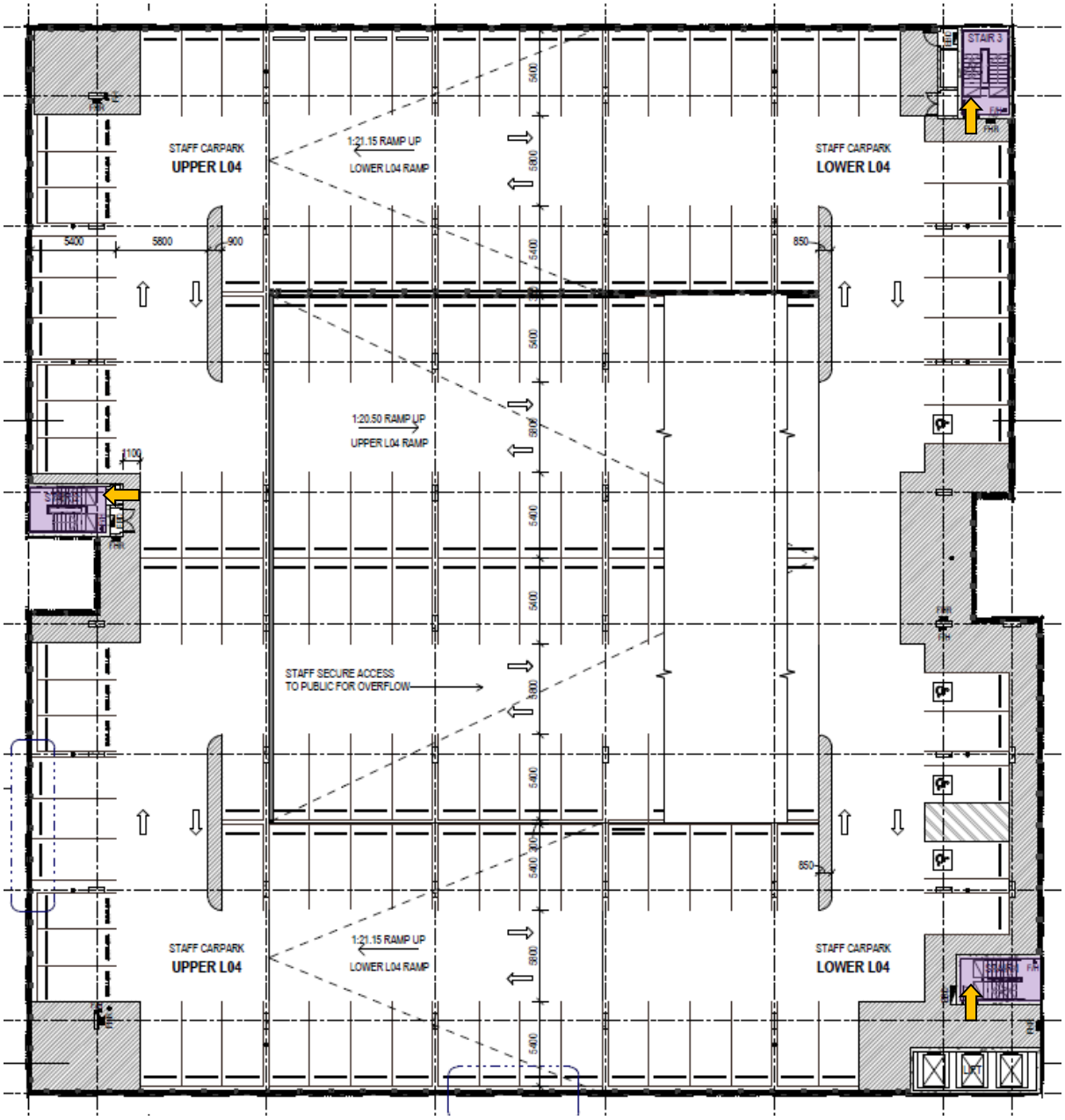


Figure 8: Level 04 Plan

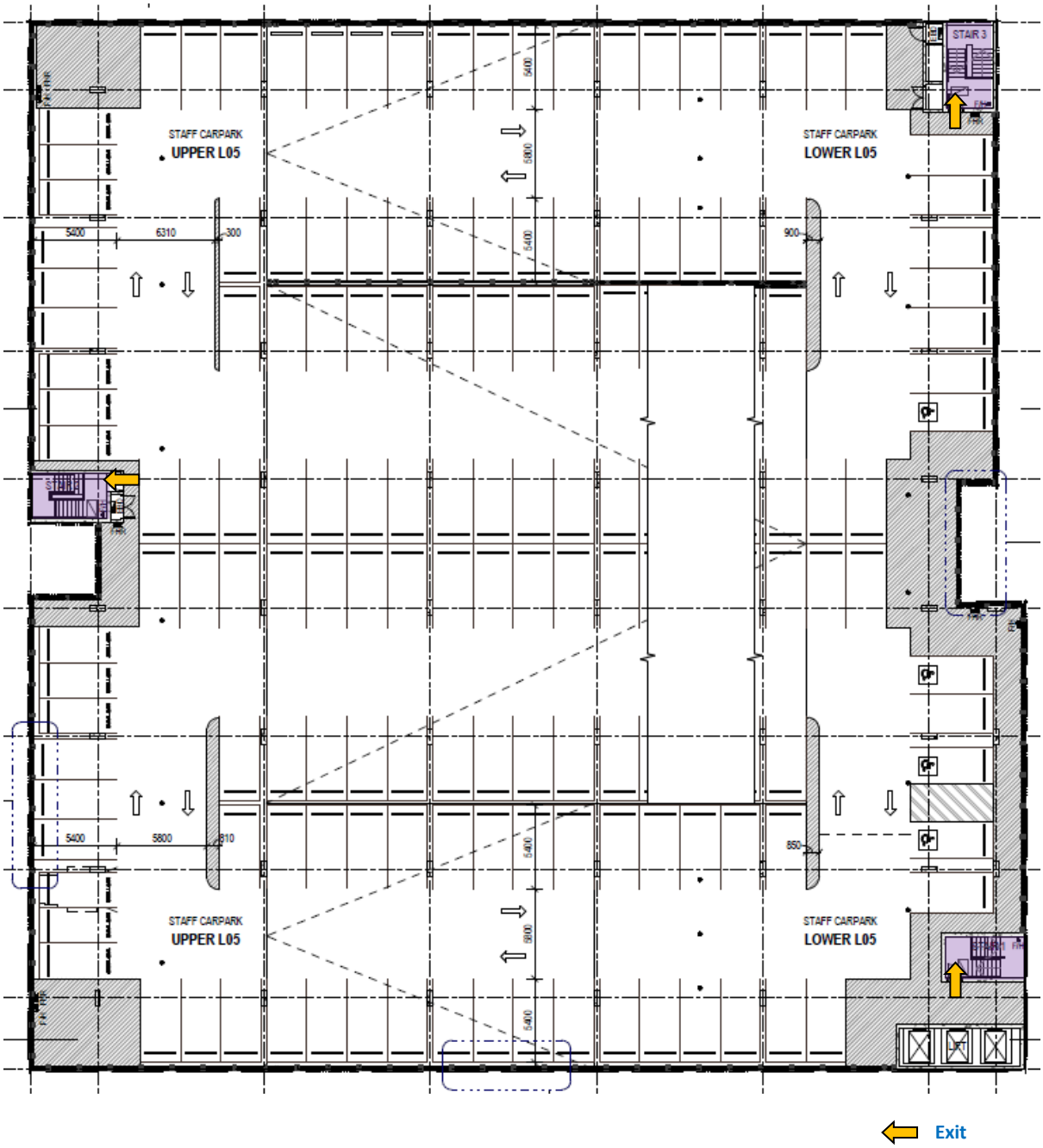


Figure 9: Level 05 Plan

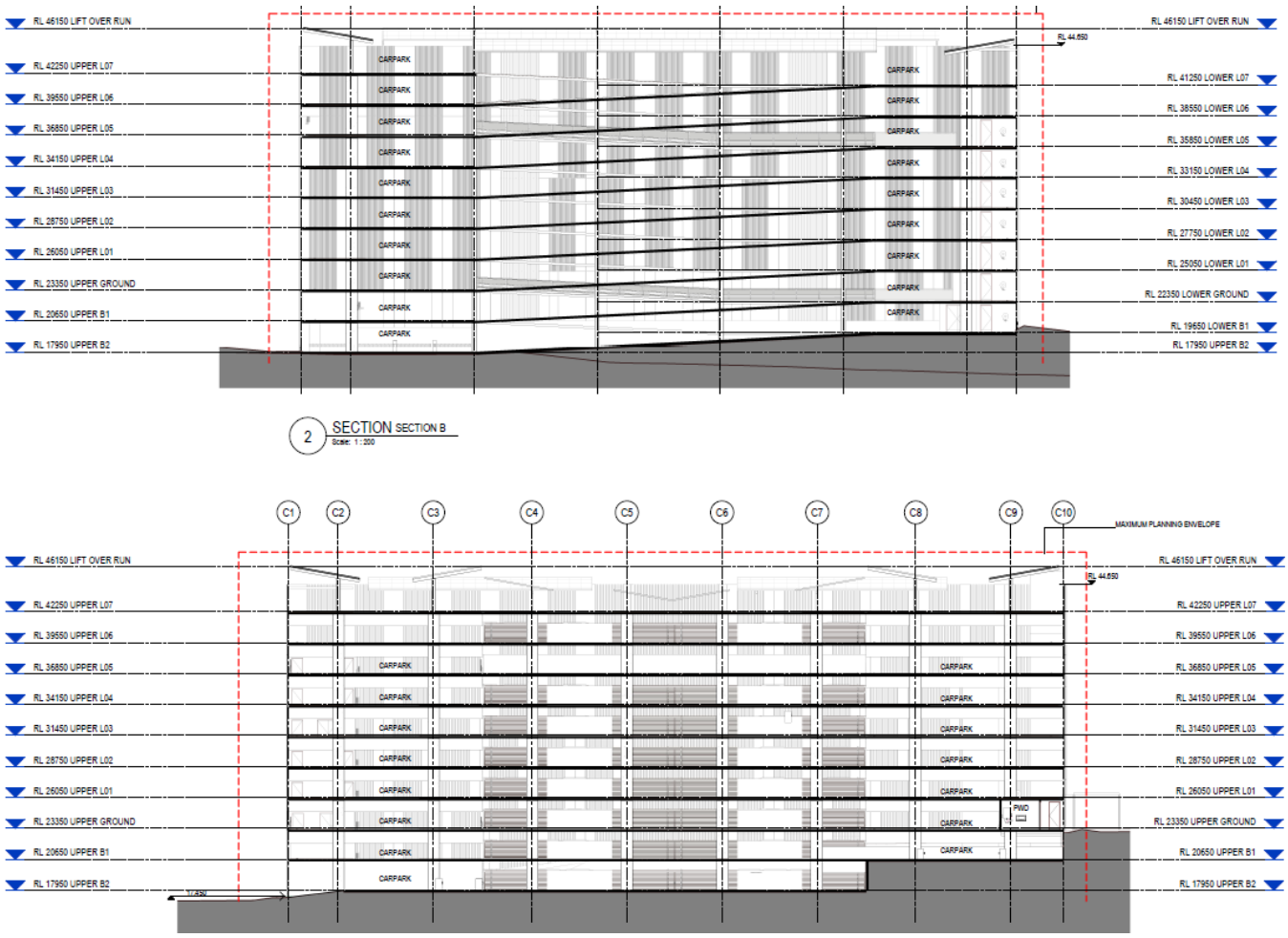


Figure 10: Sections

Provision for Fire Brigade Intervention

Fire Station Locations

The two closest fire stations to the subject development are:

- Kingscliff Fire Station (staff on-call)
- Banora Point Fire Station (staff on-call)

Fire Services Infrastructure (Site Wide)

The overall site, which includes the new multi-level car park (as addressed in this Report), the main hospital building, and the proposed private hospital will be served by a site wide fire services infrastructure.

A fire services ring main will be provided around the entire site, which will include external attack hydrants.

The fire services water supply for the overall site will comprise a dedicated water storage tank and fire services pumps within the main hospital building. The fire brigade booster assemblies and the fire control room will be located within the basement service yard of the main hospital building and will be accessible to the fire brigades.

The fire services ring amin and associated site infrastructure will be installed and commissioned prior to the completion and occupation of the multi-level car park.

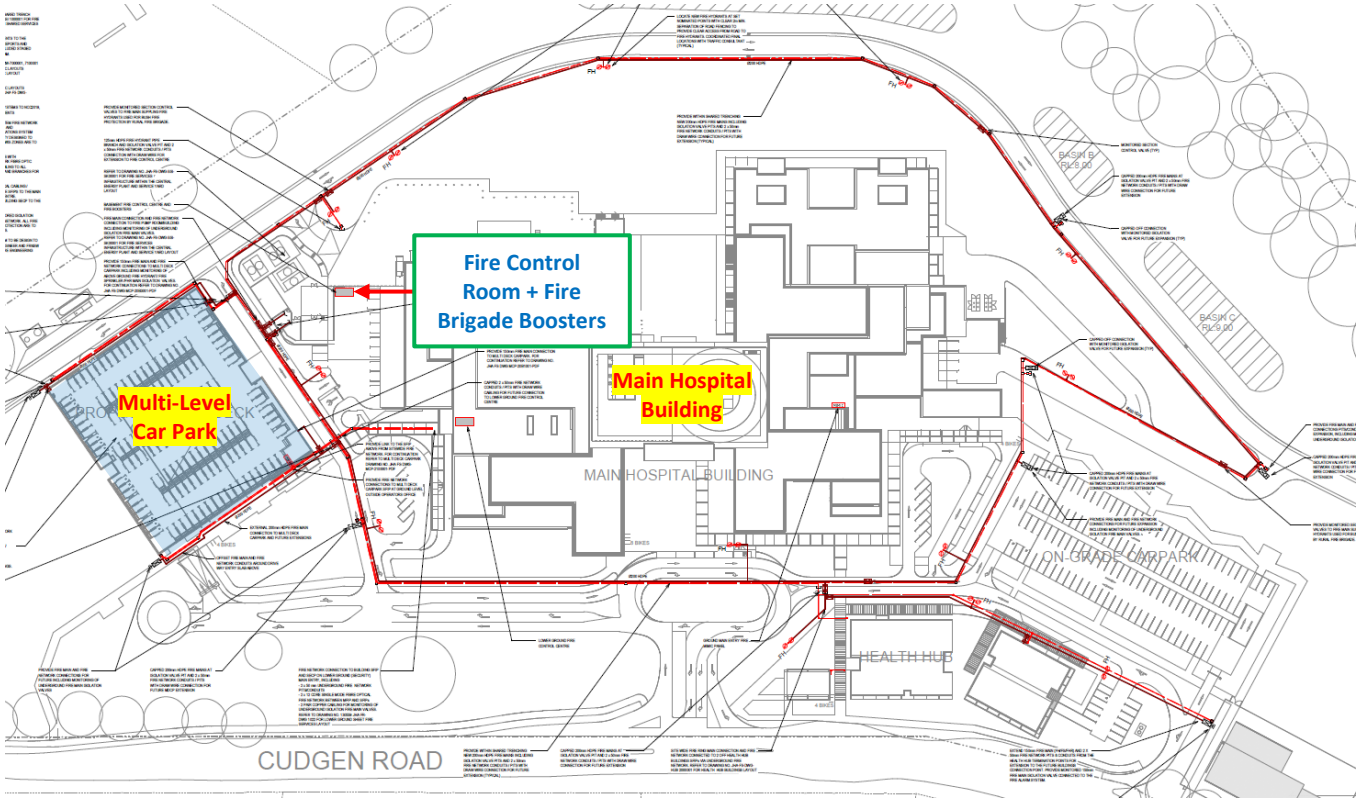


Figure 11: Fire Services Plan (Site Wide Ring Main)

Emergency Services Access (Multi-Level Car Park)

The car park will be located on the western side of the Tweed Vally Hospital site, between the main hospital building and the proposed private hospital.

Both pedestrian and vehicle entry into the car park is available on the southern side of basement 1, which is dedicated for public access. Basement 2 has its own pedestrian and vehicle entry point on the northern side, which is dedicated for staff and fleet access.

Fire Hydrants (Multi-Level Car Park)

A fire hydrant system will be installed throughout all levels of the car park in accordance with the relevant provisions of AS 2419.1-2005 and will be extended from the site wide fire services system.

However, the site infrastructure can only support a flow of 32 L/s at 1200 kPa, which complies with the new fire hydrant Standard AS 2419.1-2021, rather than AS 2419.1-2005 (being the version of the Standard adopted in the BCA). Therefore, a Performance Solution is sought to permit the flow rate for the fire hydrant system to comply with the new 2021 Standard.

Additional fire hydrants will be provided on each floor of the car park, pursuant to Clause 3.2.3.3 of AS 2419.1, to ensure coverage is achieved in accordance with Clause 3.2.3.1. Supplementary block plans will be displayed in each stairway at the levels where the additional hydrants are to be installed. The block plans will be a minimum of A3 in size and indicate the location of all hydrants affording protection to that particular level.

Fire Sprinklers (Multi-Level Car Park)

Fire sprinklers will be provided throughout basement 1 and basement 2, which will not satisfy the requirements for an open deck car park.

Fire sprinklers will not be provided to ground floor and the levels above, where each level will satisfy the requirements for an open deck car park.

Fire separation will not be provided between the sprinkler protected and non-sprinkler protected parts of the car park, which is subject to a Performance Solution as detailed in this Report.

Main Site Fire Indicator Panel (FIP) and Mimic Panel – Main Hospital Building

The main site FIP will be located within the fire control room of the main hospital building, as referenced above, and will be accessible to the fire brigades. A Mimic Panel will also be located within the lower ground floor of the main hospital building.

Sub-Fire Indicator Panel (SFIP) – Car Park

A sub-Fire Indicator Panel (SFIP) will be provided for the car park and will be located within the lift lobby on ground floor (refer Figure 4). The SFIP will be interfaced with the main site FIP that will be located within the fire control room of the main hospital building as referenced above.

The SFIP will serve as the main Fire Detection Control and Indicating Equipment (FDCIE) for the car park and will be interfaced to the main site FIP for the purposes of initiating the fire alarm monitoring system only upon sprinkler activation (i.e. call out of the fire brigades). Therefore, a fire alarm within the car park will not initiate a fire alarm within the main hospital building (and vice versa).

The Client requires an alarm indication at the Mimic Panel within the main hospital building in the event of a fire alarm within the car park (to alert staff). A fire alarm in the car park will alert the emergency teams within the main hospital building. This will be achieved via an “Integrated Messenger System”.

List key occupant characteristics for the building:

Population and Distribution

The car park will be occupied by Staff working within the Hospital and members of the public (visitors to the Hospital). Staff and visitors will have access to different levels of the car park, summarised as follows:

- Basement 2 – staff and fleet
- Basement 1 – staff, fleet and public
- Ground Floor – staff and public
- Level 01 – staff and public
- Level 02 – staff and public
- Level 03 – staff and public
- Level 04 – staff
- Level 05 – staff

The population level within the car park is assumed to be based on the population densities given in Table D1.13 of the BCA (i.e. 30 m^2 per person).

State, Physical and Mental Attributes

Occupants within the car park are expected to be awake, conscious, ambulatory, and sober. It is assumed that most occupants will require minimal response time in the event of an emergency.

Familiarity with the Building

Staff within the car park are expected to be familiar with the primary access and egress routes. Members of the public (visitors) may not be familiar with their surroundings or the location of all available exits. However, with the provision of Exit and Directional Exit signage in accordance with the DtS provisions of the BCA, the location of the available exits and the paths of travel to the exits are expected to be readily identifiable.

Disabled Occupants

People with disabilities are considered assisted by able-bodied carers, family and / or friends.

Managing the evacuation of people with disabilities relies on the individual building management systems, procedures and training, which are outside the scope of the BCA, but can substantially contribute to the overall evacuation efficiency of the subject building.

Therefore, disabled access and egress should be addressed in an emergency evacuation plan and management procedures developed for people with disabilities.

5 Hazards

Outline any hazards unique to the building:

- ☐ Combustible external cladding
- ☐ Combustible waste (i.e. waste facility)
- ☐ Hazardous chemicals / dangerous goods
- ☐ Electricity supply system (e.g. substations)
- ☐ Battery system (e.g. BSS, BESS, ESS)
- ☑ Alternative electrical generation (solar panels)
- ☐ Insulated sandwich panels
- ☐ Podium type building
- ☐ A basement level
- ☐ An atrium (Part G3 of BCA)
- ☐ Car stacker
- ☐ Other: (provide details)

Note: Clauses E1.10 and E2.3 of the NCC should be addressed when special hazards exist (e.g. car stacker, hazardous chemicals/dangerous goods).

Solar panels will be installed to the roof of the building. The proposed location and extent of the solar panels is highlighted in Figure 12.

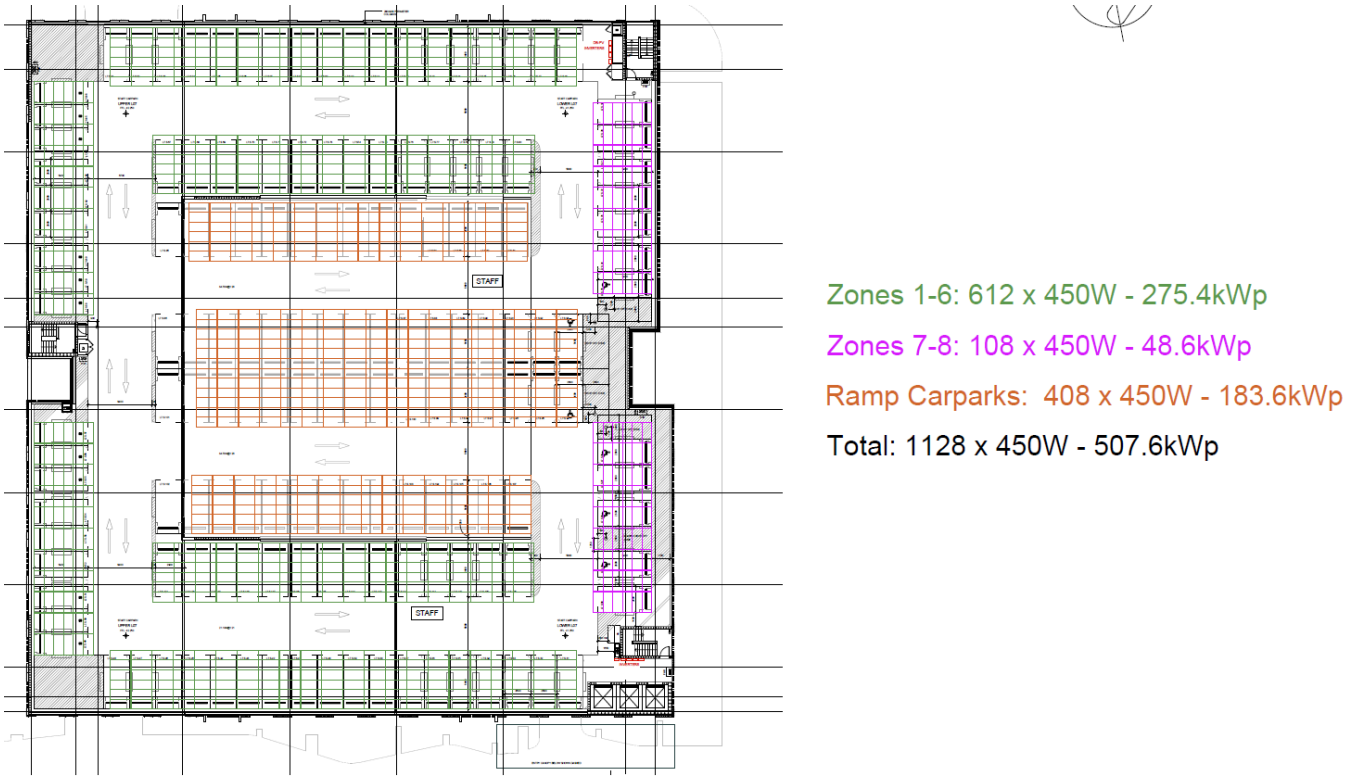


Figure 12: Proposed Solar Panel Layout

General

In identifying potential fire hazards, the following factors are considered:

- General building layout and construction
- Building activities
- Potential ignition sources
- Combustible contents

General Building Layout and Construction

The car park will comprise of eight (8) levels and will be designed as being open deck, except for basement 1 and basement 2 which will not meet the requirements to achieve open deck status.

Both basement 1 and basement 2 will be fully sprinkler protected. Fire sprinklers will not be provided to the open deck levels of the car park. The omission of fire separation between the sprinkler protected and non-sprinkler protected levels of the car park is subject to a Performance Solution as detailed in this Report.

The building is assumed to comply with the relevant provisions for Type A construction.

Building Activities

The building will be predominately used for car parking purposes. There are no retail or commercial areas within the car park, thus the installed fire safety systems are unlikely to be isolated for long periods of time for building and / or fitout works.

Potential Ignition Sources and Areas of Fire Origin

The following ignition sources are considered present within the car park:

- Motor vehicles
- Faulty electrical equipment (within plant rooms)
- Arson attack (single point of ignition only)

Combustible Contents

Combustible contents within the car park will be those primarily associated with the parked motor vehicles, including:

- Internal furnishings and upholstery
- Personal items
- Gasoline

6 Preventative and protective measures

Identify fire safety measures that are, or will be, provided throughout the building, including anything undecided, which should be mentioned as part of the FEBQ review. Additional information may be added to the comments section below to better describe any systems or indicate systems that may be subject to a performance solution.

Suppression system

- ☐ CA16 (existing building)
- ☑ AS 2118.1-2017 (B1 & B2)
- ☐ AS 2118.1-2006
- ☐ AS 2118.1-1999 (existing building)
- ☐ AS 2118.2-2010 (wall-wetting)
- ☐ AS 2118.3-2010 (deluge)
- ☐ AS 2118.4-2012 (residential)
- ☐ AS 2118.5-2006 (domestic)
- ☐ AS 2118.6-2012
- ☐ FPAA101D (class 2 or 3)
- ☐ FPAA101H (class 2 or 3)
- ☐ Fast response heads
- ☐ ESFR
- ☐ Storage mode sprinklers
- ☐ Gaseous suppression system
- ☐ Water mist system

Hydrant system

- ☐ AS 2419.1-2017
- ☑ AS 2419.1-2005
- ☐ AS 2419.1-1994 (existing building)
- ☐ Ordinance 70 (existing building)
- ☐ External hydrants
- ☑ Internal hydrants
- ☐ Internal dry-riser (for Class 2/3)
- ☐ Street hydrant coverage only
- ☑ Hydrant booster assembly
- ☑ Pumpset

Firefighting equipment

- ☑ Portable fire extinguishers
- ☑ Fire hose reels

Detection system

- ☐ AS 3786:2014
- ☐ AS 3786-1993 (existing building)
- ☑ AS 1670.1:2018
- ☐ AS 1670.1:2015 (existing building)
- ☑ AS 1668.1:2015
- ☑ AS 1670.3-2018 (monitored)
- ☐ AS 1670.3-2004 (existing building)
- ☐ Smoke alarms
- ☐ Heat alarms
- ☑ Smoke detectors (B1 & B2)
- ☐ Heat detectors (fire shutters)
- ☐ Flame detectors
- ☐ CO detectors
- ☐ Multi-criteria fire detectors
- ☐ Aspirated smoke detection
- ☐ Beam detection

Water supply

- ☐ Reticulated town main
- ☐ Private water main
- ☑ Onsite storage tank (site wide)
- ☐ Gravity tank/reservoir
- ☐ Dual supply

Smoke hazard management

- ☐ Zone smoke control
- ☐ Purge system (existing building)
- ☐ Smoke and heat vents
- ☐ Smoke exhaust
- ☐ Smoke baffles
- ☐ Ridge vents
- ☐ Stair pressurisation
- ☐ Impulse / jet fans (in carpark)

Facilities for emergency services

- ☐ Emergency lifts
- ☐ Fire control centre
- ☐ Fire control room
- ☐ Perimeter vehicular access
- ☐ Standby power supply system

Occupant warning system

- ☑ Building occupant warning
- ☐ EWIS
- ☐ SSISEP
- ☐ Break glass unit
- ☐ Visual / tactile alarm devices

Signage

- ☑ Emergency lighting
- ☑ Exit and direction signs
- ☑ Warning and operational signs

Protection of openings

- ☑ Fire doors
- ☐ Smoke doors
- ☐ Solid core doors
- ☐ Fire windows
- ☐ Fire shutters
- ☐ Wall-wetting sprinklers
- ☐ Fire curtain
- ☐ Smoke curtain
- ☐ Safety curtain for openings
- ☐ Fire dampers
- ☐ Smoke dampers
- ☐ Fire seals (intumescent)
- ☐ Hot smoke seals (>200ºC)
- ☐ Medium temp. smoke seals

Additional information:

SUMMARY OF FIRE SAFETY REQUIREMENTS

GENERAL

All building works associated with the new multi-level car park for Tweed Valley Hospital shall comply with the relevant DtS provisions of Section C, D and E of the BCA, except for the permitted variations identified in this Report.

SPECIFIC REQUIREMENTS

Specific fire engineering requirements that are applicable to subject building, which vary from or exceed, the DtS provisions of the BCA have been summarised below.

General

1. Ground floor to level 05 of the building shall be designed as an open deck car park as defined by the DtS provisions of the BCA. These levels of the building are not required to be sprinkler protected.
2. Basement 1 and basement 2 of the building are not required to satisfy the provisions for an open deck car park and shall be fully sprinkler protected throughout.
3. Fire separation is not required between the sprinkler protected and non-sprinkler protected levels of the car park.
4. Spandrel separation is not required between levels of the car park.
5. All penetrations for services through fire rated building elements, including through each intervening floor or ramp of the car park, shall be protected in accordance with Clause C3.15 of the BCA.

Roof Mounted Solar Panels

6. Signage shall be clearly displayed at the sub-Fire Indicator Panel (SFIP), within the fire control room, and at the fire brigade booster assemblies identifying the presence and location of the solar electrical generation system.
7. A block plan showing the location of all associated isolation switches, AC and DC isolator for the shut-off of generated electricity shall be displayed at the SFIP.
8. If the solar panels automatically isolate on fire trip, signage shall be provided at the SFIP detailing this provision that can clearly be identified by firefighters.
9. The following shall be provided with regards to the required signage:
    - Be constructed of all-weather fade resistant material with red lettering not less than 25 mm high with a contrasting-coloured background.
    - Provide notice of the type of alternative electrical generation system and the location of any isolation/shut-off switches and shut down procedures.
    - Be provided on or adjacent to the sub-Fire Indicator Panel (SFIP)
    - Be provided on or adjacent to all hydrant block plans.

FIRE SAFETY SYSTEMS

The required fire safety systems that are applicable to the subject building have been summarised below, including additional provisions where noted that exceed or vary from the minimum DtS provisions of the BCA.

Note: Reference shall also be made to the Fire Safety Schedule for the subject building for the list of required fire safety systems and measures and the relevant Standards of Performance.

Fire Hydrants

1. A fire hydrant system shall be installed throughout the subject building in accordance with Clause E1.3 of the BCA, and the relevant provisions of AS 2419.1-2005, except as where varied in this Report. The system shall be extended from the site wide fire services system.
2. Notwithstanding, the flow rate for the fire hydrant system serving the building is permitted to comply with the relevant provisions of the new fire hydrant Standard AS 2419.1-2021, rather than AS 2419.1-2005.

3. Where necessary, additional fire hydrants shall be provided on each floor of the car park, pursuant to Clause 3.2.3.3 of AS 2419.1, to ensure coverage is achieved in accordance with Clause 3.2.3.1. Supplementary block plans shall be displayed in each stairway at the levels where the additional hydrants are to be installed. The block plans shall be a minimum of A3 in size and indicate the location of all hydrants affording protection to that particular level.
4. The site wide Block Plan of the fire hydrant system shall be upgraded as necessary to include reference to the subject building in accordance with AS 2419.1. A copy of the Block Plan shall also be located at the fire brigade booster assemblies, at the fire pumps, and at the SFIP serving the subject building. The Block Plans shall be designed and mounted to be in the correct orientation to the reader.
5. All fire hydrant valves shall be fitted with Storz aluminium alloy delivery couplings manufactured and installed in accordance with Clauses 7.1 and 8.5.11.1 of AS 2419.1-2005. All hydrant valves shall possess a forging symbol and manufacturers mark and shall comply with Fire & Rescue NSW Fire Safety Guideline Technical Information (D15/45534).

Fire Hose Reels

6. A fire hose reel system shall be installed throughout the subject building in accordance with Clause E1.4 of the BCA, and the relevant provisions of AS 2441-2005.
7. The system shall be extended from the site wide fire services system.

Sprinklers

8. An automatic fire sprinkler system shall be installed throughout basement 1 and basement 2 of the subject building in accordance with Specification E1.5 of the BCA, and the relevant provisions of AS 2118.1-2017, except as where varied in this Report.
9. All sprinkler heads shall be of the fast response type, with a Response Time Index (RTI) of not greater than 50 $(m.s)^{1/2}$.
10. Extended coverage sprinklers shall not be utilised within the building.
11. The site wide Block Plan of the fire sprinkler system shall be upgraded as necessary to include reference to the subject building in accordance with AS 2118.1. A copy of the Block Plan shall also be located at the fire brigade booster assemblies, at the fire pumps, and at the SFIP serving the subject building. The Block Plans shall be designed and mounted to be in the correct orientation to the reader.
12. The fire sprinkler system shall be connected to a fire station dispatch centre in accordance with AS 1670.3-2018.

Portable Fire Extinguishers

13. Portable fire extinguishers shall be provided throughout the subject building in accordance with Clause E1.6 of the BCA, and the relevant provisions of AS 2444-2001.

Automatic Smoke Detection and Alarm System

14. An automatic smoke detection and alarm system shall be installed throughout basement 1 and basement 2 of the subject building in accordance with Clause E2.2 of the BCA, Specification E2.2a of the BCA, and the relevant provisions of AS 1670.1-2018 and AS 1668.1-2015.
15. A sub-Fire Indicator Panel (SFIP) shall be provided for the building and shall be located within the lift lobby on ground floor. The SFIP shall be interfaced with the main site FIP that will be located within the fire control room of the main hospital building.
16. The SFIP shall serve as the main Fire Detection Control and Indicating Equipment (FDCIE) for the car park and shall be interfaced to the main site FIP for the purposes of initiating the fire alarm monitoring system only upon sprinkler activation (i.e. call out of the fire brigades). Therefore, a fire alarm within the car park shall not initiate a fire alarm within the main hospital building (and vice versa).
17. A fire alarm in the car park shall alert the emergency teams within the main hospital building. This shall be achieved via an “Integrated Messenger System”.

Building Occupant Warning System

18. A building occupant warning system shall be installed throughout the subject building in accordance with Specification E2.2a of the BCA (Clause 7), and the relevant provisions of AS 1670.1-2018.
19. The building occupant warning system shall automatically activate upon operation of the automatic smoke detection and alarm system and / or the fire sprinkler system serving the building.

Emergency Lighting and Exit Signs

20. Emergency lighting and exit signs shall be installed throughout the subject building in accordance with Clauses E4.2, E4.4, E4.5, E4.6 and E4.8 of the BCA, and the relevant provisions of AS/NZS 2293.1-2018.

Car Park Ventilation System

21. The mechanical ventilation system serving basement 1 and basement 2 of the subject building shall be designed to comply with the relevant provisions of AS 1668.2-2012 and Clause 5.5 of AS 1668.1-2015. Fan override controls for the car park ventilation fan(s) shall be provided in accordance with Clause 5.5 of AS 1668.1-2015.

22. A series of multiple Jet Fans (or Impulse Fans) shall not be installed within the building.

MANAGEMENT AND USE

General

1. The Body Corporate or Managing Entity shall implement a Management in Use system for the subject building that incorporates the following measures as a minimum:
    - Routine maintenance of all plant and equipment.
    - Routine maintenance of all fire safety systems and measures.
    - Regular emptying of rubbish bins.
    - Ensuring paths of travel to exits are kept free of anything that may obstruct or impede the free passage of persons.
    - Ensuring all exit doors are functional and all statutory signage is in place.
    - Ensuring any stolen / missing / discharged portable fire extinguishers are promptly replaced with new, certified, and ready to use extinguishers.

Maintenance and Servicing

2. All fire safety measures installed throughout the subject building shall be maintained and serviced in accordance with relevant Australian Standards and manufacturers guidelines and shall be certified annually as part of an Annual Fire Safety Statement (AFSS).

Certification of Fire Engineering Design

3. The Fire Engineering Report shall form part of the Fire Safety Schedule for the subject building and shall be certified annually as part of the AFSS. Should the building undergo a change in use or classification, or be modified in any way, the Fire Engineering Designs for the building shall be re-evaluated by an appropriately qualified Fire Safety Engineer.

7 Departures from the Deemed-to-Satisfy provisions

Issue number: 1 **Title:** **Separation of Sprinklered and Non-Sprinklered Areas**

Details of departures from DtS provisions:

The subject car park will be designed as open deck as defined by the BCA, except for basement 1 and basement 2 which will not meet the requirements to achieve open deck status.

Both basement 1 and basement 2 will be fully sprinkler protected. Fire sprinklers will not be provided to the open deck levels of the car park.

It is not proposed to provide 2-hour fire separation between the sprinkler protected levels (non-open deck) and the non-sprinkler protected levels (open deck) of the car park.

Applicable DtS provisions:	Clause C2.7, Specification E1.5	Performance requirements:	CP2, EP1.4

List key fire safety measures:

- The characteristics of the open deck levels of the car park, where the effects of fire (smoke and heat) are expected to spread upwards rather than downwards to the sprinkler protected parts of the car park.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- Fire Dynamics Simulator (FDS) will be used to assess the temperature distribution within the car park in the event of fire for the relevant Design Fire Scenarios for the purposes of determining whether a fire within the non-sprinkler protected part of the car park on ground floor will activate the sprinkler system in the non-open deck parts of the car park on basement 1 below.

  FDS is a computational fluid dynamics (CFD) model for fire-driven fluid flow. The software solves numerically a form of the Navier-Stokes equations appropriate for low-speed, thermally driven flow, with an emphasis on smoke and heat transport from fires. FDS has been developed by the National Institute of Science and Technology (NIST) in the US for the purposes of modelling smoke and fire in buildings.

  A software program Pyrosim will be employed to generate a text file defining the computational geometry, numerical grid, design fire and its location, fuel properties, and output parameters etc. This file is used as an input to the FDS program. A companion program Smokeview will be used to create graphical representation of the output parameters.

  Sprinkler devices will be inserted into the model to reflect the sprinkler design on basement 1.

- It is proposed to demonstrate that in the event of fire the fire plume will spread upwards rather than downwards to the sprinkler protected parts of the car park. Therefore, it is proposed to demonstrate that in the event of a fully developed fire on ground floor the products of combustion (smoke and heat) will spread upwards and will not activate the fire sprinkler system serving basement 1 below.

Performance solution:

- ☑ A2.2(1)(a) - Comply with all relevant performance requirements
- ☐ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

- ☐ A2.2(2)(a) - Evidence of suitability
- ☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
- ☑ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
- ☐ A2.2(2)(c) - Expert judgement
- ☐ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☐ Comparative	☐ Qualitative	☑ Deterministic
☑ Absolute	☑ Quantitative	☐ Probabilistic

IFEG sub-systems used in the analysis:

- ☑ A – Fire initiation and development and control
- ☐ B – Smoke development and spread and control
- ☑ C – Fire spread and impact and control
- ☑ D – Fire detection, warning and suppression
- ☑ E – Occupant evacuation and control
- ☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that the risk of a fully developed fire within the non-sprinklered part of the car park growing to a size that could affect the performance of the sprinkler system within the sprinklered part of the car park will be mitigated.

Fire scenarios and design fire parameters:

A fully developed fire on ground floor (non-sprinkler protected) located directly above and adjacent to the sprinkler protected part of the car park on basement 1 below will be considered.

A 12 MW fire will be considered for the assessment. The Heat Release Rate (HRR) curve will be based on experimental results of a free burn 3 car fire[1] as shown in Figure 13. Conservatively a Fast t^2 fire has been assumed.

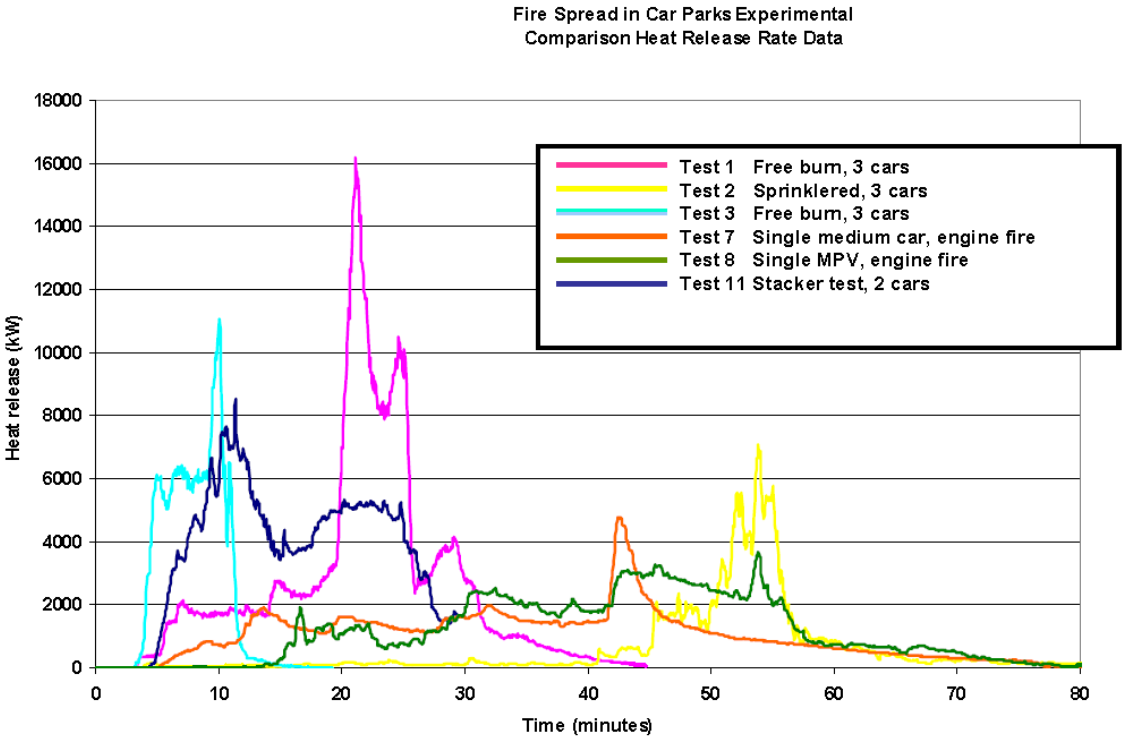


Figure 13: Fire Spread in Carparks HRR Curve for Multi-Car Free Burn (BRE, 2010)

[1] Fire Spread in Car Parks, BRE – Department for Communities and Local Government, 2010

Consideration has been given to the open-deck car park fire within the Kings Dock Car Park, Liverpool UK on 31 December 2017 in which approximately 1,150 vehicles were lost, and the building fabric was damaged to the extent that demolition of the structure was required. The following is a discussion regarding the key factors that led to the spread of fire and consideration of these factors in relation to the building subject of this Report.

An investigation into the incident was conducted by Merseyside Fire & Rescue Service which noted that "*in the case of Kings Dock this was likely to have been through the drainage system and failure of the ribbed slab floors in the early stages of the incident*"[2].

The applicable building regulations, Approved Document B, Volume 2 2010, defines an open sided car park as a building conforming to the following:

- There should not be any basement storeys;
- Each storey should be naturally ventilated by permanent openings at each car parking level, having an aggregate vent area not less than 1/20th of the floor area at that level, of which at least half (1/40th) should be equally provided between two opposing walls;
- where one element of structure supports or carries or gives support to another, the fire resistance of the supporting element should be no less than the minimum period of resistance for the other element (whether that element is load bearing or not);
- If the building is also used for any other purpose, the part forming the car park is a separated part and the fire resistance of any element of structure that supports or carries or gives stability to another element in the other part of the building should be no less than the minimum period of fire resistance for the elements it supports; and
- All materials used in the construction of the building, compartment or separated part should be non-combustible, except for:
    - Any surface finish applied to a floor or roof of the car park, or within any adjoining building, compartment or separated part to the structure enclosing the car park, if the finish meets all aspects of the guidance on requirements B2 and B4;
    - Any fire door
    - Any attendant's kiosk not exceeding 15 m^2 in area; and
    - Any shop mobility facility

The above requirements are noted to be similar to those for an open-deck car park defined within the BCA, being a car park in which all parts of the parking storeys are cross-ventilated by permanent unobstructed openings in not fewer than 2 opposite or approximately opposite sides, and

- each side that provides ventilation is not less than 1/6 of the area of any other side; and
- the openings are not less than ½ of the wall area of the side concerned.

Being designed and built as an open sided car park, the Kings Dock car park is required to achieve a fire-resistance of not less than 15 minutes, with stair cores of not less than 2 hours. In comparison, the BCA requires an FRL of not less than 120/120/120 for Class 7a floors within a Type A building, with a concession permitting this to be reduced to 60/60/60 for a fully sprinkler protected or open-deck car park. Therefore, the subject building is required to achieve an FRL of at least 4 times that of the Kings Dock car park.

In the Kings Dock incident, it was observed that the fire exceeded the design fire-resistance, resulting in the failure of the ribbed slab floors and facilitating fire spread between storeys. In the subject building the increased fire rating is expected to mitigate this mode of fire spread, preventing the fast rate of fire spread observed in the Kings Dock fire.

Fire spread via the drainage system was attributed to PVC downpipe sections that were observed to burn away, allowing for fire spread via ignited flowing fuel. This unprotected section of drainage pipe is not noted to be in contravention to the building regulation requirements and is therefore assumed to comply with the requirements for prevention of fire spread.

Under BCA Clause C3.15, where the subject pipes penetrate a building element that is required to have an FRL with respect to integrity and insulation (i.e. the floor slabs within the car park), the installation must be protected to prevent the spread of fire. Therefore, it is considered that this mode of fire spread is adequately mitigated in the subject building.

[2] Merseyside Fire & Rescue Service, 2018, "Kings Dock Car Park Fire – Protection Report, April 2018

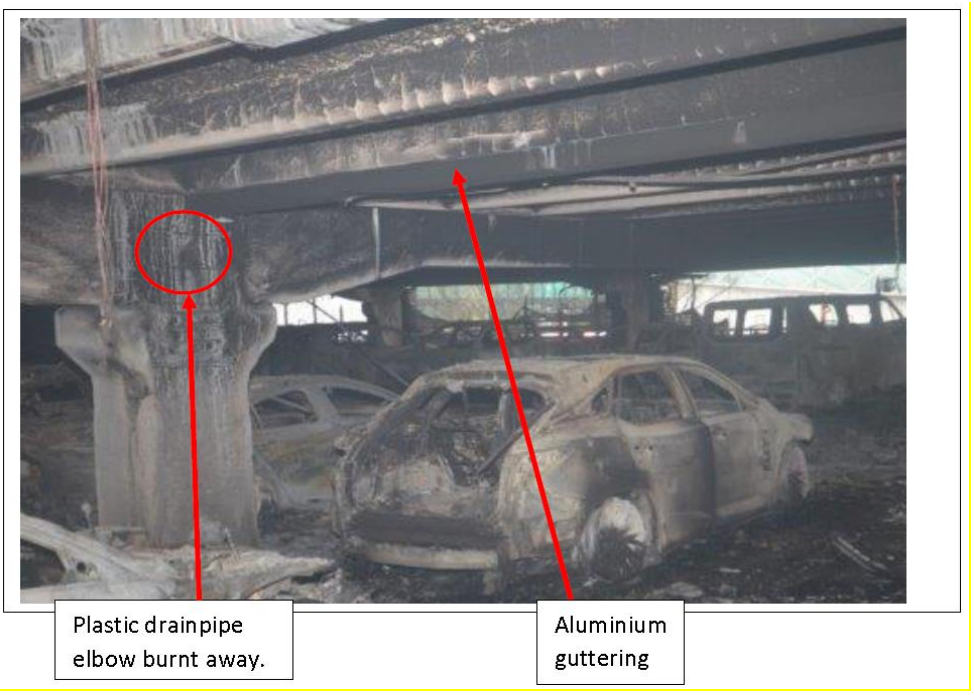


Figure 14: Fire Spread via PVC Drainage Pipe

The Merseyside Fire & Rescue Service investigation noted that very early failure of plastic elbow pipes would have occurred, resulting in fire spread vertically, both downwards and upwards. Failure of the aluminium drainage tray would have exposed the drainage channel and allowed hot gases and flame to be directed to the floor above and impinge on the two rows of cars adjoining this channel.

Based on the above observations taken from the Kings Dock car park fire, and the comparison of the relevant fire safety requirements and resultant modes of fire spread, it is considered that the modes of fire spread are mitigated by the subject building design and applicable DtS requirements.

In consideration of the above, the proposed **12 MW** design fire is considered appropriate for the assessment.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

N/A

FRNSW Comment: In principle support is provided subject to all analysis inputs and assumptions being detailed in the FER and agreed upon by all relevant stakeholders, and the analysis demonstrating compliance with the Performance Requirements of the NCC.

Innova: Noted.

Issue number: 2 **Title:** **Vertical Separation of Openings in External Walls (Omission of Spandrels)**

Details of departures from DtS provisions:

The requirement for vertical separation of openings in external walls of a building, pursuant to Clause C2.6 of the BCA, is not applicable to an open deck car park or a building which has a fire sprinkler system complying with AS 2118.1-2017 installed throughout.

The subject car park will be designed as open deck as defined by the BCA, except for basement 1 and basement 2 which will not meet the requirements to achieve open deck status. Therefore, both basement 1 and basement 2 will be fully sprinkler protected. Fire sprinklers will not be provided to the open deck levels of the car park.

As fire sprinklers will not be installed throughout the entire car park, vertical spandrels are technically required to provide separation between basement 2 and basement 1. The Performance Solution seeks to omit the provision of spandrels.

Applicable DtS provisions:	Clause C2.6	Performance requirements:	CP2

List key fire safety measures:

- The provision of a fire sprinkler system throughout basement 1 and basement 2, which is expected to mitigate the development and spread of fire.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- An automatic fire sprinkler system will be installed throughout basement 1 and basement 2 in accordance with the relevant provisions of AS 2118.1-2017. A properly designed, installed and maintained fire sprinkler system is expected to control / suppress a fire, limit the spread of fire within a close proximity of the fire origin, limit fire growth (heat release rate), and limit smoke production. Further, fast response sprinklers will be utilized, in lieu of standard response sprinklers, which is expected to further reduce the fire size and associated hazard.

  It is considered reasonable to assume that the intensity and extent of a fire will be reduced upon sprinkler activation[3,4], and this would likely be achieved in the following ways:

  - Sprinklers are designed to limit the size of a fire or even suppress a fire by removing heat from the seat of the fire.
  - Sprinklers are expected to limit the spread and growth of fire to an area in the close proximity of the fire seat.
  - Sprinklers may mitigate the impact of fire on the building structural elements by way of decreasing the temperature of the fire plume and combustion gases to temperatures less than the critical temperatures of the structural elements inside the building.

  Further, the Technical Memoranda TM19:1995[5] published by The Chartered Institution of Building Services Engineers (CIBSE) states that; "*it may be assumed that the sprinklers cool most of the smoke layer to below that of the operating temperature of the sprinklers*", and that, "*it is considered that an average smoke layer temperature of 100°C may be assumed whilst the sprinklers are operating*".

  Therefore, during a sprinkler-controlled fire, the risk of vertical fire spread between basement 2 and basement 1 is expected to be mitigated.

- The effectiveness of fire sprinklers is also supported by the Guide to the BCA, which states that the requirements of Clause C2.6 does not apply to "***sprinkler protected buildings because the sprinklers should prevent the fire developing to the stage where it could spread to the floor above***".

  Therefore, whilst fire sprinklers will not be provided throughout all levels of the building, creating a technical non-compliance whereby spandrel separation is required to basement 1 and basement 2, the provision of fire sprinklers throughout the basement levels will mitigate the risk of vertical fire spread between levels.

[3] Approved Document B: The Building Regulations 1991 - Fire Safety, Department of the Environment, Transport and the Regions, 2002.
[4] Guide to the BCA; Australian Building Codes Board, 2006.
[5] Relationships for smoke control calculations; Technical Memoranda TM19:1995, The Chartered Institution of Building Services Engineers, 1995.

Performance solution:

☐ A2.2(1)(a) - Comply with all relevant performance requirements
☑ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☐ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☑ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☑ Comparative ☑ Qualitative ☑ Deterministic
☐ Absolute ☐ Quantitative ☐ Probabilistic

IFEG sub-systems used in the analysis:

☑ A – Fire initiation and development and control
☐ B – Smoke development and spread and control
☑ C – Fire spread and impact and control
☑ D – Fire detection, warning and suppression
☑ E – Occupant evacuation and control
☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that the risk of vertical fire spread between basement 2 and basement 1 will be mitigated to the same degree as the DtS provisions of the BCA.

Fire scenarios and design fire parameters:

A sprinkler-controlled fire on basement 2 resulting in the evacuation of occupants and the arrival of the fire brigades will be considered. The design fire will be considered in a qualitative manner.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

N/A

FRNSW Comment: In principle support is provided subject to the analysis in the FER demonstrating compliance with the performance requirements of the NCC.

Innova: Noted.

Issue number: 3 **Title:** **Exit Travel Distances / Distance between Alternative Exits (Enclosed Car Park)**

Details of departures from DtS provisions:

To have the following extended exit travel distances from basement 1 and basement 2, which will not be designed as open deck:

- Up to 45 m travel to the nearest exit, in lieu of 40 m.
- Up to 82 m travel between alternative exits, in lieu of 60 m (when measured through the point of choice).

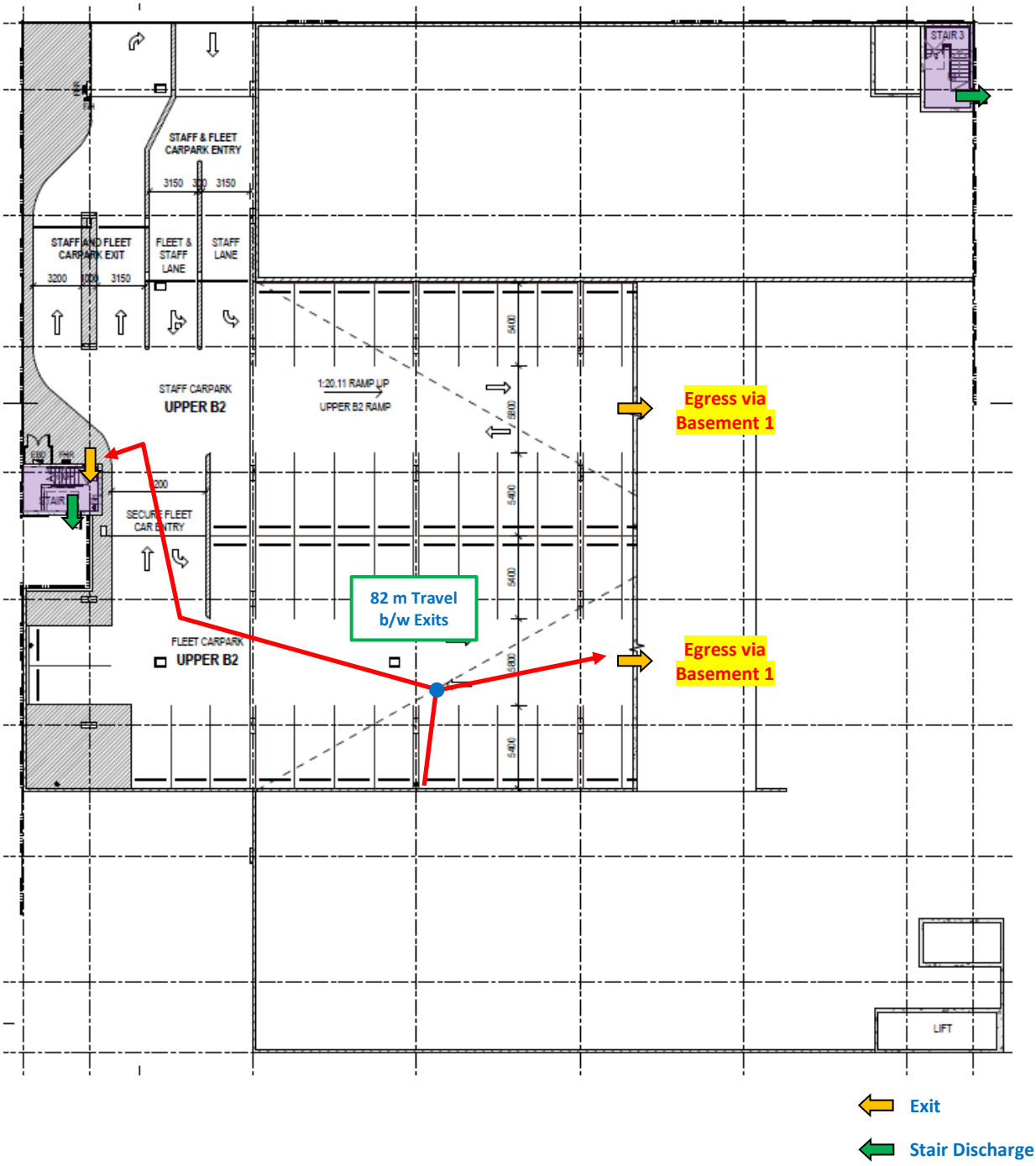


Figure 15: Basement 2 Plan

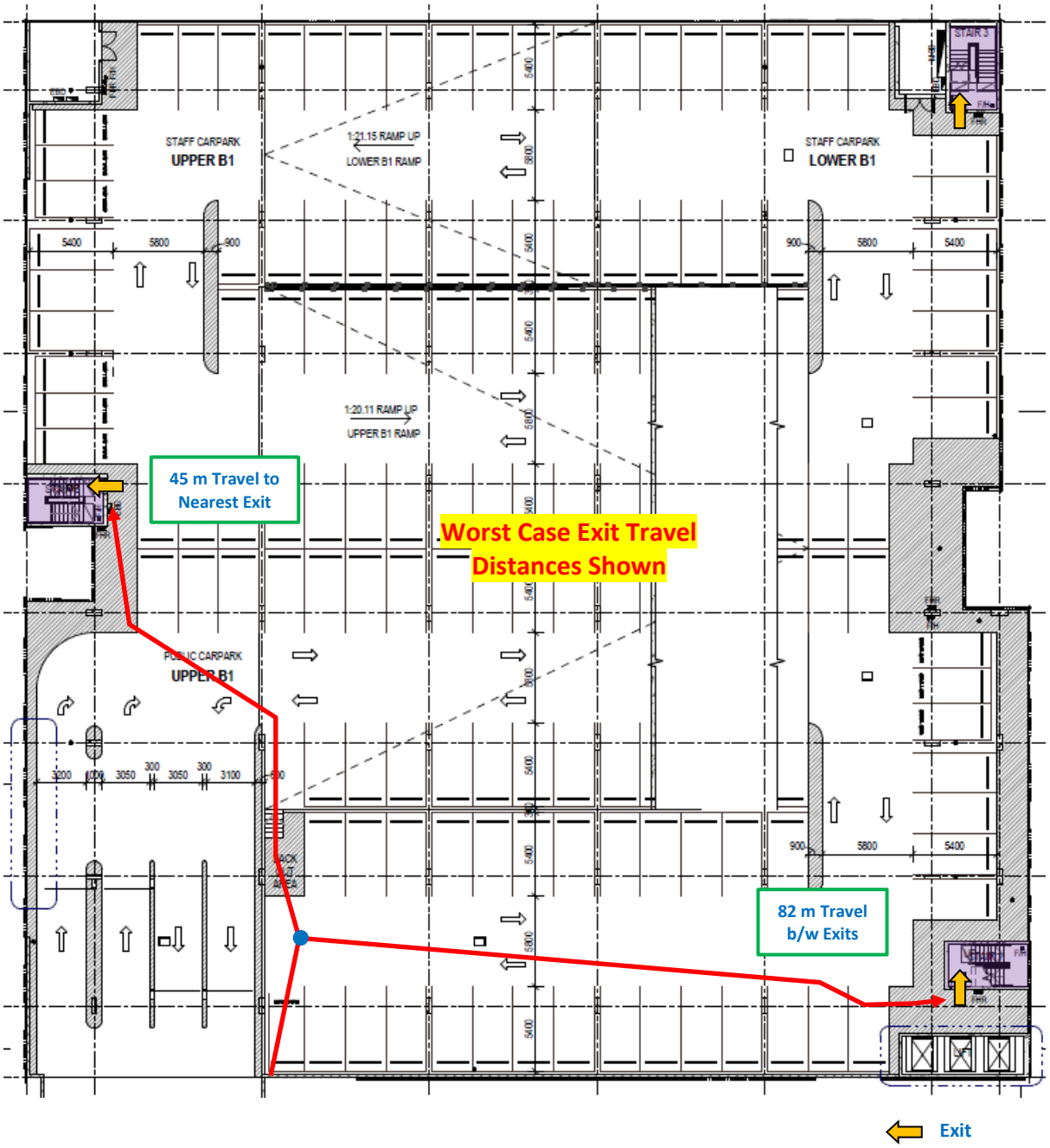


Figure 16: Basement 1 Plan

Applicable DtS provisions:	Clauses D1.4, D1.5	Performance requirements:	DP4, EP2.2

List key fire safety measures:

- The provision of fire sprinklers throughout basement 1 and basement 2, including the use of fast response sprinklers in lieu of standard response sprinklers to improve occupant cue time.
- The characteristics and use of the car park.
- The number of occupants within the car park.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- The characteristics of the occupants and the relatively low population number within basement 1 and basement 2, which is expected to be used as a transient area for occupants accessing their respective vehicles.
- The provision of fast response sprinklers throughout basement 1 and basement 2, in lieu of standard response sprinklers. It is proposed to demonstrate that the provision of fast response sprinklers will improve occupant cue time in the event of fire, and thus offset the additional travel distances. Therefore, it is proposed to demonstrate that the Required Safe Evacuation Time (RSET) for the Performance Solution is at least equal to a DtS Compliant Design.

  That is, $\mathbf{RSET}_{PS} \leq \mathbf{RSET}_{DtS}$

  The provision of fast response sprinklers will also result in a smaller fire size when compared to the DtS provisions of the BCA where standard response sprinklers can be used.
- The floor to ceiling height within basement 1 and basement 2 is on average ~2.7 m, which is greater than the minimum DtS provisions of the BCA pursuant to Clause F3.1 (being 2.1 m). This results in a greater smoke reservoir for smoke to accumulate at ceiling or soffit level when compared to a design that complies with the DtS provisions of the BCA. Therefore, the Available Safe Evacuation Time (ASET) from basement 1 and basement 2 for the Performance Solution is expected to be greater than a DtS Compliant Design.
- The paths of travel to the required exits from the car parking levels predominantly comprise of vehicle driveway areas that are expected to remain relatively fuel free. Therefore, the risk of a path of travel being blocked or obstructed in the event of fire is not expected to be increased when compared to a design that complies with the DtS provisions of the BCA.

Performance solution:

☐ A2.2(1)(a) - Comply with all relevant performance requirements
☑ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☐ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☑ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☑ Comparative ☑ Qualitative ☑ Deterministic
☐ Absolute ☑ Quantitative ☐ Probabilistic

IFEG sub-systems used in the analysis:

☑ A – Fire initiation and development and control
☑ B – Smoke development and spread and control
☑ C – Fire spread and impact and control
☑ D – Fire detection, warning and suppression
☑ E – Occupant evacuation and control
☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that occupants will be permitted to evacuate from basement 1 and basement 2 safely and in conditions that are comparable to the DtS provisions of the BCA.

Fire scenarios and design fire parameters:

As basement 1 and basement 2 will be fully sprinkler protected, the most likely and credible fire scenario is expected to involve sprinkler activation.

Research from BRE indicates that fires within a car park resemble a fast growth rate. Therefore, the fire growth rate for the design fire within basement 1 and basement 2 will be based on a **Fast T^2** fire. For a sensitivity analysis, a **Medium T^2** fire will also be considered.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☑ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☐ None

Both a Fast T^2 fire and a Medium T^2 fire will be considered for the assessment as detailed above.

Provide details on proposed modelling/assessment tools:

An evacuation analysis will be carried out to directly compare the Required Safe Evacuation Time (RSET) for the Performance Solution against a design that complies with the minimum DtS provisions of the BCA. The additional travel distances will be justified by earlier detection time (i.e. fast response sprinklers, in lieu of standard response sprinklers).

That is, $\mathbf{RSET}_{PS} \leq \mathbf{RSET}_{DTS}$

DtS Compliant Design

- Travel distance to the nearest exit of 40 m
- Travel distance between alternative exits of 60 m
- Standard response sprinkler heads with an RTI of 135 $(m.s)^{1/2}$, reference to Fire Engineering Design Guide[6]
- Sprinkler spacing for Ordinary Hazard is 2.5 m to the 1st row sprinkler head (same in both scenarios)
- Population numbers determined from BCA D1.13 (same in both scenarios)
- Minimum ceiling height from drawings (same in both scenarios, i.e. 2.7 m high)
- The fire source location is assumed to be above floor level (i.e. a fire within car engine being 1.2 m high off the ground and same in both scenarios)
- Assessed for both Medium and Fast T^2 fire

Performance Solution

- Travel distance to the nearest exit of 45 m
- Travel distance between alternative exit of 82 m
- Fast response sprinkler heads with an RTI of 50 $(m.s)^{1/2}$, reference to Fire Engineering Design Guide[7]
- Sprinkler spacing for Ordinary Hazard is 2.5 m to the 1st row sprinkler head (same in both scenarios)
- Population numbers determined from BCA D1.13 (same in both scenarios)
- Minimum ceiling height from drawings (same in both scenarios, i.e. 2.7 m high)
- The fire source location is assumed to be above floor level (i.e. a fire within car engine being 1.2 m high off the ground and same in both scenarios)
- Assessed for both Medium and Fast T^2 fire

FRNSW Comment: In principle support is provided subject to the following:

- The analysis in the FER demonstrating compliance with the Performance Requirements of the NCC.
- The occupant speed to be utilised as part of the assessment method is to be adequately outlined within the FER, demonstrating that appropriate conservatism has been shown to include all possible demographics of the expected occupants (i.e. – both able-bodied and mobility-impaired occupants). It is recommended that an occupant speed of 0.8m/s be employed in the proposed assessment in order to maintain a conservative approach to the performance solution.

Innova: Noted. An occupant movement speed of 0.78 m/s will be utilised in the assessment.

[6] Fire Engineering Design Guide 3rd Edition Ch 8 Part 2 pg 147-8
[7] Fire Engineering Design Guide 3rd Edition Ch 8 Part 2 pg 147-8

Issue number: 4 **Title:** **Exit Travel Distances / Distance between Alternative Exits (Open Deck Car Park)**

Details of departures from DtS provisions:

To have the following extended exit travel distances from the open deck levels of the car park:

- Up to 50 m travel to the nearest exit, in lieu of 40 m.
- Up to 82 m travel between alternative exits, in lieu of 60 m (when measured through the point of choice).

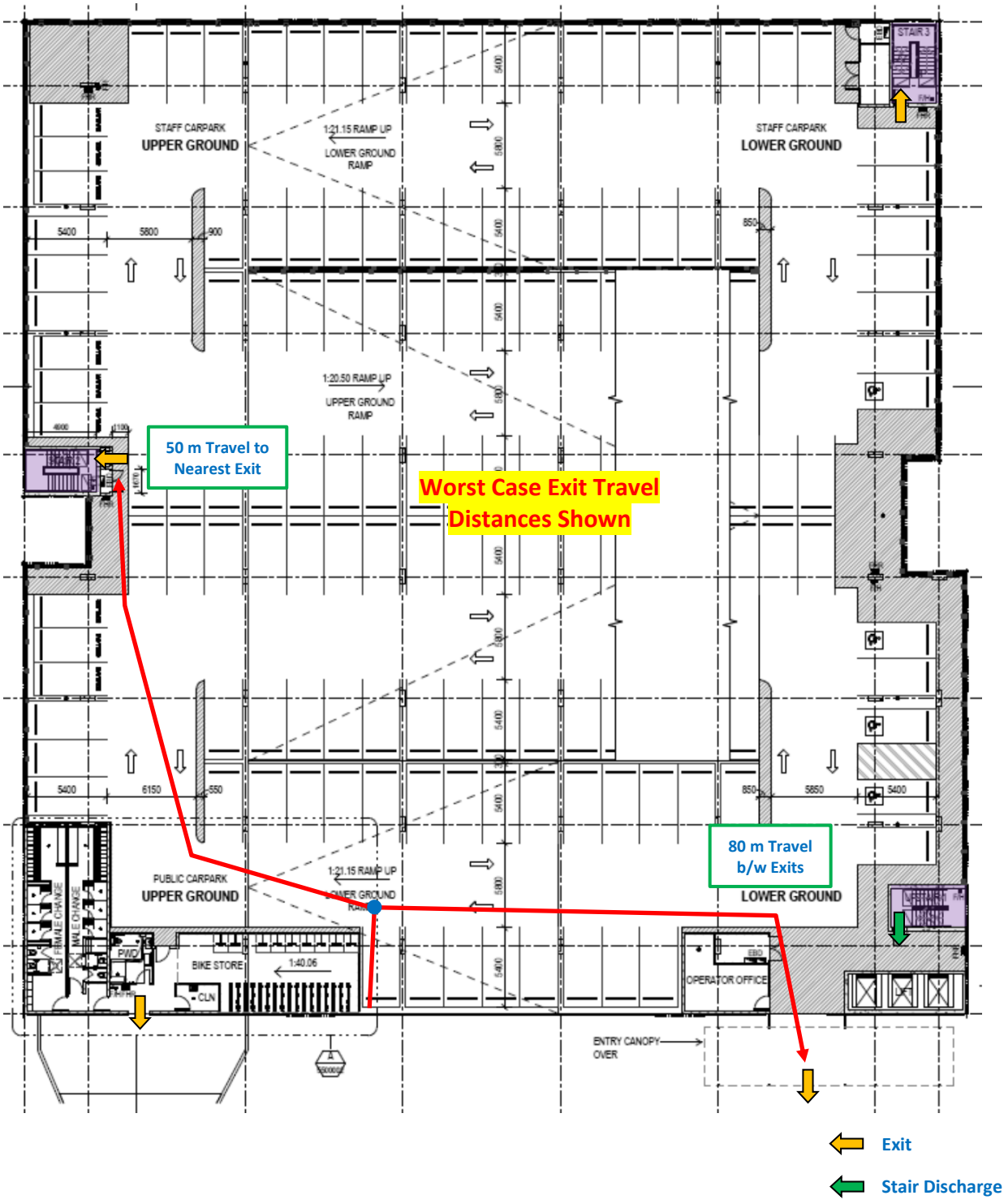


Figure 17: Ground Floor Plan

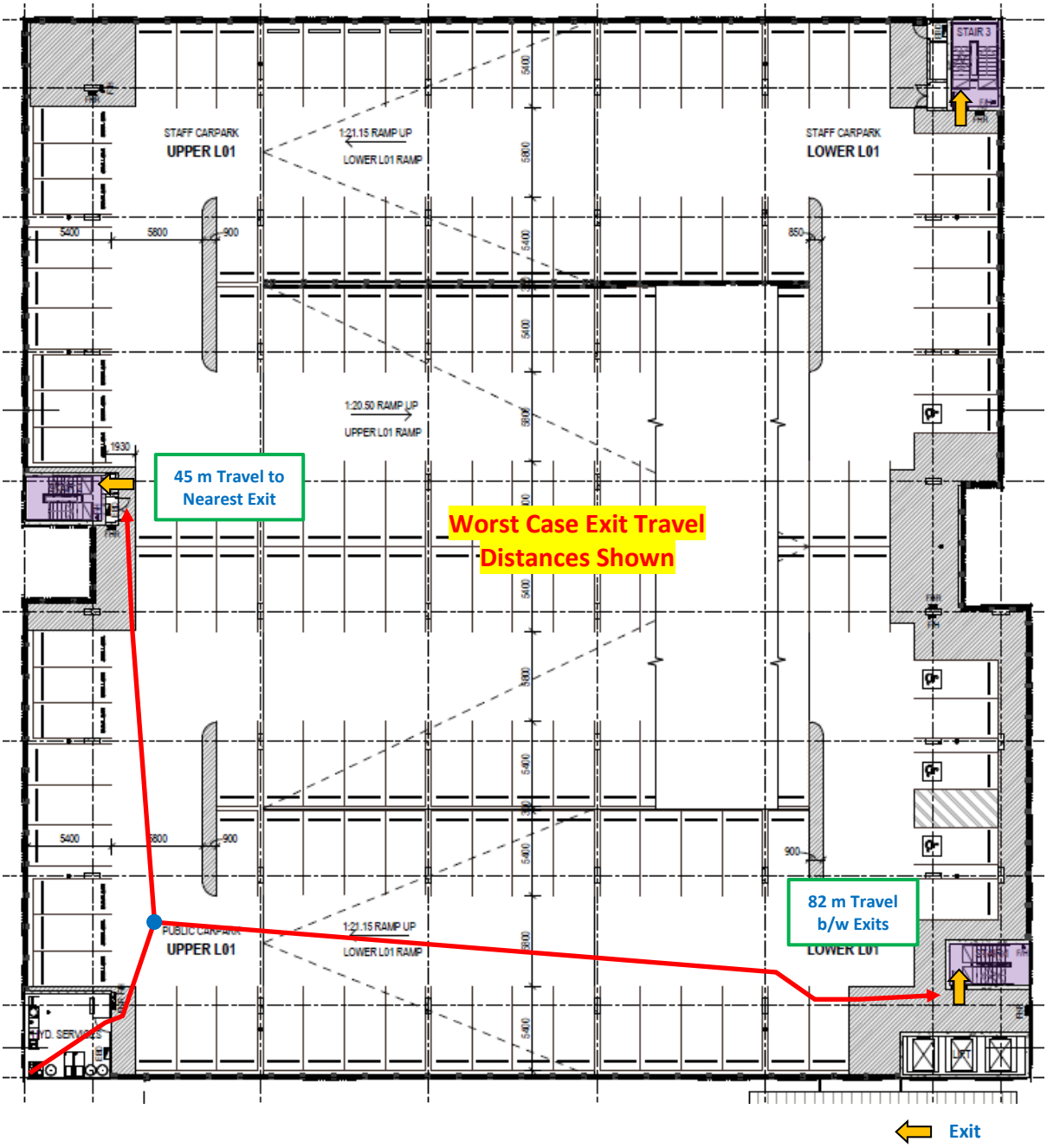


Figure 18: Level 01 Plan

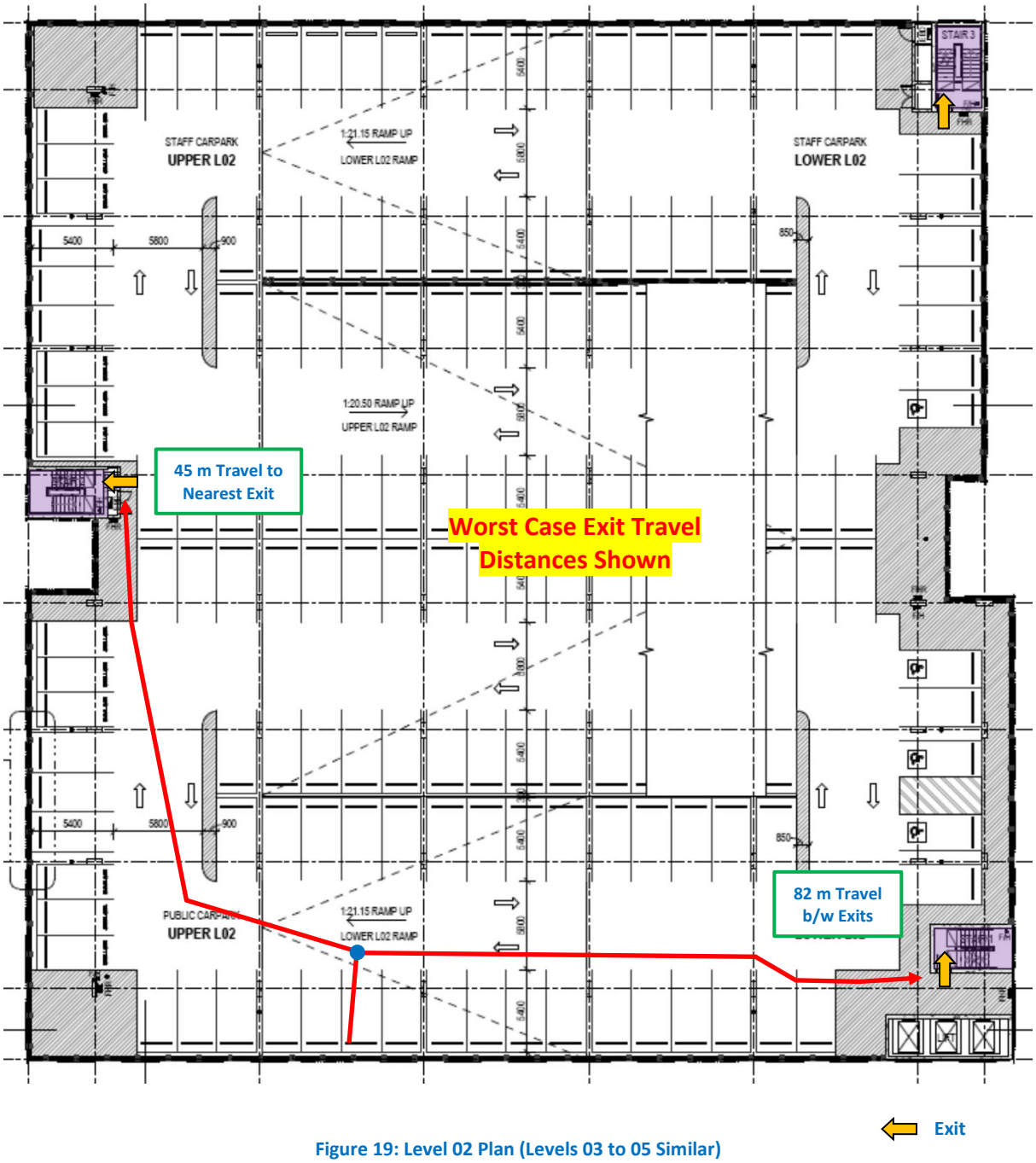


Figure 19: Level 02 Plan (Levels 03 to 05 Similar)

Applicable DtS provisions:	Clauses D1.4, D1.5	Performance requirements:	DP4

List key fire safety measures:

- The characteristics and use of the car park, being open deck.
- The characteristics and number of occupants within the car park.
- The provision of alternative exits and alternative paths of travel to reach the exits.

Proposed performance solution:

The proposed fire safety strategy is based on the following:

- The subject levels within the car park will be designed as open deck as defined in the BCA. To achieve compliance as an open deck car park, only 2 elevations of the building are required to be provided with permanent natural ventilation openings whereby the openings are not less than 50 % of the wall area of the side concerned.

  In addition to the minimum requirements of the BCA with regards to achieving open deck, permanent natural ventilation openings will be provided to each elevation of the building. That is, permanent ventilation openings will be provided on all 4 sides of the building.

  Therefore, the additional free area of permanent natural ventilation opening that will be provided to the façade of the building will improve tenability conditions within the car park in comparison to the DtS provisions of the BCA.

  The extent of free area openings on each elevation of the building, for each respective level, is detail in Figure 20.

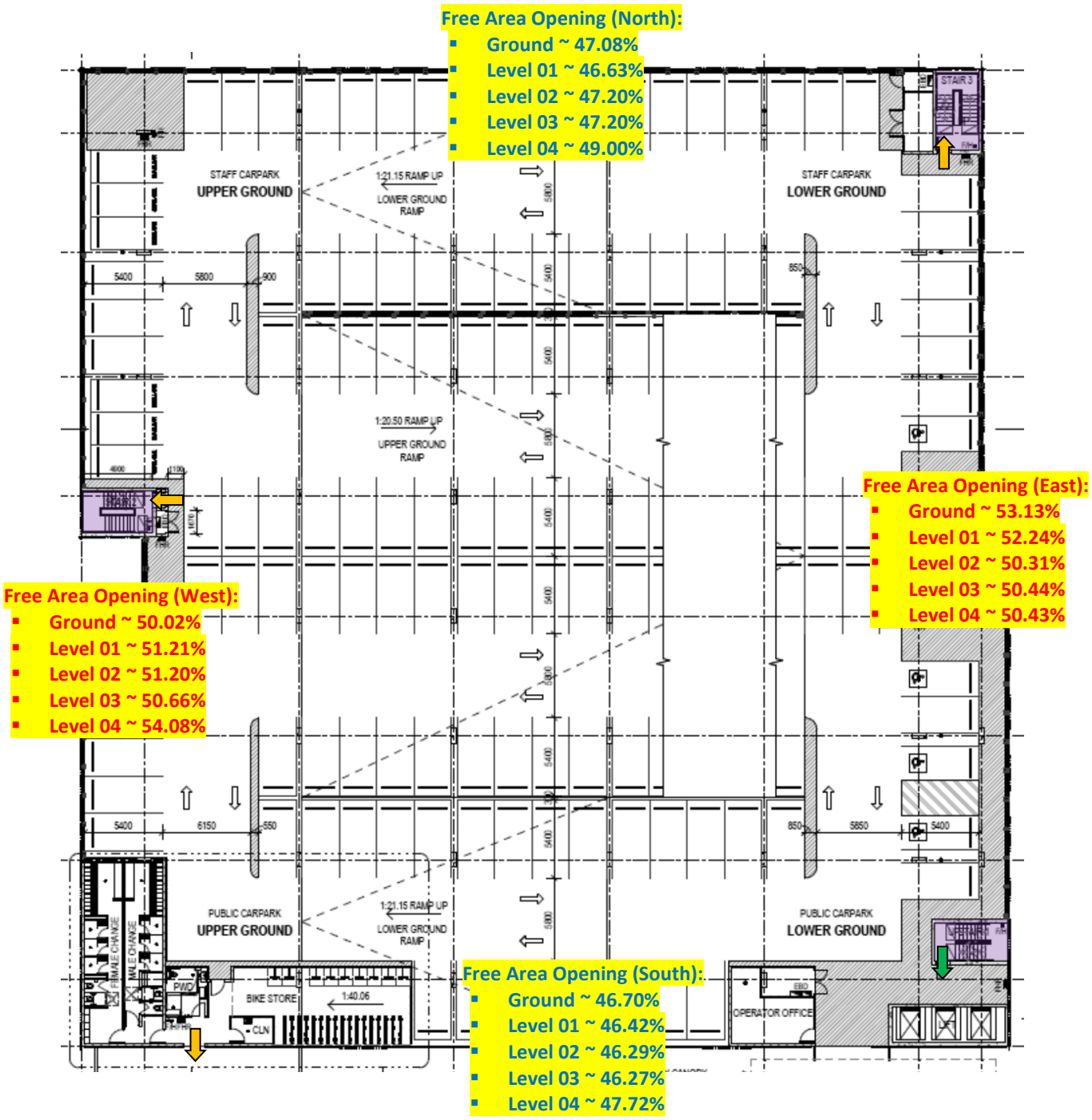


Figure 20: Ground Floor Plan

Innova: The revised percentage of free area openings within the façade of the open deck levels of the car park have been summarised in the table below.

For each level, the percentage of free area opening on at least 2 sides will exceed 60% (DtS is 50%). Further (with the exception of lower ground floor), 50% free area openings will be provided on all 4 sides of the car park (DtS is 2 opposite sides only).

Level-Face	Face m²	Open m²	% Open		Face A	Face B	Face A&B
B01-N	181.455	50.31313	27.73%				
B01-S	186.325	84.27348	45.23%				
B01-W	161.752	90.82164	56.15%				
B02-N	175.524	0	0.00%				
B02-S	175.473	54.65165	31.15%				
B02-W	161.784	38.04543	23.52%				
L01-E	163.246	98.46606	60.32%		L01-N	L01-S	N
L01-N	188.354	109.1521	57.95%		L01-E	L01-W	Y
L01-S	193.37	125.391	64.85%				
L01-W	159.207	104.0745	65.37%				
L02-E	163.246	103.4931	63.40%		L02-N	L02-S	N
L02-N	188.354	106.359	56.47%		L02-E	L02-W	Y
L02-S	193.37	121.4828	62.82%				
L02-W	159.207	104.0745	65.37%				
L03-E	163.246	99.84137	61.16%		L03-N	L03-S	N
L03-N	188.354	106.359	56.47%		L03-E	L03-W	Y
L03-S	193.37	116.0609	60.02%				
L03-W	159.207	102.6836	64.50%				
L04-E	163.246	99.84137	61.16%		L04-N	L04-S	N
L04-N	188.354	105.3113	55.91%		L04-E	L04-W	Y
L04-S	193.37	115.4419	59.70%				
L04-W	159.207	100.9614	63.42%				
L05-E	163.246	100.0308	61.28%		L05-N	L05-S	N
L05-N	188.354	104.7902	55.63%		L05-E	L05-W	Y
L05-S	193.37	113.5507	58.72%				
L05-W	159.207	100.9614	63.42%				
LGR-E	163.246	53.07636	32.51%		LGR-N	LGR-S	Y
LGR-N	188.354	121.7957	64.66%		LGR-E	LGR-W	N
LGR-S	193.37	110.4266	57.11%				
LGR-W	159.207	100.4187	63.07%				

- Pursuant to Clause F3.1(f) of the BCA, the unobstructed ceiling height within a car park must not be less than 2.1 m. The ceiling height within the open deck part of the car park is approximately 2.7 m, which exceeds the minimum DtS provisions of the BCA.

  A typical compartment fire generates an upper hot smoke layer, and a relatively cool lower layer comprising of less smoke and predominantly ambient air. Occupants would evacuate through this lower layer where tenable conditions are maintained 2 m above the floor. The higher ceilings within the car park would provide a larger reservoir for smoke to accumulate at ceiling level, delaying the descent of the hot smoke layer to below 2 m from the floor level.

  Therefore, the Performance Solution would render a longer Available Safe Evacuation Time (ASET) for building occupants where the average ceiling height is greater than that permitted for a DtS Compliant Design and will therefore reduce the risk associated with occupant evacuation from the car park.

  It is noted that Performance Requirement EP2.2 (Safe evacuation routes) does not apply to an open deck car park. The Guide to the BCA states that smoke and hot gases within an open deck car park can vent naturally, thereby allowing occupants to evacuate safely. This implies that tenable conditions within an open deck car park will be maintained to facilitate the safe evacuation of occupants.

  The increased ceiling heights within the car park, and the increased provisions for natural ventilation as detailed above, is expected to offset the additional travel distance to reach the nearest exit and to reach the alternative exits.

- Alternative exits and alternative paths of travel to reach the exits are available on each level of the open deck part of the car park.

  Exit signs will be provided throughout the car park in accordance with the relevant provisions of BCA Part E4 and AS/NZS 2293.1-2018. The Guide to the BCA recognises the use of exit signs to minimise the risk of death or injury to occupants during an emergency because of an inability to find their way along an exit path of travel or an inability to find an exit.

  Further, the car park is rectangular in shape with good visual access to the available exits. All points on the floor on each level of the car park will be within view or the direct line of sight to at least 2 exits. Further, given the location of the exits at the perimeter of the building, there is no dead-end travel. Therefore, occupants are expected to travel away from the fire source during an evacuation event. That is, occupants will not require to travel towards a fire affected part of the car park to reach an exit or an alternative exit.

- ~~Demonstrating that tenable conditions within the car park will be improved when compared to a DtS Compliant Design via zone modelling.~~
- Demonstration through an ASET / RSET assessment that occupants will be permitted to evacuate from the open deck car parking levels prior to the on-set of untenable conditions.

Performance solution:

☑ A2.2(1)(a) - Comply with all relevant performance requirements
☑ ~~A2.2(1)(b) - Be at least equivalent to the DtS provisions~~

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☑ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☑ ~~A2.2(2)(d) - Comparison with the DtS provisions~~

Assessment approach:

☑ ~~Comparative~~	☑ Qualitative	☑ Deterministic
☑ Absolute	☑ Quantitative	☐ Probabilistic

IFEG sub-systems used in the analysis:

☑ A – Fire initiation and development and control	☑ D – Fire detection, warning and suppression
☑ B – Smoke development and spread and control	☑ E – Occupant evacuation and control
☑ C – Fire spread and impact and control	☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that occupants will be permitted to evacuate from the open deck levels of the car park safely and in conditions that are comparable to the DtS provisions of the BCA.

Fire scenarios and design fire parameters:

A fully developed fire within an open deck level of the car park resulting in the evacuation of occupants and the arrival of the fire brigades will be considered.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

The CFAST computer model will be used to estimate the tenability conditions within the car park in the event of fire.

CFAST is a deterministic Zone Model that predicts the spread of heat and smoke within a compartment or a number of compartments. CFAST can predict the temperature, smoke and gas concentrations within a specified compartment by solving differential conservation equations for mass and energy.

The algorithms, procedures, and computer programs within CFAST have been compiled from the latest knowledge and understanding currently available, and is distributed by the U.S. Department of Commerce, National Institute of Standards and Technology (NIST).

As a Zone Model, CFAST divides the compartment into 2 separate zones: the upper and lower layers. In the compartment of fire origin, there may be a third zone being the fire plume. Some of the assumptions adopted by CFAST include:

- The temperature, smoke and gas concentrations within the upper and lower layers are uniform within each layer, and will vary over the time of the fire.
- The input fire is treated as a source of mass and energy. The combustion process is not modeled.
- The fire plume instantaneously reaches the ceiling of the compartment of fire origin.
- Individual compartments are considered rectangular in shape, with a constant ceiling height.

FRNSW Comments are as follows:

- There is insufficient information provided regarding the DtS-compliant building scenario and what fire safety measures will be incorporated into the base case scenario, in which the performance solution will be compared against (given the nominated “comparative” assessment method). This is recommended to be addressed, in order for FRNSW to review the proposed methodology and its’ suitability for the mentioned performance solution. Refer to the International Fire Engineering Guidelines (IFEG) 2005, Section 1.2.9.1 for further information on an appropriate comparative analysis approach.
- In conjunction with the above, insufficient information has been provided in relation to the proposed quantitative assessment method to be undertaken, in particular as to how the performance solution will demonstrate that the non-compliant extended travel distances will be satisfactorily offset such that an equivalent or better-level of safety will be provided in comparison to a DtS-compliant design. This is to be addressed, with all inputs, assumptions and assessment methodology outlined to allow FRNSW to undertake an informed review of the proposal.
- FRNSW also notes that the performance solution is heavily-reliant on the natural ventilation provided by the open-deck nature of the above-ground levels of the carpark. Given that this natural ventilation is to be relied upon, the assessment is to quantitatively demonstrate that this will provide/maintain tenable conditions such that safe occupant egress provisions are provided at all times given a worst-case credible fire scenario. Consideration should be given to the impact of local wind conditions on the proposed natural ventilation design. Is there a potential for local wind climate to impact on smoke spread within the carpark levels? This is to be addressed.
- Additionally, given the simplistic nature of the zone modelling, it is to be adequately justified how appropriate it is to employ this type of quantitative analysis method in assessing the proposed performance solution, clearly demonstrating that appropriate conservatism has been maintained in the assessment given the known shortcomings of zone modelling. For example, due to the simplistic nature of zone modelling, the potential for the smoke layer to

cool and subsequently impact occupant tenability will not be accurately reflected within the selected modelling. This is to be addressed satisfactorily.

Innova:

It was discussed and agreed during the FEBQ meeting with FRNSW and HI (23 February 2022) that an ASET / RSET assessment will be undertaken to demonstrate that occupants will be permitted to evacuate from the open deck car parking levels prior to the on-set of untenable conditions.

That is, the assessment will now be quantitative and absolute.

Acceptance Criteria

- The Performance Requirements are considered satisfied when it is demonstrated that occupants will be permitted to evacuate from the open deck car parking levels prior to the onset of untenable conditions. This will be based on undertaking a quantitative ASET / RSET assessment with a suitable safety factor.

  ASET > 1.5 RSET

- A sensitivity analysis will also be considered whereby one of the available exits is blocked in the event of fire. For the sensitivity analysis:

  ASET > RSET

Table 1: Tenability Acceptance Criteria

Tenability Criteria	Limiting Value
Minimum Visibility	≥ 10 m (OD=0.1 m-1) in large open paths and ≥ 5 m when queuing and in small rooms measured at 2 m above floor level
Maximum Heat Radiation	2.5 kW/m^2, at or below 2 m above floor level (corresponds to a hot layer temperature of 180-200°C)
Maximum Convected Heat	60°C, at 2 m above floor level
Toxicity	Not directly measured. Limiting conditions for noxious gases are unlikely to be exceeded if the visibility is 10 metres or greater[8].

Design Fires

- A fully developed fire that reaches a Peak Heat Release Rate of 12 MW will be considered, as detailed for Performance Solution 1. A Fast T^2 fire will be considered.
- The design fire will be located centrally to the car park. For the sensitivity analysis, the design fire will be located at the corner of the car park adjacent to one of the exits (rendering the exit unusable).

Modelling / Assessment Tools

Determining ASET

- Fire Dynamics Simulator (FDS) will be used to assess the tenability conditions within the open deck levels of the car park. A discussion of FDS is provided under Performance Solution 1.

Determining RSET

The RSET for building occupants considers the summation of three component times; the cue time, the pre-movement time, and the movement time. This is summarised by the following equation:

$$RSET = T_c + T_p + T_m$$

where: T_c = cue time (min)

T_p = pre-movement time (min)

T_m = movement time (min)

[8] Buchanan, A.H. – *Fire Engineering Design Guide, Second Edition* - Centre for Advanced Engineering, New Zealand – 2001 – p. 90

Cue Time

The Cue Time is the time at which occupants are alerted to a fire situation. As the open deck levels of the car park will not be equipped with a detection system, the Cue Time will be based on visual detection when the hot smoke layer descends below 95% of the ceiling height[9].

Pre-Movement Time

The Pre-Movement Time is the time between the cue and the initiation of occupant evacuation. Building occupants can often react in several ways in this situation such as attempting to receive more information about the fire incident or trying to extinguish the fire.

The pre-movement time is estimated using method proposed by Sime[10], which includes assessing efficiency rating scales on various pre-movement factors.

Movement Time

The Movement Time is the time required to reach and pass through an exit into a place of safety. Factors that affect the travel time includes number/density of occupants, travel distance to an exit, available exit widths, speed of travel and specific flow rate.

Proulx[11] indicates that the maximum unimpeded travel speed is 1.19 m/s whilst, people with disabilities are reported with a travel speed of 0.57 m/s. However, for added redundancy, an average occupant travel speed of **0.78 m/s** will be adopted to account for assisted, but ambulant, occupants that may have a disability.

The evacuation model 'Pathfinder' will be used to calculate the movement time of occupants to reach a place of safety. Pathfinder is an agent-based simulator that uses steering behaviours to model occupant motion, and comprises 3 modules; a graphical interface, the simulator, and a 3D results viewer.

With reference to the Pathfinder Technical Reference Guide, the simulator provides 2 options for occupant motion; an SPFE Mode and a Steering Mode. The SFPE Mode is a flow model that implements the concepts provided within the SFPE Handbook of Fire Protection Engineering (Nelson and Mowrer, 2002). For the SFPE Mode walking speeds are determined by occupant density within each room and flow through doors is controlled by door width. In SFPE Mode, occupants make no attempt to avoid one another and are allowed to interpenetrate, but doors impose a flow limit and velocity is controlled by density.

The Steering Mode is based on the idea of inverse steering behaviours. Steering behaviours were first presented in Craig Reynolds' paper "Steering Behaviours for Autonomous Characters" (Reynolds, 1999) and later refined into inverse steering behaviours in a paper by Heni Ben Amor (Amor et. al., 2006). Pathfinder's Steering Mode allows more complex behaviour to naturally emerge as a by-product of the movement algorithms - eliminating the need for explicit door queues and density calculations.

[9] Building Regulations review Task Force, May 1991 – Draft National Building Fire Safety Systems Code

[10] Sime, J. D., (1996), Assessing Occupant Response Time: A Key Issue for Fire Engineering. In R. Barham (ed) Fire and Emergency Planning: Research and Applications, E & F N Spon, London (48, pp442-449).

[11] Proulx, "Evacuation Time", Section 3, Chapter 12, SFPE Handbook of Fire Protection Engineering, 4th Edition, 2008.

Issue number: 5 **Title:** External Stairways in Lieu of Fire-Isolated Exits

Details of departures from DtS provisions:

To have the external stairway on the southern side of the building discharge into the building on ground floor, rather than directly to the open space.

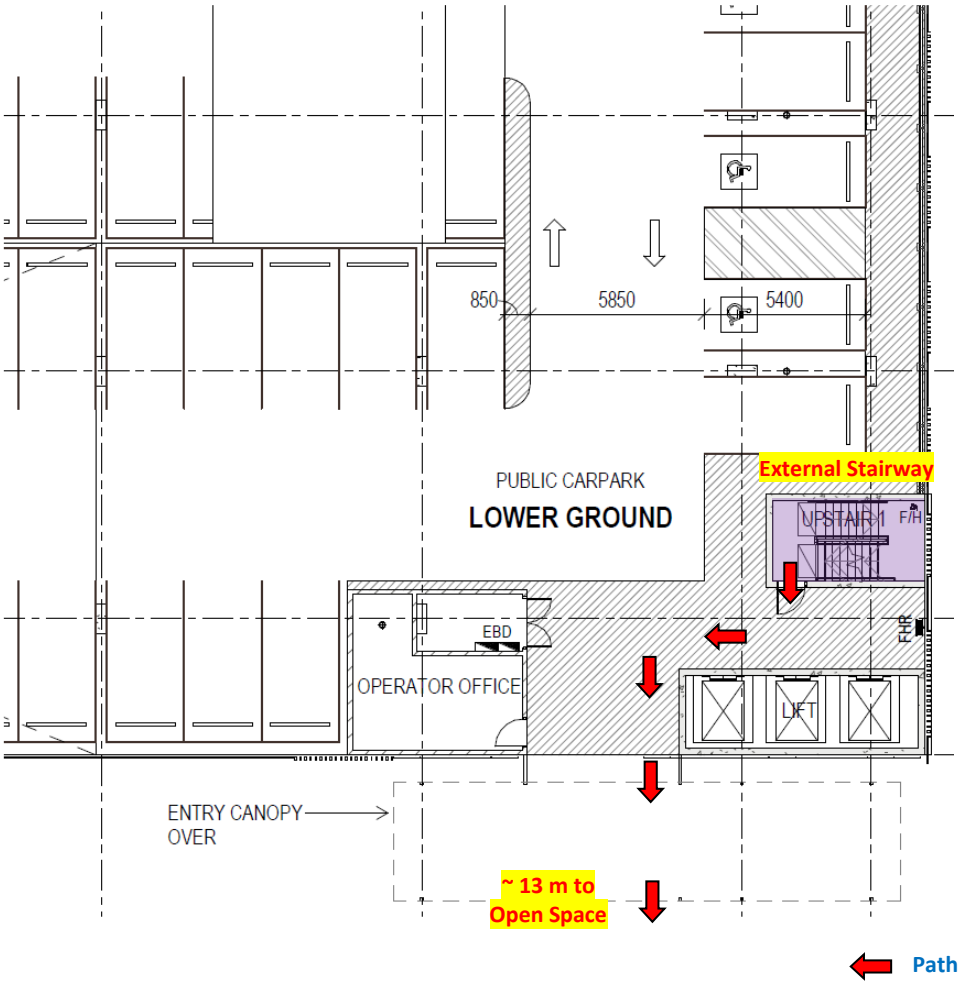


Figure 21: Part Ground Floor Plan

Applicable DtS provisions:	Clause D1.8	Performance requirements:	DP4, DP5

List key fire safety measures:

- The characteristics and use of the lift lobby.
- The characteristics and use of the car park, being open deck.
- Comparison to a fire stair discharging into the confines of the building pursuant to Clause D1.7(b)(ii) of the BCA.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- The external stairway discharges into the lift lobby on ground floor. The lift lobby will serve as a thoroughfare for occupants accessing the various levels of the building via the lifts and is unlikely to comprise stagnant fuel loads.

  Therefore, a fire within the lift lobby is considered unlikely and the path of travel from the external stairway to the open space is unlikely to be blocked or obstructed by the effects of fire.

- Reference is made to BCA Clause D1.7(b)(ii) which permits a fire-isolated exit to discharge directly within the confines of the building, that is used only for pedestrian movement, car parking or the like and is open for at least 2/3 of its perimeter, and from which an unimpeded path of travel, not further than 20 m, is available to a road or open space.

  It is noted that the car park is designed an open deck. Further, the travel distance to reach the open space from the final exit door from the external stairway is approximately 13 m (being less than 20 m).

  It is noted that Performance Requirement EP2.2 (Safe evacuation routes) does not apply to an open deck car park. The Guide to the BCA states that smoke and hot gases within an open deck car park can vent naturally, thereby allowing occupants to evacuate safely. Further, the Guide to the BCA recognises that a car park usually represents a relatively low fire risk and is unlikely to have many occupants for any length of time.

  In consideration of the above, if the subject stairway was designed as a fire-isolated exit, it would achieve compliance with the DtS provisions of the BCA pursuant to Clause D1.7(b)(ii).

  Therefore, the risk of the path of travel from the external stairway to the open space on ground floor being blocked or obstructed in the event of fire is not expected to be increased in comparison to a fire-isolated exit that is permitted to discharge within the confines of the building.

- Alternative exits and alternative paths of travel to reach the exits are available on each level of the car park. Therefore, should the path of travel from the external stairway through the car park on ground floor become blocked or obstructed in the event of fire occupants will be permitted to evacuate from the car park via an alternative exit protected from the effects of fire.

Performance solution:

☑ A2.2(1)(a) - Comply with all relevant performance requirements
☐ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☑ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☐ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☐ Comparative ☑ Qualitative ☑ Deterministic
☑ Absolute ☐ Quantitative ☐ Probabilistic

IFEG sub-systems used in the analysis:

☑ A – Fire initiation and development and control
☑ B – Smoke development and spread and control
☑ C – Fire spread and impact and control
☑ D – Fire detection, warning and suppression
☑ E – Occupant evacuation and control
☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that occupants evacuating from the car park via the external stairway will be protected from the effects of fire.

Fire scenarios and design fire parameters:

A fully developed fire within the car park on ground floor resulting in the evacuation of occupants and the arrival of the fire brigades will be considered. The design fire will be considered in a qualitative manner.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

N/A

FRNSW Comment: In principle support is provided subject to the analysis in the FER demonstrating compliance with the Performance Requirements of the NCC.

Innova: Noted.

Issue number: 6 **Title:** **Fire Hydrants (Design Flow to AS 2419.1-2021)**

Details of departures from DtS provisions:

A fire hydrant system will be installed throughout all levels of the car park in accordance with the relevant provisions of AS 2419.1-2005 and will be extended from the site wide fire services system.

However, the site infrastructure can only support a flow of 32 L/s at 1200 kPa, which complies with the new fire hydrant Standard AS 2419.1-2021, rather than AS 2419.1-2005 (being the version of the Standard adopted in the BCA).

Therefore, the Performance Solution seeks to permit the flow rate for the fire hydrant system serving the car park to comply with the new 2021 Standard.

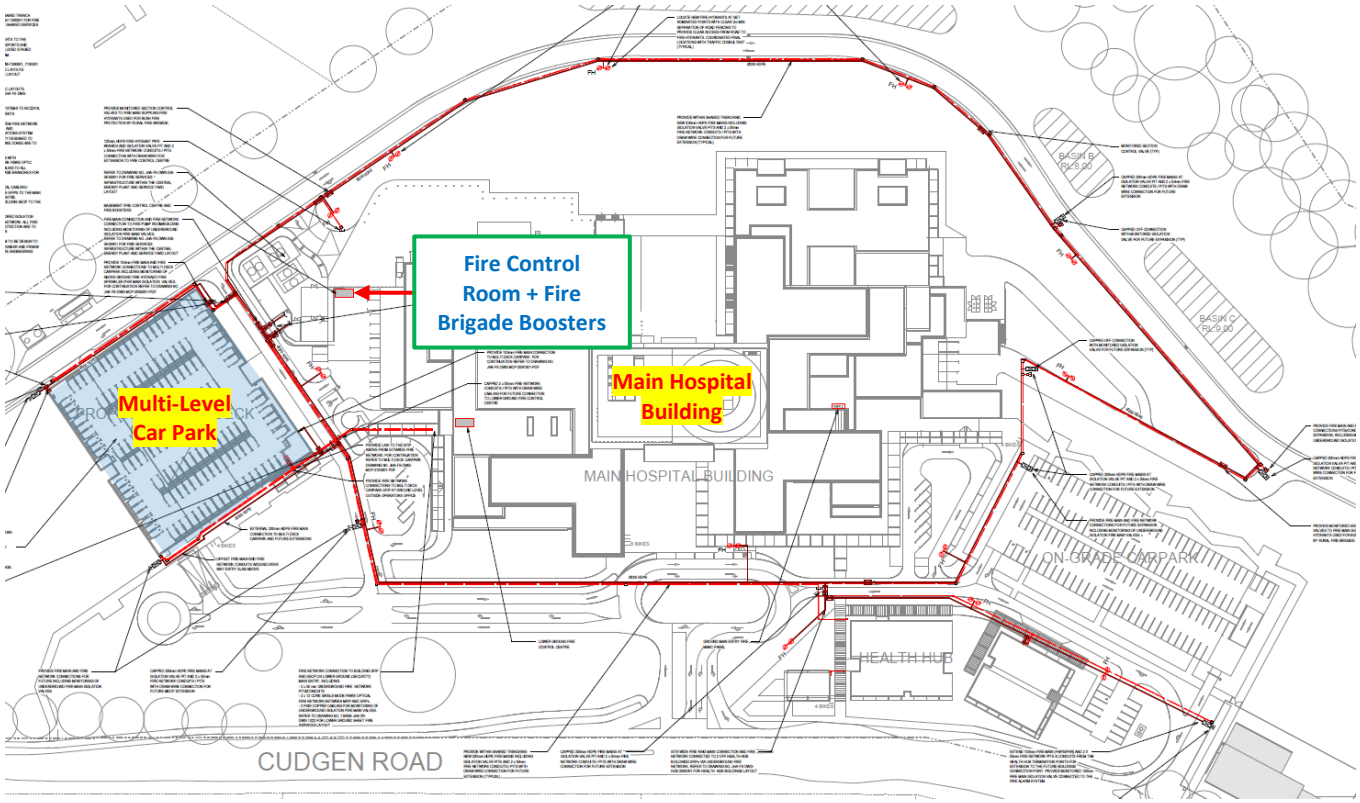


Figure 22: Fire Services Plan (Site Wide Ring Main)

Applicable DtS provisions:	Clause E1.3	Performance requirements:	EP1.3

List key fire safety measures:

- Reference to AS 2419.1-2021.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- The Performance Solution seeks to permit the flow rate for the fire hydrant system serving the car park to comply with the new 2021 fire hydrant Standard.

  Whilst it is acknowledged that AS 2419.1-2021 is not referenced in the current version of the BCA, the adoption of the new Standard is considered appropriate with regards to facilitating effective fire brigade intervention activities. Fire & Rescue NSW (FRNSW) also support the use of the new fire hydrant standard as a Performance Solution.

  Figure 23 is an extract from the FRNSW website with regards to their 'Position Statement' in relation to the adoption of AS 2419.1-2021. The Position Statement confirms that FRNSW will likely support a Performance Solution with regards to a fire hydrant system that meets the requirements of the new Standard.

Fire hydrant system in new premises

FRNSW endorse the use of *Australian Standard AS 2419.1-2021* in the design and installation of fire hydrant systems in new premises. If *AS 2419.1-2021* is adopted in its entirety to meet performance requirement EP1.3 of the *National Construction Code*, instead of the referenced *AS 2419.1*-2005 version, FRNSW will be likely to support an exemption under clause 188 of the *Environmental Planning and Assessment Regulation 2000 (EP&A Reg.)* or a performance solution with regards to the fire hydrant system.

[Last updated: 24 December 2021]

Figure 23: FRNSW Policy for Fire Hydrant System in New Premises

- The adoption of AS 2419.1-2021 with regards to flow rate, in lieu of the 2005 edition, is not expected to reduce the safety of occupants within the building and is considered to facilitate effective fire brigade intervention. The benefits of AS 2419.1-2021 are noted as:
  - Restructures the document and adds informative appendices for ease of use and to clarify the intent of sections and clauses;
  - Includes new technologies and practices;
  - Acknowledges the life safety benefits of installed sprinkler systems; and
  - Adds a range of provisions for high-rise buildings.

Performance solution:

☑ A2.2(1)(a) - Comply with all relevant performance requirements
☐ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☑ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☐ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☐ Comparative ☑ Qualitative ☑ Deterministic
☑ Absolute ☐ Quantitative ☐ Probabilistic

IFEG sub-systems used in the analysis:

☐ A – Fire initiation and development and control
☐ B – Smoke development and spread and control
☐ C – Fire spread and impact and control
☐ D – Fire detection, warning and suppression
☐ E – Occupant evacuation and control
☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that the adoption of the new fire hydrant standard for the design of the fire hydrant system, with regards to flow rate, will facilitate effective fire brigade intervention.

Fire scenarios and design fire parameters:

A fully developed fire within the car park resulting in the evacuation of occupants and the arrival of the fire brigades will be considered. The design fire will be considered in a qualitative manner.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

N/A

FRNSW Comment: In principle support is provided subject to the analysis in the FER demonstrating compliance with the Performance Requirements of the NCC.

Innova: Noted.

Issue number: 7 **Title: Fire Resisting Construction (No FRL to Structure Supporting Solar Panels)**

Details of departures from DtS provisions:

An array of solar panels will be installed to the top level of the car park (refer Figure 24). The solar panels will be supported by a structure comprising steel columns and roof structure / sheeting. Therefore, the structure supporting the solar panels has been defined as a roof.

For Type A construction, a roof in a Class 7a building is required to achieve an FRL of 120/60/30. External columns supporting the roof are required to achieve an FRL of 120/-/-.

The building does not qualify for the concession pursuant to Clause 3.5 of Specification C1.1.

The Performance Solution seeks to permit the load bearing external columns and the roof that support the solar panels to not achieve an FRL.

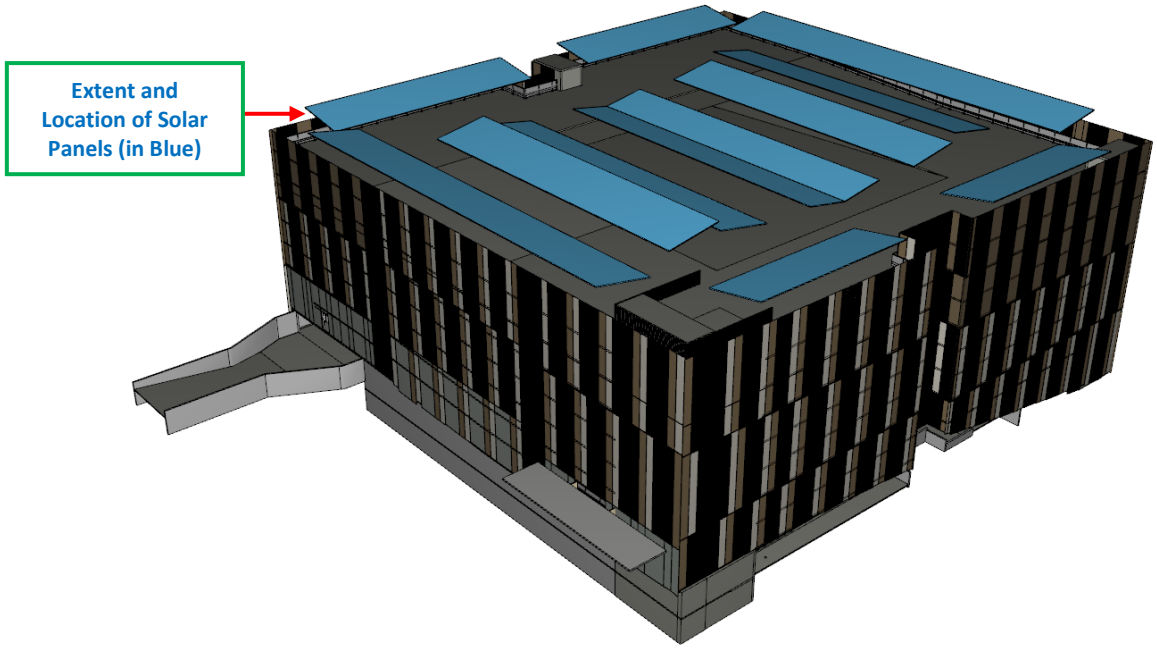


Figure 24: Multi-Level Carpark (Solar Panels Highlighted in Blue)

Applicable DtS provisions:	Clause C1.1, Specification C1.1	Performance requirements:	CP1, CP2

List key fire safety measures:

- Non-combustible nature of the structure supporting the solar panels.
- The structure supporting the solar panels will be structurally independent from the remainder of the building.
- The open nature of the roof level is conducive to heat and smoke ventilation.
- Any failure of the structure supporting the solar panels will be limited to isolated segments.

Proposed performance solution:

The proposed Performance Solution is based on the following:

- The structure that supports the solar panels will comprise of non-combustible steel construction that will not support flame spread or contribute to the development and spread of fire.
- The building elements associated with the structure that supports the solar panels will be structurally independent from the adjoining parts of the building. Therefore, failure of any part of the structure will not result in the structural failure or collapse of the building.
- The open nature of the car park on the top level where the roof structure that supports the solar panels will be located, being over the car parking spaces only and permanently open to the perimeter. The vehicle driveway areas, being paths of travel to the required exits, will remain fully open to the sky as highlighted in Figure 24 and Figure 25. This is considered favourable for minimising the severity of a potential fire event on this level where the effects of fire are expected to natural dissipate to atmosphere without forming a descending hot smoke layer.

- The structure supporting the solar panels will be designed such that a fire involving a car(s) to the underside of the solar panels, or involving the solar panels themselves, will result in isolated structural failure only (should failure occur).

  This is also evident in Figure 24 and Figure 25 where the structure supporting the solar panels comprises of multiple independent segments. Therefore, failure of a particular segment will not block or impede access to all exits from the car park and in turn will not impede fire brigade access via the exits to undertake intervention activities.

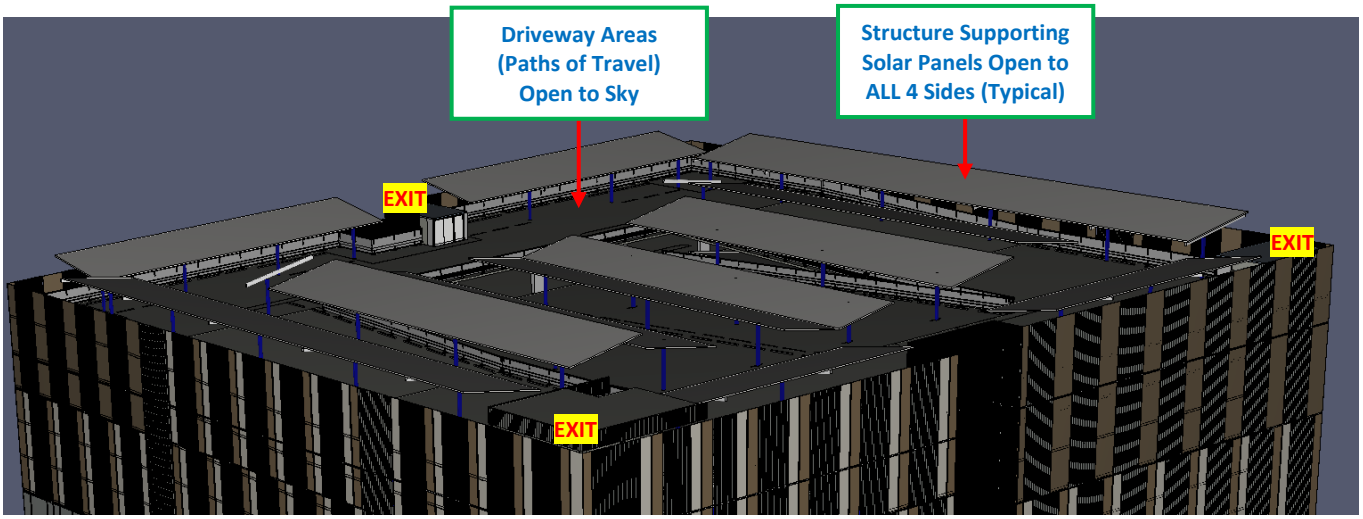


Figure 25: Isometric View of Roof Level

Performance solution:

☑ A2.2(1)(a) - Comply with all relevant performance requirements
☐ A2.2(1)(b) - Be at least equivalent to the DtS provisions

Assessment methods:

☐ A2.2(2)(a) - Evidence of suitability
☐ A2.2(2)(b)(i) - Verification methods provided in the NCC
☑ A2.2(2)(b)(ii) - Other verification methods accepted by the appropriate authority
☐ A2.2(2)(c) - Expert judgement
☐ A2.2(2)(d) - Comparison with the DtS provisions

Assessment approach:

☐ Comparative ☑ Qualitative ☑ Deterministic
☑ Absolute ☐ Quantitative ☐ Probabilistic

IFEG sub-systems used in the analysis:

☑ A – Fire initiation and development and control
☐ B – Smoke development and spread and control
☑ C – Fire spread and impact and control
☐ D – Fire detection, warning and suppression
☑ E – Occupant evacuation and control
☑ F – Fire services intervention

Acceptance criteria and factor of safety:

The Performance Requirements are considered satisfied when it is demonstrated that failure of the structure that supports the solar panels on the top level of the car park will not impede occupant evacuation or fire brigade intervention. Further, failure of the structure must not increase the risk of fire spread within the building.

Fire scenarios and design fire parameters:

A fully developed fire to the underside of the solar panels resulting in the evacuation of occupants and the arrival of the fire brigades will be considered. The design fire will be considered in a qualitative manner.

Describe how fire brigade intervention will be addressed or considered:

Fire hydrant coverage will be provided throughout the building in accordance with AS 2419.1-2005. Fire brigade intervention will be considered in a qualitative manner.

Verification/validation analyses:

☐ Sensitivity studies ☐ Redundancy studies ☐ Uncertainty studies ☑ None

Not proposed.

Provide details on proposed modelling/assessment tools:

N/A

8 Construction, commissioning, management, use and maintenance

What considerations does the performance solution require during the construction phase?

The Performance Solutions are considered applicable during the occupation of the building following the issue of an Occupation Certificate.

How will the performance solution affect commissioning of the systems (e.g. listed on fire safety schedule as essential or critical measure, combined new and old installations)?

The required fire safety systems and equipment associated with the building shall be designed and installed in accordance with relevant Australian Standards and as varied within the future Engineering Report and shall be fully commissioned prior to the issued of an Occupation Certificate.

How will the performance solution be addressed for ongoing building management and use (e.g. details to be provided in a 'fire safety management plan' for the building manager)?

The Body Corporate or Managing Entity shall implement a Management in Use system for the subject building that incorporates the following measures as a minimum:

- Routine maintenance of all plant and equipment.
- Routine maintenance of all fire safety systems and measures.
- Regular emptying of rubbish bins.
- Ensuring paths of travel to exits are kept free of anything that may obstruct or impede the free passage of persons.
- Ensuring all exit doors are functional and all statutory signage is in place.
- Ensuring any stolen / missing / discharged portable fire extinguishers are promptly replaced with new, certified, and ready to use extinguishers.

How will any restrictions on fuel load/use/populations within the performance solution be managed and enforced (e.g. details to be provided in 'fire safety management plan')?

As above.

How will the performance solution be addressed for maintenance (e.g. details included on fire safety schedule, location of fire engineering report on site, plain English summary adjacent to FIP)?

The Fire Engineering Report shall form part of the Fire Safety Schedule for the subject building and shall be certified annually as part of the AFSS. Should the building undergo a change in use or classification, or be modified in any way, the Fire Engineering Designs for the building shall be re-evaluated by an appropriately qualified Fire Safety Engineer.

9 Additional comments

Provide any additional comment relevant to the FEBQ

Note: Any in principle support extended for performance solution issues through consultation is contingent upon all assumptions, analyses and conclusions in the fire engineering report being fully justified, and referenced as appropriate, to demonstrate how the relevant performance requirements have been satisfied to the extent required by the agreed acceptance criteria.

10 Scheduled charges

FRNSW charge for the provision of services performed in connection with statutory fire safety as per the schedule of charges identified in clause 46 and schedule 3 of the *Fire Brigades Regulation 2014*.

The charge applicable is $2,600 for each day (or part of a day) spent by the Commissioner or a fire brigade member providing advisory, assessment or consultancy services.

Note: For a full description of the charges applicable including terms, payment options, applying for a waiver or reduction of the charges, please refer to the FRNSW website at firesafety.fire.nsw.gov.au.

11 Submission of this form

This completed form is to be emailed to firesafety@fire.nsw.gov.au.

All plans and specifications required by FRNSW for assessment are to be attached to the email (or sent separately if necessary due to file size). Refer to Submitting plans and specifications to FRNSW for further information.

12 Contact us

For further information contact the Fire Safety Branch on (02) 9742 7434 or email firesafety@fire.nsw.gov.au.

BLACKETT MAGUIRE+ GOLDSMITH

FINAL BCA ASSESSMENT REPORT
CAPABILITY STATEMENT
Detailed Design

TWEED VALLEY HOSPITAL
New multi deck carpark

PREPARED FOR:

NSW GOVERNMENT Health Infrastructure

Revision: 3

Date:4 March 2022

Project No: N210535

Address
Suite 2.01,
22-36 Mountain St
Ultimo NSW 2007

Contact
Ph: 02 9211 7777
Fax: 02 9211 7774

EXECUTIVE SUMMARY

The project is a multi deck car park (MDCP) to be located at 771 Cudgen Road Cudgen NSW to service the main hospital. This report comprises a review of the updated schematic design of works comprising the development of a 8 storey multi deck carpark.

The Multi Deck Carpark Building is classified as follows:

+ **BCA Classification:**	Class 7a (Car Park)
+ **Rise in Storeys:**	8 (Eight) – Future 10
+ **Storeys Contained:**	8 (Eight) - Future 10
+ **Type of Construction:**	A
+ **Importance Level (Structural):**	2 – Confirmed by structural engineer.
+ **Sprinkler Protected Throughout:**	No (open deck carpark) Level B1, B2 sprinkler protected only (see note 3)
+ **Effective Height:**	Proposed 8 storey: 19.40m (RL36.850 – 17.450) (see note 2)
+ **Max. Fire Compartment Size:**	N/A Note: Maximum fire compartment sizes do not apply to open deck car parks OR carparks provided with a AS2118.1 sprinkler system (see note 3)
+ **Climate Zone:**	Zone 2

Note 1: The proposed multi deck car park is considered a separate building. The amenities and operator office on ground level are <10% floor area of storey and therefore are considered the same Classification as the building they are located within in accordance with BCA A6. Modified consent to capture proposed retail use, reassessment of that aspect will be required.

Note 2: The effective height was calculated from Mode Architect plan MDD-AR-DWG-MCP- 5000001 (2). The lowest RL is deemed to be the entry ramp where under building line.

Note 3: Level B2 and B1 are not considered an open deck carpark and have more than 40 cars. A performance solution is proposed to sprinkler protect B2 and B1 only and omit fire separation from remainder of carpark levels considered open deck.

Note 4: The assessment is based on received plans from lower B2 – Level 5 only. Current plans depict <25m effective height for proposed 8 storey noting an additional 2 storeys is proposed in future. Effective height to be reviewed in future works to confirm <25m is achieved. No future proofing proposal for additional floors post stage 1 delivery permitted.

While the building is proposed to generally comply with the deemed-to-satisfy provisions of the BCA the departures will need to be addressed as a fire engineered performance solution.

C. SUMMARY OF KEY COMPLIANCE ISSUES

Based on the Design Development Drawings reviewed, the following is a summary of the key compliance issues identified associated with the proposed multi deck carpark.

C.1 Summary of Key DtS Compliance Items:

No.	DtS Clause	KEY COMPLIANCE ISSUE
1.	C1.1	Refer to Appendix for all required FRL's. The structural engineer shall confirm all FRL have (120 mins) have been achieved throughout on design certificate.
2.	C1.9 / C1.14	All external wall components and attachments are to be of non combustible construction and comply with HI Design guideline 032. Confirmation of product and associated testing as required to be provided at application for Crown Certificate stage for all materials.
3.	C2.2	It is understood that East and West elevation will generally be the designated open sides in opposite direction as reflected in below architectural façade schedule by MODE.

		To support the extended travel distance FRNSW and the FER will require a minimum 60% freely ventilated façade on two opposite sides of all open deck storeys with the exception that one façade on ground (south elevation) shall be no less than 55% open. The following additional information is required in regards to required ventilation for open-deck carpark: + Updated plans required depicting compliance. The final openness to be reflected in FEBQ submission. Final façade plans to be consistent to Mod SSD plans. + Façade plans are required to demonstrate available openness is provided for ALL upper levels. Level 5 shall be included in the façade schedule. + Additional construction tolerance / design redundancy for free ventilated area is required. Anything less than 60% or 55% for ground level south will not comply FRNSW / FER requirements. Ground North requires additional ventilation over the 60% for design redundancy. + Please evidence on the percentage of openness from supplier for proposed sun shading louvre screen (FS-263). + No future architectural or anti ligature screens / obstructions permitted to reduce free air ventilation.
4.	C2.12 / C2.13	The following items required additional information: + B1 – Main distribution and switch room to be separated from the remainder of the building by FRL 120-minute construction including self-closing -/120/30 FRL. + Confirmation is required if the Telcom room (ground, level 3, level 6) will have batteries that exceed limitations listed in BCA C2.12. + Solar inverters require confirmation from electrical consultant for C2.12 and C2.13 consideration.
5.	D1.6	Egress paths require a clear unobstructed width not less than 1m. Areas requiring rectification include: + B2 requires further design development to ensure a path is available around boom gate. + Similarly the operator office is to ensure the nib wall has a min 1m clear unobstructed width. + The end of trip facilities shall ensure a minimum clear 1m width.
6.	D1.8	Updated façade plans do not depict >60% ventilated area on external stairs. Updated façade plans are required to confirmation is required that external stairs in lieu of fire isolated have >60% open for full length of façade that is not exposed to the building. The plans generally have aluminium battens which can achieve compliance however some stairs have partial coverage only. All external stairs are to achieve compliance in this regard. Please provide updated plans demonstrating compliance (aluminium battens for full length of stair opening or sunshade louvre where open area is confirmed >60%)
7.	D1.10	<u>Discharge from Exits:</u> If an exit discharges to open space that is at a different level than the public road in which it is connected to, the path of travel to the road must be via a ramp having a gradient not steeper than 1:8, or not steeper than 1:14 if required to be accessible Confirmation is required on plans that permissible gradients are located at discharge points. Suitable barriers (bollards) are to be introduced to prevent vehicles from blocking access to the exit. A minimum 1m clear width shall be maintained.
8.	D2.16	The following balustrade issued are to be addressed: + Confirm a balustrade is provided at the stair between lower B1 and upper B1 area and where car park ramp is under building (gridline CC) + All stairs are considered external in lieu of fire isolated (refer D1.7 comments in report). Balustrades within external stairs must not permit a 125mm sphere to pass through any opening. Amended plans required to demonstrate compliance (below right picture)

9.	D2.19 / D2.20	Ground level pedestrian entry operator office door shall be fitted with a device to holding the door in the open position or swing in direction of egress. The door schedule shall confirm that the sliding door from end of trip facilities will auto open upon power failure or activation of fire or smoke alarm.
10.	E1.3	Fire hydrant coverage is required to be provided to the building in accordance with AS 2419.1 – 2005 except where varied by the fire engineered solution. The following action is required: + Booster and pump location including required hardstands to AS2419.1 + Note requirement for protection of internal pipework or supports in non sprinkler protected areas to have fire rating (FRL 60 mins) + Coverage plans are required from hydraulic Accredited Fire Safety Practitioner. + Confirm fire hydrants are not located on intermediate landings (ref stair 3 lower L01)
11.	E1.4	Fire hose reel coverage is required to be provided to the building in accordance with AS2441-2005. + Coverage plans are required from hydraulic Accredited Fire Safety Practitioner. + Ground level FHR is to be <4m from a exit, stair 3 is not the exit for this storey area relocate to compliant location. + Ensure stair 3 FHR is <4m from exit, scaled plans appear just over. Level 5 requires a FHR within 4m of stair 3 exit prior to supplementary FHR being located throughout.
12.	E2.2	The following is noted for action for smoke hazard management Where mechanical ventilation is provided, compliance with BCA E2.2, Clause 5.5 of AS1668.1 and AS1670.1 for detection within circulation spaces is required. and at each required exit and lift landing door. Override controls, supply air smoke detectors shall be provided in accordance with Clause 7.6.8 of AS1670.1
13.	F2.3	Please confirm if retail spaces are intended to be provided and number of persons proposed to be accommodated so provision of sanitary facilities can be confirmed. Locations of basins are to be confirmed on plans.
14.	G	Bushfire report will need to be provided by the projects bushfire consultant and recommendations will need to be included in the design accordingly. Particular attention will need to be paid to any additional fire fighting equipment that may be required by RFS such as external hydrants and the like. In this regard all service consultants will need to ensure compliance is achieved with details demonstrating compliance.

Table 1 – Summary of Key Compliance Items

C.2 SUMMARY OF ITEMS REQUIRING A FIRE ENGINEERING PERFORMANCE SOLUTION:

1.	**C1.1, Spec C1.1**	A performance solution is proposed to omit the required fire rating under Spec C1.1 for the solar structure considered roof located on the top storey. Structural advice on the failure mode is required.
2.	**C2.7 / Spec E1.5**	The building will primarily be an open deck carpark except for B2 and B1 lower ground which have been indicated to not have enough openings to be defined as open deck. The proposal seeks to sprinkler protect basement level B2 and B1 with the remainder of levels to be open deck. Façade plans are required to demonstrate available openness is provided for upper levels. A fire engineered performance solution is proposed to omit the fire separation between sprinkler protected and non-sprinkler protected areas noting compartmentation is not applicable using a combination of Sprinkler protected areas and open deck carparking.
3.	**C2.6**	Spandrels are not applicable to an open deck carpark or a building having a AS2118.1 sprinkler system provided throughout. The building is understood to be primarily an open deck carpark with levels B2 and B1 to be sprinkler protected only. Noting the B2 and B1 lower floor are not considered open deck and as sprinkler system is not installed throughout, fire rated spandrels are required in lower levels. This is considered a technical non compliance and is recommend omission of fire rated spandrels in lower lever B1 and B2 is addressed by way of fire engineered solution.
4.	**D1.4, D1.5**	To potentially justify travel distances in a number of instances within the **enclosed car park**. The current fire engineered strategy permits: + Up to 45m travel to the nearest of two exits in lieu of 40m. + Up to 82m travel between alternate exits in lieu of 60m (worst case) when measured through the point of choice.
5.	**D1.4, D1.5**	To potentially justify travel distances in a number of instances within the **open deck car park**. The current fire engineered strategy permits: + Up to 50m travel to the nearest of two exits in lieu of 40m. + Up to 82m travel between alternate exits in lieu of 60m (worst case) when measured through the point of choice.
6.	**D1.8**	It is proposed to permit an external stair in lieu of fire isolated discharge within the building on ground floor by way of fire engineered strategy.
7.	**E1.3**	It is proposed to permit the required flow and pressure to comply with the 2021 version of As2419.1 in lieu of the 2005 version referenced within the BCA.

Table 2 - Summary of required non compliances to be addressed via a Fire Engineering Assessment

The FER process must include input from the LHD, HI & FRNSW being key stakeholders in the delivery and operation of the hospital project.

C.3 SUMMARY OF ITEMS REQUIRING A PERFORMANCE SOLUTION:

8.	**FP1.4**	Damp and weatherproofing: A performance solution is required to demonstrate how damp and weatherproofing (including around windows and doors) must prevent the penetration of water that could cause: + Unhealthy and dangerous conditions, or loss of amenity for occupants; and + Undue dampness or deterioration of building elements. The performance solution shall confirm how compliance with the performance requirement FP1.4 will be achieved for operators' office and any retail spaces proposed. The solution shall also address how drainage at door is achieved.
9.	**F4.11**	Carparks: Every storey of a carpark except an open deck carpark, must have: + A system of mechanical ventilation complying with AS1668.2; or + A system of natural ventilation complying with Section 4 of AS1668.4. A performance solution is proposed for level B2 and B1 which is not considered an open deck carpark. The performance solution proposed a combination of natural and mechanical ventilation in lieu of one or the other required by BCA F4.11.

TABLE OF CONTENTS

REPORT STATUS				
DATE	**REVISION**	**STATUS**	**AUTHOR**	**REVIEWED**
09.12.2021	0	Draft Developed Design – Issued for Client Review	PK	JH
17.12.2021	1	Amended Draft Developed Design – Issued for Client Review – Effective height adjusted	PK	JH
15.02.2022	2	Final BCA Report	PK	BM
04.03.2022	3	Updated Final BCA Report	PK	BM

Prepared by:

Peter Keppie
Senior Building Surveyor
Blackett Maguire + Goldsmith
A1 Accredited Certifier (NSW) – BDC No. 4603

Reviewed by:

Brian Maguire
Director
Blackett Maguire + Goldsmith
A1 Accredited Certifier (NSW) – BDC No. 0241

1.0 INTRODUCTION

BACKGROUND

Blackett Maguire + Goldsmith Pty Ltd have been commissioned by NSW Health Infrastructure to undertake an assessment of the Updated Design of the proposed development of the new Multi Deck Car Park located at Tweed Hospital 771 Cudgen Road Cudgen against the relevant provisions of the Building Code of Australia 2019 Amendment 1 (BCA).

OBJECTIVE OF REPORT

The objective of this report is to:

+ Confirm that the referenced Updated Design has been reviewed by an appropriately qualified Building Surveyor and Accredited Certifier.
+ Outline the BCA Compliance Strategy for the building and certification pathway for the project.
+ Identify BCA compliance matters that require further resolution.
+ Identify matters that are to be required to be addressed by Performance Solutions prior to issue of the S6.28 Crown Certificate. Noting reliance is also placed on the applicable design consultants to ensure non-compliances within their discipline are identified for consideration.
+ Enable the Public Authority to satisfy its statutory obligations under Section 6.28 of the Environmental Planning and Assessment Act, 1979.
+ Identify the relevant essential fire safety measures that are applicable to the proposed development.

PROJECT TEAM

The following BM+G Team Members have contributed to this Report:

+ Peter Keppie – Report Preparation / Project PCA (Senior Building Surveyor) | A1 Accredited Certifier
+ Jake Hofner – Peer Review (Senior Building Surveyor) | A1 Accredited Certifier
+ Brian Maguire – Director | A1 Accredited Certifier

REFERENCED DOCUMENTATION

The following documentation was relied upon when preparing this Report:

+ Building Code of Australia 2019 Amendment 1 (BCA)
+ Guide to the Building Code of Australia 2019 Amendment 1
+ Plans prepared by Mode dated February 2022.

DRAWING NO.	DRAWING NAME	REVISION	DATE
MDD- AR- DWG- MCP- 000	SITE PLAN	2	01.02.2022
MDD- AR- SKE- MCP- 20B1001	FLOOR PLAN – BASEMENT 1	2	15.12.2021
MDD- AR- SKE- MCP- 20B2001	FLOOR PLAN – BASEMENT 2	2	15.12.2021
MDD- AR- DWG- MCP- 20B1001	FLOOR PLAN – BASEMENT 1	3	01.02.2022
MDD- AR- DWG- MCP- 20B2001	FLOOR PLAN – BASEMENT 2	3	01.02.2022
MDD- AR- DWG- MCP- 30B1001	RCP - BASEMENT 1	1	16.12.2021
MDD- AR- DWG- MCP- 30B2001	RCP - BASEMENT 2	1	16.12.2021
MDD- AR- DWG- MCP- 2000001	FLOOR PLAN - GROUND	3	01.02.2022
MDD- AR- DWG- MCP- 2001001	FLOOR PLAN - LVL 01	3	01.02.2022
MDD- AR- DWG- MCP- 2002001	FLOOR PLAN - LVL 02	3	01.02.2022
MDD- AR- DWG- MCP- 2003001	FLOOR PLAN - LVL 03	3	01.02.2022
MDD- AR- DWG- MCP- 2004001	FLOOR PLAN - LVL 04	3	01.02.2022
MDD- AR- DWG- MCP- 2005001	FLOOR PLAN - LVL 05	3	01.02.2022

MDD- AR- DWG- MCP- 3000001	RCP - GROUND FLOOR	1	16.12.2021
MDD- AR- DWG- MCP- 3001001	RCP – LVL 01	1	16.12.2021
MDD- AR- DWG- MCP- 3002001	RCP – LVL 02	1	16.12.2021
MDD- AR- DWG- MCP- 3003001	RCP – LVL 03	1	16.12.2021
MDD- AR- DWG- MCP- 3004001	RCP – LVL 04	1	16.12.2021
MDD- AR- DWG- MCP- 4000001	ELEVATIONS	2	01.02.2022
MDD- AR- DWG- MCP- 4000002	ELEVATIONS	2	01.02.2022
MDD- AR- DWG- MCP- 5000001	SECTIONS	2	01.02.2022
MDD- AR- DWG- MCP- 5000002	SECTIONS	2	01.02.2022
MDD- AR- DWG- MCP- 5500001	TYPICAL HEIGHTS SETOUT	1	16.12.2021
MDD- AR- DWG- MCP- 5500002	EOT FACILITY	1	16.12.2021
MDD- AR- DWG- MCP- 5500003	EOT FACILITY	1	16.12.2021
MDD- AR- DWG- MCP- 6000001	STAIR 1 DETAILS	1	16.12.2021
MDD- AR- DWG- MCP- 6000002	STAIR 2 DETAILS	1	16.12.2021
MDD- AR- DWG- MCP- 6000003	STAIR 3 DETAILS	1	16.12.2021
MDD- AR- DWG- MCP- 6000010	LIFT DETAILS	1	16.12.2021
MDD- AR- DWG- MCP- 6000011	LIFT DETAILS	1	16.12.2021
SCH_001	EXTERIOR FINISHES SCHEDULE	1	16.12.2021

LIMITATIONS AND EXCLUSIONS

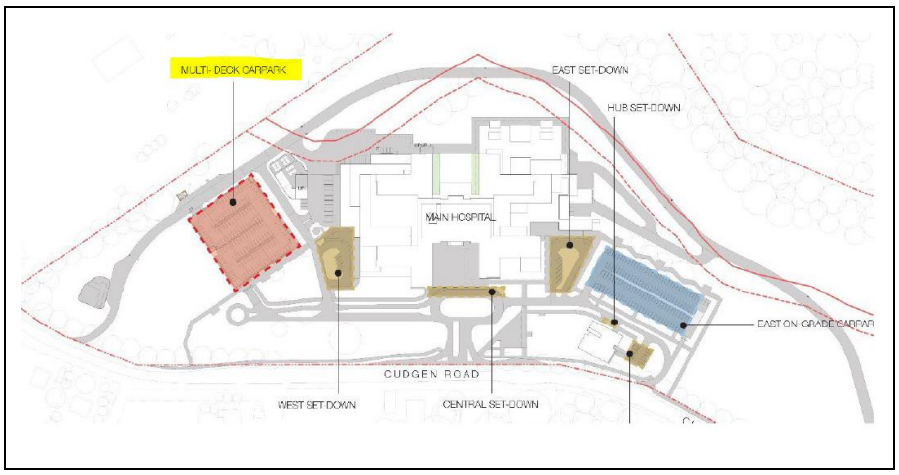
The limitations of this report are as follows:

+ This report is based on a review of the referenced documents. At this point in time, no inspection has been undertaken of the refurbishment areas to ascertain the current level of BCA compliance.
+ No assessment has been undertaken with respect to access for people with disabilities and the Disability Discrimination Act 1992 (DDA). The building owner should be satisfied that their obligations under the DDA have been addressed. In this instance, we note that an Access Consultant has been engaged to advise further in this regard,
+ The Report does not address issues in relation to the following:
  i. The design, maintenance or operation of any existing electrical, mechanical, hydraulic or fire protection services.
  ii. Work Health and Safety Act and Regulations.
  iii. Water, drainage, gas, telecommunications and electricity supply authority requirements.
+ No part of this document may be reproduced in any form or by any means without written permission from Blackett Maguire + Goldsmith Pty Ltd.
+ This report is based solely on client instructions, and therefore should not be used by any third party without prior knowledge of such instructions.

PROJECT OVERVIEW

DESCRIPTION OF DEVELOPMENT

The project site is located at Tweed Hospital site 771 Cudgen Road Cudgen. This report comprises a review of the DA submission design plans of the proposed works comprising the development of a new multi- deck carpark.



BCA COMPLIANCE METHODOLOGY

The proposed building work will be subject to compliance with the relevant requirements of BCA 2019 Amendment 1 as required by Section S6.28 of the Environmental Planning & Assessment Act 1979.

BUILDING CHARACTERISTICS

The Multi Deck Carpark Building is classified as follows:

+ **BCA CLASSIFICATION:**	Class 7a (Car Park)
+ **RISE IN STOREYS:**	8 (Eight) – Future 10
+ **STOREYS CONTAINED:**	8 (Eight) - Future 10
+ **TYPE OF CONSTRUCTION:**	A
+ **IMPORTANCE LEVEL (STRUCTURAL):**	2 – Confirmed by structural engineer.
+ **SPRINKLER PROTECTED THROUGHOUT:**	No (open deck carpark) Level B1, B2 sprinkler protected only (see note 3)
+ **EFFECTIVE HEIGHT:**	Proposed 8 storey: 19.40m (RL36.850 – 17.450) (see note 2 & 4)
+ **MAX. FIRE COMPARTMENT SIZE:**	N/A Note: Maximum fire compartment sizes do not apply to open deck car parks OR carparks provided with a AS2118.1 sprinkler system (see note 3)
+ **CLIMATE ZONE:**	Zone 2

Note 1: The proposed multi deck car park is considered a separate building. The amenities and operator office on ground level are <10% floor area of storey and therefore are considered the same Classification as the building they are located within in accordance with BCA A6. Modified consent to capture proposed retail use, reassessment of that aspect will be required.

Note 2: The effective height was calculated from Mode Architect plan MDD-AR-DWG-MCP- 5000001 (2). The lowest RL is deemed to be the entry ramp where under building line. (see note 4 for future 2 storey)

Note 3: Level B2 and B1 are not considered an open deck carpark and have more than 40 cars. A performance solution is proposed to sprinkler protect B2 and B1 only and omit fire separation from remainder of carpark levels considered open deck.

Note 4: The assessment is based on received plans from lower B2 – Level 5 only. Current plans depict <25m effective height for proposed 8 storey noting an additional 2 storeys is proposed in future. Effective height to be reviewed in future works to confirm <25m is achieved. No future proofing proposal for additional floors post stage 1 delivery permitted.

Note 5: Reassessment

While the building is proposed to generally comply with the deemed-to-satisfy provisions of the BCA the departures will need to be addressed as a fire engineered performance solution.

BCA ASSESSMENT – KEY ISSUES

We note the following BCA compliance matters with relation to proposed building works are capable of complying with the BCA. Please note that this is not a full list of BCA clauses, they are the key requirements that relate to the proposed work and the below should be read in conjunction with the BCA.

LEGEND

General Note
Matters Requiring Redesign / Further Information
Performance Solution

SECTION B - STRUCTURE

B1

General Note

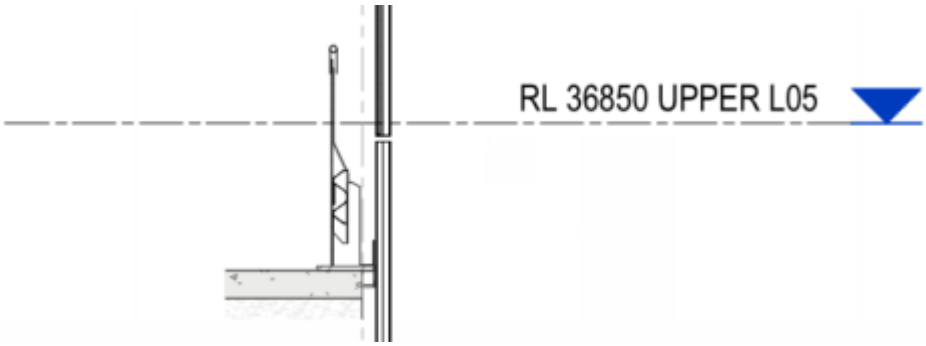
New building works are to comply with the structural provisions of the BCA 2019 amdt 1 and referenced standards including AS 1170.

The Importance Level 2 provisions of BCA (Section B) are to be acknowledged by the Structural Engineer and addressed to the degree necessary.

New building works to must be compliant with earthquake provisions of AS1170.4 – Earthquake Actions in Australia.

Design team shall ensure the method of fixing services has adequate seismic restraint to AS1170.4.

The balustrades serving car park areas shall be included within the structural engineered design.



SECTION C – FIRE RESISTANCE

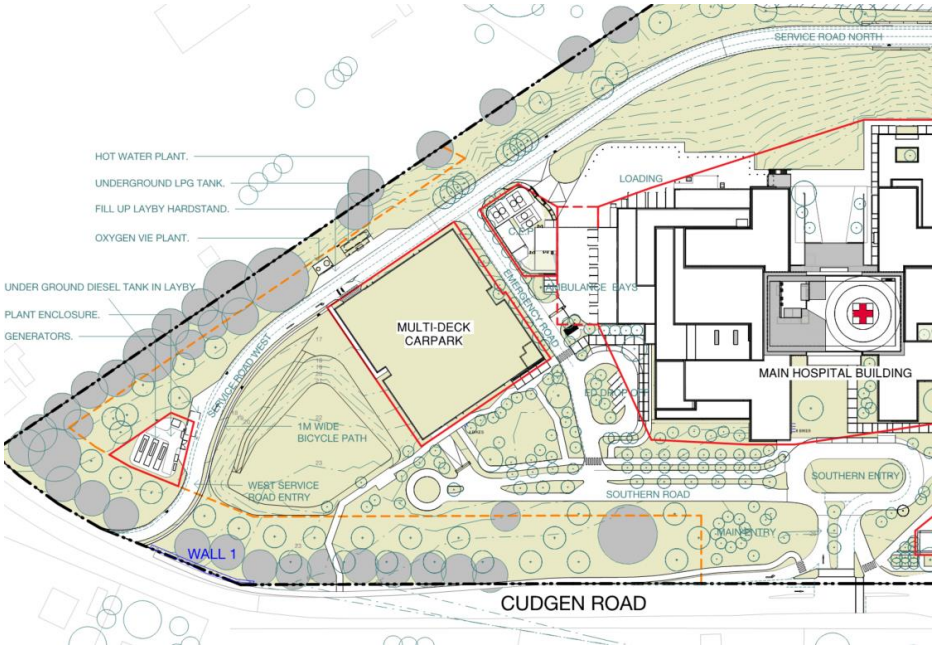
C1.1

Type of Construction: As the building contains three or more storeys, Type A Construction applies to the building. The relevant FRLs as listed in Table 3 of Specification C1.1 must be adhered to. Refer to **APPENDIX A.**

General Note

Any concessions under BCA Spec C1.1 to reduce fire resistance levels shall be confirmed with the Certifier prior to application. The report proceeds based on general FRL of 120 mins throughout.

All external walls to be in excess of 3-6m from any allotment boundary or other building on the same allotment. An updated site plan is required to be provide with the Crown Certificate Application.

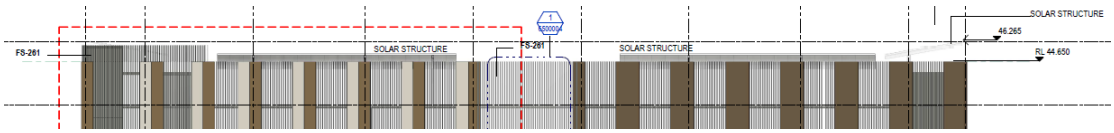


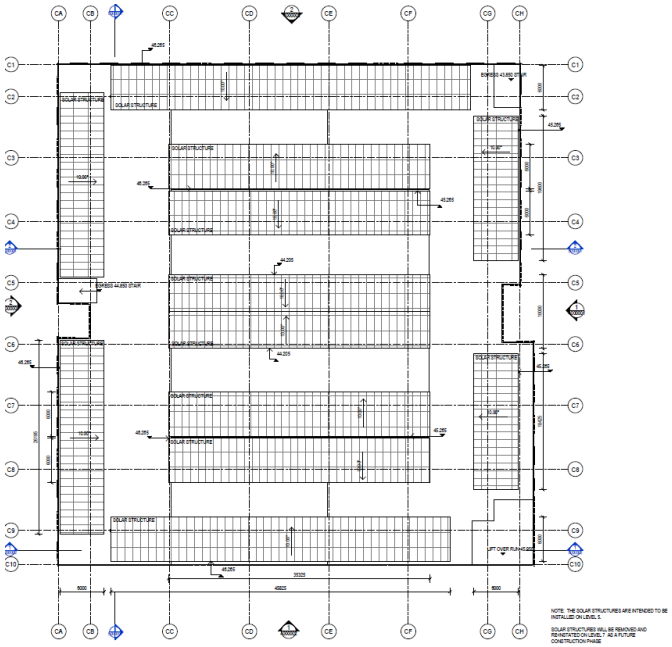
Matters requiring further information / performance solution

Refer to Appendix for all required FRL's. The structural engineer shall confirm all FRL have (120 mins) have been achieved throughout on design certificate.

Performance solution

A performance solution is proposed to omit the required fire rating under Spec C1.1 for the solar structure considered roof located on the top storey. Structural advice on the failure mode is required.





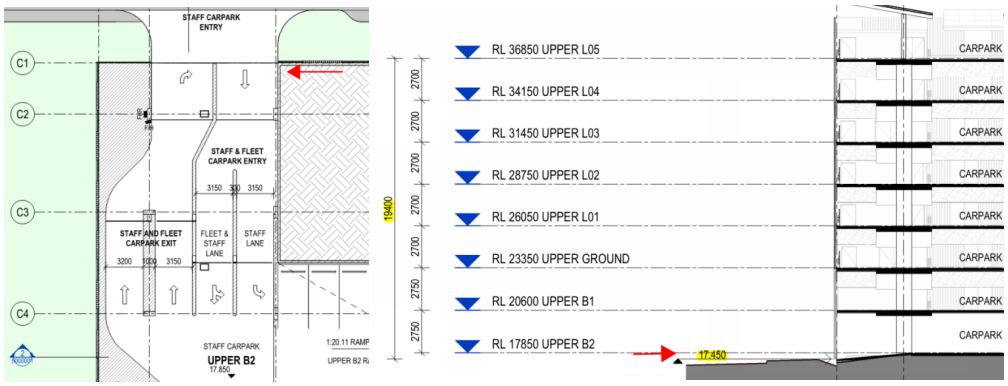
C1.2

Calculation of Rise in Storeys:

General Note

Note 2: The effective height was calculated as 19.40m (RL36.850 – 17.450) from Mode Architect plan MDD-AR-DWG-MCP- 5000001 (2) being <25m effective height.

The lowest RL is deemed to be the entry ramp where under building line. The RL is to be confirmed on floor plan, future expansion will require assessment at that time to confirm effective height for additional storeys.



C1.9 & C1.14

Non-Combustible Building Elements: Documentation is required to be provided as relevant to:

- Any external wall claddings.
- Any framing or integral formwork systems i.e. timber framing, sacrificial formwork, etc.
- Any external linings or trims i.e. external UPVC window linings, timber window blades, etc.
- Any sarking or insulation contained within the wall assembly.

General Note

All external cladding and attachments to comply with BCA C1.9, C1.14 and HI Design Guideline 032.

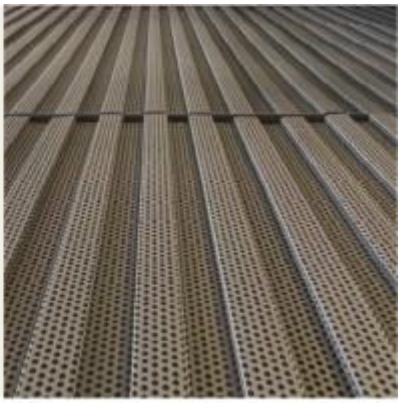
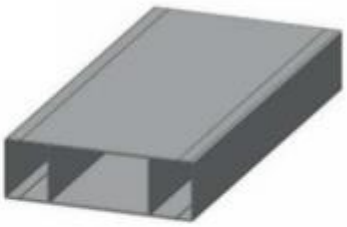
This is not an exhaustive list, and any element incorporated within any external wall assembly must be identified and provided for review.

BUILDING ELEMENT	TYPE A CONSTRUCTION
External wall	Non-combustible
Common wall	Non-combustible
Floor and floor framing of lift pit	Non-combustible
All loadbearing internal walls (including those of shafts)	Concrete, masonry or fire-protected timber
Loadbearing fire walls	Concrete, masonry or fire-protected timber
Non-loadbearing internal walls required to be fire-resistant	Non-combustible
Non-loadbearing lift, ventilating, pipe, garbage and like shafts which do not discharge hot products of combustion	Non-combustible

All ancillary elements attached to the external wall are to be non-combustible or comply with BCA C1.14. Any awnings, sunshades, the pedestrian entry canopy and any proposed signage shall be of non-combustible construction. Compliance is readily achievable with confirmation of product and associated testing as required to be provided at application for Crown Certificate stage.

Matters requiring further information

Compliance is readily achievable with confirmation of product and associated testing as required to be provided at application for Crown Certificate stage.

	Perforated profiled sheet	Powder-coat color: AL-05, Dulux Electro Brilliance Flat 	
	Aluminium batten screen type 1	Powder-coat color: AB-01, Duratec Eternity Pewter Pearl Satin 	 
	Sunshading louvre screen	Powder-coat color: EM-01, Dulux Duratec Eternity, Chain Pearl Matt 	 Louvre Profile

C1.10	Fire Hazard Properties: The fire hazard properties of all new building materials and assemblies as well as all new floor materials, floor coverings, wall and ceiling linings materials used in the development must comply with the requirements of Specification C1.10 of the BCA. Material test data sheets will need to be submitted for further assessment to ensure compliance with the above.
C2.2	General floor area and volume limitations: Open deck carparks or carparks provided with a AS2118.1 sprinkler system throughout do not have compartmentation limits under BCA C2.2. The building will be a combination of sprinkler protected and open deck, **General Note** Open deck carpark is defined as below.

Open-deck carpark means a carpark in which all parts of the parking *storeys* are cross-ventilated by permanent unobstructed openings in not fewer than 2 opposite or approximately opposite sides, and—

(a) each side that provides ventilation is not less than $^1/_5$ of the area of any other side; and

(b) the openings are not less than ½ of the wall area of the side concerned.

The building will primarily be an open deck carpark except for B2 and B1 lower ground which have been indicated to not have enough openings to be defined as open deck. The proposal seeks to sprinkler protect basement level B2 and B1 with the remainder of levels to be open deck. A fire engineered performance solution is proposed to omit the fire separation between sprinkler protected and non-sprinkler protected areas noting compartmentation is not applicable using a combination of Sprinkler protected areas and open deck carparking (see C2.7 and Spec E1.5).

Matters requiring further information

It is understood that East and West elevation will generally be the designated open sides in opposite direction as reflected in below architectural façade schedule by MODE.

To support the extended travel distance FRNSW and the FER will require a minimum 60% freely ventilated façade on two opposite sides of all open deck storeys with the exception that one façade on ground (south elevation) shall be no less than 55% open.

Current façade calculations as below from MODE.

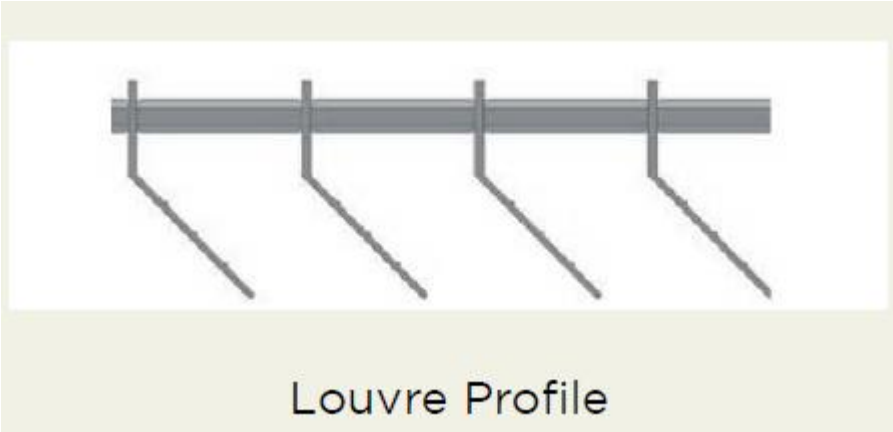
AUTO - REVISED VALUES					OPPOSITES		
Level-Face	Face m²	Open m²	% Open		Face A	Face B	Face A&B
B01-N	181.455	50.31313	27.73%				
B01-S	186.325	84.27348	45.23%				
B01-W	161.752	90.82164	56.15%				
B02-N	175.524	0	0.00%				
B02-S	175.473	54.65165	31.15%				
B02-W	161.784	38.04543	23.52%				
L01-E	163.246	98.46606	60.32%		L01-N	L01-S	N
L01-N	188.354	109.1521	57.95%		L01-E	L01-W	Y
L01-S	193.37	125.391	64.85%				
L01-W	159.207	104.0745	65.37%				
L02-E	163.246	103.4931	63.40%		L02-N	L02-S	N
L02-N	188.354	106.359	56.47%		L02-E	L02-W	Y
L02-S	193.37	121.4828	62.82%				
L02-W	159.207	104.0745	65.37%				
L03-E	163.246	99.84137	61.16%		L03-N	L03-S	N
L03-N	188.354	106.359	56.47%		L03-E	L03-W	Y
L03-S	193.37	116.0609	60.02%				
L03-W	159.207	102.6836	64.50%				
L04-E	163.246	99.84137	61.16%		L04-N	L04-S	N
L04-N	188.354	105.3113	55.91%		L04-E	L04-W	Y
L04-S	193.37	115.4419	59.70%				
L04-W	159.207	100.9614	63.42%				
L05-E	163.246	100.0308	61.28%		L05-N	L05-S	N
L05-N	188.354	104.7902	55.63%		L05-E	L05-W	Y

L05-S	193.37	113.5507	58.72%
L05-W	159.207	100.9614	63.42%
LGR-E	163.246	53.07636	32.51%
LGR-N	188.354	113.0049	60.00%
LGR-S	193.37	110.4266	57.11%
LGR-W	159.207	100.4187	63.07%

LGR-N	LGR-S	Y
LGR-E	LGR-W	N

The following additional information is required in regards to required ventilation for open-deck carpark:

+ Updated plans required depicting compliance. The final openness to be reflected in FEBQ submission. Final façade plans to be consistent to Mod SSD plans.
+ Façade plans are required to demonstrate available openness is provided for ALL upper levels. Level 5 shall be included in the façade schedule.
+ Additional construction tolerance / design redundancy for free ventilated area is required. Anything less than 60% or 55% for ground level south will not comply FRNSW / FER requirements. Ground North requires additional ventilation over the 60% for design redundancy.
+ Please evidence on the percentage of openness from supplier for proposed sun shading louvre screen (FS-263).



C2.6

Vertical protection of openings in external walls. Spandrels are not applicable to an open deck carpark or a building having a AS2118.1 sprinkler system provided throughout. The building is understood to be primarily an open deck carpark with levels B2 and B1 to be sprinkler protected only.

Performance Solution

Noting the B2 and B1 lower floor are not considered open deck and as sprinkler system is not installed throughout, fire rated spandrels are required in lower levels. This is considered a technical non compliance with the omission of fire rated spandrels within the building to be addressed by way of fire engineered solution.

C2.7

Separation by Fire Walls: The building is primarily an open deck carpark except for B2 and B1 LG.

Performance Solution / Further Information required

Separation by way of fire wall is not intended to be provided between sprinkler and non sprinkler protected areas as required by AS2118.1. This will be omitted by way of fire engineered strategy.

C2.10

Separation of Lift Shafts: Lift shafts are required to be bound by FRL 120/120/120 construction.

C2.12 / C2.13

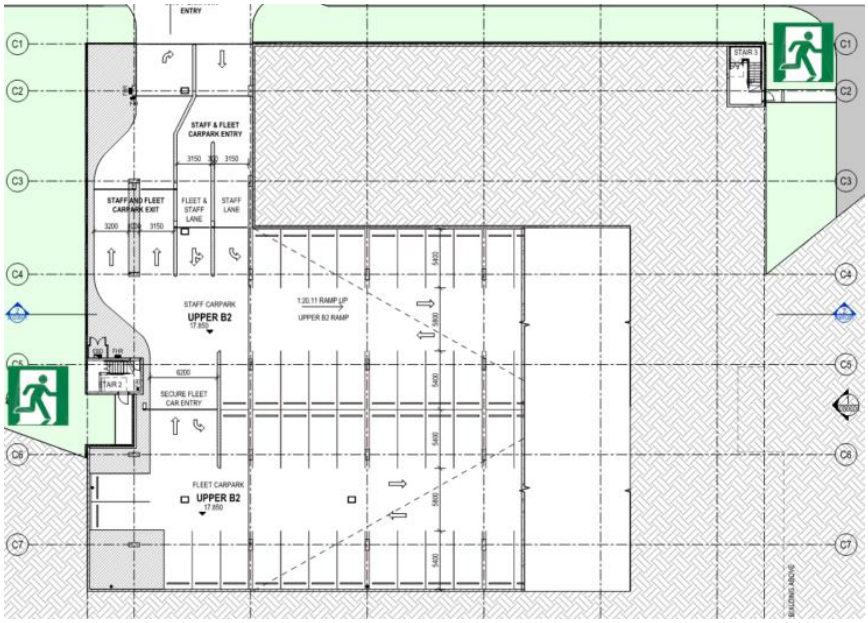
Separation of Equipment: Dependent on plant and equipment to be housed within the plant rooms, FRL 120/120/120 fire separation may be required to separate these areas from the building remainder. This is applicable to:

+ Main switch rooms / boards; or

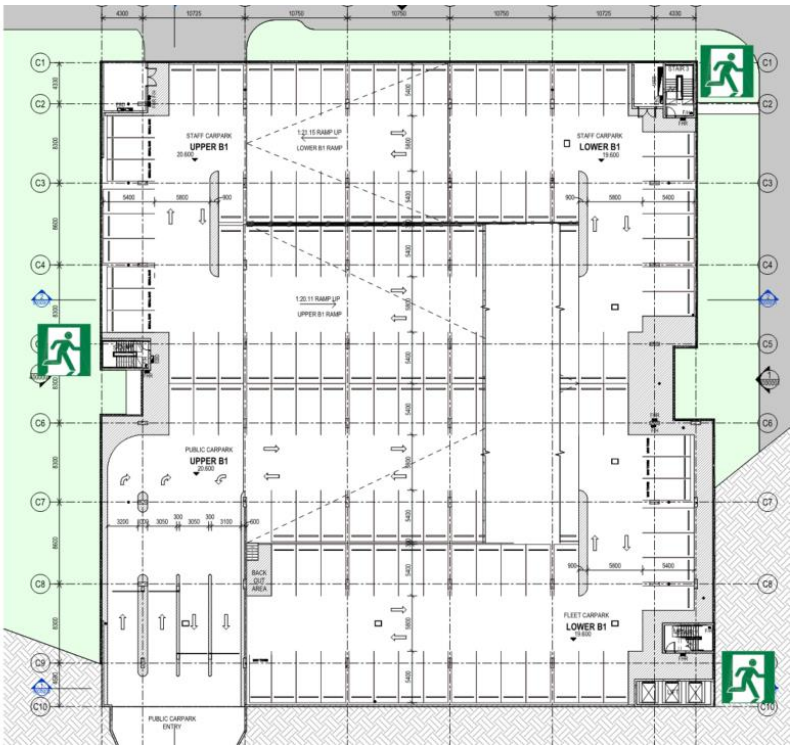
	+ Electricity substations; or + Light motors and lift control panels; or + Emergency generators used to sustain emergency equipment operating in the emergency mode; or + Central smoke control plant; or + Boilers; + A battery or batteries installed in the building that have a voltage exceeding 12 volts and a 200kWh or more. **Further Information required** The following items required additional information: + B1 – Main distribution and switch room to be separated from the remainder of the building by FRL 120-minute construction including self-closing -/120/30 FRL. + Confirmation is required if the Telcom room (ground, level 3, level 6) will have batteries that exceed limitations listed in BCA C2.12. + Solar inverters require confirmation from electrical consultant for C2.12 and C2.13 consideration.
C3.3	Separation of Different Fire Compartments: Exposure of external walls and associated openings in different fire compartments. **General Note** No fire compartments depicted, omission of separation of B2 from remainder of open deck carpark addressed within fire engineered solution.
C3.12	Openings in floor and ceilings for services: Where a service passes through a floor required to have an FRL the service must be protected: + With a shaft complying with Specification C1.1; or + In accordance with C3.15

PARTS D1 & D2 – PROVISION FOR ESCAPE AND CONSTRUCTION OF EXITS

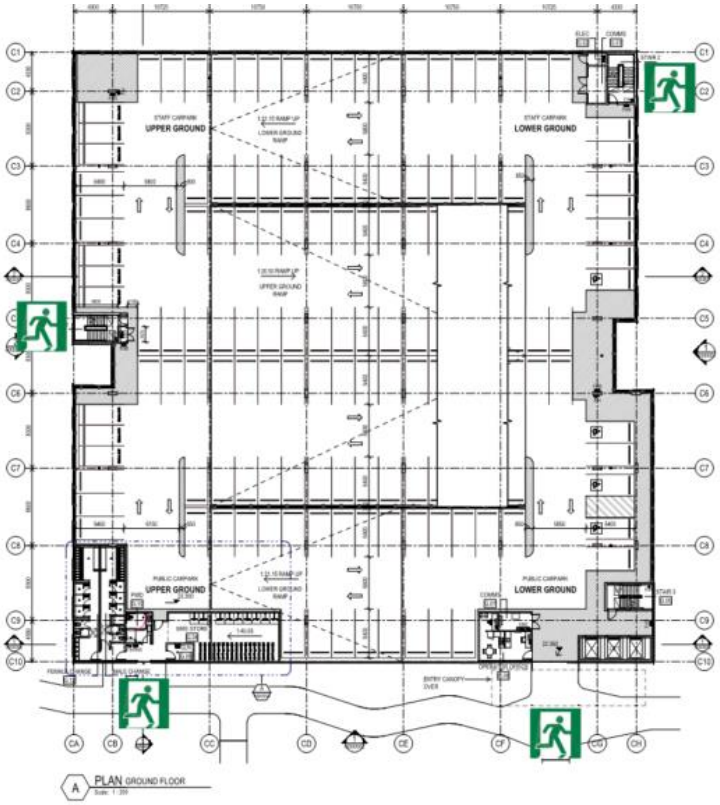
D1.2	Number of Exits Required: A minimum of one exit is required to be provided form each storey for building under 25m EF. Additional exits more than this requirement are required to satisfy aggregate exit width and travel distances. **General Note** We understand exists are primarily served by external stairs in lieu providing direct access to outside on grade. The exception being ground level has access directly to outside by via entry canopy pedestrian entry point. See below exit distribution: Basement 2



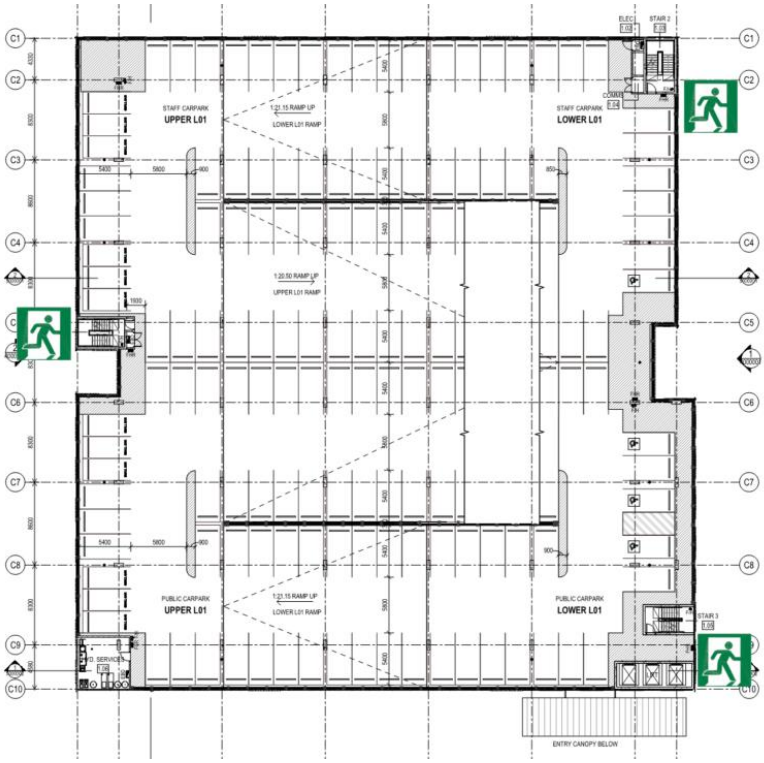
Basement 1



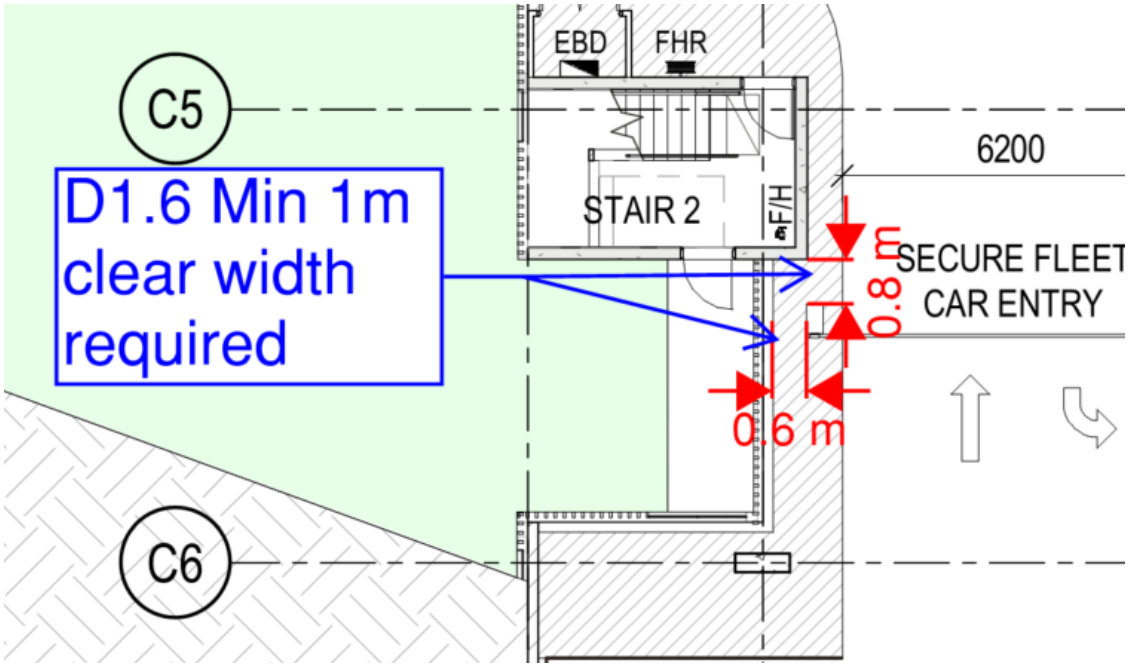
Ground



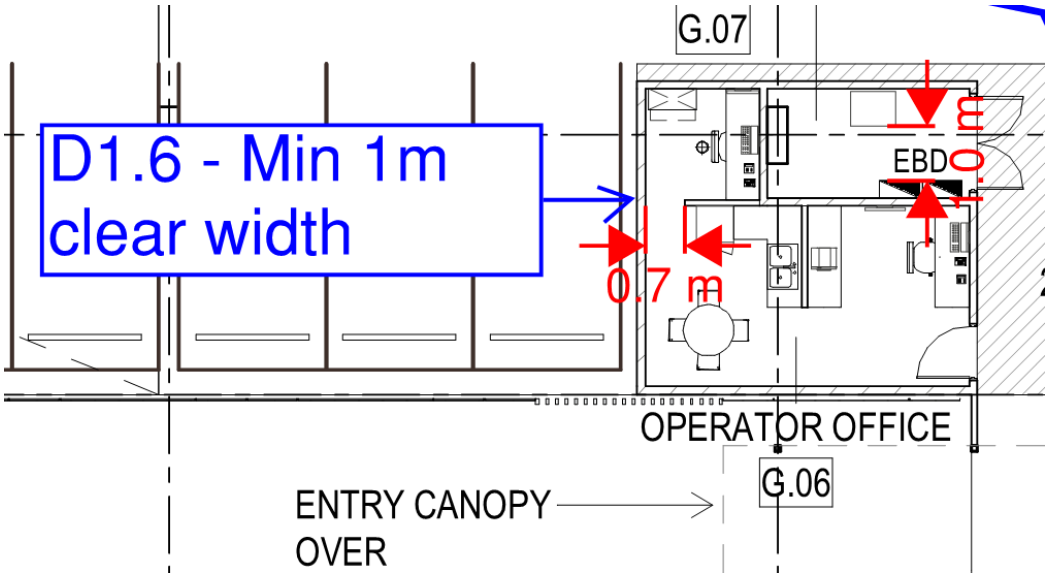
Level 1 (and reflective of above storeys)



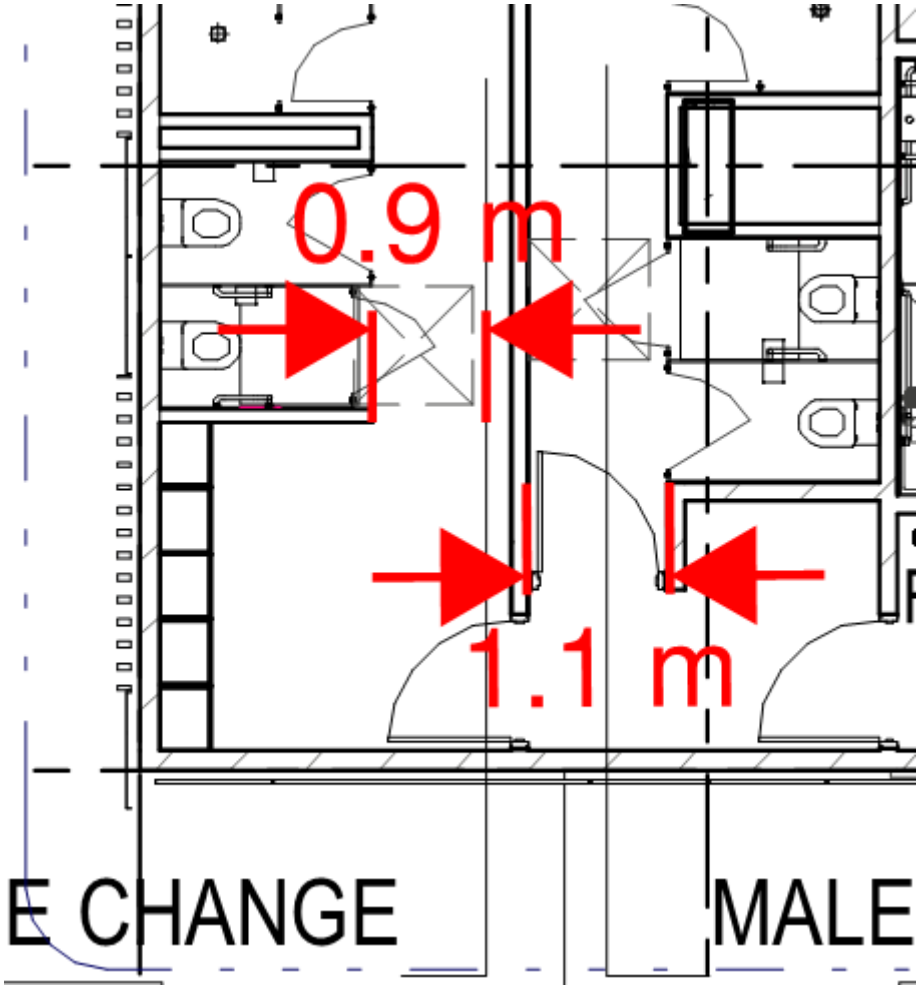
D1.4	Exit Travel Distances: Travel distances must not exceed 20m to a point of choice between two exits, and 40m to a single exit. **General Note** It is understood there will be no physical separation between sprinkler protected areas and open deck carpark levels by way of fire engineered solution which will permit unimpeded travel throughout all areas. **Performance Solution** Multiple areas of extended travel distance to nearest exit. The fire engineered strategy permits extended travel to the nearest exit being: + Up to 45m in lieu of 40m to the nearest exit (worst case) within enclosed carpark levels B2 and B1. + Up to 50m in lieu of 40m to the nearest exit (worst case) with the open deck carpark levels GL and above. Current plans are within limitations of fire engineered strategy.
D1.5	Distance Between Alternative Exits: Distances between alternative exits must not exceed 60m. **General Note** We can potentially support a fire engineered performance solution to justify a distance between alternative exits of up to 82m. Note that excessive travel distances will be considered on a case-by-case basis and will require a detailed review once the design progresses. **Performance Solution** Multiple areas of extended travel distance between alternative exits where measured through the point of choice. The fire engineered strategy permits extended travel between alternative exits being: + Up to 82m in lieu of 60m (worst case) where measured through the point of choice Current plans are within limitations of fire engineered strategy.
D1.6	Dimensions of Paths of Travel to an Exit: The minimum clear height through all egress paths is required to be no less than 2m, and a minimum of 1m wide (this width dimension is measured clear of any obstructions such as handrails and joinery). In a required exit or path of travel to an exit there is concession for the unobstructed width of a doorway to be reduced to 850mm min in lieu of 1m, and the unobstructed height for an exit doorway can be reduced to 1,980mm min. **Further Information Required** Egress paths require a clear unobstructed width not less than 1m. There are egress paths that are less than 1m and require rectification throughout. Ensure a minimum 1m clear unobstructed throughout all areas. B2 requires further design development to ensure a path is available around boom gate.



Similarly the operator office is to ensure the nib wall has a min 1m clear unobstructed width.



The end of trip facilities shall ensure a minimum clear 1m width.



D1.7

Travel via Fire-Isolated Exits:

General Note

The building is less than 25m effective height (see C1.2), in this regard external exits on lieu of fire isolated are permitted. Similarly where the provisions of D1.8 cannot be achieved, fire isolated stairs can be used where constructed to Spec C1.1 and any exposure to external wall of the same building is protected in accordance with BCA D1.7

Stair 3 could readily comply with D1.7 where appropriate fire ratings for doors and shafts are proposed. Stair 1 and 2 are considered external due to discharge required to pass external wall of same building. The assessment proceeds based on all stairs will comply with D1.8, the design team shall confirm if this is not the intent.

D1.8

External Stairways or Ramps In lieu of Fire-Isolated Exits: External stairways must discharge directly to open space. They must be non-combustible throughout and protected with FRL 60/60/60 construction any part of the stairway is within 6m of the external walls of the building served. No openings are permitted within 0-3m of the exit, except for an FRL -/60/30 fire door serving as access to the exit. Openings within 3-6m of the exit must be protected in accordance with C3.4, where wall-wetting sprinklers are provided, they must be located internally.

General Note

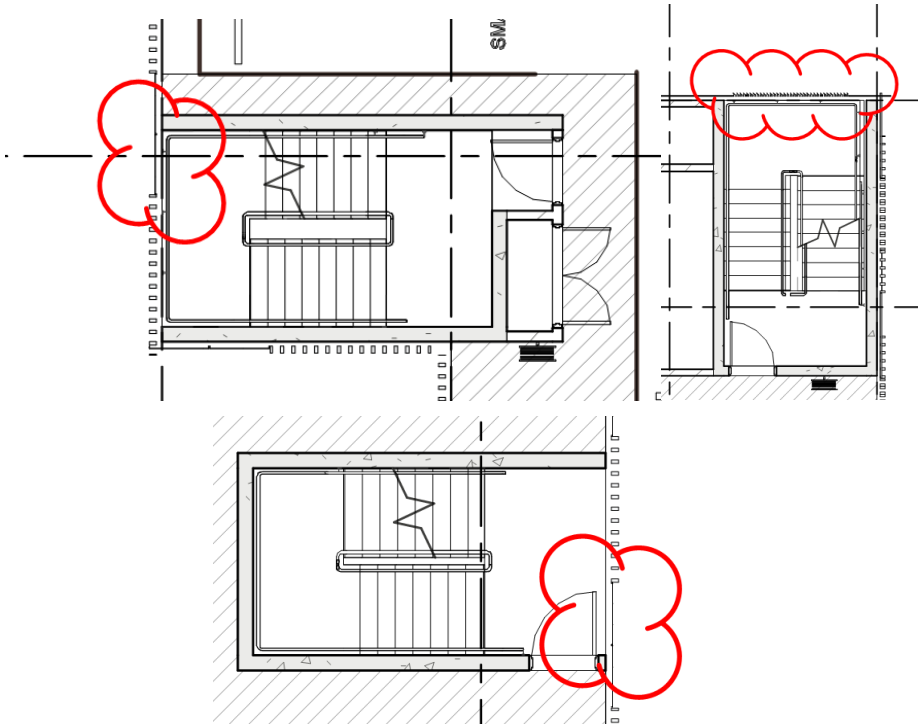
The building will have external stairs in lieu of fire isolated (see D1.7 comments). External stairs are to discharge on grade.

Further Information Required

Updated façade plans do not depict >60% ventilated area on external stairs. Updated façade plans are required to confirmation is required that external stairs in lieu of fire isolated have >60% open for full length of façade that is not exposed to the building.

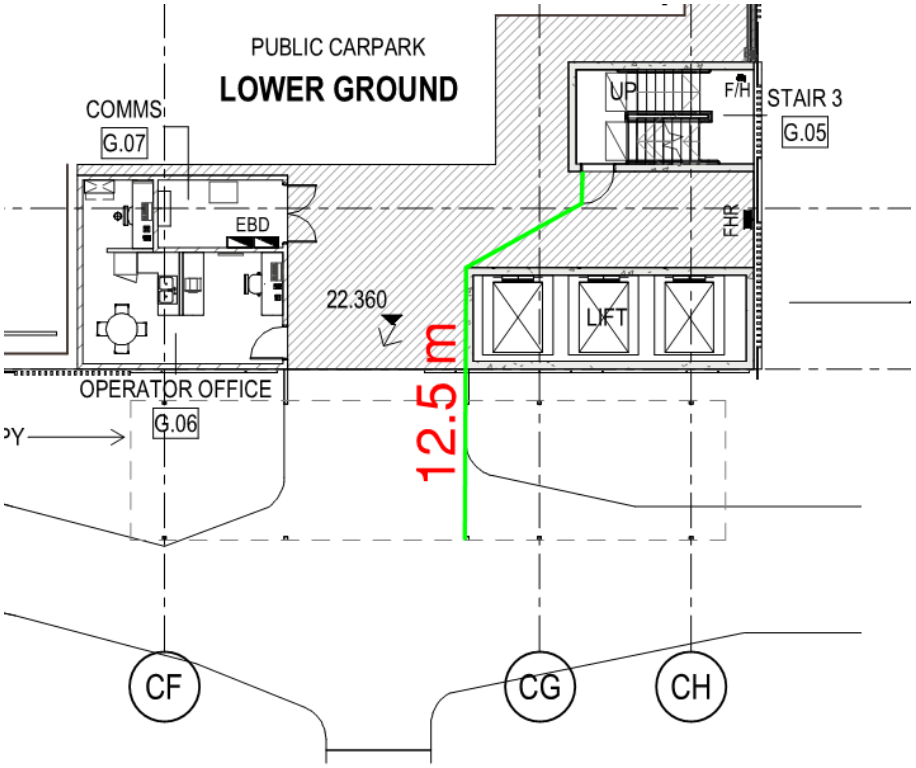
The plans generally have aluminium battens which can achieve compliance however some stairs have partial coverage only. All external stairs are to achieve compliance in this regard. Please provide updated plans

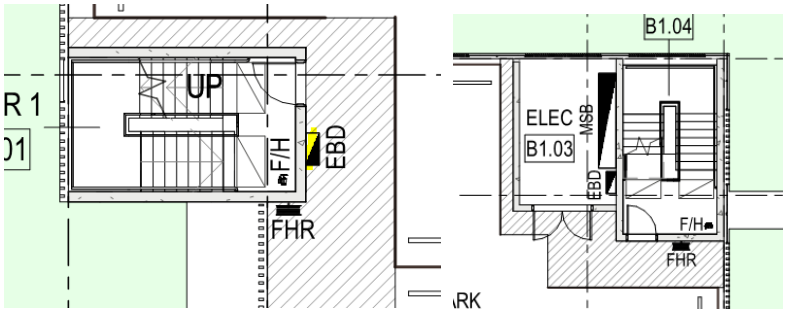
demonstrating compliance (aluminium battens for full length of stair opening or sunshade louvre where open area is confirmed >60%)



Performance Solution

It is proposed to permit an external stair in lieu of fire isolated discharge within the building on ground floor by way of fire engineered strategy.



D1.10	Discharge from Exits: If an exit discharges to open space that is at a different level than the public road in which it is connected to, the path of travel to the road must be via a ramp having a gradient not steeper than 1:8, or not steeper than 1:14 if required to be accessible. The discharge point of exits must be located as far away from one another as reasonably practical. **Further Information Required** Confirmation is required that permissible gradients are located at discharge points. Suitable barriers (bollards) are to be introduced to prevent vehicles from blocking access to the exit. A minimum 1m clear width shall be maintained.
D2.3	Non fire isolated stairways and ramps: Required stairs (refer D1.8) must be of: + Non combustible construction; + Reinforced or prestressed concrete; or + Steel in no part less than 6mm thick. Crown Certificate plans required to demonstrate compliance.
D2.7	Installations in Exits and Paths of Travel: Any electricity and communications cupboards located within a nominated egress paths within the proposed building will be required to be suitably smoke sealed and enclosed in non-combustible construction in accordance with D2.7(d). 
D2.13 / D2.14 / D2.16 / D2.17	Stairways: + A stairway must have no more than 18, nor less than 2, risers in each flight. + Landings must be not less than 750mm in length. Balustrades: + Where façade screening or battens are to be relied on for a balustrade the structural engineer shall confirm compliance with AS1170.1. + All balustrades must achieve a minimum height of 1m above finished floor level. No climbable elements are permitted within non climbable zone between 150mm – 760mm. + Where balustrades are located in front of ventilation screens they shall not reduce required ventilation for open deck carpark. + Balustrades must not permit a 125mm sphere to pass through any opening as there are no stairs considered fire isolated. **Further Information Required** All stairs are considered external in lieu of fire isolated (refer D1.7 comments). Balustrades within external stairs must not permit a 125mm sphere to pass through any opening. Amended plans required to demonstrate compliance (below right picture)

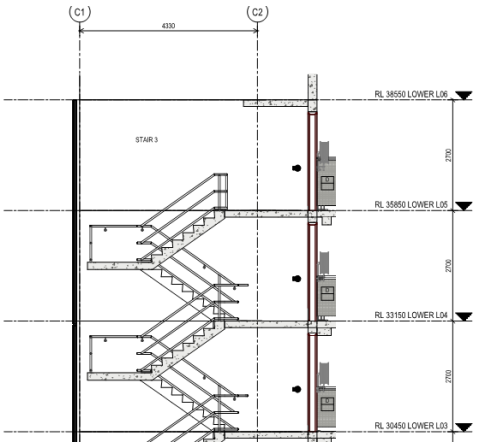
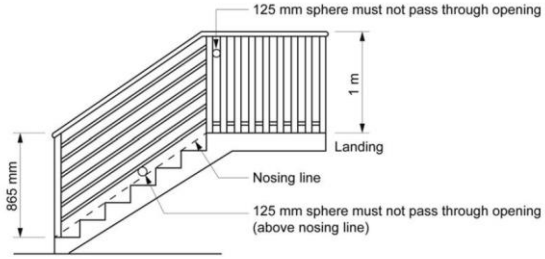


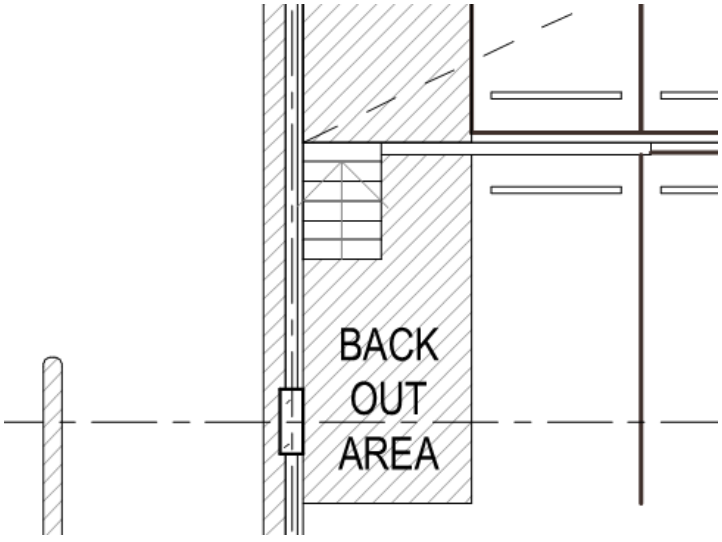
Figure D2.16(1) Illustration of barrier heights and spacings



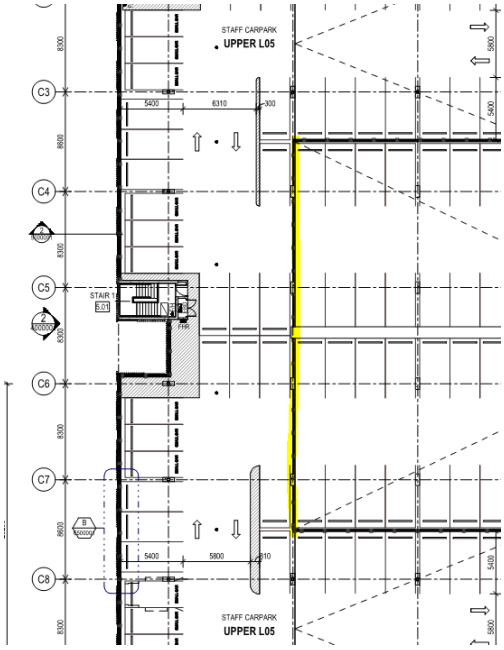
(a) Stairways – Table D2.16a 2(c)

Figure D2.16(2) Illustration showing when barriers are required

Confirm a balustrade is provided at the stair between lower B1 and upper B1 area.



Balustrade between different carpark levels to confirm compliance.



Handrails:

+ Handrails must be located on both sides of all stairways and ramps including above mentioned stair.

D2.19
D2.20
D2.21

Doorways and doors:

A doorway serving as a required exit or forming part of a required exit must not be fitted with a sliding door unless:

+ It leads directly to open space; and
+ The door is able to be opened manually under a force of not more than 110N; and
+ If fitted with a door that is power operated it must be able to be opened manually under a force of not more than 110N if there is a malfunction or failure of the power source; and
+ If it leads directly to a road or open space it must open automatically if there is a power failure to the door or on the activation of a fire or smoke alarm.
+ The exit door shall not encroach more than 500mm into required width of stair

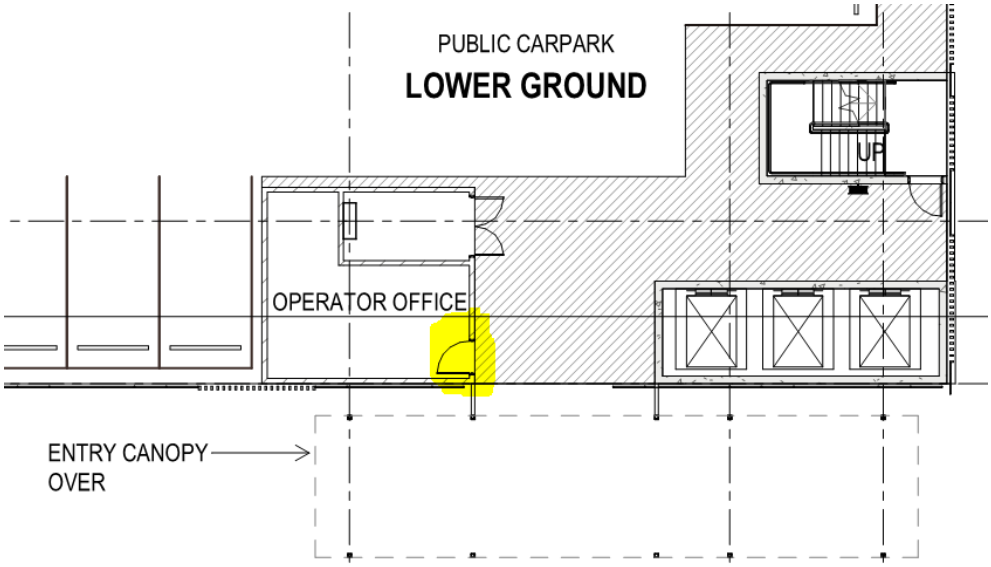
Doors and latching: All egress doorways must swing in the direction of egress and must be readily openable without a key from the side that faces a person seeking egress, by a single handed downward or pushing action on a single device which is located between 900mm and 1100mm from the floor.

Further Information Required

The door schedule shall confirm that the sliding door from end of trip facilities will auto open upon power failure or activation of fire or smoke alarm.

Further Information Required

Ground level pedestrian entry operator office door shall be fitted with a device to holding the door in the open position or swing in direction of egress.



PART D3 – ACCESSIBILITY – REFER DDA REPORT

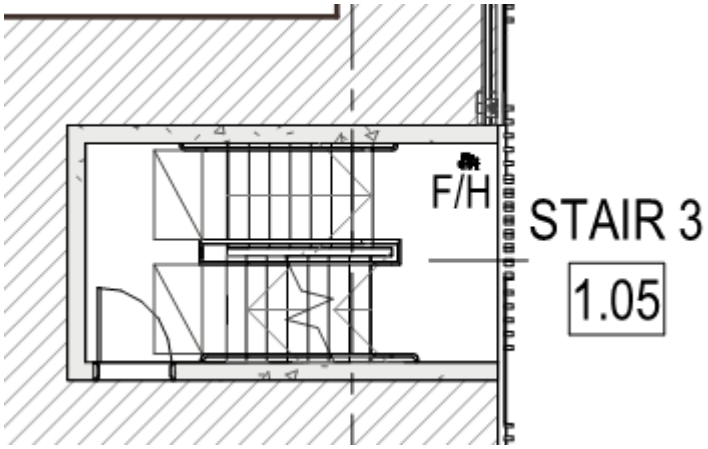
SECTION E – SERVICES AND EQUIPMENT

E1.3

Fire Hydrants: Fire hydrant coverage is required to be provided to the building in accordance with AS 2419.1 – 2005 except where varied by fire engineered solution.

Further Information Required

+ Booster and pump location including required hardstands to AS2419.1 - 2005
+ Note requirement for protection of internal pipework or supports in non sprinkler protected areas to have fire rating (FRL 60 mins)
+ Coverage plans are required from hydraulic Accredited Fire Safety Practitioner.
+ Confirm fire hydrants are not located on intermediate landings (ref stair 3 lower L01)



Performance Solution

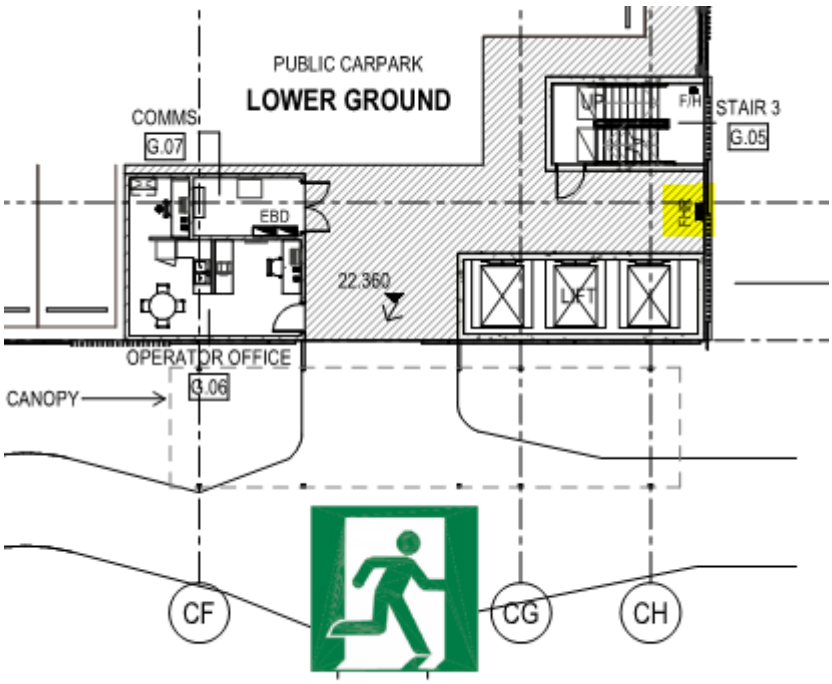
A performance solution is proposed to permit the flow rate for hydrants systems serving the carpark to comply with 2021 version of AS2419.1 in lieu of 2005 being the referenced standard in the BCA. The performance solution is proposed on the basis the site infrastructure can only support a flow of 32L/s at 1200kPa.

E1.4

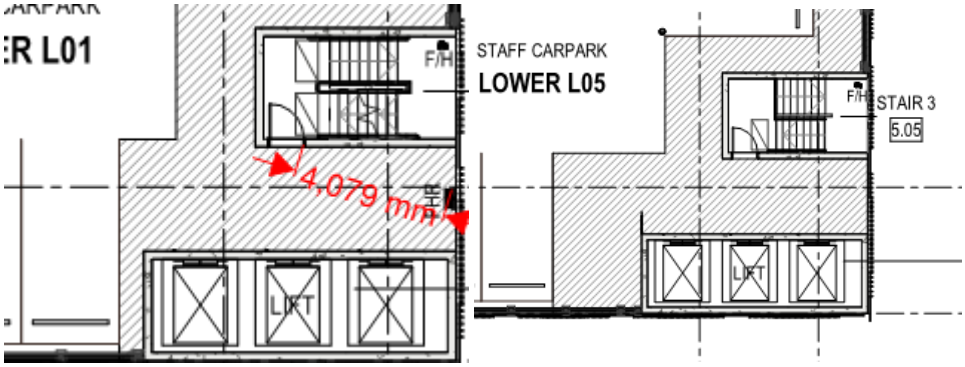
Fire Hose Reels: Fire hose reel coverage is required to be provided to the building in accordance with AS2441-2005.

Further Information Required

+ Coverage plans are required from hydraulic Accredited Fire Safety Practitioner.
+ FHR are required within 4m of an exit (external stairs in lieu OR open space) prior to being located at other locations. FHR shall be co located adjacent to internal fire hydrants.
+ Ground level FHR is to be <4m from a exit, stair 3 is not the exit for this storey area relocate to compliant location.



+ Ensure stair 3 FHR is <4m from exit, scaled plans appear just over. Level 5 requires a FHR within 4m of stair 3 exit prior to supplementary FHR being located throughout.



E1.5

Fire Sprinklers: Sprinklers complying with AS2118.1 are required to be installed in fire compartments that have more than 40 cars within a fire compartment in levels not considered an open deck carpark .

Performance Solution

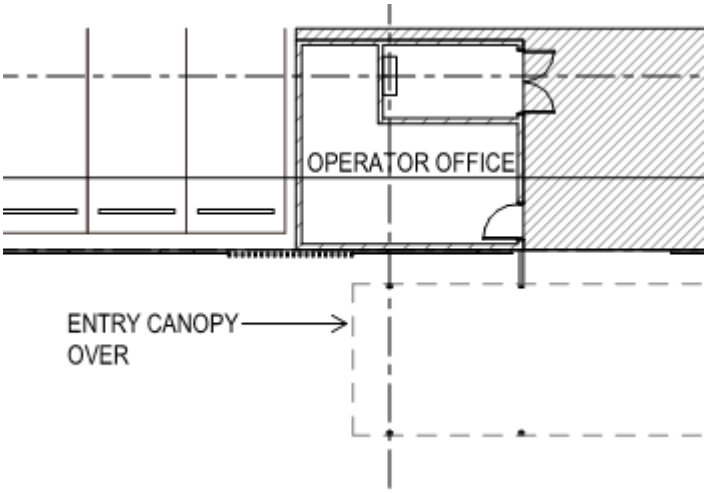
A performance solution is proposed to sprinkler protect level B2 and B1 which have more than 40 cars, the solution will omit separation between sprinkler protected an non sprinkler protected areas.

E1.6

Fire Extinguishers: To be provided and designed in accordance with AS 2444-2001.

E1.10	Provision for special hazard: Suitable provision must be made if special problems of fighting fire could arise because of the nature or quality of materials stored, displayed or used in the building. **General Note** The building will have solar panels installed to the roof of the building, FRNSW requirements for signage, block plans associated shut down systems to be included in construction.
E2.2a	Smoke Hazard Management: The following is noted in regard to provision of smoke hazard management: + The building will be considered a single fire compartment where performance solution omits separation between sprinkler protected and non-sprinkler protected areas. + Detection plans are required from Accredited Fire Safety Practitioner. + Where mechanical ventilation is provided, compliance with BCA E2.2, Clause 5.5 of AS1668.1 and AS1670.1 for detection within circulation spaces is required. and at each required exit and lift landing door. Override controls, supply air smoke detectors shall be provided in accordance with Clause 7.6.8 of AS1670.1
Part E3	Emergency Lifts: We understand the building has less than 25m effective height therefore emergency lifts are not required. Lifts shall comply with Part E3.

SECTION F – HEALTH AND AMENITY

FP1.4	Damp and weatherproofing: A performance solution is required to demonstrate how damp and weatherproofing (including around windows and doors) must prevent the penetration of water that could cause: + Unhealthy and dangerous conditions, or loss of amenity for occupants; and + Undue dampness or deterioration of building elements. **Performance Solution** Please provide a performance solution for damp and weatherproofing, the solution shall confirm how compliance with the performance requirement FP1.4 will be achieved for operators' office and any retail spaces proposed. The solution shall also address how drainage at door is achieved. 
F1.1	Stormwater drainage: Stormwater drainage must comply with AS 3500.3
F1.7	Waterproofing in wet areas in buildings: Waterproofing in wet areas shall comply with AS3740 and Table F1.7

F2.3

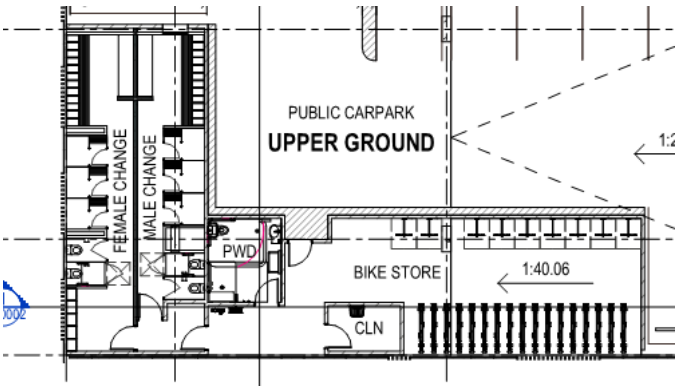
Sanitary facilities: Sanitary facilities are only required to be provided in accordance with the requirements for employees for Class 7a building.

Sanitary Facilities for the proposed works – *Class 7 Employees*						
	Closet Pans		Urinals		Washbasins	
	Required	Proposed	Required	Proposed	Required	Proposed
Male	1 – 20	1	1 – 10	0	1 – 30	1
	>20	Add 1 per 20	11 – 25	1	>30	Add 1 per 30
			26 – 50	2		
			>50	Add 1 per 50		
Female	1 – 15	1	-	-	1 – 30	1
	> 15	Add 1 per 15	-	-	>30	Add 1 per 30

Further Information Required

Please confirm if retail spaces are intended to be provided and number of persons proposed to be accommodated so provision of sanitary facilities can be confirmed.

Locations of basins are to be confirmed on plans.



Part F3

Room Heights: The ceiling height in a 7a building shall be 2.4m except corridors, passageways or the like can be 2.1m. Sanitary compartments, air-locks, tea preparation areas, store rooms and garages must achieve no less than 2.1m.

The floor to ceiling height above a stairway, ramp, landing or the like must achieve no less than 2m when measured vertically above the nosing line of stairway treads or the floor surface of the ramp, landing, or the like.

F4.5

Ventilation of Rooms: Any room occupied by a person for any purpose must be provided with natural ventilation complying with this clause, or a mechanical ventilation or air-conditioning system complying with AS 1668.2 and AS 3666.1.

F4.11

Carparks: Every storey of a carpark except an open deck carpark, must have:

+ A system of mechanical ventilation complying with AS1668.2; or
+ A system of natural ventilation complying with Section 4 of AS1668.4.

Further Information / Performance Solution

A performance solution is proposed for level B2 and B1 which is not considered an open deck carpark. The performance solution proposed a combination of natural and mechanical ventilation in lieu of one or the other required by BCA F4.11.

Part G

Construction in Bushfire prone areas:

Further Information Required

Bushfire report will need to be provided by the projects bushfire consultant and recommendations will need to be included in the design accordingly. Particular attention will need to be paid to any additional fire fighting equipment that may be required by RFS such as external hydrants and the like. In this regard all service consultants will need to ensure compliance is achieved with details demonstrating compliance.

Section J	Energy Efficiency: The new building works subject to compliance with the Energy Efficiency Provisions of Section J relating to: + J1: Building Fabric (as appliable for any proposed conditioned space) + J3: Building Sealing (as appliable for any proposed conditioned space) + J5: Air-conditioning and ventilation systems + J6: Artificial lighting and power + J7: Hot water supply + J8: Access for maintenance The architect, mechanical, electrical, and hydraulic engineers are to incorporate details demonstrating compliance with the above provisions (as applicable to their respective disciplines).

FIRE SAFETY SCHEDULE

The following table is a list of the required fire safety measures within the building. These measures may be subject to further change pending the outcomes of the final Fire Safety Engineering Review and acceptance from FRNSW.

Statutory Fire Safety Measure	Design / Installation Standard	Existing	Proposed
Alarm Signaling Equipment	AS 1670.3 – 2018		✓
Automatic Fail Safe Devices	BCA Clause D2.21		✓
Automatic Fire Detection & Alarm System	BCA Spec. E2.2a & AS 1670.1 – 2018		✓
Automatic Fire Suppression Systems (B1 and B2 only)	BCA Spec. E1.5 & AS 2118.1 – 2017		✓
Building Occupant Warning System activated by the Sprinkler System	BCA Spec. E1.5, Clause 8 and Clause 3.22 of AS 1670.1 – 2018		✓
Emergency Lighting	BCA Clause E4.4 & AS 2293.1 – 2018		✓
Emergency Evacuation Plan	AS 3745		✓
Exit Signs	BCA Clauses E4.5, E4.6 & E4.8; and AS 2293.1 – 2018		✓
Fire Dampers	BCA Clause C3.15, AS 1668.1 – 2015 & AS 1682.1 & 2 – 2015 and manufacturer's specification		✓
Fire Doors	BCA Clause C2.12, D1.8 and AS 1905.1 – 2015 and manufacturer's specification		✓
Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 2005		✓
Fire Hydrant Systems	Clause E1.3 & AS 2419.1 – 2005		✓
Fire Seals	BCA Clause C3.15, AS 1530.4 – 2014 & AS 4072.1 – 2005 and manufacturer's specification		✓
Mechanical Air Handling Systems (shutdown)	BCA Clause E2.2, AS/NZS 1668.1 – 2015 & AS 1668.2 – 2012		✓
Paths of Travel	EP&A Regulation Clause 186		✓
Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 – 2001		✓
Required Exit Doors (power operated) (end of trip facilities)	BCA Clause D2.19(b)		✓
Warning & Operational Signs	Section 183 of the EP&A Regulation 2000, AS 1905.1 – 2015, BCA Clause D2.23, D3.6, E3.3		✓

Statutory Fire Safety Measure	Design / Installation Standard	Existing	Proposed
Fire engineered Alternative Solutions relating to: 1. Omission of required FRL's to solar structure on roof. 2. Omission of fire separation between sprinkler protected and non-sprinkler protected areas. 3. Omission of fire rated spandrels throughout despite sprinkler being provided to part of building only and the remainder being an 4. Extended travel distance and distance between alternate exits (enclosed car park) 5. Extended travel distance and distance between alternative exits (Open Deck car park) 6. External stairways in lieu of fire isolated discharging inside building 7. Fire Hydrants (Design Flow to AS2419.1 – 2021)	Fire Engineering Report prepared by Innova Services Australia		

CONCLUSION

This report contains an assessment of the referenced architectural documentation for the proposed multi deck car park (MDCP) to be located at 771 Cudgen Road Cudgen NSW against the Deemed-to-Satisfy provisions and Performance Requirements of the National Construction Code Series (Volume 1) **Building Code of Australia 2019 amendment 1.**

In view of the above assessment we can confirm that subject to the above measures being appropriately addressed by the project design team, compliance with the provisions of the BCA is readily achievable.

In addition, it is considered that such matters can adequately be addressed in the preparation of the Crown Certificate documentation.

If you have any questions or require further information, please do not hesitate to contact Peter Keppie on 0460 420 554 or peter@bmplusg.com.au

Regards

Prepared by:

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APPENDIX A – TYPE A CONSTRUCTION

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

Building element	Class of building — FRL: (in minutes) *Structural adequacy/Integrity/Insulation*			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any *fire-source feature* to which it is exposed is—				
For *loadbearing* parts—				
less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180	240/240/240
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120	240/240/180
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90	240/180/ 90
For non-*loadbearing* parts—				
less than 1.5 m	–/ 90/ 90	–/120/120	–/180/180	–/240/240
1.5 to less than 3 m	–/ 60/ 60	–/ 90/ 90	–/180/120	–/240/180
3 m or more	–/–/–	–/–/–	–/–/–	–/–/–
EXTERNAL COLUMN not incorporated in an *external wall*—				
For *loadbearing* columns—	90/–/–	120/–/–	180/–/–	240/–/–
For non-*loadbearing* columns—	–/–/–	–/–/–	–/–/–	–/–/–
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	120/120/120	180/180/180	240/240/240
INTERNAL WALLS—				
Fire-resisting lift and stair *shafts*—				
Loadbearing	90/ 90/ 90	120/120/120	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding *public corridors*, public lobbies and the like—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding *sole-occupancy units*—				
Loadbearing	90/ 90/ 90	120/–/–	180/–/–	240/–/–
Non-*loadbearing*	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Ventilating, pipe, garbage, and like *shafts* not used for the discharge of hot products of combustion—				
Loadbearing	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
Non-*loadbearing*	–/ 90/ 90	–/ 90/ 90	–/120/120	–/120/120
OTHER LOADBEARING INTERNAL WALLS, INTERNAL BEAMS, TRUSSES and COLUMNS—	90/–/–	120/–/–	180/–/–	240/–/–
FLOORS	90/ 90/ 90	120/120/120	180/180/180	240/240/240
ROOFS	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30	240/ 90/ 60

Notes:

1. Any concessions under BCA Spec C1.1 to reduce fire resistance levels shall be confirmed with the Certifier prior to application. The report proceeds on the basis of general FRL of 120 mins throughout.
2. Any lightweight construction in a fire wall or an internal wall required to have an FRL is to comply with Specification C1.8.
3. All elements of an external wall assembly (except those allowed under Clause C1.9) must be non-combustible. This includes, framing, integral formwork, insulation, sarking, façade coverings, and the like.

4. Fire rated shafts are required to be enclosed at the top and bottom by construction having an FRL of not less than what the shaft requires (in both directions)
5. Lift shafts are required to be enclosed at the top of the shaft with fire rated construction having an FRL of 120/120/120.

6. Any loadbearing internal walls or loadbearing fire walls are to be masonry or concrete.
7. External walls must be non-combustible construction. Non-loadbearing parts of an external wall that are more than 3m from a fire source feature need not be fire rated.
8. Internal columns in this building (being less than 25m in effective height) that are in the storey immediately below the roof, can be constructed as follows:
    a. Building with a rise in storeys exceeding 3 – FRL 60/60/60
    b. *Building with a rise in storeys not exceeding 3 – no FRL*.