ARCADIS

MOTT MACDONALD

A joint venture between Arcadis Australia Pty Ltd and Mott MacDonald Australia Pty Ltd

OSD Detailed SSD DA – FIRE ENGINEERING REVIEW

Victoria Cross Over Station Development

Document No: SMCSWSVO-LLC-SVC-FL-REP-000002

Revision - D

Prepared For – Lendlease Building Pty Limited | ABN 97 000 098 162

OSD Detailed SSD DA – FIRE ENGINEERING REVIEW

Victoria Cross Over Station Development

Client:

Lendlease Building Pty Limited

Level 14, Tower Three, International Towers Sydney, Exchange Place, 300 Barangaroo Avenue, Barangaroo NSW 2000

ABN: 97 000 098 162

Prepared by:

Arcadis Australia Pacific Pty Ltd and Mott MacDonald Australia Pty Limited (ARCMAC Joint Venture)

Level 16, 580 George Street Sydney NSW 2000

ABN: 794 7393 1704

Quality information

Title	OSD Detailed SSD DA – FIRE ENGINEERING REVIEW
Document No / ref:	SMCSWSVO-LLC-SVC-FL-REP-000002
Zone:	OSD South Building
Disciplines:	Fire and Life Safety
Suitability Code:	For Information

Approval Record

Function	Position	Name	Date
Prepared by	*Fire safety engineer*	*Quentin Li*	*23/08/2019*
Technical Checker	*Accredited fire safety engineer*	*Victor Tung*	*23/08/2019*
Reviewed By	*Accredited fire safety engineer*	*Victor Tung*	*23/08/2019*
Approved by	*OSD Design Manager*	*Stephen Canty*	*23/08/2019*

Amendment Record

Changes made to this document since its last revision, which affect its scope or sense, are marked in the right margin by a vertical bar (|).

Date	Rev	Amendment Description	By
03/06/2019	A	Issued for Information	Stephen Canty
02/07/2019	B	Updated for Submission	Stephen Canty
11/07/2019	C	Updated for Submission	Stephen Canty
23/08/2019	D	Sydney Metro comments incorporated	Stephen Canty

Contents

Acronyms

Abbreviation	Description
CSSI	Critical State Significant Infrastructure
DA	Development Application
FRNSW	Fire and Rescue NSW
GFA	Gross Floor Area
IFEG	International Fire Engineering Guidelines
NCC	National Construction Code
NSW DPIE	NSW Department of Planning, Industry and Environment
OSD	Over Station Development
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
FRL	Fire Resistance Level

1. Introduction

This report has been prepared to accompany a detailed State Significant Development (SSD) development application (DA) for a commercial mixed-use Over Station Development (OSD) above the new Sydney Metro Victoria Cross Station. The detailed SSD DA is consistent with the Concept Approval (SSD 17_8874) granted for the maximum building envelope on the site, as proposed to be modified.

The Minister for Planning, or their delegate, is the consent authority for the SSD DA and this application is lodged with the NSW Department of Planning, Industry and Environment (NSW DPIE) for assessment.

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 6 May 2019. Specifically, this report has been prepared to respond to the following SEARs:

'2. Consistency with Stage 1 Concept Approval

The EIS shall:

- *address the consistency of the proposal with the approved Concept Application (SSD 8874) conditions and building envelope …'*

This report has also been prepared in response to the following condition of consent for the State Significant Development Concept (SSD 8874) for the OSD:

'Fire and Rescue Assessment

B8. Future detailed development application(s) shall be accompanied by a draft Fire and Rescue Assessment / Engineering Brief for the OSD prepared in consultation with Fire and Rescue NSW providing relevant details of:

(a) The various sectors within the Victoria Cross Metro site served by independent fire systems (such as the OSD, the underground and aboveground metro sector, etc.)

(b) Fire engineering analysis of the pedestrian connection interfaces between the sectors and the sectors themselves, having regard to emergency occupant egress, fire and smoke compartmentation, smoke hazard management and fire fighting intervention

(c) Adequacy of fire and life safety systems within the Victoria Cross Metro site in relation to the fire hazards of the Sydney Metro

(d) Design of fire hydrant systems for OSD elements that exceed 135m

(e) Future consultation to be undertaken with Fire and Rescue NSW in respect of the final design and construction of the OSD and operational compatibility of the Victoria Cross Metro site's proposed fire and life safety systems.'

The above will be further developed and incorporated as part of the construction issue documentation. Consultation with Fire and Rescue NSW is ongoing.

The detailed SSD DA seeks development consent for:

- Construction of a new commercial office tower with a maximum building height of RL 230 or 168 metres (approximately 42 storeys).
- The commercial tower includes a maximum GFA of approximately 61,500sqm, excluding floor space approved in the CSSI
- Integration with the approved CSSI proposal including though not limited to:
  - Structures, mechanical and electronic systems, and services; and
  - Vertical transfers;
- Use of spaces within the CSSI 'metro box' building envelope for the purposes of:
  - Retail tenancies;
  - Commercial office lobbies and space;
  - 161 car parking spaces within the basement for the purposes of the commercial office and retail use;
  - End of trip facilities; and
  - Loading and services access.
- Utilities and services provision.
- Signage locations (building identification signs).
- Stratum subdivision (staged).

2. The Site

The site is generally described as 155-167 Miller Street, 181 Miller Street, 187-189 Miller Street, and part of 65 Berry Street, North Sydney (the site). The site occupies various addresses/allotments and is legally described as follows:

- 155-167 Miller Street (SP 35644) (which incorporates lots 40 and 41 of Strata Plan 81092 and lots 37, 38 and 39 of Strata Plan 79612)
- 181 Miller Street (Lot 15/DP 69345, Lot 1 & 2/DP 123056, Lot 10/DP 70667)
- 187 Miller Street (Lot A/DP 160018)
- 189 Miller Street (Lot 1/DP 633088)
- Formerly part 65 Berry Street (Lot 1/DP 1230458)

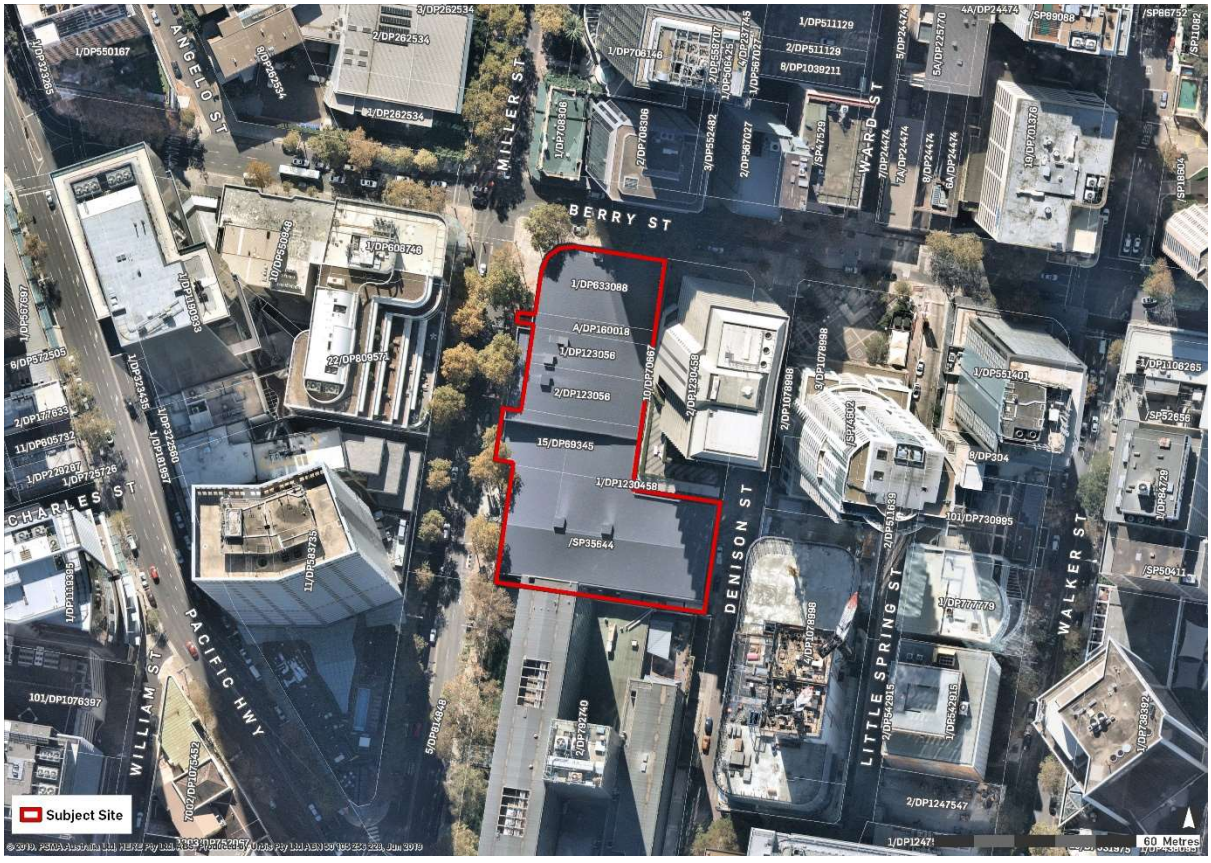


Figure 1 Site aerial

3. Sydney Metro Description

Sydney Metro is Australia's biggest public transport project. Services started in May 2019 in the city's North West with a train every four minutes in the peak. Metro rail will be extended into the CBD and beyond to Bankstown in 2024. There will be new metro railway stations underground at Crows Nest, Victoria Cross, Barangaroo, Martin Place, Pitt Street, Waterloo and new metro platforms under Central.

In 2024, Sydney will have 31 metro railway stations and a 66 km standalone metro railway system – the biggest urban rail project in Australian history. There will be ultimate capacity for a metro train every two minutes in each direction under the Sydney city centre. The Sydney Metro project is illustrated in the Figure below.

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham project as a Critical State Significant Infrastructure project (reference SSI 15_7400) (CSSI Approval). The terms of the CSSI Approval includes all works required to construct the Sydney Metro Victoria Cross Station, including the demolition of existing buildings and structures on both sites. The CSSI Approval also includes construction of below and above ground improvements with the metro station structure for appropriate integration with the OSD.

With regards to CSSI related works, any changes to the “metro box envelope” and public domain will be pursued in satisfaction of the CSSI conditions of approval and do not form part of the scope of the detailed SSD DA for the OSD.

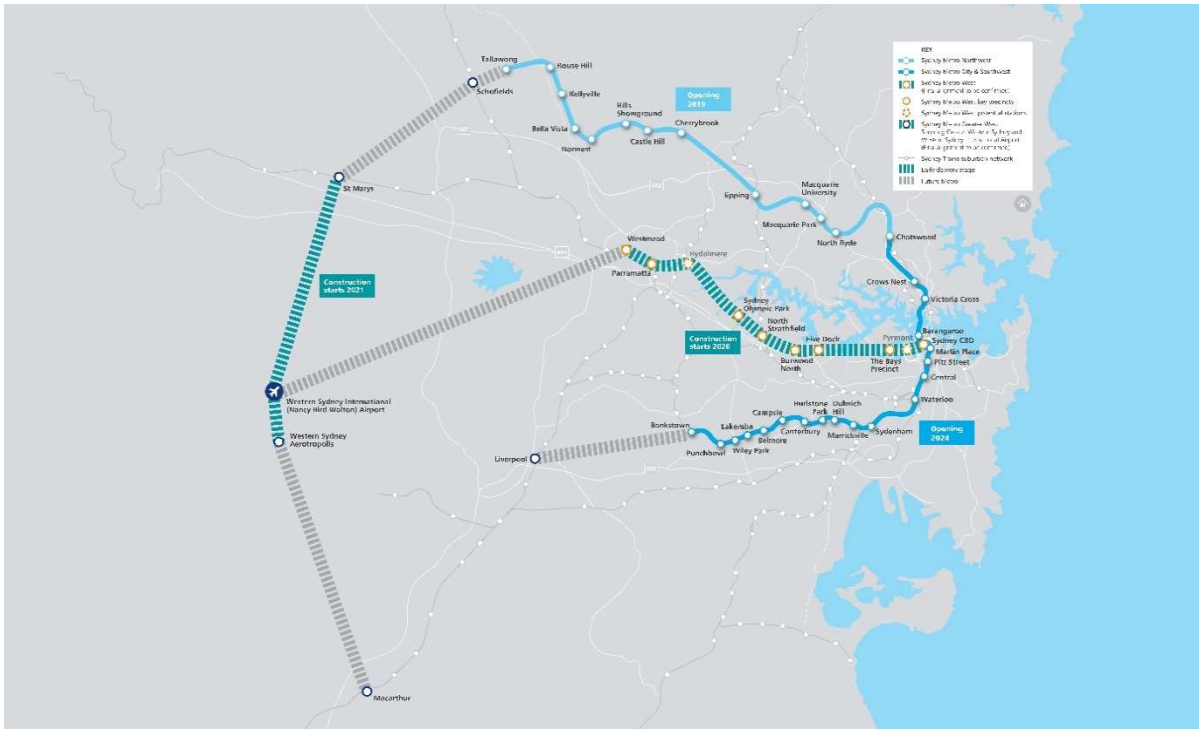


Figure 2 Sydney Metro alignment map

Source: Sydney Metro

4. Description of performance solutions

The designs of the OSD and the OSD enabling works include areas that do not comply with the DTS provisions of the National Construction Code Volume One – Building Code of Australia (NCC) 2019 and 2016 Amendment 1. We intend to use performance solutions to meet relevant performance requirements of the NCC.

The current extent of the non-compliances with the DTS provisions of the NCC are identified in the Building Code of Australia assessment report 2019/0506 R1.4 dated 9 July 2019 and prepared by Steve Watson & Partners. The requirements of the fire safety measures schedules will be further reviewed and developed once the detailed fire safety engineering assessment has been undertaken to determine whether additional fire safety measures are required. The fire safety measures schedules may also be modified following any updates to the Building Code of Australia assessment report by Steve Watson & Partners.

Table 1 shows the NCC requirements associated with the performance solutions for the OSD.

4.1 OSD

No	Description of performance solutions	DTS provisions	Performance requirements
1.	Openings to the lift lobbies on levels 16 to 39 are located within 3m of the eastern boundary and are not proposed to be protected.	Clauses C3.2 and C3.4	CP1, CP2 and CP8
2.	The OSD incorporates the following maximum travel distances: • 30m to a point of choice • 60m to the nearest exit • 90m between alternative exits.	Clauses D1.4 and D1.5	DP4, DP6 and EP2.2
	Shortfall in aggregate exit width on the mid rise office levels – 2m proposed instead of 2.5m required for a population of 220 persons.	Clause D1.6	
3.	The southern fire-isolated stair serving the OSD requires occupants to travel within a fire isolated passageway that is shared with Victoria Cross Station before discharging to road and open space.	Clause D1.7	DP4, DP5 and EP2.2
4.	Access to the fire control room requires a change in level of 600mm instead of 300mm.	Clause E1.8 and specification E1.8	EP1.6
5.	The two paths of travel to the fire control room are not from the front entrance of the building or from a fire-isolated passageway.	Clause E1.8 and specification E1.8	EP1.6

Table 1 NCC requirements associated with the performance solutions – OSD

4.2 OSD enabling works

Table 2 shows the NCC requirements associated with the performance solutions for the OSD enabling works.

No	Description of performance solutions	DTS provisions	Performance requirements
1.	The FRLs of the retail areas are proposed to be reduced from 3 hours to 2 hours.	Clauses C1.1, C2.8 and specification C1.1	CP1, CP2 and CP8
2.	The FRLs of the bicycle parking facility in basement level 2 are proposed to be reduced from 4 hours to 2 hours.	Clauses C1.1, C2.8 and specification C1.1	CP1, CP2 and CP8
3.	The podium office is provided with a single exit instead of two.	Clause D1.2	DP4 and EP2.2
4.	The maximum travel distance to a single exit in the podium office is 30m instead of 20m. The maximum travel distance to a point of choice in the southern laneway building is 30m instead of 20m.	Clause D1.4	DP4 and EP2.2
5.	The basement carpark incorporates the following maximum travel distances: • 30m to a point of choice • 60m to the nearest exit • 90m between alternative exits.	Clauses D1.4 and D1.5	DP4 and EP2.2
6.	The gates providing egress via the OSD lobby on level 2 achieve a width of 900mm instead of 1m.	Clause D1.6	DP4 and DP6
7.	The fire-isolated stairs serving the OSD, the basement carpark and the podium office requires occupants to travel within a fire-isolated passageway that is shared with Victoria Cross Station before discharging to road and open space.	Clause D1.7	DP4, DP5 and EP2.2
8.	The fire-isolated stair serving the basement carpark discharges within a covered area – i.e. below the Miller / Denison through link – that is not open for at least 1/3 of its perimeter and travel to open space is more than 6m.	Clause D1.7	DP4, DP5 and EP2.2
9.	The non-fire-isolated stair serving the level 3 plant room does not provide a continuous means of evacuation to road or open space.	Clause D1.9	DP4 and EP2.2
10.	For security purposes, the automatic doors to the OSD sky lobby are not proposed to open automatically if there is power failure or on activation of a fire or smoke alarm in the building. The doors will be openable by a green push button device to allow occupant evacuation.	Clause D2.19	DP2

No	Description of performance solutions	DTS provisions	Performance requirements
11.	Fire hose reels are not proposed to be provided to the retail areas.	Clause E1.4	EP1.1
12.	The sprinkler-protected retail area on Denison Street level is not proposed to be separated from the non-sprinkler-protected area of Victoria Cross Station by 2 hour fire-rated construction.	Specification E1.5	CP2 and EP1.4
13.	Access to the fire control room requires a change in level of 600mm instead of 300mm.	Clause E1.8 and specification E1.8	EP1.6
	The two paths of travel to the fire control room are not from the front entrance of the building or from a fire-isolated passageway.		
14.	A zone smoke control system is not proposed to be provided to retail areas and the podium office.	Clause E2.2 and specification E2.2a	EP2.2

Table 2 NCC requirements associated with the performance solutions – OSD enabling works

5. Fire safety measures – OSD

The following fire safety measures are proposed for the OSD as a starting point for the fire safety engineering assessment to achieve compliance with the relevant performance requirements of NCC 2019.

5.1 General

1. The design of the OSD must comply with the DTS provisions of NCC 2019 relating to fire safety except specifically mentioned. This section does not provide a comprehensive list of fire safety measures required by the DTS provisions of the NCC 2019. The fire safety measures listed within this section relate only to the performance solutions. The fire safety measures must be read in conjunction with the DTS provisions of the NCC 2019.
2. This report and the requirements listed in this section must be implemented into the design and identified on the fire safety schedule for the building. They must be maintained and certified in accordance with the Environmental Planning and Assessment Regulations 2000 and relevant Australian standards.
3. The OSD and Victoria Cross Station are to be treated as separate buildings, with independent fire safety systems including:
   a. Water storage tanks
   b. Fire pump rooms
   c. Fire hydrant booster assemblies
   d. Fire control rooms.

   Note: The exits serving the OSD and Victoria Cross Station must be independent with the exception of the fire-isolated passageway discharging onto Denison Street – refer to items 16 and 17.

5.2 Structural fire resistance

4. The FRLs of the building elements associated with the OSD must be designed in accordance with the requirements of specification C1.1 of the NCC for a building of type A construction except where otherwise specified.
5. The OSD must be fire separated from Victoria Cross Station by construction achieving an FRL of not less than 120/120/120.
6. Any ancillary building elements must not be fixed, installed or attached to the internal parts or external face of an external wall that is required to be non-combustible unless it is a material permitted by clause C1.14 of the BCA or otherwise specified in this report.
7. Emergency equipment required to operate during a fire and equipment having a high fire hazard or potential for explosion must be enclosed in construction which achieves an FRL of not less than 120/120/120 as required by clauses C2.12 and C2.13 of the NCC, or as directed by the utility authority who may have additional requirements.
8. Openings to the lift lobbies on levels 16-39 and located within 3m of the eastern boundary are not required to be protected in accordance with clause C3.2 of the NCC – see Figure 3.

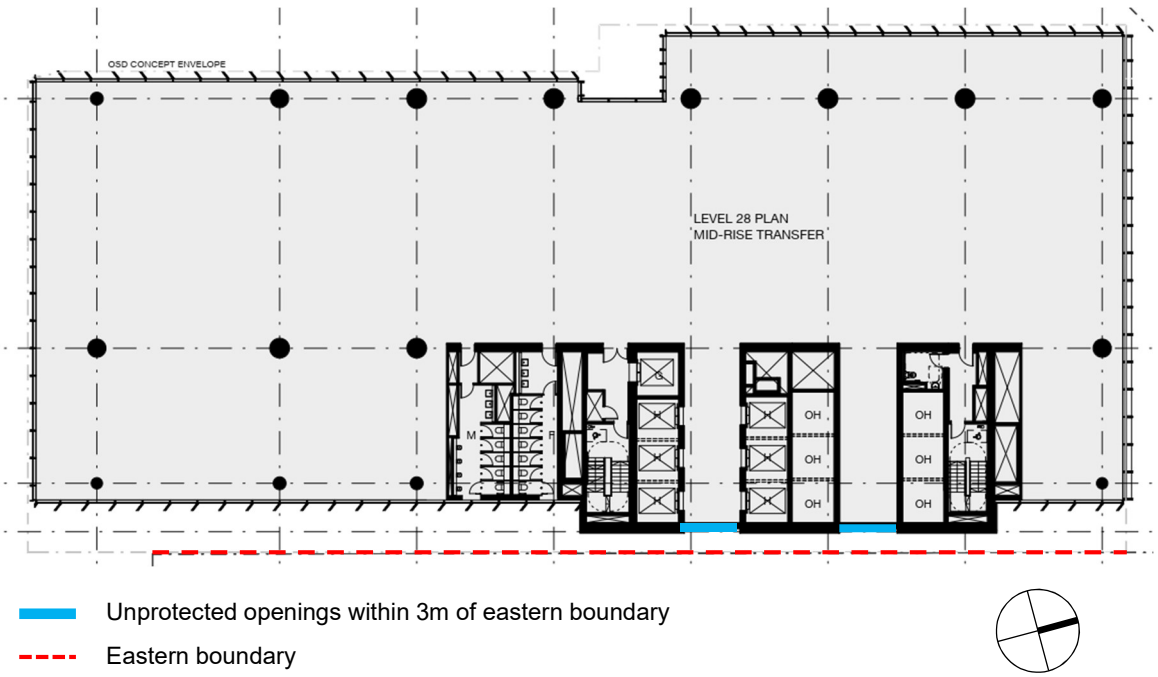


Figure 3 Openings located within 3m of eastern boundary – typical of levels 16 to 39

5.3 Access and egress

9. The following maximum travel distances apply to the OSD:
   a. 30m to a single exit or point of choice instead of 20m
   b. 60m to the closest of two or more alternative exits instead of 40m
   c. 90m between alternative exits instead of 60m.
10. All paths of travel to exits must be not less than 1m in clear width in accordance with clause D1.6 of the NCC.
11. The maximum population on the tower office levels may be up to:
   a. 200 persons per floor for the low rise and high rise office levels
   b. 220 persons per floor for the mid rise office levels
12. The OSD must be served by two fire-isolated stairs complying with the following:
   a. The stairs must be provided with handrails on both sides. Each stair must have an unobstructed width of 1m between the handrails.
   b. Refuge areas must be provided within the northern fire stair to level 3 and above and within the southern fire stair to level 16 and above. The refuge areas must be designed with a minimum floor area to accommodate a wheelchair. It is noted the current design incorporates refuges of 800mm × 1300mm.

   The exits from the typical office levels are illustrated in Figure 4, Figure 5 and Figure 6.

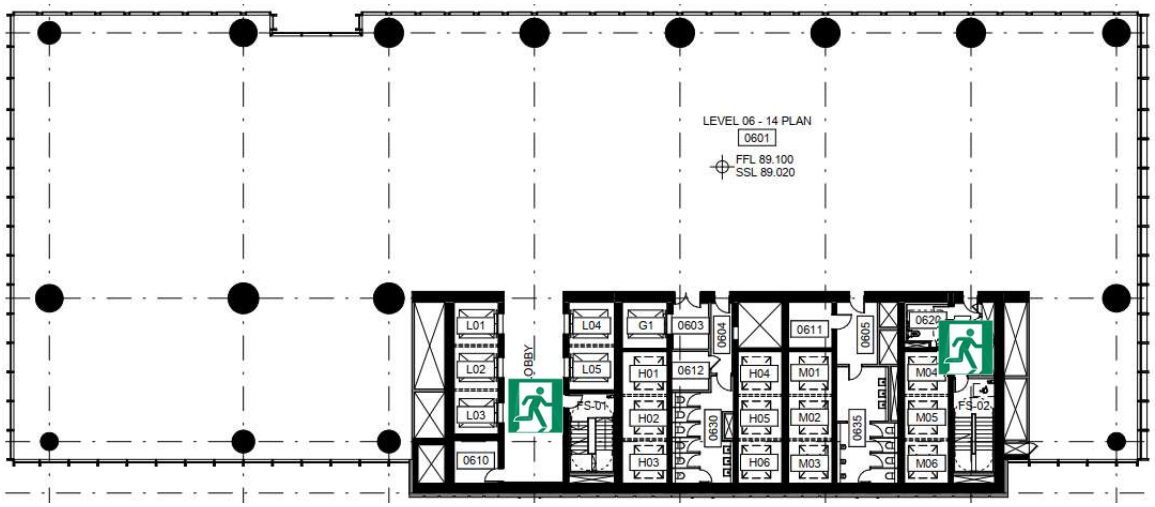


Figure 4 **Exits from typical low rise level**

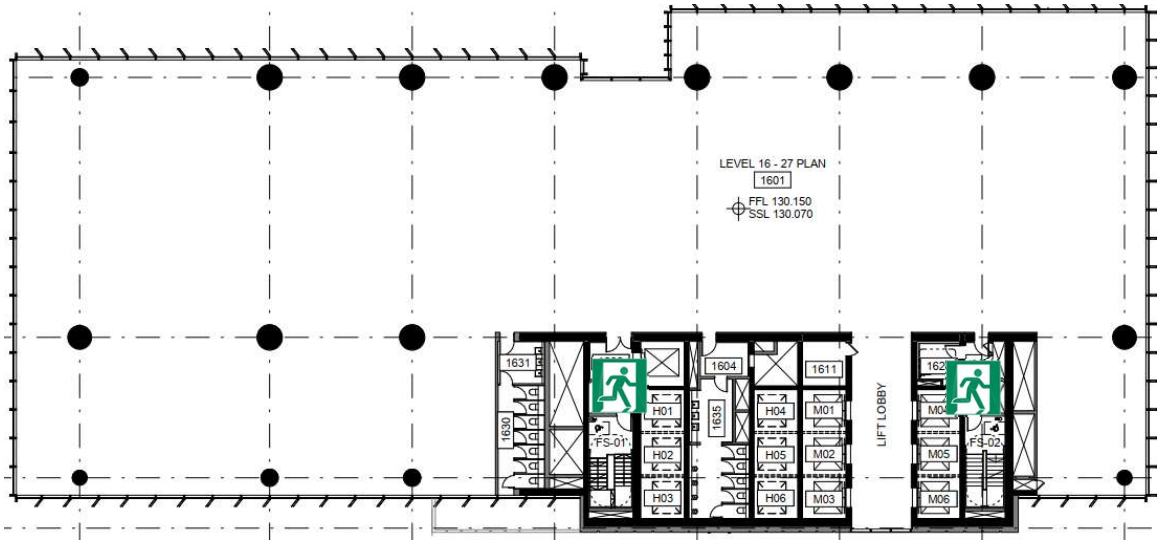


Figure 5 **Exits from typical mid rise level**

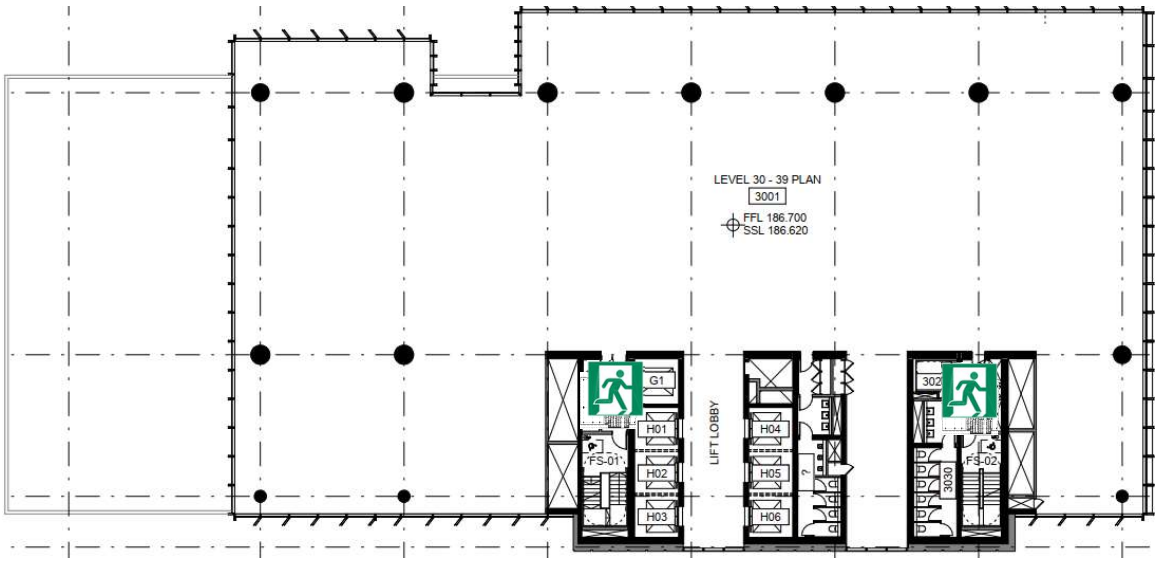


Figure 6 Exits from typical high rise level

13. Intercoms / help points for disabled occupants may be installed within the fire stairs serving the OSD instead of compliance with clauses C3.9 and D2.7 of the BCA. Any associated cabling must:
    a. have a minimum 2 hours fire rating to WS5X as specified in AS/NZS 3013:2005,
    b. be low voltage,
    c. be low smoke halogen free (LSHF), and
    d. be fire stopped in accordance with clause C3.15 of the BCA where they penetrate the fire-isolated stairs.
14. All doorways which form part of a required exit within the building must be made to swing in the direction of travel to the fire-isolated exit and from the exit to the discharge point from the building in accordance with clause D2.20 of the NCC.
15. Doors in required exits, forming part of required exits or in the paths of travel to required exits must comply with clause D2.21 of the NCC.
16. The southern fire-isolated stair (FS01) serving the OSD requires occupants to travel within a fire-isolated passageway that is shared with Victoria Cross Station before discharging to road and open space – see Figure 7.
17. The fire-isolated-passageway shared between the OSD and Victoria Cross Station must achieve an FRL of not less than 120/120/120 and achieve an unobstructed width of 2m – see Figure 7.

Figure 7 Fire-isolated passageway shared between OSD and Victoria Cross Station

18. Re-entry provisions within the OSD must comply with the following requirements:
    a. All doors to the OSD fire-isolated stairs FS01 and FS02 must be fitted with a fail-safe device that automatically unlocks the door upon the activation of a fire alarm.
    b. An intercom system must be provided at the landings of fire-isolated stairs FS01 and FS02 on at least every fourth storey near the doors. Where an intercom system is provided, a sign must be fixed adjacent to such doors explaining its purpose and method of operation.
    c. On all other levels, signs must be provided at the landings identifying the locations of the nearest intercoms on the levels above and below.
    d. The activation of the intercom system referred above must be linked to the OSD concierge / security that is monitored 24/7. The concierge / security staff must be notified that the intercom within the specific fire-isolated stairway has been activated.
    e. Battery backups must be provided to facilitate a minimum 2 hour operating time of the intercom system in the event of power outage.

5.4 Services and equipment

5.4.1 Delineation of wet and dry fire safety systems

19. The delineation of wet and dry fire safety systems, between the OSD and Victoria Cross Station are illustrated in Figure 8 to Figure 11.

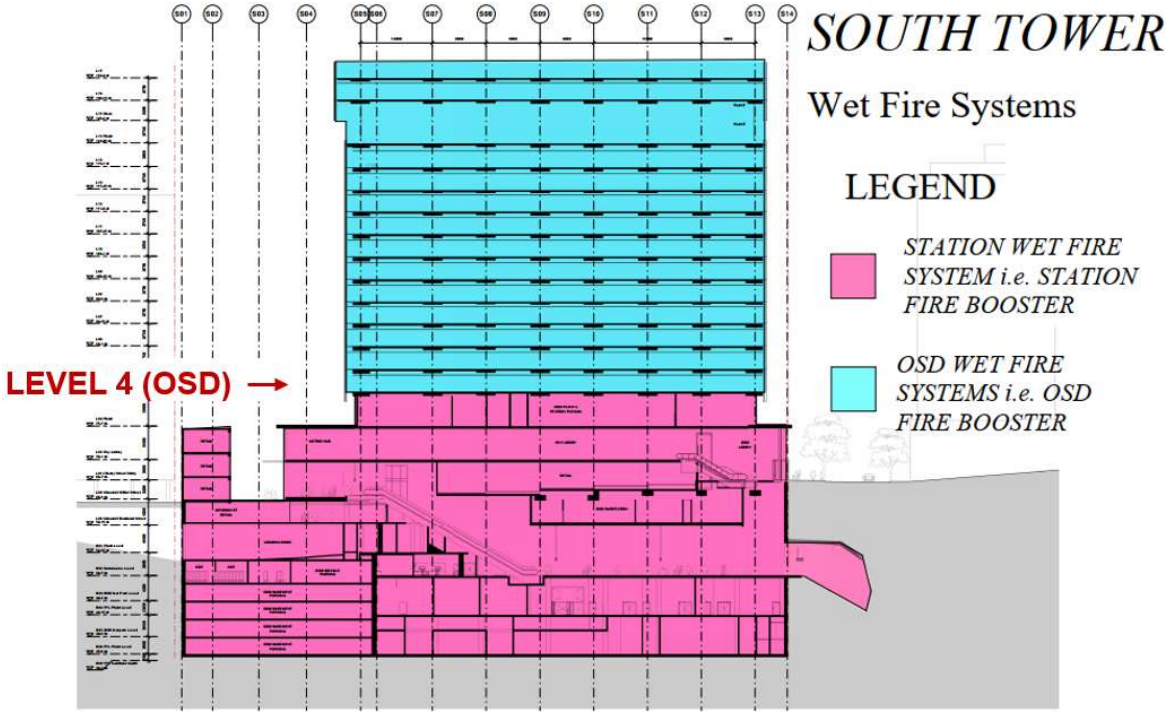


Figure 8 Wet fire services delineation – OSD and Station (north / south section)

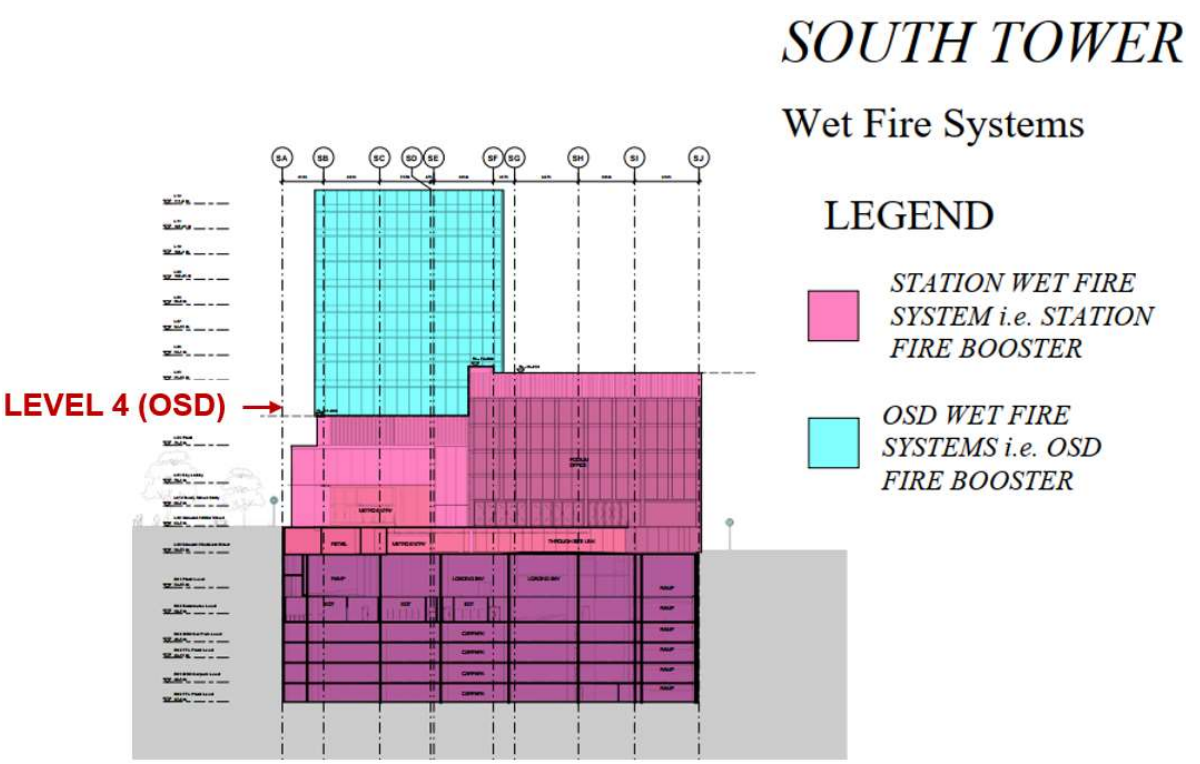


Figure 9 Wet fire services delineation – OSD and Station (laneway section)

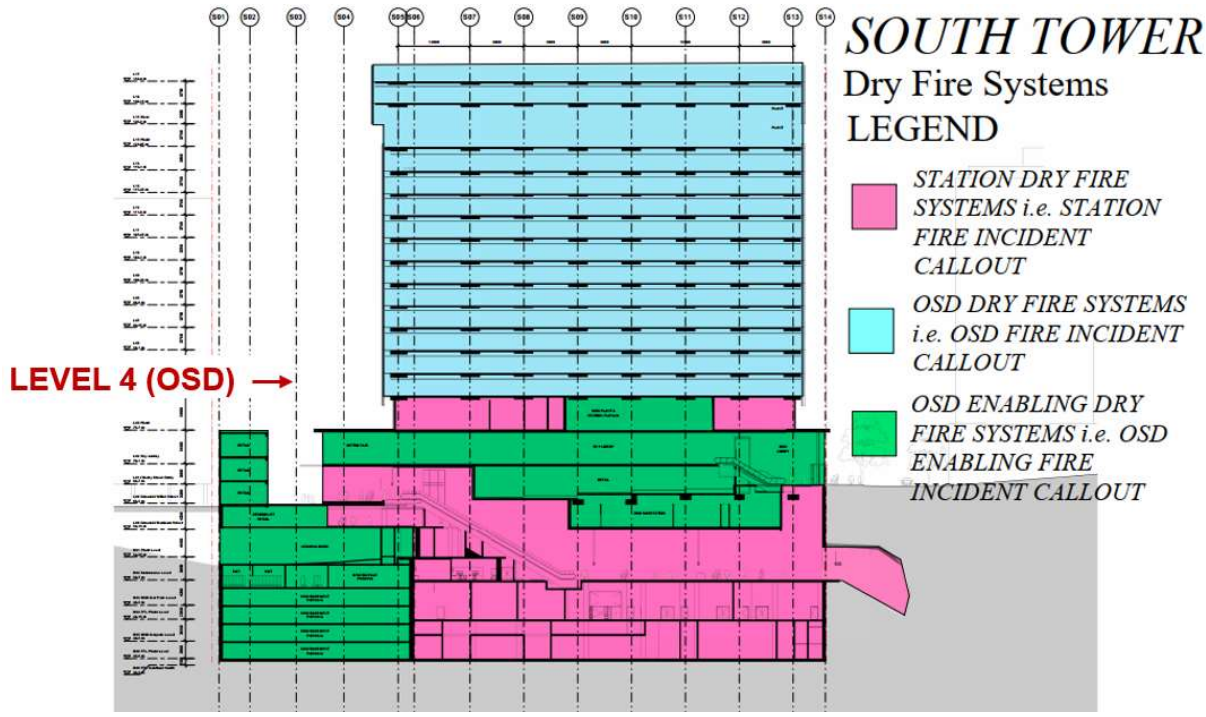


Figure 10 Dry fire services delineation – OSD and Station (north / south section)

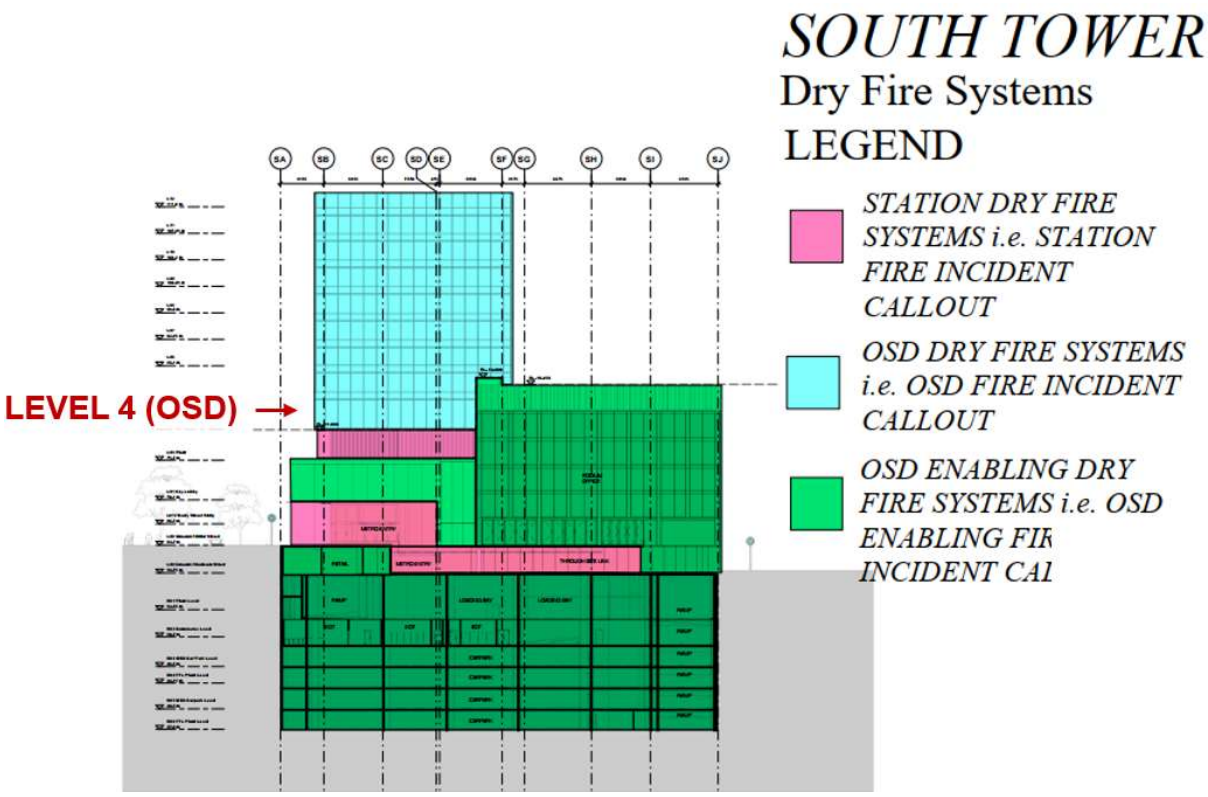


Figure 11 Dry fire services delineation – OSD and Station (north / south section)

5.4.2 Firefighting equipment

20. The combined sprinkler and hydrant system must comply with the requirements of AS 2118.1:2017 and AS 2419.1-2005, except where modified by AS 2118.6-2012 or otherwise stated within this report.
21. A fire hydrant system must be installed throughout the building in accordance with the requirements of clause E1.3 of the NCC and AS 2419.1-2005, except where stated within this report. In addition, the hydrant system is to incorporate the following requirements based on AS 2419.1:2017 to meet FRNSW operational requirements for buildings exceeding 135m in height:
    a. Roof mounted tank with a capacity of 54kL
    b. Segregation of the upper and lower pressure zones to form two independent systems, with the roof tank serving zones 4 and 5 and the low level system serving zones 1, 2 and 3
    c. 2400kPa pressure will not be exceeded anywhere in the system
    d. Low level fire pumps containing relay pump performance.
22. All of the hose connections in the system are to be fitted in accordance with FRNSW technical information sheet – FRNSW compatible hose connections available at firesafety.fire.nsw.gov.au. These couplings must be tested as part of the system when the commissioning tests are undertaken.
23. The hydrant system must be provided with a ring main in accordance with AS 2419.1-2005.
24. The following requirements are applicable for intermediate hydrants:

a. When working from an internal hydrant, the next additional hydrant should be located not more than 25m from that hydrant.
b. Where additional hydrants are provided, floor specific block plans – minimum A3 in size – must be installed adjacent to the internal fire hydrants located within the fire stairs. The purpose of these floor specific block plans is to assist fire-fighters to locate the additional internal hydrants on that level. The floor specific block plans must be permanently mounted and oriented in such a manner so as to reflect the aspect of the installation as it is presented to the reader and be incorporated into the fire safety schedule.

25. The percentage for maintenance of hydrants off the ring main is proposed to be 33% instead of 50% required by clause 8.5.5 of AS 2419.1-2005 and clause 2.6.3 of AS 2118.6-2012.
26. Two dual purpose sprinkler and hydrant pumps are proposed to be provided as permitted under AS 2419.1:2017, instead of compliance with AS 2118.6-2012.
27. Two electric motor driven pumps are proposed to be provided as per AS 2419.1-2005 instead of one electric and one compression-ignition as per AS 2118.1:2017. At least one of the pumps must be supplied by an automatic start emergency power generator.
28. The OSD booster assembly location is illustrated in Figure 12. The booster must be identifiable by a red strobe light which is activated by an alarm signal from the fire detection control and indicating equipment (FDCIE).

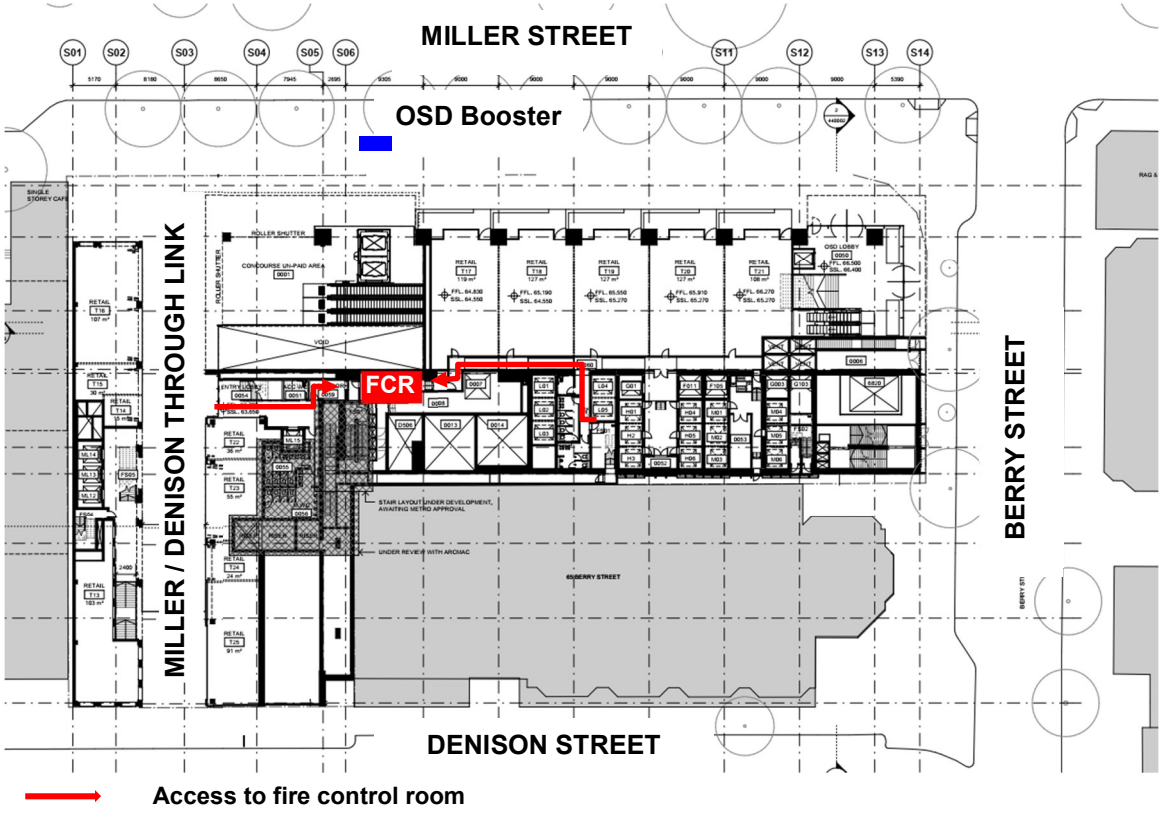


Figure 12 Location of fire hydrant booster assembly and fire control room – OSD

29. A sprinkler system in accordance with the requirements of specification E1.5 of the NCC and AS 2118.1:2017 must be provided throughout the OSD. The sprinkler system must have the following additional characteristics:

    a. All sprinkler heads must be fast response with an RTI of 50(ms)$^{1/2}$ or less in accordance with the requirements of AS 2118.1:2017.

    b. Concealed, recessed or flush-mounted sprinkler heads must not be used except where noted below as it may delay sprinkler activation. Semi-recessed sprinkler heads are considered acceptable provided they achieve a fast response rating.

       Note: Concealed, recessed or flush-mounted fast response sprinkler heads are acceptable in areas with limited / low fire load such as lift lobbies.

       Subject to review by an appropriately qualified fire safety engineer, the use of flush-mounted heads is also acceptable within other areas of office fitouts – eg circulation corridors / spaces, client floors, areas with feature ceilings etc. A statement of approval from the fire engineer must be included in the as-installed fire services operations and maintenance instruction manuals and referenced on the as-installed fire services drawings.

    c. Activation temperature of 68°C except where otherwise required by AS 2118.1:2017.

    d. Activation of the sprinkler system must operate the smoke hazard management systems of that area and activate the emergency warning and intercom systems as appropriate.

    e. The sprinkler system must be zoned to match the zoning of the smoke hazard management systems.

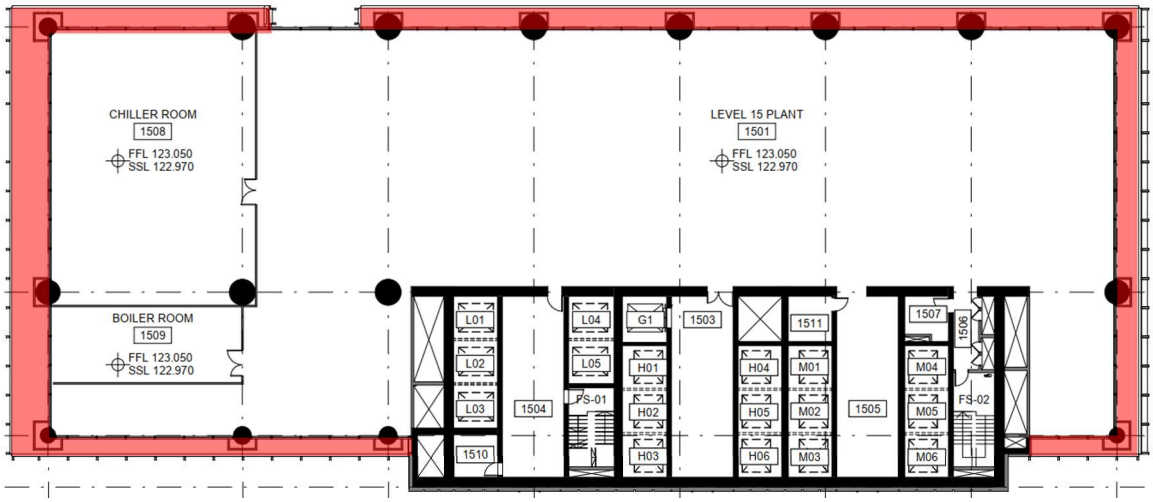
    f. The sprinkler system must be permanently connected with a direct data link or other approved monitoring system to a fire station or fire station dispatch centre in accordance with AS 2118.1:2017.

    g. Sprinkler valves must be provided to permit each floor to be isolated separately. The intent of this requirement is to prevent large areas of the building being unprotected at any one time.

    h. Records must be maintained such that there will be no confusion as to which sprinkler head belongs to which sprinkler valve.

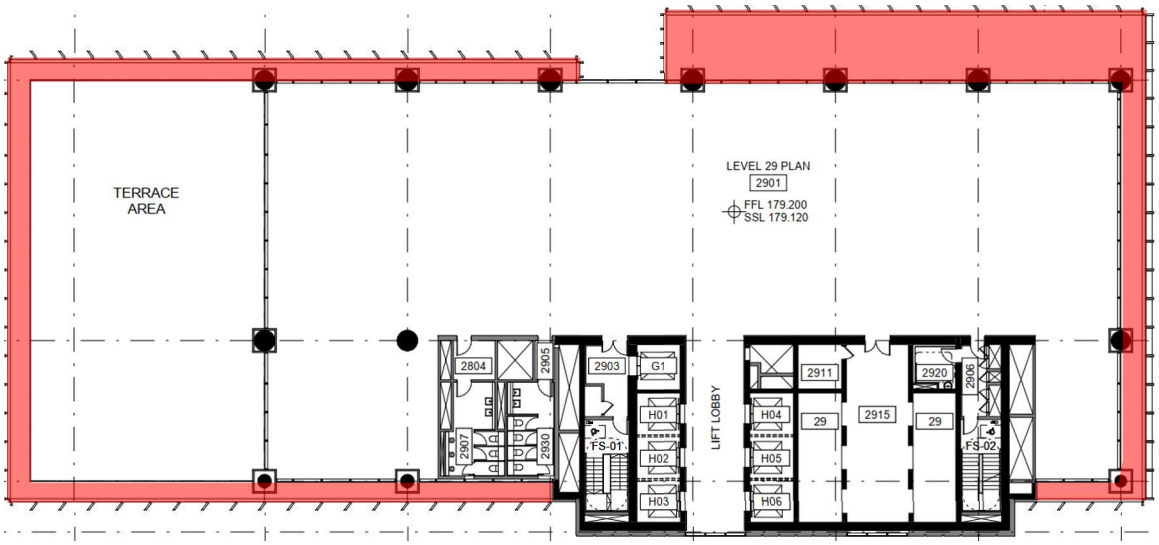
    i. The sprinkler system is to be provided with a dual water supply as set-out in specification E1.5 of the NCC and AS 2118.1:2017.

30. Sprinklers are proposed to be omitted from the external terraces on levels 15 and 29 which are only accessible for maintenance by the building maintenance unit – refer to Figure 13 and Figure 14. Fire rated separation is not required to be provided between the sprinklered and non-sprinklered areas.



Areas where sprinklers are omitted
No separation required between sprinklered and non-sprinklered areas

Figure 13 Omission of sprinklers – level 15 external terrace



Areas where sprinklers are omitted
No separation required between sprinklered and non-sprinklered areas

Figure 14 Omission of sprinklers – level 29 external terrace

31. Portable fire extinguishers must be provided as listed in table E1.6 of the NCC and must be selected, located and distributed in accordance with sections 1, 2, 3 and 4 of AS 2444-2001.

32. The OSD fire control room must comply with specification E1.8 of the NCC except for the following:
    a. Access to the fire control room requires a change in level of 600mm instead of 300mm.
    b. The two paths of travel to the fire control room are not from the front entrance of the building or from a fire-isolated passageway – refer to Figure 12.

5.4.3 Smoke hazard management

33. An analogue addressable smoke detection system in accordance with section 7 of AS 1670.1:2018 must be provided throughout the OSD. The following requirements are applicable:
    a. At least one detector shall be provided in every room throughout the building, except smoke detectors are not required in kitchens and other areas where the use of the area is likely to result in smoke detectors causing spurious signals.
    b. Smoke detectors located below ceiling level must be arranged as follows:
        – The distance from any point of the soffit of the protected area to the nearest detector does not exceed 7m. Ceiling pockets created by beams and other ceiling geometry such as ducts, bulkheads and the like need not be considered.
        – The distance from any detector and the nearest detector to it shall not exceed 10m.
        – The distance from the nearest row of detectors to any wall or partition shall not exceed 5m or be less than 300mm.
34. Smoke detectors required to activate air pressurisation systems for fire-isolated exits and zone smoke control systems must:
    a. be installed in accordance with AS 1670.1:2018, and
    b. have additional smoke detectors installed adjacent to each bank of lift landing doors set back horizontally from the door openings by a distance of not more than 3m.
35. All air-handling systems capable of recycling air between the fire compartments must be provided with smoke dampers where the air-handling ducts penetrate any elements separating the fire compartments served in accordance with clause E2.2 of the NCC. The system must be arranged such that the air-handling system is automatically shut down and the smoke dampers close by smoke detectors complying with clause 7.5 of AS 1670.1:2018.
36. The OSD must be provided with a zone pressurisation system between vertically separated fire compartments in accordance with table E2.2a of the NCC and AS/NZS 1668.1:2015.
37. All fire-isolated stairs, passages and lobbies serving the OSD must be provided with a stair pressurisation system in accordance with table E2.2a and AS/NZS 1668.1:2015.

5.4.4 Emergency lighting, exit signs and warning systems

38. An emergency lighting system must be installed throughout the OSD in accordance with clauses E4.2 and E4.4 of the NCC and AS/NZS 2293.1:2018.
39. Exit signs and directional signs must be installed throughout the OSD in accordance with clauses E4.5, E4.6 and E4.8 of the NCC and AS/NZS 2293.1:2018.
40. An emergency warning and intercom system in accordance with clause E4.9 of the NCC and AS 1670.4:2018 with pre-recorded verbal evacuation message must be provided. The system must be audible throughout the building, including external areas where evacuation back into the building is required.

5.5 Fire safety management and training

41. An emergency management plan complying with AS 3745-2010 must be developed and implemented for the building within three weeks of occupation.
Once the emergency management plan is developed, it is to be implemented with exercises, periodic audits, and suitable procedures to maintain safety. This should include training under simulated fire emergency conditions for all relevant personnel.

42. A fire safety management plan (FSMP) must be developed for the building. A FSMP is an overview of the fire safety systems installed throughout the building, with additional information relating to maintenance, housekeeping and procedures. This document must include the following information as a minimum:
    a. Identification of the building owner / manager responsible for implementation of the FSMP.
    b. A set of drawings showing the following fire safety measures for ease of maintenance and reference:
        – fire / smoke compartmentation
        – location and width of exits and paths of travel
        – fire hydrants
        – warden intercom phones
        – fire detection control and indicating equipment (FDCIE), fire fan control panel (FFCP) and mimic panel etc.
        – fire-fighting services including the booster assembly, fire pump rooms and fire control room
        – sprinkler, smoke hazard management and emergency warning zones
    c. Maintenance requirements for the fire safety measures in the building in accordance with the relevant Australian standards and applicable legislation.
    d. Identification of any performance solutions and associated fire safety measures.
    e. Requirement for an emergency evacuation plan to be developed, implemented and maintained for the building in accordance with AS 3745-2010.
    f. General housekeeping procedures to minimise the fire risks within the building.
    g. Fire risk management procedures for maintenance and building works, including:
        – Isolation of any of the fire safety measures for the building should be the subject of a risk assessment and approval process controlled by the owners / management.
        – Maintenance works requiring shutdown or isolation of the sprinkler system should be undertaken outside of normal business / trading hours when possible.
        – If the sprinkler system is isolated or turned off for an extended period – e.g. more than two days – the relevant area must be temporarily fire separated from the remainder of the building by fire-rated construction. A risk assessment should be undertaken to determine the appropriate fire rating and identify whether other fire safety measures are necessary during the period of isolation. The insurers and fire brigade are also to be notified in the event of extended sprinkler shutdown.
        – Procedures for all ‘hot work’ such as welding, oxyacetylene cutting, paint stripping, vinyl laying etc. Where conducted outside the confines of a dedicated

workshop, these works should be the subject of a hot works approval process controlled by the building owner / manager.

h. The FSMP is to be reviewed on an annual basis or whenever alteration and additions, changes in use, population or fire safety measures occur.

5.6 Commissioning of fire safety strategy

43. The building work and fire safety measures relating to the performance solution report must be inspected by an appropriately qualified fire safety engineer prior to occupation to confirm that the holistic performance is consistent with these requirements. Detailed inspections and commissioning tests for the building fire safety systems will need to be undertaken separately by the relevant consultants and/or installers.
Table 3 sets out what will be required as a minimum.

Fire safety measures	Certification from relevant consultant / installer	Visual spot checks by fire safety engineer / interview installer	Holistic witness testing by fire safety engineer
Fire rating of structural elements	✓	✓	
Fire and/or smoke doors	✓	✓	
Exits and paths of travel		✓	
Emergency lighting and exit signage	✓	✓	
Portable fire extinguishers	✓	✓	
Smoke detection system	✓	✓	✓
Emergency warning and intercom system	✓		✓
Sprinkler system	✓	✓	✓
Fire hydrant system	✓	✓	✓
Stair pressurisation	✓		✓
Zone smoke control	✓		✓

Notes:

- **Operation of smoke detectors will need to be simulated using smoke aerosol spray.**
- **Operation of sprinkler system will need to be demonstrated by opening test valve.**
- **Operation of smoke control systems / EWIS will need to be witnessed following activation of smoke detection / sprinkler system, including holistic check of general air movements for design scenarios.**
- **Hydrant valve to be opened to confirm that the system is charged.**

Table 3 Required certificates and testing

6. Fire safety measures – OSD enabling works

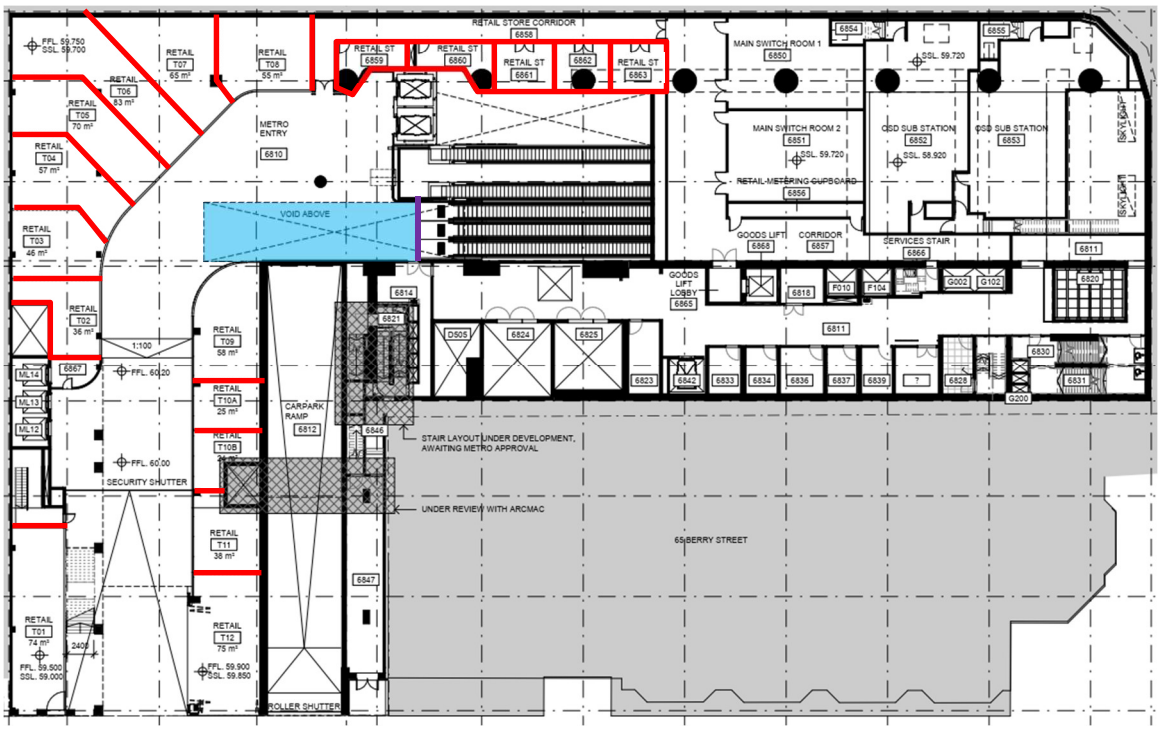
The following fire safety measures are proposed for the OSD enabling works as a starting point for the fire safety engineering assessment to achieve compliance with the relevant performance requirements of the NCC 2016 Amendment 1.

6.1 General

1. The design of the OSD enabling works must comply with the DTS provisions of BCA 2016 amendment 1 relating to fire safety except specifically mentioned. This section does not provide a comprehensive list of fire safety measures required by the DTS provisions of the BCA 2016 amendment 1. The fire safety measures listed within this section relate only to the performance solutions. The fire safety measures must be read in conjunction with the DTS provisions of the BCA 2016 amendment 1.
2. This report and the requirements listed in this section must be implemented into the design and identified on the fire safety schedule for the building. They must be maintained and certified in accordance with the Environmental Planning and Assessment Regulations 2000 and relevant Australian standards.

6.2 Structural fire resistance

3. The FRLs of the building elements must be designed in accordance with the requirements of specification C1.1 of the BCA for a building of type A construction except where otherwise specified.
4. The minimum FRL criteria for any element within the retail areas is 120 minutes – e.g. if an element is required to achieve an FRL of 180/120/90, it can be reduced to 120/120/90.
5. The minimum FRL criteria for any element within the bicycle parking facility on basement level 2 is 120 minutes – e.g. if an element is required to achieve an FRL of 240/180/90, it can be reduced to 120/120/90.
6. Emergency equipment required to operate during a fire and equipment having a high fire hazard or potential for explosion must be enclosed in construction which achieves an FRL of not less than 120/120/120 as required by clauses C2.12 and C2.13 of the BCA, or as directed by the utility authority who may have additional requirements.
7. The OSD basement carpark must be separated from the Station areas at levels B1 to B6 by construction with an FRL of not less than -/120/120. Doorways in fire walls must be protected by a self-closing or automatic closing -/120/30 fire door in accordance with clause C3.5 of the BCA.
8. The retail inter-tenancy walls within the Denison Link retail must be fire rated by construction fire separated by construction achieving an FRL of not less than -/120/120 – refer to Figure 15. Note: The extent of fire separation required may be further rationalised and locations subject to change.
9. The retail storage units within the Denison Link retail must be fire separated by construction achieving an FRL of not less than -/120/120, with the doorways protected by -/120/30 self-closing fire doors. Refer to Figure 15.



-/120/120 fire wall and -/120/30 fire doors

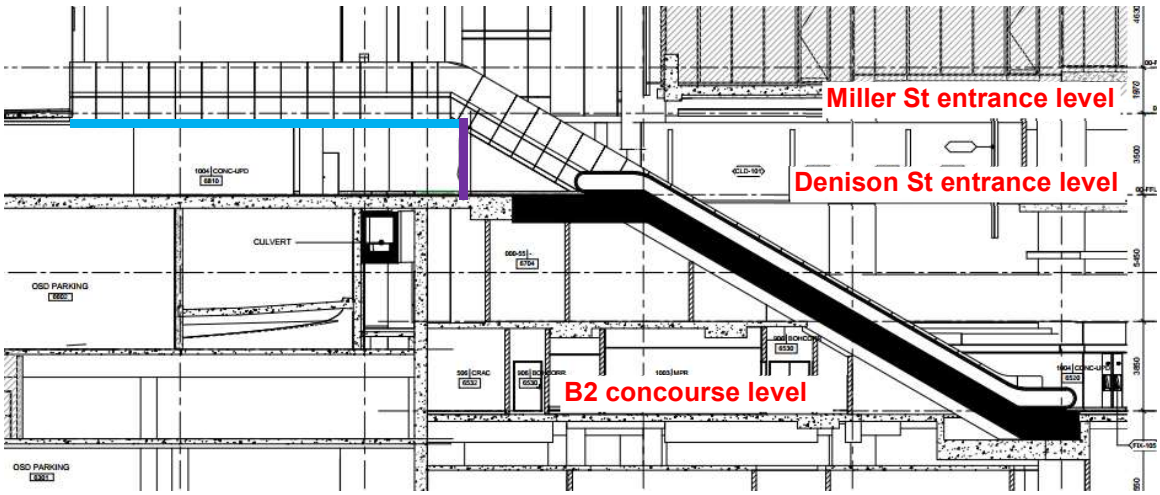
-/120/- vertical fire shutter or curtain

-/120/- horizontal fire shutter or curtain

Figure 15 Denison Link retail – fire separation (plan)

10. The Denison Link retail must be separated from the Station areas as follows:
    a. Vertical fire shutter or curtain at the top of the escalators from B2 concourse level
    b. Horizontal fire shutter or curtain at the void to Miller Street entrance level

    Refer to Figure 15 and Figure 16.



-120/- vertical fire shutter or curtain

-/120/- horizontal fire shutter or curtain

Figure 16 Denison Link retail – fire separation (section)

11. The fire shutters / curtains referred to in item 10 must comply with the following requirements:
    a. The shutters / curtains must achieve an FRL of not less than -/120/-.
    b. The shutters / curtains must automatically close upon smoke detector or sprinkler activation within the Denison Link retail.
    c. The shutters / curtains are not required to close in the event of a fire alarm within the Station.
    d. Upon deployment of the shutters / curtains, passenger information displays located at the concourse level and Denison Street entrance level, supplemented by automated PA announcements, must notify occupants that the escalators between these levels are not to be used.
    e. Operating mechanisms and material shall ensure satisfactory operation for the fire shutters / curtains during the expected lifetime of not less than 10 years.
    f. The fire shutters / curtains must be deployed in the closed position upon power failure.
    g. Physical obstructions must be constantly monitored via an inbuilt sensor system with supplementary alarm tone and voice message integration to alert occupants of potential objects obstructing the vertical fire shutter / curtain from full deployment.
    h. Maintenance must be as follows:
        – Manual deployment via smoke detection and switch at control panel to be undertaken 3-monthly under specification from the supplier/installer – or more frequently if specified by the manufacturer's specifications.
        – Testing of fail-safe by disconnecting power to control panel must be undertaken 3-monthly – or more frequently if specified by the manufacturer's specifications.
        – Essential service to be maintained 6-monthly by trained and competent technicians – or more frequently if specified by the manufacturer's specifications.

12. The podium office building, including the northern laneway retail at Miller Street level, must be separated from the OSD entry lobby (level 2 and below), station areas (level 3 and level 3 mezzanine) and OSD (level 4) by construction with an FRL of not less than -/120/120.
13. The fire separation as noted in item 12 may include glazed construction instead of -/120/120 fire rated construction provided the following criteria is achieved:
    a. The glass must be toughened and laminated – i.e. two layers of toughened glass - with a minimum thickness of 2x6mm with a plastic polyvinylbutral (pvb) interlayer not less than 0.38mm thick.
    b. The glass must have polished edges to mitigate the risk of failure of the glass at low temperatures due to imperfections at the glass edge.
    c. The maximum height of the glass must not exceed 3.96m.
    d. Frames must be non-combustible with no horizontal transoms or mullions. Butt-joints sealed with an appropriate silicone based sealant capable of withstanding at least 200°C may be used between the individual frameless panes.
    e. The glazing must be fully protected on both sides by quick response Tyco Model WS™ 5.6 K-factor pendent vertical or horizontal sidewall sprinkler heads.
    f. The water supply must be capable of protecting the glazing on one side for not less than 60 minutes at the same time as the general sprinkler system is operating, taking into account sprinkler hazard classifications and the number of wall-wetting sprinklers operational. The water supply shall be dual supply as defined by AS 2118.1:2017 e.g. one town main and one reduced capacity pump suction tank with automatic inflow. Where automatic inflow is available to a pump suction tank, with inflow to make up any reduction in storage capacity within the required time period, the minimum storage capacity shall be one-third.
    g. The wall-wetting sprinklers must be supplied from a separate valve that does not serve the sprinkler system protecting the relevant side of the glazing to be protected.

6.3 Access and egress

14. The podium office is provided with a single exit from each storey instead of two.
15. The maximum travel distance to a single exit in the podium office is 30m instead of 20m.
16. The maximum travel distance to a point of choice of two exits in the southern laneway building is 30m instead of 20m.
17. The following maximum travel distances apply to the basement carpark levels:
    a. 30m to a single exit or point of choice instead of 20m
    b. 60m to the closest of two or more alternative exits instead of 40m
    c. 90m between alternative exits instead of 60m.
18. All paths of travel to exits must be not less than 1m in clear width in accordance with clause D1.6 of the BCA, with the exception of the gates providing egress via the OSD lobby on level 2 – which only achieve a clear width of 900mm.
19. The exits from the OSD lobby, podium office building and southern laneway building are illustrated in Figure 17. The unobstructed width of a doorway must be not less than the unobstructed width of each exit minus 250mm.

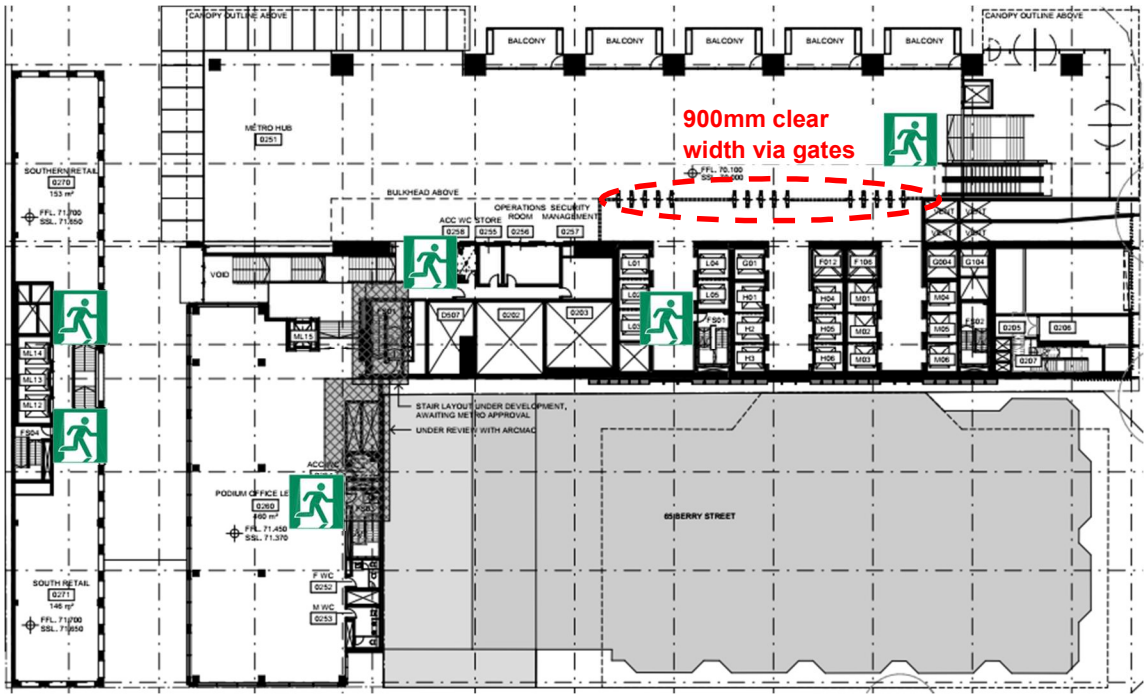


Figure 17 Exits from OSD lobby, podium office and southern laneway building (level 2 shown)

20. All doorways which form part of a required exit within the building must be made to swing in the direction of travel to the fire-isolated exit and from the exit to the discharge point from the building in accordance with clause D2.20 of the BCA.
21. Doors in required exits, forming part of required exits or in the paths of travel to required exits must comply with clause D2.21 of the BCA.
22. The fire-isolated stairs serving the OSD, the basement carpark and the podium office require occupants to travel within a fire-isolated passageway that is shared with Victoria Cross Station before discharging to road and open space – see Figure 18.
23. The fire-isolated-passageway shared between the OSD and Victoria Cross Station must achieve an FRL of not less than 120/120/120 and achieve an unobstructed width of 2m – see Figure 7.

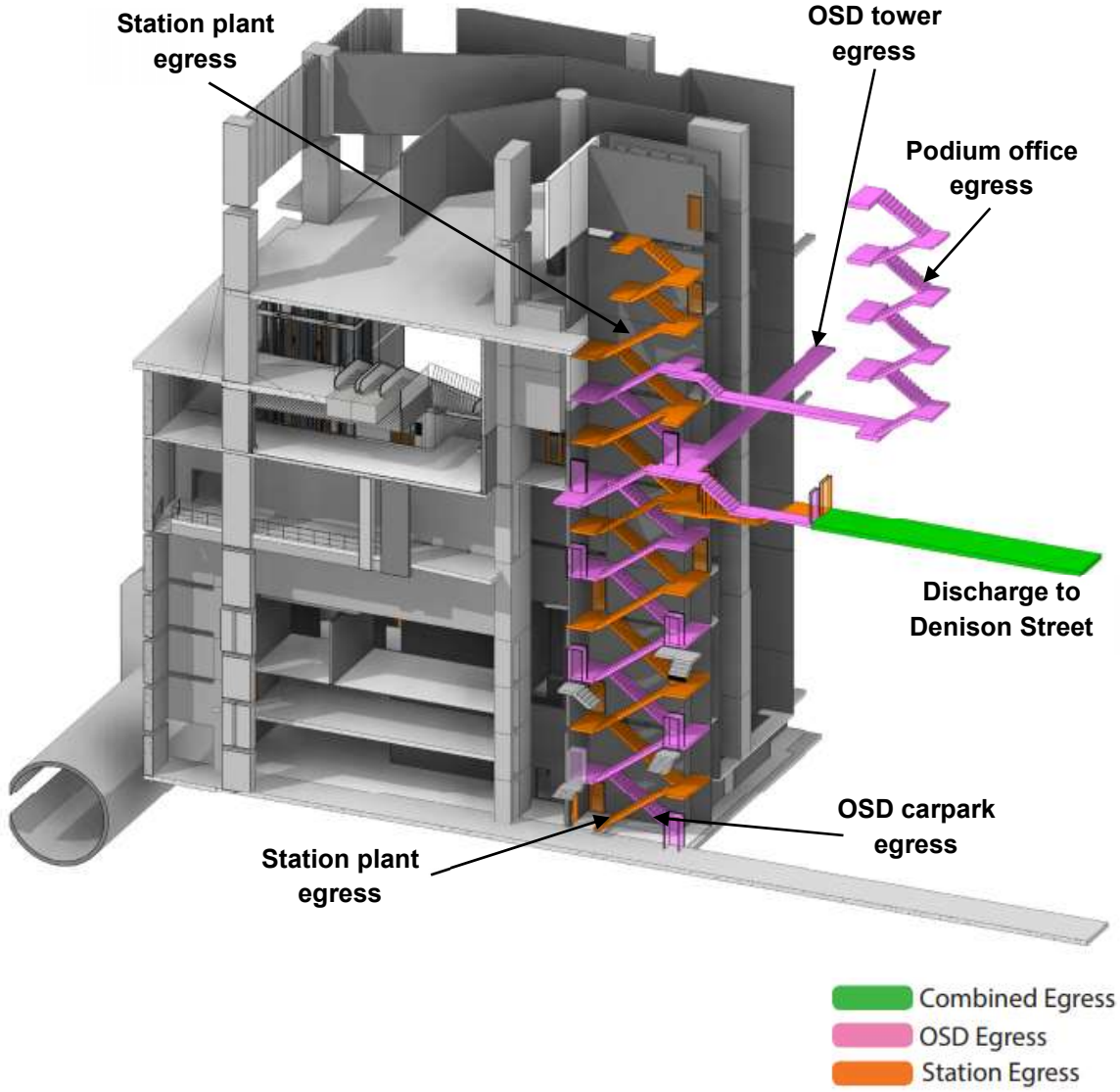


Figure 18 Combined egress

24. The fire-isolated stair serving the basement carpark discharges within a covered area – i.e. below the Miller / Denison through link. The covered area is not open for at least 1/3 of its perimeter, travel to open space is more than 6m (approximately 8m) and the unobstructed clear height is less than 3m (approximately 2.7m). Refer to Figure 19.

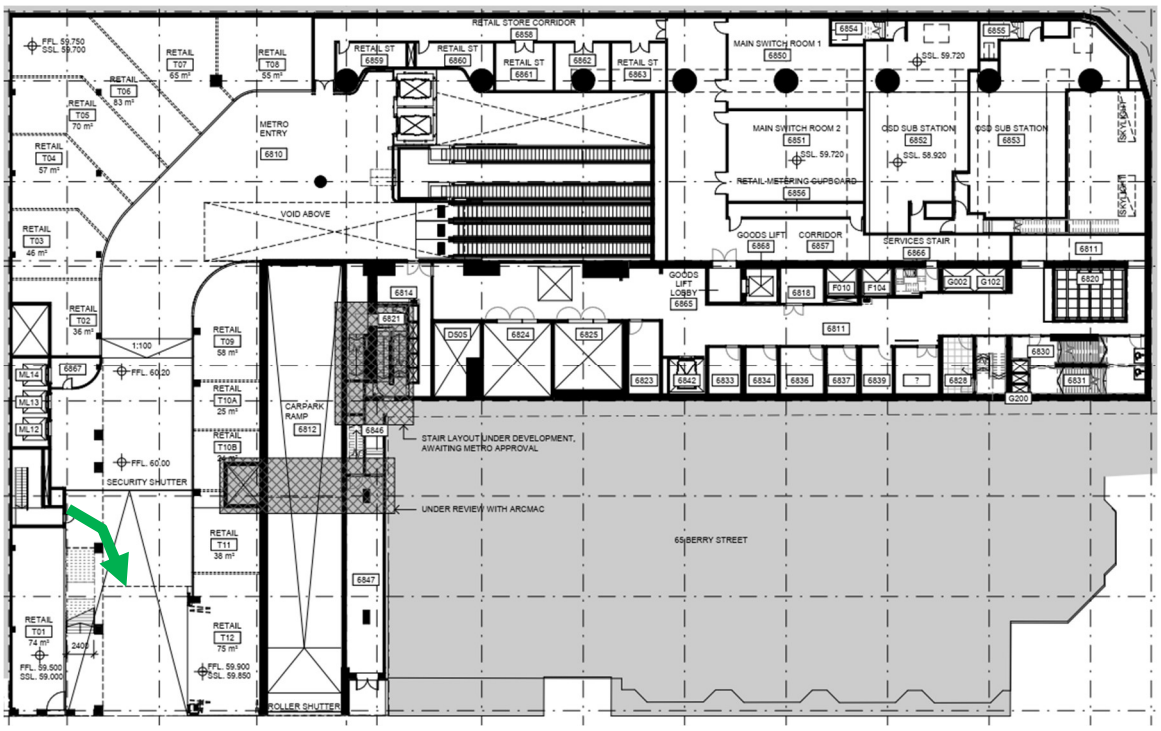
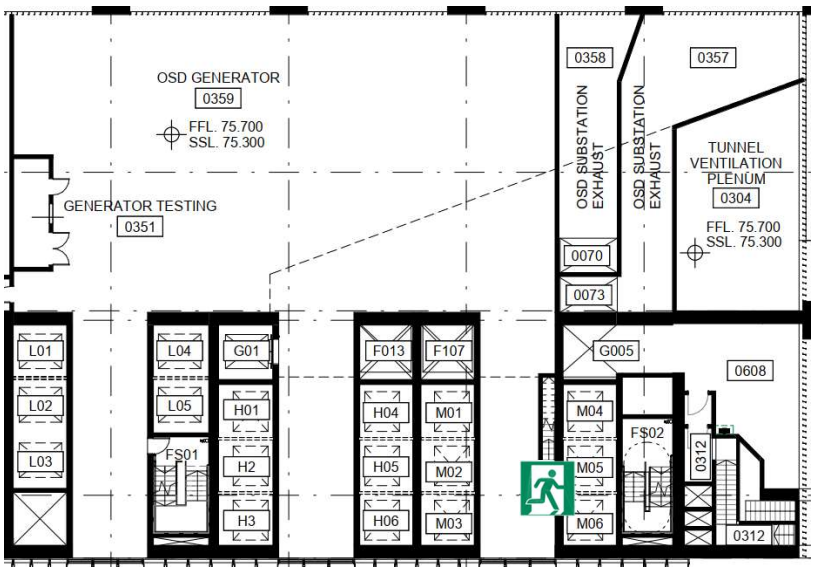
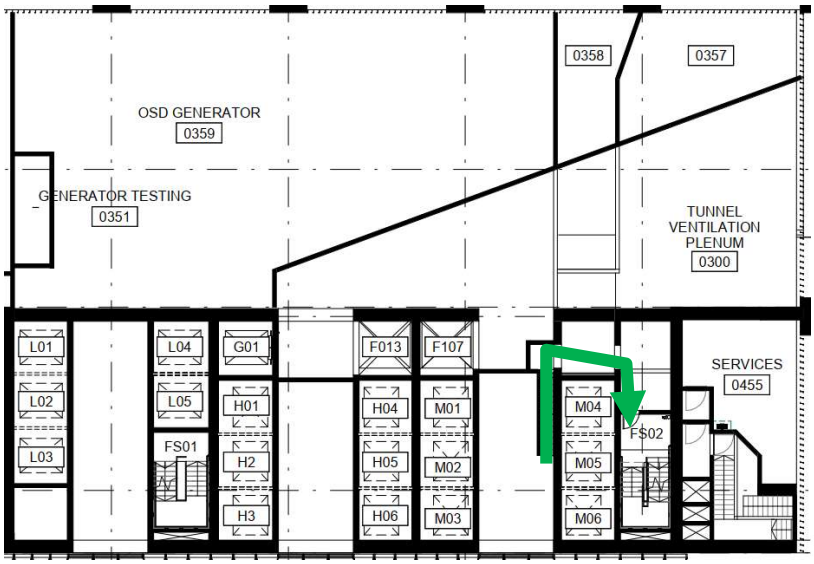


Figure 19 Discharge of basement carpark fire stair under Miller / Denison through link

25. The non-fire-isolated stair serving the level 3 plant room discharges within the confines of the level 3 mezzanine. Occupants are required to traverse along the mezzanine to reach the fire-isolated exit and are not provided with a continuous means of evacuation. Refer to Figure 20.
26. The non-fire-isolated stair serving the basement 1 mezzanine water storage area discharges within the confines of basement 1. Occupants are required to traverse on basement level 1 to reach either of the fire-isolated exits and are not provided with a continuous means of evacuation. The basement 1 mezzanine water storage area is also only provided with a single exit instead of two. Refer to Figure 21.

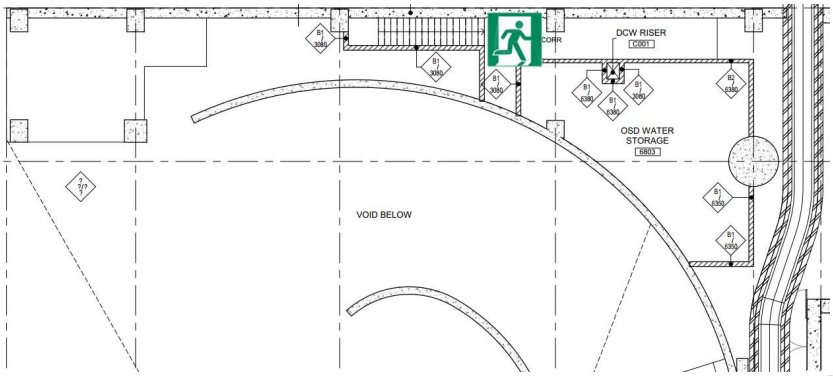


Level 3



Level 3 mezzanine

Figure 20 Evacuation from level 3 plant



Basement 1 mezzanine

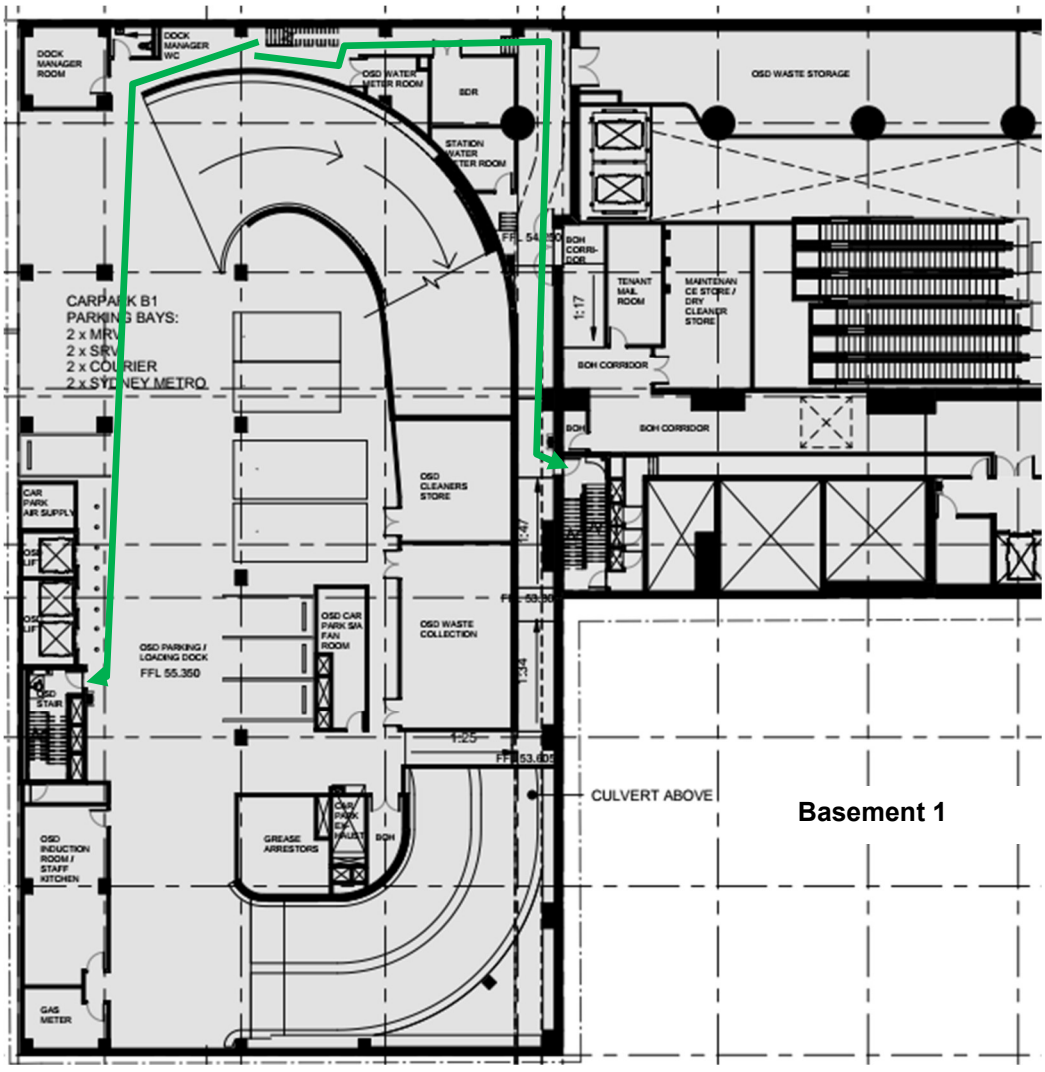


Figure 21 Evacuation from basement 1 mezzanine OSD water storage area

27. The automatic doors to the OSD lobby – refer to Figure 22 – must achieve the following characteristics:
    a. The doors must serve as a required exit for the OSD lobby on level 2 only – i.e. the doors must not serve as a required exit for the podium office.
    b. The doors must be able to be opened manually under a force of not more than 110N. This includes situations where there is a malfunction or failure of the power source to the doors.
    c. The doors are not required to open automatically if there is a power failure to the doors or on activation of a fire or smoke alarm in the building. The automatic sliding doors must be readily openable from the side that faces a person seeking egress by a green push button device located between 900mm and 1.2m from the floor. Signage must be located above or on the button stating,

       PUSH TO EXIT

       in letters not less than 50mm high and in a colour contrasting with that of the background.
    d. The automatic sliding doors must be provided with a 60-minute battery backup that is monitored by building management.

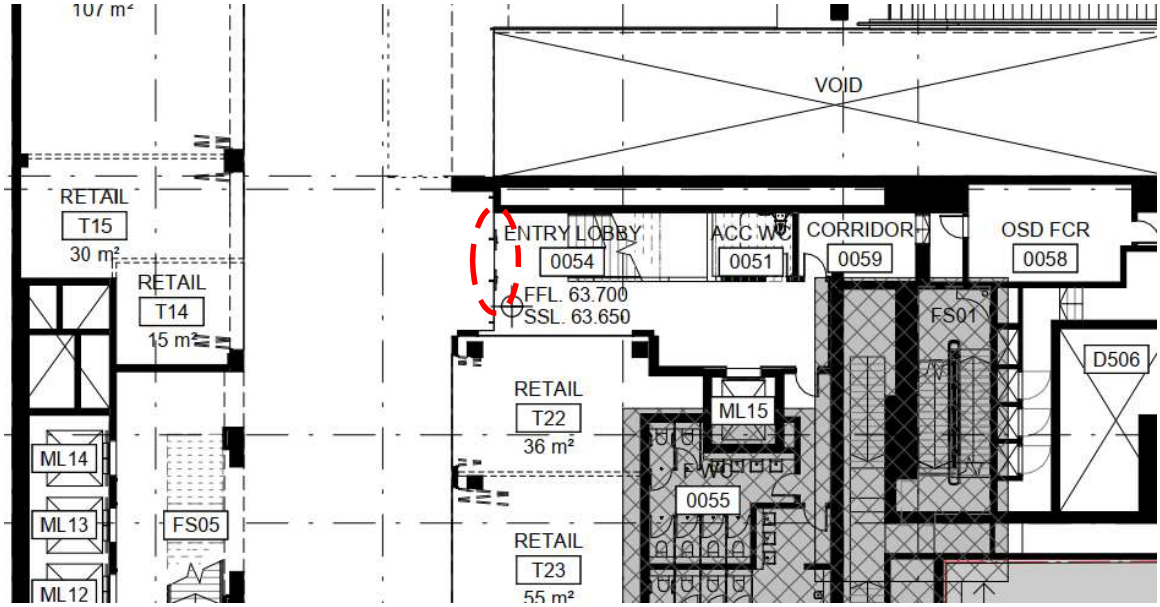


Figure 22 Auto doors to OSD lobby (Miller Street level)

6.4 Services and equipment

6.4.1 Delineation of wet and dry fire safety systems

28. The delineation of wet and dry fire safety systems, between the OSD and Victoria Cross Station are illustrated in Figure 8 to Figure 11.

6.4.2 Firefighting equipment

29. The combined sprinkler and hydrant system must comply with the requirements of AS 2118.1:2017 and AS 2419.1-2005, except where modified by AS 2118.6-2012 or otherwise stated within this report.
30. A fire hydrant system must be installed throughout the building in accordance with the requirements of clause E1.3 of the BCA and AS 2419.1-2005.
31. All of the hose connections in the system are to be fitted in accordance with FRNSW technical information sheet – FRNSW compatible hose connections available at firesafety.fire.nsw.gov.au. These couplings must be tested as part of the system when the commissioning tests are undertaken.
32. The locations of the Station booster assembly (which serves the station and the OSD enabling works) and the OSD booster assembly (which serves the OSD above level 4), are illustrated in Figure 23. Each booster must be identifiable by a red strobe light which is activated by an alarm signal from the fire detection control and indicating equipment (FDCIE).

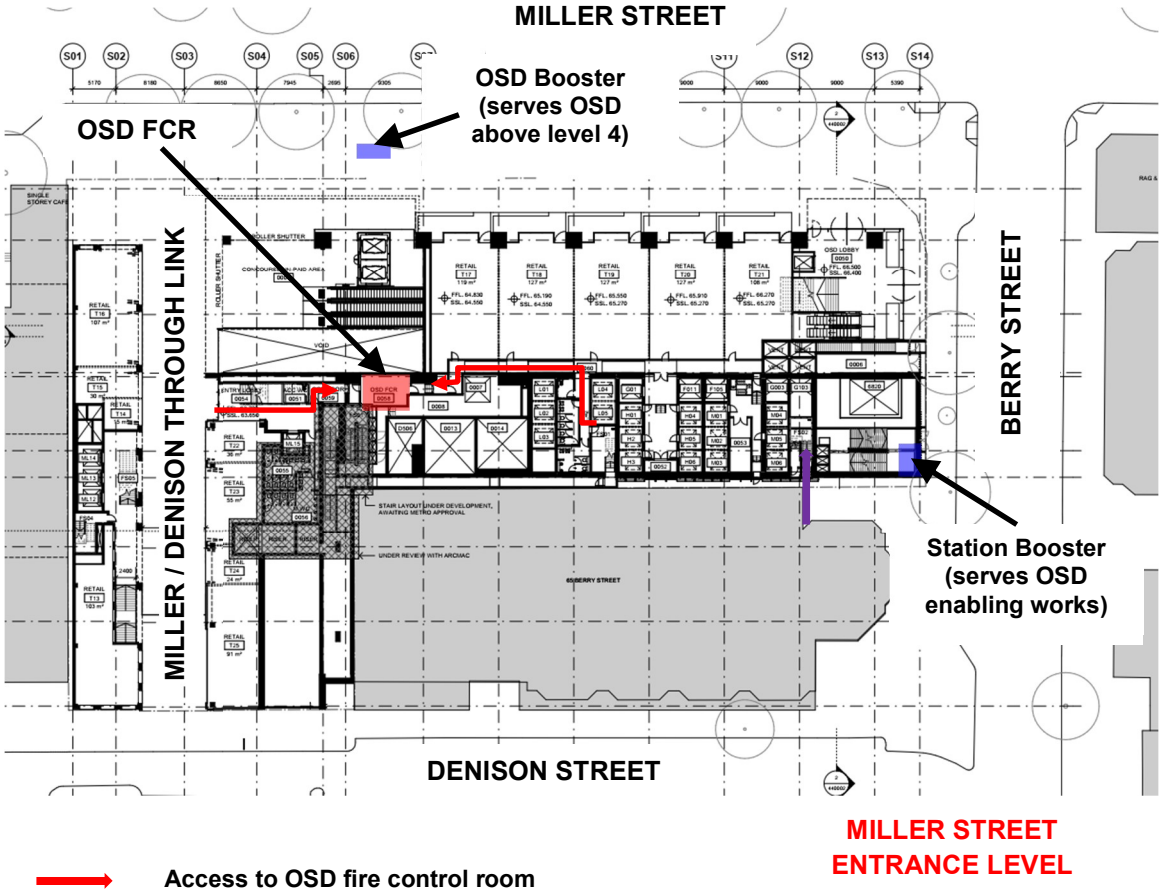


Figure 23 Location of fire hydrant booster assemblies and access to fire control rooms

33. A fire hose reel system must be installed through the basement carpark in accordance with the requirements of clause E1.4 of the BCA and AS 2441-2005.
34. Fire hose reel coverage is not proposed to be provided to the retail and office areas.

35. A sprinkler system in accordance with the requirements of specification E1.5 of the BCA and AS 2118.1:2017 must be provided throughout the OSD enabling works, except where stated within this report. The sprinkler system must have the following additional characteristics:
    a. All sprinkler heads must be fast response with an RTI of 50(ms)$^{1/2}$ or less in accordance with the requirements of AS 2118.1:2017.
    b. Concealed, recessed or flush-mounted sprinkler heads must not be used except where noted below as it may delay sprinkler activation. Semi-recessed sprinkler heads are considered acceptable provided they achieve a fast response rating.

       Note: Concealed, recessed or flush-mounted fast response sprinkler heads are acceptable in areas with limited / low fire load such as lift lobbies.

       Subject to review by an appropriately qualified fire safety engineer, the use of flush-mounted heads is also acceptable within other areas of office and retail fitouts – e.g. circulation corridors / spaces, areas with feature ceilings etc. A statement of approval from the fire engineer must be included in the as-installed fire services operations and maintenance instruction manuals and referenced on the as-installed fire services drawings.
    c. Activation temperature of 68°C except where otherwise required by AS 2118.1:2017.
    d. Activation of the sprinkler system must operate the smoke hazard management systems of that area and activate the sound system and intercom system for emergency purposes as appropriate.
    e. The sprinkler system must be zoned to match the zoning of the smoke hazard management systems.
    f. The sprinkler system must be permanently connected with a direct data link or other approved monitoring system to a fire station or fire station dispatch centre in accordance with AS 2118.1:2017.
    g. Sprinkler valves must be provided to permit each floor to be isolated separately. The intent of this requirement is to prevent large areas of the building being unprotected at any one time.
    h. Records must be maintained such that there will be no confusion as to which sprinkler head belongs to which sprinkler valve.
    i. The sprinkler system is to be provided with a dual water supply as set-out in specification E1.5 of the BCA and AS 2118.1:2017.
36. The sprinkler system to the retail storage units associated with Denison Link retail may be designed to ordinary hazard 3 instead of high hazard, subject to the fire separation of the retail storage units in item 9 – refer to Figure 15. The overall storage height and the maximum storage area within the individual units must comply with appendix A4.2.2 of AS 2118.1:2017.
37. Portable fire extinguishers must be provided as listed in table E1.6 of the BCA and must be selected, located and distributed in accordance with sections 1, 2, 3 and 4 of AS 2444-2001. The retail and office tenancies without fire hose reel coverage must be provided with a 4.5kg ABE type fire extinguisher, located in an accessible location by staff. This is in addition to extinguishers that may be required within kitchen areas of food and beverage tenancies.

38. The OSD fire control room must comply with specification E1.8 of the BCA except for the following:
    a. Access to the fire control room requires a change in level of 600mm instead of 300mm.
    b. The two paths of travel to the fire control room are not from the front entrance of the building or from a fire-isolated passageway – refer to Figure 23.
39. Block plans, with an A3 minimum size, indicating the location of the fire control room must be provided at the fire hydrant booster assembly and at the OSD lobby on level 2 off the main Miller Street / Berry Street entry. The site plan must be weatherproof and fade resistant.
40. Mimic panels for the OSD must be provided at the Station fire control room and at the OSD lobby on level 2 off the main Miller Street / Berry Street entry – e.g. at concierge desk. If provided within a cupboard, signage to the mimic panel must include lettering not less than 50mm high in a contrasting colour.
41. Areas that form part of the OSD enabling works must be able to be evacuated via both the Station fire control room and the OSD fire control room. The master panels for the OSD enabling works are to be located in the Station fire control room – refer to Figure 24. Sub-panels for the OSD enabling works are to be located in the OSD fire control room.

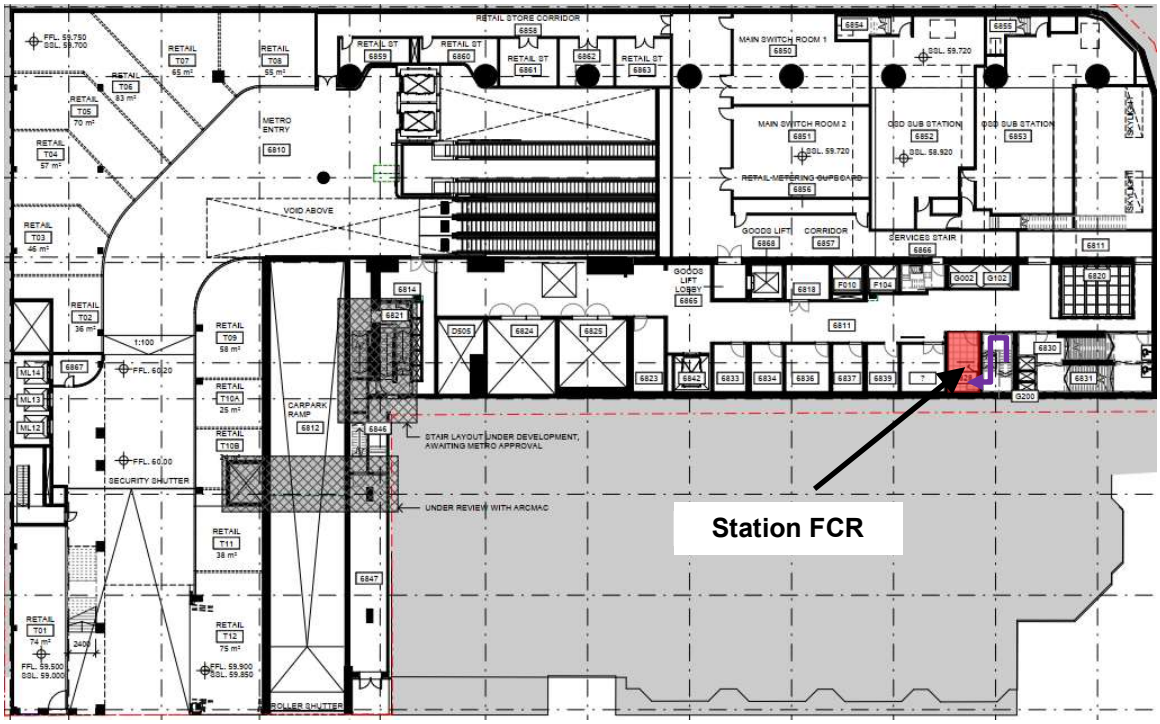


Figure 24 Location of Station fire control room

6.4.3 Smoke hazard management

42. An analogue addressable smoke detection system in accordance with section 7 of AS 1670.1:2015 must be provided throughout the OSD enabling works. The following requirements are applicable:
    a. At least one detector shall be provided in every room throughout the building, except smoke detectors are not required in kitchens and other areas where the use of the area is likely to result in smoke detectors causing spurious signals.
    b. Smoke detectors located below ceiling level must be arranged as follows:
        – The distance from any point of the soffit of the protected area to the nearest detector does not exceed 7m. Ceiling pockets created by beams and other ceiling geometry such as ducts, bulkheads and the like need not be considered.
        – The distance from any detector and the nearest detector to it shall not exceed 10m.
        – The distance from the nearest row of detectors to any wall or partition shall not exceed 5m or be less than 300mm.
43. All air-handling systems capable of recycling air between the fire compartments must be provided with smoke dampers where the air-handling ducts penetrate any elements separating the fire compartments served in accordance with clause E2.2 of the BCA. The system must be arranged such that the air-handling system is automatically shut down and the smoke dampers close by smoke detectors complying with clause 7.5 of AS 1670.1:2015.
44. The retail areas and the podium office are not required to be provided with a zone pressurisation system.
45. The fire stairs serving the basement carpark must be provided with a stair pressurisation system in accordance with table E2.2a of the BCA and AS/NZS 1668.1:2015, with the exception that the system is to be designed with three doors open – i.e. doors from two carpark levels and the final discharge door.

6.4.4 Emergency lighting, exit signs and warning systems

46. An emergency lighting system must be installed throughout the OSD enabling works in accordance with clauses E4.2 and E4.4 of the BCA and AS 2293.1-2005.
47. Exit signs and directional signs must be installed throughout the OSD enabling works in accordance with clauses E4.5, E4.6 and E4.8 of the BCA and AS 2293.1-2005.
48. A sound system and intercom system for emergency purposes in accordance with clause E4.9 of the BCA and AS 1670.4:2015 with pre-recorded verbal evacuation message must be provided. The system must be audible throughout the building, including external areas where evacuation back into the building is required.

6.5 Commissioning of fire safety strategy

49. The building work and fire safety measures relating to the performance solution report must be inspected by an appropriately qualified fire safety engineer prior to occupation to confirm that the holistic performance is consistent with these requirements. Detailed inspections and commissioning tests for the building fire safety systems will need to be undertaken separately by the relevant consultants and/or installers.
    Table 4 sets out what will be required as a minimum.

Fire safety measures	Certification from relevant consultant / installer	Visual spot checks by fire safety engineer / interview installer	Holistic witness testing by fire safety engineer
Fire rating of structural elements	✓	✓	
Fire and/or smoke doors	✓	✓	
Exits and paths of travel		✓	
Emergency lighting and exit signage	✓	✓	
Portable fire extinguishers	✓	✓	
Smoke detection system	✓	✓	✓
Sound system and intercom system for emergency purposes	✓		✓
Sprinkler system	✓	✓	✓
Fire hydrant system	✓	✓	✓
Fire hose reel system	✓	✓	
Stair pressurisation	✓		✓

Notes:

- Operation of smoke detectors will need to be simulated using smoke aerosol spray.
- Operation of sprinkler system will need to be demonstrated by opening test valve.
- Operation of smoke control systems / SSISEP will need to be witnessed following activation of smoke detection / sprinkler system, including holistic check of general air movements for design scenarios.
- Hydrant valve to be opened to confirm that the system is charged.

Table 4 Required certificates and testing

7. Agency consultation

This section documents the consultation undertaken with Fire and Rescue NSW in accordance with item (e) of condition B8 of SSD 8874. Consultation with Fire and Rescue NSW is ongoing and will be incorporated as part of the construction issue documentation.

7.1 Concept Design

Consultation with Fire and Rescue NSW (FRNSW) has been undertaken during Concept Design development by Sydney Metro. This included meeting on 20 September 2017 to discuss the Sydney Metro fire and life safety strategy for the stations and services. Appendix B includes the minutes of the meeting.

7.2 Detailed / AFT Design

Follow-up meetings were undertaken on 2 May 2019, 26 June 2019 and 13 August 2019 to familiarise FRNSW with the latest design for Victoria Cross Station and associated OSD, as well as discuss the proposed performance solutions. Appendix C, Appendix D and Appendix E include the minutes of the meetings on 2 May 2019, 26 June 2019 and 13 August 2019 respectively.

8. Conclusion

This report has been prepared in response to the requirements contained within the SEARs dated 6 May 2019 and condition of consent for the SSD 8874 for the OSD.

Condition B8	Response
Future detailed development application(s) shall be accompanied by a draft Fire and Rescue Assessment / Engineering Brief for the OSD prepared in consultation with Fire and Rescue NSW providing relevant details of:	A fire engineering brief has been developed for the OSD and issued to Sydney Metro on 22 August 2019 for distribution to Fire and Rescue NSW.
(a) The various sectors within the Victoria Cross Metro site served by independent fire systems (such as the OSD, the underground and aboveground metro sector, etc.)	Details of the independent fire safety systems serving the OSD, OSD enabling works and the Station are included in the fire engineering brief for the OSD and in sections 5 and 6 of this report.
(b) Fire engineering analysis of the pedestrian connection interfaces between the sectors and the sectors themselves, having regard to emergency occupant egress, fire and smoke compartmentation, smoke hazard management and fire fighting intervention	The proposed methods of analysis and acceptance criteria for the fire engineering analysis has been included in the fire engineering brief for the OSD. The fire engineering analysis is currently being undertaken and will be documented in the fire engineering report for submission to Fire and Rescue NSW.
(c) Adequacy of fire and life safety systems within the Victoria Cross Metro site in relation to the fire hazards of the Sydney Metro	The fire and life safety systems proposed for the OSD are documented in the fire engineering brief for review by Fire and Rescue NSW. The adequacy of these systems in relation to the fire hazards of the Sydney Metro will be confirmed as part of the fire engineering analysis in the fire engineering report.
(d) Design of fire hydrant systems for OSD elements that exceed 135m	The fire hydrant systems have been designed in accordance with the requirements of clause E1.3 of the NCC, AS 2419.1-2005 and AS 2118.1:2017. In addition, the design includes requirements based on AS 2419.1:2017 to meet FRNSW operational requirements for buildings exceeding 135m in height. Refer to section 5 of this report.
(e) Future consultation to be undertaken with Fire and Rescue NSW in respect of the final design and construction of the OSD and operational compatibility of the Victoria Cross Metro site's proposed fire and life safety systems.	Consultation with Fire and Rescue NSW is ongoing – refer to section 7.

Table 5 Condition B8 – SSD 8874

As detailed in this report, it is possible to develop performance solutions for the issues identified to demonstrate compliance with the relevant performance requirements of the NCC without major changes to the proposed OSD design.

The details of the proposed performance solutions are subject to the outcome of the fire engineering analysis which will be carried out generally in accordance with the International Fire Engineering Guidelines (IFEG).

The performance solutions for the building are currently being developed as part of the ongoing design and development process and documented in a format suitable for submission to the relevant approval authorities. It is noted that additional performance solutions may be identified during the ongoing design development process in consultation with the design team.

Appendix A Drawings and information

Drawing title	Dwg no	Date	Drawn
Denison Street Plan	SMCSWSVI-LLC-SVC-AT-DWG-521000	24/06/19	Bates Smart
Miller Street Plan	SMCSWSVI-LLC-SVC-AT-DWG-521001	24/06/19	Bates Smart
Level 01 Plan (Podium Office)	SMCSWSVI-LLC-SVC-AT-DWG-521010	24/06/19	Bates Smart
Level 02 Plan (OSD Lobby)	SMCSWSVI-LLC-SVC-AT-DWG-521020	24/06/19	Bates Smart
Level 03 Plan (Podium Office + Plant)	SMCSWSVI-LLC-SVC-AT-DWG-521030	24/06/19	Bates Smart
Level 03 Mezzanine Plan (Podium Office L04)	SMCSWSVI-LLC-SVC-AT-DWG-521035	24/06/19	Bates Smart
Level 04 Plan (Podium Office)	SMCSWSVI-LLC-SVC-AT-DWG-521040	24/06/19	Bates Smart
Level 05 Podium Office and Tower	SMCSWSVO-LLC-SVC-AT-DWG-420050	24/06/19	Bates Smart
Level 06-14 Low Rise Typical	SMCSWSVO-LLC-SVC-AT-DWG-420060	24/06/19	Bates Smart
Level 15 Mid Level Plant	SMCSWSVO-LLC-SVC-AT-DWG-420150	24/06/19	Bates Smart
Level 16-27 Mid Rise Typical	SMCSWSVO-LLC-SVC-AT-DWG-420160	24/06/19	Bates Smart
Level 28 Mid Rise Lift Overhead	SMCSWSVO-LLC-SVC-AT-DWG-420280	24/06/19	Bates Smart
Level 29 Mid Rise Terrace	SMCSWSVO-LLC-SVC-AT-DWG-420290	24/06/19	Bates Smart
Level 30-39 High Rise Typical	SMCSWSVO-LLC-SVC-AT-DWG-420300	24/06/19	Bates Smart
Level 40 Roof Plant	SMCSWSVO-LLC-SVC-AT-DWG-420400	24/06/19	Bates Smart
Level 43 Roof	SMCSWSVO-LLC-SVC-AT-DWG-420430	24/06/19	Bates Smart
North Elevation	SMCSWSVO-LLC-SVC-AT-DWG-430001	24/06/19	Bates Smart
West Elevation	SMCSWSVO-LLC-SVC-AT-DWG-430002	24/06/19	Bates Smart
South Elevation	SMCSWSVO-LLC-SVC-AT-DWG-430003	24/06/19	Bates Smart
East Elevation	SMCSWSVO-LLC-SVC-AT-DWG-430004	24/06/19	Bates Smart
North/South Section	SMCSWSVI-LLC-SVC-AT-DWG-540001	24/06/19	Bates Smart
East/West Section	SMCSWSVI-LLC-SVC-AT-DWG-540002	24/06/19	Bates Smart
Laneway Section	SMCSWSVI-LLC-SVC-AT-DWG-540003	24/06/19	Bates Smart
North/South Section	SMCSWSVI-LLC-SVC-AT-DWG-540005	24/06/19	Bates Smart

Other information	Ref no	Date	Prepared by
Building Code of Australia assessment report	2019/0506 R1.4	09/07/19	Steve Watson & Partners
Fire engineering brief – Stage 1 design: Underground stations design & technical services	NWRLSRT-MET-SRT-FL-REP-000003 rev P08	05/03/18	Sydney Metro

Appendix B FRNSW consultation – 20/09/17

Attendance:

- Mark Castelli – FRNSW
- Matthew Rowley – FRNSW
- Andy Tam – MTR
- David Sweetman – Metron
- Elliott Vercoe – Metron
- Roger Blackwell – TfNSW
- Shaohua Xia – FRNSW
- Patrick NG – MTR
- Will Marshall – Metron
- Geoff Pearce – Metron

Minutes:

1. TfNSW explained intent of meeting was to introduce Metron and the basis of fire safety design of their stations and service buildings.
2. TfNSW presented 4 copies of the tunnel alignment drawings, from Chatswood to Sydenham for reference throughout the project briefings and discussions.
3. Metron explained the limitation of areas associated with their works and interface needed to both linewide, as well as Martin Place and Central stations
4. Metron identified –
    a. Each station to have Fire Control Room, generally at surface
    b. Sprinkler booster, station hydrant booster and tunnel hydrant booster at each station
    c. all travel distances and egress times will be demonstrated by Fire Engineering, with ASET/RSET calcs and modelling.
    d. All escalators will be on essential supplies with those running in direction of egress to be maintained, those travelling towards the incident will slow to stop.
    e. All lifts are stretcher lifts and also on essential supplies, with UPS for homing.
    f. All plant rooms are fire separated.
    g. Over Station Development will be designed by Others, but all OSD areas will be fully fire separated. All OSD areas will be fitted-out separately as a part of that development. No services will be shared, separate fire water supplies and boosters, separate FCR, egress and other provisions.
5. Metron presented stations as being of 2 types,–
    a. Cut and Cover – Crows Nest; Barangaroo; Waterloo - all with Island platforms and having an enclosed, pressurised scissor stair at each end
    b. Cavern – Victoria Cross; Pitt Street (also includes Martin Place, but that station is designed by Others.) – all with separate caverns per platform and interconnecting adits to centralised egress routes having escalators and an enclosed, pressurised scissor stair at each end.
6. Barangaroo Station was discussed–
    a. Unusual escape stair arrangements in Pods at street level, with ground level egress facilities still under development.

b. Underground connection to future shopping centre – to be separated by a fire shutter.

7. Victoria Cross Station was discussed –
   a. Deep station, with lifts and stairs at one end, escalators lifts and stairs at other.
   b. Ground level to form a breezeway, allow natural smoke venting – FRNSW noted the detailed design at Chatswood demonstrated the need for smoke modelling to be undertaken with wind analysis.
8. Pitt Street Station was discussed –
   a. Cavern station with 2 separate OSD towers, ground level wraps around Edingburgh Castle Hotel.
   b. Separate FCR and FIP for towers and station, with interlink for information
   c. Shared egress stairs from above ground areas shared, i.e. car park and service rooms. FRNSW queried the clarity of direction and separation between areas especially if their access opposes direction of general population's egress.
9. Metron presented an outline of their FEB, which included Over Station Development Transfer levels, but excludes the OSD as such. Metron confirmed:
   a. clarified that Metro boosters would comprise separate Tunnel and Station systems, with the Tunnel boosters to be separate for tunnels each side of the station. OSD boosters are to be completely separated from Metro boosters.
   b. clarified that the NFPA standards and ASA standards are considered reference documents only and are not mandated.
   c. identified that platform/train evacuation scenarios were based on a single missed headway to both up and down track for both design and high challenge events, using AW4 loadings, SFAIRP principles will be adopted for Extreme cases.
   d. confirmed 10MW train fires are assessed for structural integrity, but smoke control and egress assessments are limited to 3MW as fire growth beyond this would be after evacuation completed.
   e. Concourse smoke exhaust is generally provided with a dedicated exhaust system (with the exception of Pitt Street). Station entrances are provided with natural ventilation.
   f. Egress provisions are generally based around 2 x 2m wide fire separated paths at each end of the platforms, with a total of 8 wheelchair refuges within the stairwell.
   g. Pedestrian modelling has been performed to demonstrate maximum of 8 minutes queue time, with ASET/RSET calcs to support this
10. FRNSW queried the assessments performed for bomb threat evacuation. It was discussed that this is currently not included, but given the increased terrorist threat, could be included within the next design phase if instructed by TfNSW.
11. FRNSW queried the inclusion of fare gate opening and Opal card instructions during evacuation, as recent example at Wynyard station demonstrated delays as passengers attempted to "tap-off" despite the Opal system being shut down during the evacuation. TfNSW to review arrangements and potential for messages with the Operator – currently represented by MTR.
12. FRNSW queried Stabling areas and how doors would be opened during an incident at the stabling. TfNSW to review arrangements and potential for messages with the Operator – currently represented by MTR.

13. FRNSW advised that from the broad overview of the preliminary station designs presented there didn't appear to be any issues of major concern at this stage of the design phase. Notwithstanding, FRNSW advised that further assessment of the submitted drawings may identify issues that may be of concern and need resolution.
14. Post meeting comment: FRNSW advised that once the station designs progress to the final detailed stages and further consultations are undertaken, there is potential for design issues to arise that may be of concern to FRNSW with regard to fire and life safety or detrimentally impact FRNSW firefighting operations. As per previous infrastructure stakeholder engagement and protocol, FRNSW will welcome engagement with the project's design team to work through any issues of concern to achieve safe and satisfactory resolutions.

Appendix C FRNSW consultation – 02/05/19

warringtonfire
Proud to be part of element

Warringtonfire
ABN: 81 050 241 524
P: 02 9211 4333

Suite 802 Lvl 8, 383 Kent St
Sydney NSW
2000 Australia

Time	1pm	**Date**	02/05/2019
Job no	SY190062	**Issued**	02/05/2019
Project	Sydney Metro City & Southwest – Victoria Cross		

Meeting minutes

Attendees	Role	Organisation
Cherylene Teoh (CT)	Senior Project Manager	Lendlease
Peter Small (PS)	Fire Services Engineer	Lendlease
Chris Collignon (CC)	Architect – Station	Cox Architecture
Peter Ohnrich (PO)	Architect – OSD	Bates Smart
James Henriques (JH)	Design Manager (SSD & services)	ARCMAC
Michael Reidy (MR)	Fire Services Engineer	ARCMAC
Roger Blackwell (RB)	Engineering Manager	MTR
Mick Henly (MH)	Referral Authority	FRNSW
Shaohua Xia (SX)	Referral Authority	FRNSW
Yael Bornstein (YB)	Mechanical Engineer	Transport for NSW
Victor Tung (VT)	Fire Safety Engineer	Warringtonfire

Table 1 Stakeholders present at meeting

Agenda

- Introductions
- Site location and overview
- Previous FRNSW meeting
- Planning approval status
- Classifications of buildings and occupancy
- Design criteria
- Southern Building
- Northern Building
- Next steps

Refer to powerpoint presentation accompanying these minutes.

Purpose

The purpose of the meeting was to familiarise FRNSW with the latest design for Victoria Cross Station and associated Over Station Development (OSD).

warringtonfire

Key points discussed

1. CT provided a description of the site and project overview
2. CT provided an update regarding the planning approvals and indicative construction program
3. CT advised that the OSD will be designed to NCC 2019 whilst the station will be designed to NCC 2016 amendment 1
4. CC and PO provided descriptions of the Southern Building (Station), Southern Building (OSD) and Northern Building:
   - Fire stairs and egress locations
   - Constraints associated with the Southern Building
   - Proposed locations of fire boosters and fire control rooms for the station and OSD, noting the differences from the reference design and tender design
   - Station booster, fire control room and access to fire stair located in close proximity to each other
   - Denison Street has bi-directional traffic in part and uni-directional traffic in part
   - Slope of McLaren Street was noted
   - Two OSD tower fire stairs will each be 1m in clear width. A performance solution will be undertaken to justify the shortfall in aggregate exit width on the mid rise floors (for a floor population of 218 persons) based on reduced smoke detection spacing and improved efficiency in stair usage through the provision of handrails on both sides of the stairs.
5. RB identified that the lifts may be required for the northern building evacuation due to the number of levels and suggested the provision of refuge spaces. CC identified that the current design contains a fire isolated passageway from platform which links to the station lifts which could be used as refuge or waiting areas.
6. MH and SX did not raise objections to the locations of the fire boosters and fire control rooms for the station and OSD at the meeting.
7. MH identified the gradient of McLaren Street may have an impact on brigade operation of the track booster. It was considered acceptable as long as the spatial requirements are met.
8. YB queried the potential use of smoke baffles and advised against the use of smoke curtains. The use of fire shutters to provide separation of the voids was discussed for the southern building Denison street station entry if station needs to be isolated from retail.

Conclusion

Should any of the stakeholders have any comments or inclusions for the meeting minutes please respond in writing to Lendlease as soon as practically possible. If no comments are received within 7 days it is assumed that all stakeholders accept and agree with the contents of the meeting minutes.

If you have any questions or would like to discuss this matter further please contact Cherylene Teoh of Lendlease on 0418 269 656.

Appendix D FRNSW consultation – 26/06/19

Meeting

Meeting No:	#2
Date:	26-Jun-19
Time:	9.45am-11.15am
Location:	Sydney Metro Offices, Level 39, 680 George St, Room 39.11

Attendees:		
	Cherylene Teoh	LLB
	Yael Bornstein	Sydney Metro
	Leander Noodijk	Metron
	James Henriques	ArcMec
	Shaohua Xie	FRNSW
	Greg Purvis	FRNSW
	David Absalom	FRNSW
	Quentin Li	Warrington Fire
	Victor Tung	Warrington Fire
	David Ibbotson	LLB
	Peter Small	LLAI
	Anthony Ljubicic	SWP
	Peter Ohnrich	Bates Smart
	Andrew Addindell	Metron
	Steven Le	Sydney Metro
Apologies:	Chris Collingon	Cox
Distribution:	Paul Elkington	LLB
	Clare Beker	LLB
	Mark Robertson	LLB
	Milka Gercis	LLB
	Nichole Keningale	Sydney Metro
	Craig Seeto	ArcMec
	David Keogh	ArcMec
	Michael James	LLB
	Greta King	LLB
	Mel Chandler	LLB
	Gemma Gupta	LLB
	Kieran Maple	ArcMec
	Greg Shargorodsky	ArcMec
	Raj Jayasekera	ArcMec
Next Meeting:	13 Aug 19 - Two meetings proposed AM & PM	

Item No.	Action	Resp.	Date
1.0	**Purpose**		
2.1.1	FRNSW / Metro Victoria Cross Station Meeting #2 to provide:- • Overall familiarisation continuation - North Station Building - South Station Building - Station - Retail and Podium Office - OSD office tower • Applicable BCA, ownership, use and key fire services • Access and egress - Vehicular access - Fire brigade access - Pedestrian access and egress • Key fire brigade facilities - Continuation of Booster locations discussion - Continuation of Fire Control Room locations discussion • Sprinklered / non-sprinklered areas within the Station • Delineation of wet and dry fire services	Note	
2.0	**Introductions**		
2.2.1	Introduction of meeting attendees	Note	

3.0	**Victoria Cross Fire Safety / Services Installation**		
3.2.1	Lendlease Design Team presented the attached FRNSW Presentation for the Victoria Cross Development. Post Meeting Note: The presentation discussed at the meeting has been updated to provide additional information / clarifications.	Note	
3.2.2	Lendlease presented locations for Fire control rooms for OSD and Station located in the South Building. OSD Fire control room accessible from through site link lobby and Denison Street fire stairs. Station Fire control room is one level below ground (Level B1). Accessible from the Berry Street fire stairs. Station Fire control room is located adjacent to station pump rooms, and stairs which link to platform.	Note	
3.2.3	Lendlease presented locations for Fire boosters for:- - OSD Booster located on Miller Street. - Station Booster located on Berry Street.	Note	
3.2.4	Lendlease presented that the northern entry building shall have track booster only located on McLaren Street. Mimic panel for Station located within the BOH corridor accessible from Miller Street.	Note	
3.2.5	Lendlease presented principles for operation of wet fire systems (Sprinklers and Hydrants) below level 4 shall be boosted via Berry Street Station booster. OSD functional areas within the station box (Retail, OSD lobby etc) will have alarms to OSD control room in the first instance. Signage shall be provided within the OSD Fire Control room to notify FRNSW that these areas under level 4 are to be boosted from Berry Street (Station booster). Mimic panel requirements for both Station and OSD FCRs were discussed.	Note	
3.2.6	Lendlease to provide further details of the Refuge Points / Rest Areas to the Northern Stair to comply with SWTC requirements. Post Meeting Note: Further details of the Refuge Points / Rest Areas for the Southern Platform Fire Corridor / stair will also be provided. Details are included in the attached updated presentation.	LL (DI)	5/07/2019
3.2.7	Lendlease to provide further details of the Lift operation to the Northern Entrance. Post Meeting Note: Further details of lift and escalator operation are included in the attached updated presentation.	LL (DI)	5/07/2019
3.2.8	Lendlease to confirm grading of McLaren Street. Detail included in attached updated presentation.	LL (DI)	5/07/2019
3.2.9	Lendlease to provide copy of full set of sprinklers / non-sprinklered drawings to be issued as part of the updated presentation. Detail included in attached updated presentation.	LL (DI)	5/07/2019
3.2.10	Lendlease to raise all questions / queries via Sydney Metro (Yael Bornstein) via Teambinder. Post Meeting Note: A Metro Form for questions / queries is not available - agreed Lendlease will use the Metro Review Comments Sheet for all FRNSW questions. Copy of questions / queries attached to Meeting Minutes	LL (DI)	5/07/2019

4.00	**Other items**		
4.1.1	Confirmed and agreed at the meeting the next arranged FRNSW Vic X meeting for 10 July 2019 is cancelled.	Note	
4.1.2	Proposed to have two meetings / workshops with FRNSW for Vic X Station (AM and PM) on 13th August 2019 - Metro to confirm times.	Metro (YB)	10/07/2019

Meeting Numbering Key:-
FIRST NUMBER - i.e. 1 - Meeting number minute is tabled.
SECOND NUMBER - i.e. 2 - Section / Item header
THIRD NUMBER - i.e. 3 - Meeting activity number

Minuted by DI on behalf of Lendlease.

Appendix D FRNSW consultation – 13/08/19

Meeting

Meeting No:	#3
Date:	13-Aug-19
Time:	1st Session 8.15am - 9.45am / 2nd Session 10.00am - 11.30am
Location:	Sydney Metro Offices, Level 39, 680 George St, Room 40.05

Attendees:		
	Cherylene Teoh	LLB
	David Ibbotson	LLB
	Yael Bornstein	Sydney Metro
	Andrew Addinsell	Metron
	Mark Porter	FRNSW
	Shaohua Xie	FRNSW
	David Absalom	FRNSW
	Leigh Clark	Warrington Fire
	Victor Tung	Warrington Fire
	Quentin Li	Warrington Fire
	James Henriques	ArcMac
	Kieran Maple	ArcMac
	Joshua Hawke	SWP
	Anthony Ljubicic	SWP
	Peter Ohnrich	Bates Smart
	Chris Collignon	Cox
Apologies:	Peter Small	LLAI
Distribution:	Paul Elkington	LLB
	Clare Baker	LLB
	Mark Robertson	LLB
	Milka Garcia	LLB
	Michael James	LLB
	Greta King	LLB
	Mel Chandler	LLB
	Garima Gupta	LLB
	Nichola Keringale	Sydney Metro
	Craig Seeto	ArcMac
	David Keogh	ArcMac
	Greg Shargorodsky	ArcMac
	Raj Jayasekera	ArcMac

Next Meeting: TBC

Item No.	Action	Resp.	Date
1.0	**Purpose**		
3.1.1	**FRNSW / Metro Victoria Cross Station Meeting #3 to provide:-** **Session #1 - Overall familiarisation continuation** • Familiarisation of the overall Victoria Cross Development using the Architects Models • Re-cap previous high level discussions • Responses to any queries from previous presentations **Session #2** • Updated locations of fire brigade facilities • Proposed assessments - Station • Proposed assessments - OSD enabling • Proposed assessments - OSD	Note	
2.0	**Introductions**		
3.2.1	Introduction of meeting attendees	Note	
3.0	**Victoria Cross Fire Safety / Services Installation**		
3.3.1	Lendlease Design Team presented the current layout for the Victoria Cross Development using the Architects Models - Bates Smart - OSD Tower / Cox Station - Southern / Northern Buildings	Note	
3.3.2	Lendlease presented revised locations for Fire control rooms for OSD and Station located in the South Building.	Note	

3.3.3	OSD Fire Control Room OSD Fire control room accessible from through site link lobby and Denison Street fire stairs - Vic X Design Team to review provision of fire isolated passageway in retail corridor from OSD Fire control room to fire stair leading to Denison Street.	Bates / ArcMac	
3.3.4	FRNSW request that Signage to be provided on the front of fire doors to indicate "Refuge zones". Note that in an evacuation scenario doors will be open and refuges for wheelchair access will be directly visible.	Bates / ArcMac	
3.3.5	Station Fire Control Room Access to Station Fire control room from the street is now via separate dedicated fire isolated stair. The following options were discussed with FEB with regards to access from the Station Fire control room to the platform: 1. Access through FCR secondary door and linking to northern passenger egress stair to Berry Street 2. Access through FCR secondary door and heading south to BOH fire isolated stair which leads to all levels of the Station. Access to platforms will be via level B6 which links into the passenger fire stair at platform level.	Note	
3.3.6	Station South Entry Mimic Panel to be installed on column c/w block plans within metro station entry to nominate the Station is boosted from Berry Street.	Cox/ ArcMac / Bates	
3.3.7	Station South Entry Signage to be installed within the OSD booster to nominate / confirm that the booster is to be utilised for level 4 and above only.	Bates/ Aspect/ ArcMac	
3.3.8	Wheelchair provisions percentages to be confirmed – current pedestrian modelling is 0.2%. It should be noted that the space provisions in the stairs particularly on the south allows additional wheelchairs to be located if required	Cox	
3.3.9	FRNSW request that Signage to be provided on the fire doors to indicate "Refuge zones". Note that in an evacuation scenario doors will be open and refuges for wheelchair access will be directly visible - Final Signage to be agreed with Sydney Metro / FRNSW.	Cox	
3.3.10	Pedestrian traffic and egress modelling to demonstrate that fire brigades will not have an issue with traffic in stair during their intervention activities.	ArcMac/ Warringtonfire	
3.3.11	Common theme for signage for all boosters. Strobes to be provided on top of boosters to make it easier for fire brigade to identify boosters.	Cox/ ArcMac / Bates	
3.3.12	Treads and risers of escalators being utilised for egress calculation to be checked by SWP. SWP advised that this will be considered and will be reviewed in detail with pedestrian movement experts.	SWP	
3.3.13	Escalators travelling in the direction of egress will continue to operate whilst escalators entering station will be stopped. Passengers then have the option to use both the travelling and stationary escalators for egress. The use of escalators for evacuation is consistent with the approach in NFPA 130 Standard for Fixed Guideway Transit and Passenger Rail Systems, with different occupant flow rates for travelling and stationary escalators	Note	
3.3.14	Security classifications and considerations for the station and impact on Arson modelling - fire scenarios to be confirmed. Central Station was high challenge for example due to security rating of station.	ArcMac	
3.3.15	Smoke baffle construction details to be provided. LL advised that current proposal is glass.	Cox	
3.3.16	Denison Street smoke exhaust adjacent to retail and void is still under development to resolve a 2.5 MW incident. Scenarios investigated include: • Exhaust on Denison Street and Miller Street • Introducing fire shutters	Warrington/ Cox/ ArcMac	
3.3.17	Alarms for OSD Enabling areas and Station to be alarmed separately. It does not matter if the Fire brigade respond to the Station Fire control room for the OSD enabling alarms as there is the capacity to fight fires from this FCR.	Note	
3.3.18	LL highlighted that due to the constraints of the fire panel which needs to be utilised for the project for compatibility to Sydney Metro Central Control and graphics interface, toggle switches must be used for fire fan controls. The limitation of the toggle switches is that it does not provide dual interfaces. Ie if switched on one panel it would not replicate in secondary panel. For this reason, the fire fan control panel of the OSD enabling is only provided in the OSD Fire control room. Master fire control panels for all areas below level 4 are provided in the Station Fire control room.	Note	

3.3.19	Station booster capacity is designed on the following: 2 hydrants and sprinklers (18 heads) OH3 for retail. The street capacity is 61L/s and pump sets have been designed that are capable of 51L/s. Fire brigade have requested for 30L/s in tunnel and 20L/s at platform. It should be noted that there are no sprinklers on the platform.	Note
3.3.20	Fire brigade advised that their fire truck has variable speed pumps and it would be preferable if building pumps are also variable speed. LL advised that quality / manufacture of on-site pumps would be equivelent to prime pumps or equivalent which has been used in a Metro Station.	Note
3.3.21	Dispensation for hydrant isolation from 50% to 33%. Arcmac to check 2017 hydrant code which is believed to deal with odd number of hydrants per floor.	ArcMac
3.3.22	Confirmed at the meeting that all areas of the OSD Tower - Level 4 and above are sprinkler protected.	Note

4.00	**Other items**	
4.1.1	Lendlease to propose date for next meeting with FRNSW for the Victoria Cross Project	Lendlease

Meeting Numbering Key:-
FIRST NUMBER - i.e. 1 - Meeting number minute is tabled.
SECOND NUMBER - i.e. 2 - Section / item header
THIRD NUMBER - i.e. 3 - Meeting activity number

Minuted by DI and CT on behalf of Lendlease.