VIC LILLI
&PARTNERS CONSULTING

BCA CAPABILITY REPORT

FOR

Combined Projects (Westmead)

PREMISES

Lot 4 WSU
2A Darcy ROAD,
WESTMEAD NSW 2145

Date: 12 December 2016

Our Ref: J160221

BCA FIRE LEGAL

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TABLE OF CONTENTS

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CONTENTS Page No.

1.0 Executive Summary

This report has been prepared to identify the extent of compliance achieved by the architectural documentation against the relevant provisions of the Building Code of Australia (BCA) 2016 and adopted standards.

The proposed development of a residential apartment building development as detailed in the Development Application comprises construction of a building containing:

- Five (5) levels of car-parking on levels B01, B02, B03, B04 & Lower ground floor.
- Block D1 - Twenty-one (21) levels of residential units.
- Block D2 - Six (6) levels of residential units.
- Block E - Ten (10) levels of residential units.
- Block F - Nine (9) levels of residential apartments.

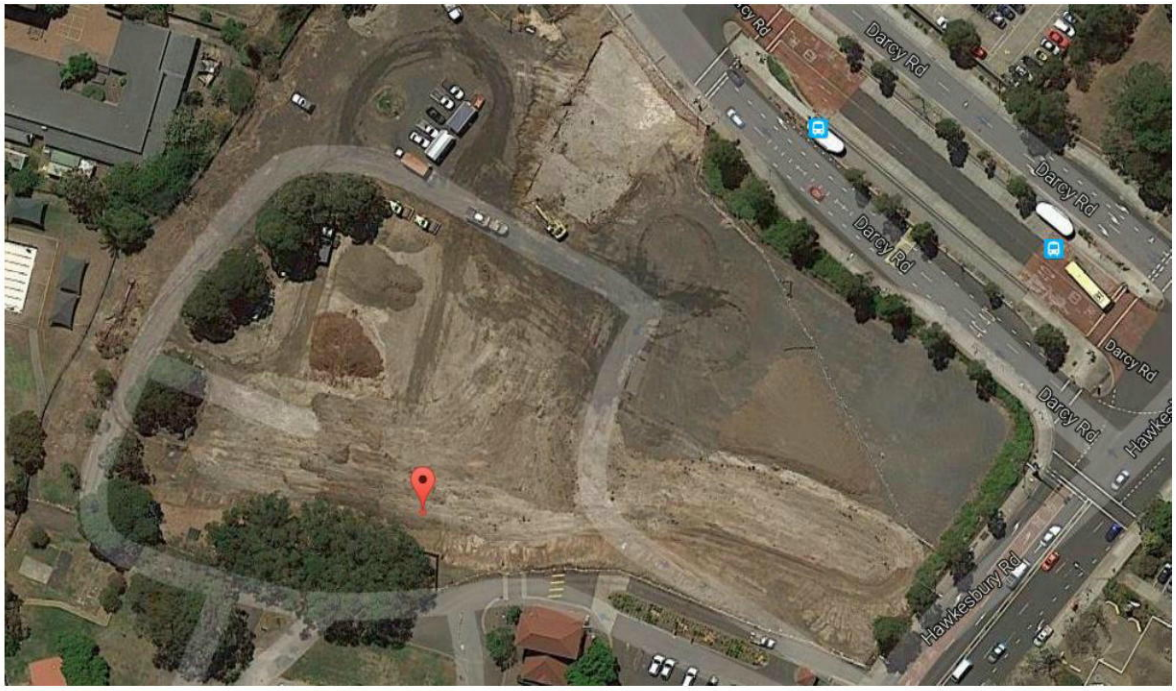
The proposed development for the purposes of the BCA will be assessed a united building and assessed as one building.

This report will provide a BCA analysis to assist in the process of design development and to assist the consent authority in the determination of the Development Application relating to the works.

2.0 Report Summary

2.1 – Location

The subject building works comprise the construction of a residential apartment building at 158-164 Hawkesbury Road, 2a Darcy Road, Westmead. The site is bounded by Parramatta Marist High to the west, an internal road the east and south, and a 6m wide right of access to the north.



2.2 –Description of works

The construction of a building containing the following:

- Five (5) levels of car-parking on levels B01, B02, B03, B04 & Lower ground floor.
- Block D1 - Twenty-one (21) levels of residential units.
- Block D2 - Six (6) levels of residential units.
- Block E - Ten (10) levels of residential units.
- Block F - Nine (9) levels of residential apartments.

2.3 – Report purpose

This report has been prepared to identify aspects of the proposed design that require further consideration and to identify aspects of the design that may be altered subsequent to the issue of a Development Consent.

This report has been prepared on the basis of an assessment of compliance only and should not be construed as being design advice.

2.5 – Building Description

Use/Classification	Proposed classification being- Level / Use / Classification Levels B1-B4, LG, / Car park / 7a Levels B1-B4 / Storage / 7b **(Architect to confirm if storage equates for more than 10% of the floor area for each storey, if so must be assessed as Class 7b storage)** Levels LG-20 / Residential / 2
Rise in Storeys	The building has a rise in twenty-two (22) storeys.
Storeys Contained	The building contains a total of twenty-six (26) storeys.
Effective Height	The building will have an effective height greater than 50m (67.25m). (Lower Ground Floor RL: 28.700 – Level 20 Roof RL: 95.950)
Type of Construction (BCA)	The building is to achieve Type A construction
Building Population	Car parking levels at 1 person / 30m² Residential levels are not populated using BCA D1.13.
Floor Area & Volume Limitations	There are no limitations for car parking and residential use.
Climate Zone	6

3.0 – Building Code of Australia Assessment

3.1 – Fire Resistance and Stability (Section C, BCA)

<table>
<tr><th>Item</th><th>Comment</th></tr>
<tr><td>Fire Resistance</td><td>
The proposed building structure, being reinforced concrete floors, columns and the various shafts and cores, are to comply with the required fire resistance levels as specified in Clause C1.1 and Clause 2 & 3 of Specification C1.1 for Type A construction. Refer to Table 3 of Specification C1.1 for the specific FRL's.

The building is to comply with Clause C1.1 and Clause 2 & 3 of Specification C1.1, for a building required to have Type A construction. Refer to Table 3 of Specification C1.1 for the specific Fire Resistance Levels [FRL's].

Structural: the ability to maintain stability and adequate load-bearing capacity as determined by AS 1530.4.

Integrity: the ability to resist the passage of flames and hot gases specified in AS 1530.4.

Insulation: The ability to maintain a temperature on the surface not exposed to the furnace below the limits specified in AS 1530.4.

FRLs are generally as follows;

<table>
<tr><th>Class</th><th>FRL</th></tr>
<tr><td>Class 2</td><td>90/90/90</td></tr>
<tr><td>Class 7a</td><td>120/120/120</td></tr>
<tr><td>Class 7b</td><td>240/240/240</td></tr>
</table>

Where lightweight fire rated construction is proposed for walls, the system must comply with Specification C1.8 of BCA and the manufactures tested specification. Furthermore, the system proposed must be consistent with sound and energy efficiency requirements with Part F5 and Part J of BCA.

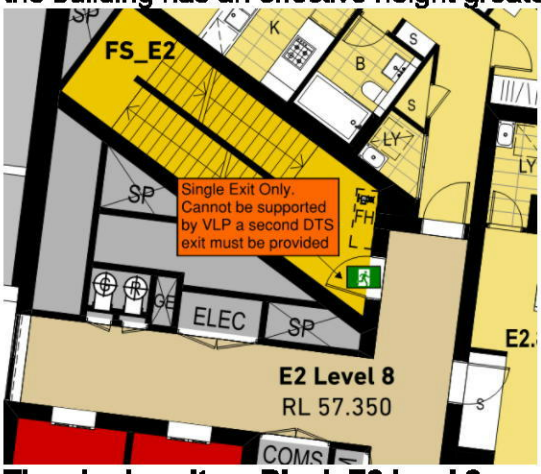
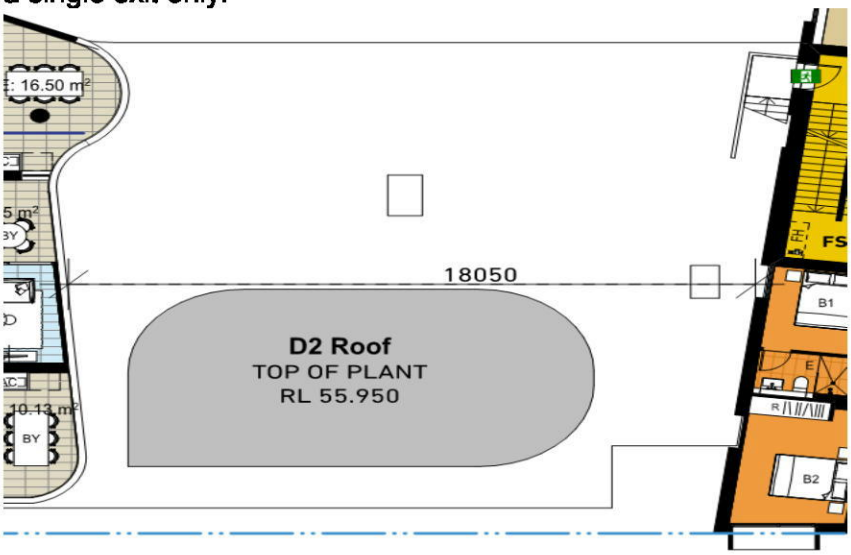
Columns protected with lightweight fire rated construction that are subject to mechanical damage must be protected and/or internally filled in accordance with Clause C1.8(b) of BCA.

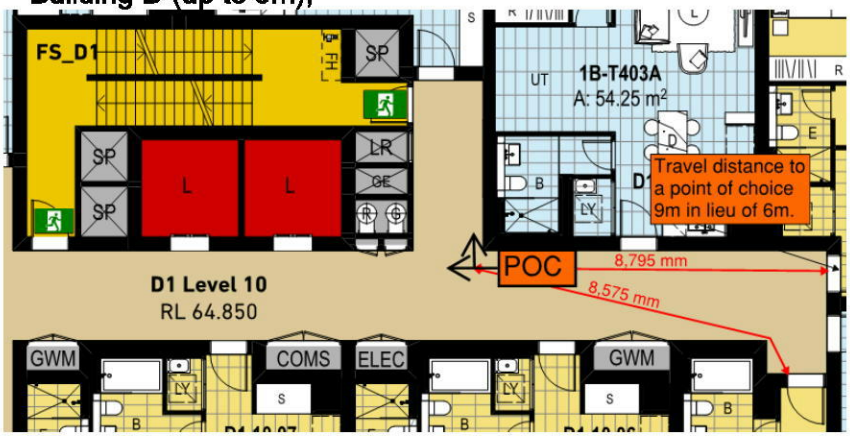
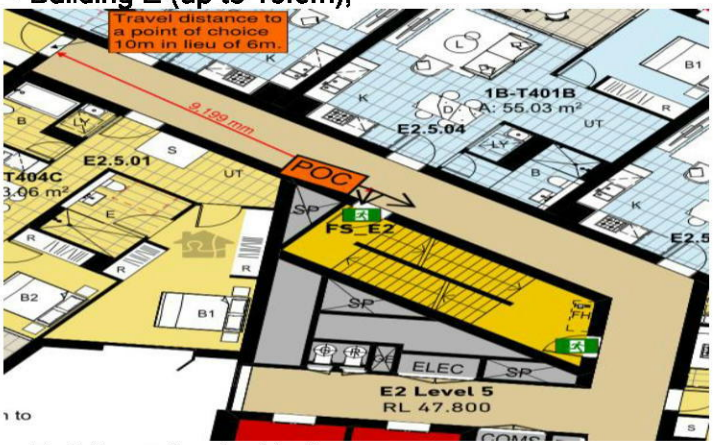
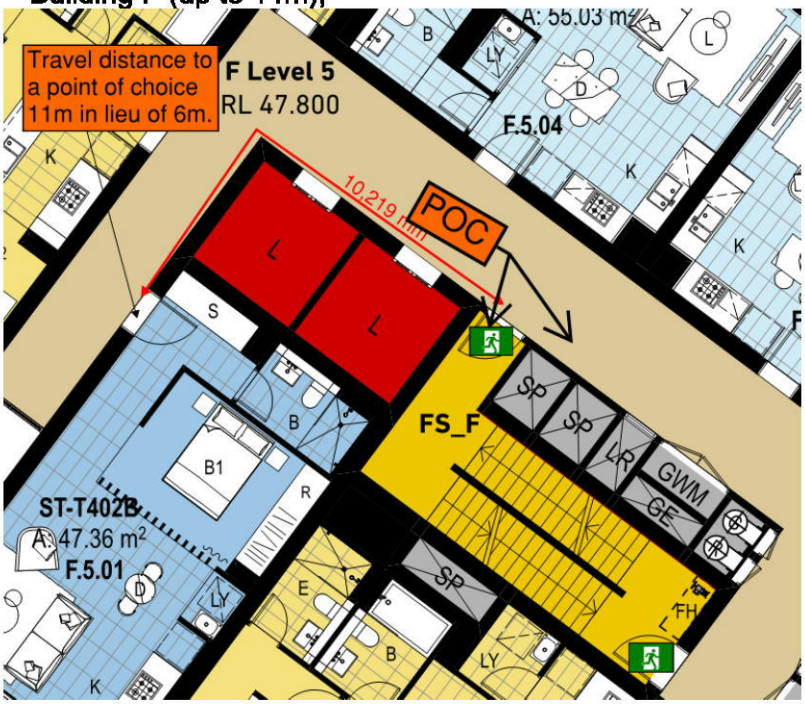
The fire hazard properties of floor, wall and ceiling linings are to comply with Part C1.10, and Specification C1.10 of BCA.
</td></tr>
</table>

Compartmentation and fire separation	In accordance with BCA Clause C2.7, C2.8 and Table 3 of Specification C1.1 the following FRL (in minutes) for all internal walls bounding sole occupancy units are as follows; ▪ 90/90/90 FRL (Loadbearing walls in Class 2) ▪ --/60/60 FRL (Non-loadbearing walls in Class 2) In accordance with BCA Clause C2.9 and Table 3 of Specification C1.1 the floor to the following parts must have an FRL of not less than that as follows; ▪ 120/120/120 between car-park and residential components; ▪ 240/240/240 between car-park and storage components; ▪ 240/240/240 between storage areas and residential components; and ▪ 90/90/90 between remaining residential floors **Notes:** 1. The FRL of the building elements in the carpark level will be reduced due to sprinkler protection system evident. The proposed FRLs will have to be in accordance with Table 3.9 of BCA Specification C1.1. With respect to the above requirements, the proposed development can achieve the required FRL's which will be confirmed at the construction certificate phase. **Note: The client has advised that they will be undertaking a fire engineered alternative solution for the reduction in FRL Levels for the Class 7a & 7b parts of the development.**
Protection of Openings	In buildings of this type, openings in an external wall (i.e. a wall that is required to have a fire resistance level) must if situated from a fire-source feature to which it is exposed less than 3.0 m from a side or rear boundary of the allotment (both parallel and perpendicular) must be protected in accordance with Clause C3.4 of the BCA, and if wall-wetting sprinklers are used, they are located externally and not occupy more than 1/3 of the area of the external wall of the storey in which it is located. Assessment of the plans has revealed that external openings in the proposed development are positioned less than 3.0 metres from the adjacent property boundaries (i.e. *fire source features*). **Southern Boundary (Multiple levels)**  **Note: The client has advised that they will be undertaking a fire engineered alternative solution for any compliance in relation to the protection of openings required in BCA Clause C3.4.**

Vertical separation of openings	Not required as the building exceeds 25m in effective height in which a sprinkler system will be provided.
Fire hazard properties	The wall and floor linings must achieve the fire hazard properties stipulated in BCA Specification C1.10.
Public corridors	Public corridors exceeding 40m in length and are required to be divided by a smoke proof wall in accordance with BCA C2.14. Smoke proof walls are detailed as required. Details show compliance is generally provided.
Protection of equipment.	The following equipment is to be fire separated with construction complying with BCA Clause C2.12 (d). (i) lift motors and lift control panels; or (ii)emergency generators used to sustain emergency equipment operating in the emergency mode; or (iii) central smoke control plant; or (iv) boilers; or (v) a battery or batteries installed in the building that have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours. Separation of on-site fire pumps must comply with the requirements of AS 2419.1-2005.
Electricity supply	Electrical equipment is to be separated from the building in accordance with BCA Clause C2.13. Any substation and/or main switchboard is to be constructed to achieve a fire resistance level of 120/120/120 with the door being -/120/30 fire rated, unless higher FRL's are required by electrical providers.
Fire sealing of penetrations	All service penetrations must be sealed to the requirements of BCA Clause/Spec C3.15.

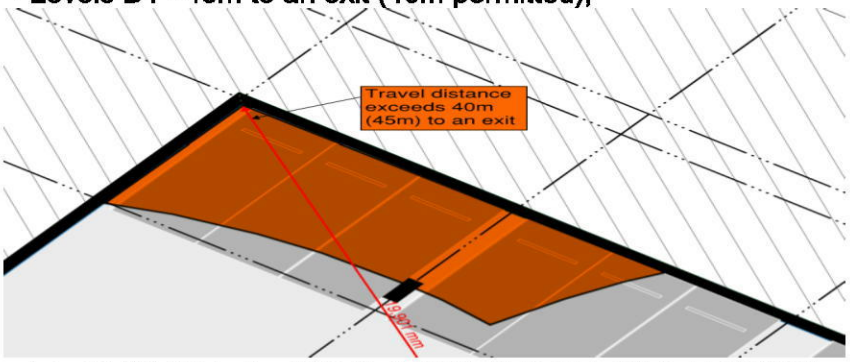
3.2 – Access & Egress (Section D, BCA)

Item	Comment
Number of exits required	Two exits are required from each storey by BCA Clause D1. 2 as the building has an effective height greater than 25m.  **The single exit on Block E2 level 2 cannot be supported by VLP as the building has an effective height of >50m and two exits are required for all areas.** It has been noted that roof top plant rooms which have access to a single exit only.  **Note: The client has advised that they will be undertaking a fire engineered alternative solution for any compliance in relation to the number of exits required in BCA Clause D1.2.**

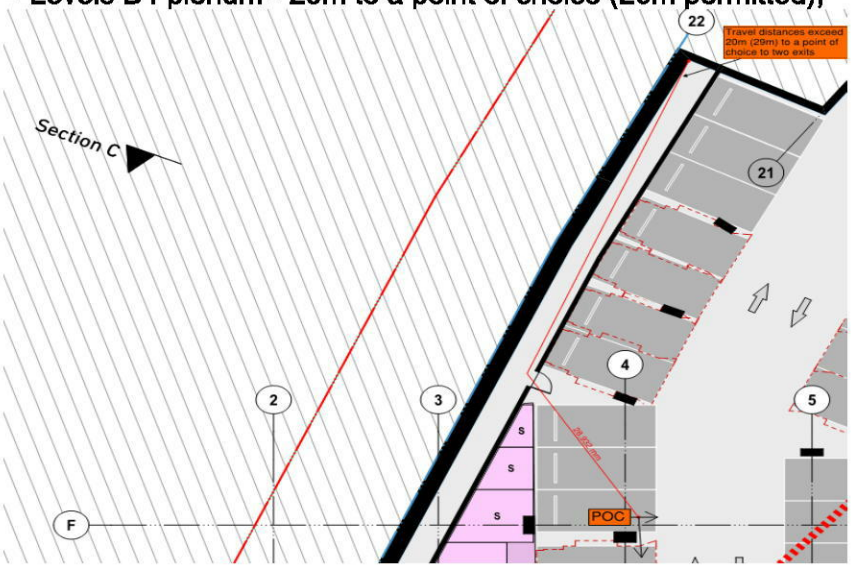
Exit travel distances and distance between exits	The distance of travel from the apartments to an exit or point of choice between alternative exits exceeds the maximum of 6m permitted by BCA Clause D1.4 in the following areas: ▪ Building D (up to 9m),  ▪ Building E (up to 10.0m),  ▪ Building F (up to 11m), 

The travel distance within non-residential levels to an exit and to a point of choice to alternative exits exceeds the maximums permitted by BCA Clause D 1.4 in the following locations:

- Levels B4 - 45m to an exit (40m permitted),

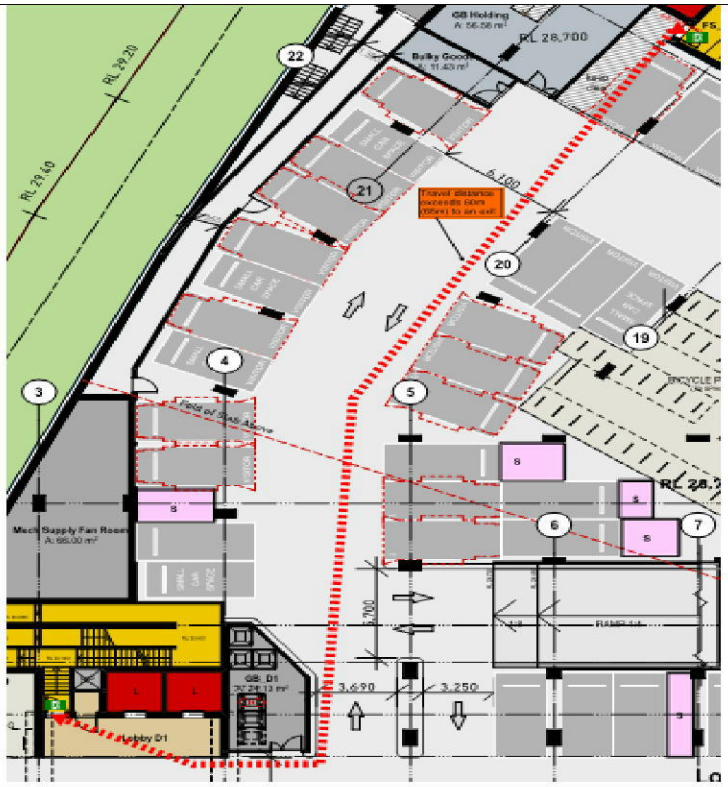
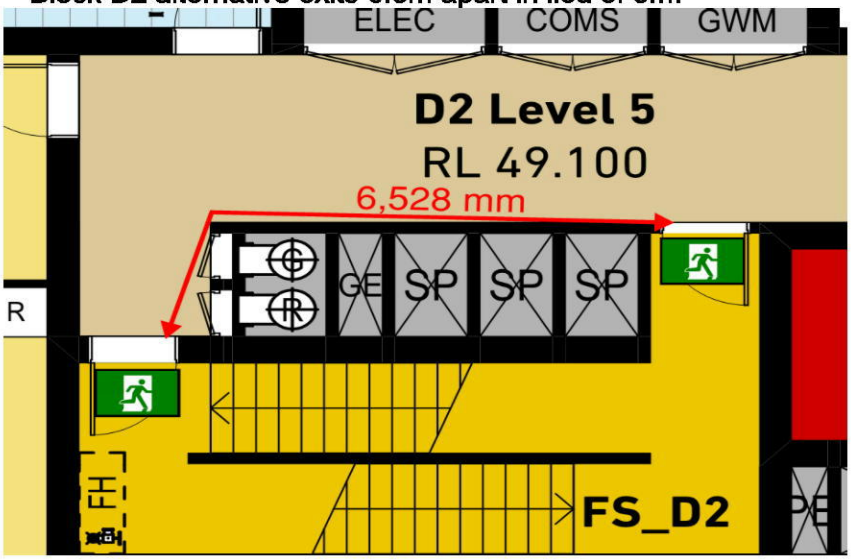


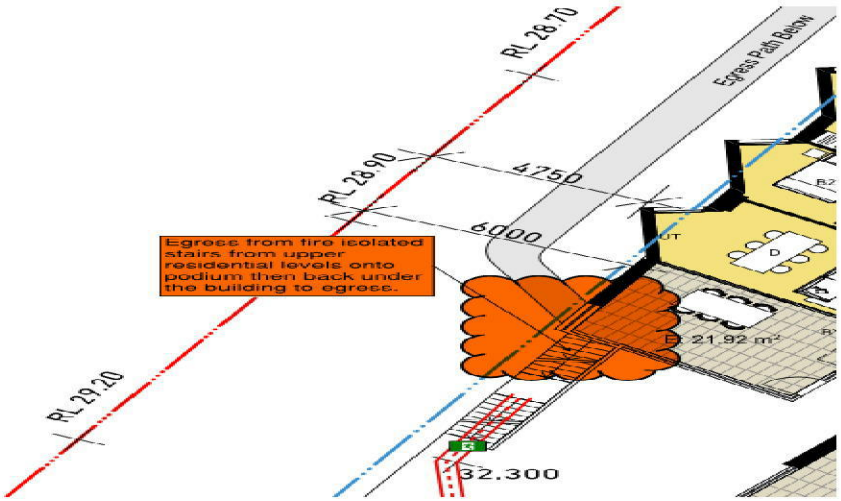
- Levels B4 plenum - 29m to a point of choice (20m permitted),



The distance within non-residential levels between the alternative exits exceeds the maximum of 60m permitted by BCA Clause D1.5 in the following locations:

- Levels B4 & Lower Ground Floor – up to 65m.

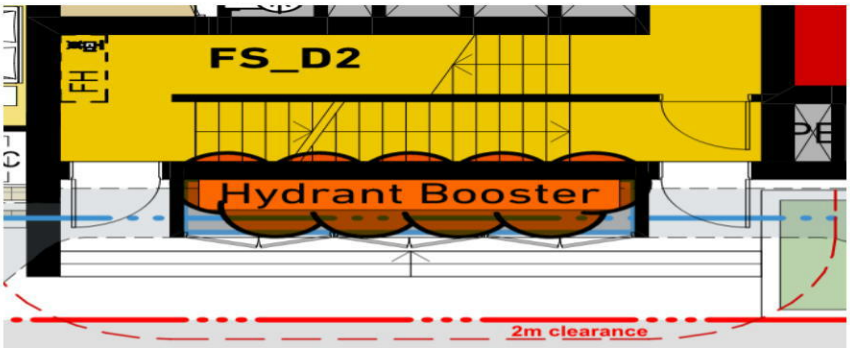
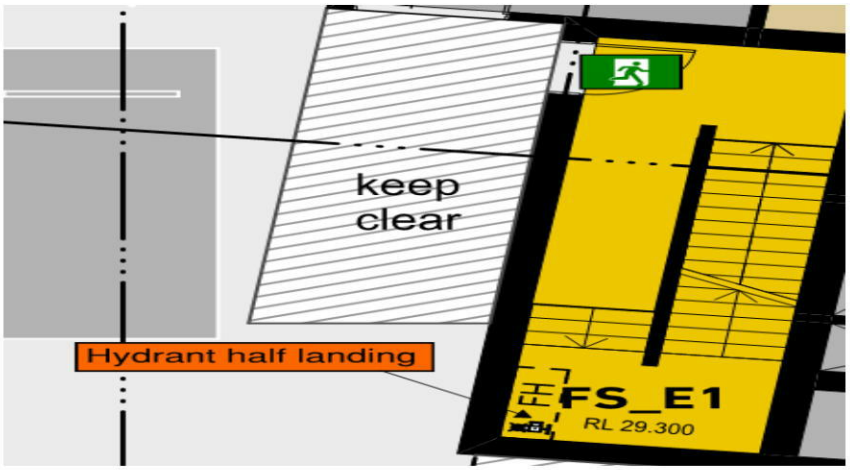
	 ▪ Block D2 alternative exits 6.5m apart in lieu of 9m.  **Note: The client has advised that they will be undertaking a fire engineered alternative solution for any compliance in relation to the travel distances required in BCA Clause D1.4.**
Dimensions of exits.	The proposed aggregate egress width is adequate to serve the anticipated building population. A minimum clear width of 1m must be maintained to all exit stairways. The overall width of the stairways must be such that the clear width can be achieved between handrails.

Travel via fire isolated exits	Each fire isolated exit must provide independent egress from each storey to a point of open space or covered areas of uses and open perimeters, as nominated. Discharge from the fire-isolated stairways serving the residential storeys does not comply with the Prescriptive Requirements of BCA Clause D1.7(b). • Fire isolated stairs F & E2 discharge onto the Ground floor podium courtyard, and then have to pass under the building again (along GL22 – T) prior to discharging along the egress path located on the setback.   **Note: The client has advised that they will be undertaking a fire engineered alternative solution for the non-compliant exit discharges.**
Roof as open space	The podium level is to be roof as open space for the purposes of egress and will be required to comply with BCA Clause D2.12. Paths of travel to exits from the podium are to be a minimum of 3m from any clear openings and the roof slab of the podium must achieve a minimum FRL 120/120/120. **Note: The client has advised that they will be undertaking a fire engineered alternative solution for any compliance in relation to the openings within 3m of exits as required in BCA Clause D2.12.**

Construction of exits	All exits must be constructed as fire isolated exits to the requirements of BCA Part D2. The exit stairways must comply with requirements for treads, risers, landings and thresholds in accordance with clauses D2.13, D2.14 & D2.15 of the BCA respectively.
Electrical distribution boards	Electrical distribution boards located in the path of travel to an exit must be enclosed in a non-combustible enclosure and sealed to prevent the escape of smoke.
Egress Doors.	All doors acting as exits are required to swing in the direction of egress and are required to be provided with the appropriate hardware in accordance with Clauses D2.20 & D2.21 of the BCA. • Egress doors from lobby's do not swing in the direction of egress as required. **Note: The client has advised that they will be undertaking a fire engineered alternative solution for the non-compliant door swing.**
Balustrades	Balustrades must be provided for all areas where it is possible to fall more than 1m. Balustrades are to be designed in accordance with BCA Clause D2.16. Balustrades protecting a difference in levels of over 4m must not have horizontal elements between 150mm and 760mm of the floor that facilitate climbing. Balustrades within fire isolated stairways may be constructed with three horizontal rails with gaps up to 460mm.
Handrails	Handrails are to be provided to stairways as required by Clause D2.17 of the BCA 2013, including internal stairs within a residential sole occupancy unit.
Signage	Signage must be provided to all fire and smoke doors (except those doorways providing access to sole occupancy units) and to doors leading from enclosed stairways as required by BCA Clause D2.23.
Protection of openable windows	Windows in bedrooms where the floor is more than 2 m above the surface beneath require restricted openings or protection in accordance with BCA D2.24. Where the window opening is restricted calculations are to be provided at Construction Certificate stage that sufficient natural ventilation is provided by Part F4.5.

Access for people with disabilities	The proposed building is required to comply with the following: ▪ The Disability (Access to Premises - Buildings), Standard 2010; ▪ Part D3 of the BCA; ▪ Australian Standard AS 1428.1-2009. Buildings and parts of buildings must be accessible as required by Table D3.1, unless exempted by D3.4, which requires access as follows: <u>Class 2 – Common areas.</u> From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level. To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, individual shop, eating area, or the like. Where a ramp complying with AS 1428.1 or a passenger lift is installed— (a) to the entrance doorway of each sole-occupancy unit; and (b) to and within rooms or spaces for use in common by the residents, located on the levels served by the lift or ramp <u>Class 7a -</u> To and within any level containing accessible car parking spaces. The building is capable of compliance subject to detailed design. Full documentation is to be provided for assessment at the Construction Certificate stage.

3.3 – Services and Equipment (Section E, BCA)

Item	Comment
Hydrant System	The building will be provided with a hydrant system in accordance with the provisions of BCA Clause E1.3 and AS 2419.1- 2005. The fire hydrant system is to be designed and certified by a practising professional Hydraulic Engineer or other competent Hydraulic Designer. ***Note:*** Where an on-site fire hydrant system is required, a fire brigade booster facility is to be detailed on the plans to serve the building in accordance with AS 2419.1-2005. The fire hydrant booster facility is required to be protected by a radiant heat shield wall having an FRL of not less than 90/90/90. The wall is to have a height not less than 3.0 metres above the upper hose connections and project not less than 2.0 metres each side of the booster valves in accordance with AS 2419.1-2005.   Full documentation is to be provided for assessment at the Construction Certificate stage. **Note: The client has advised that they will be undertaking a fire engineered alternative solution for any non-compliant fire hydrant booster assembly location.**

Hose Reel System	The building is required to be provided with a fire hose reel system to the car park and storage areas in accordance with the provisions of Clause E1. 4 of the BCA and AS 2441.
Portable Fire Extinguishers	Fire extinguishers must be provided throughout the building in accordance with BCA Clause E1.6 of the BCA and AS 2444.
Sprinklers	The building is required to be provided with a sprinkler system to all areas in accordance with the provisions of Clause E1. 5 of the BCA and AS 2118.1.
Smoke Hazard Management	The building is required to be provided with: ▪ A smoke detection and alarm system complying with BCA Specifications E2.2a and E2.2b. ▪ An automatic air pressurisation system for fire-isolated exits servings storeys over 25m in accordance with AS/NZS 1668.1.
Fire Control Centres	A fire control room is required in accordance with BCA Specification E1.8.
Lifts	Emergency lifts with stretcher facility are required is each tower. A sign must be provided in accordance with BCA Clause E3.3 warning against the use of lifts in a fire.
Emergency Lighting.	Emergency lighting is required throughout the building in accordance with Clauses E4.2 and E4.4 of the BCA and AS 2293.1.
Exit Signs.	Exit signs are required throughout the building in accordance with BCA Clauses E4.5, E4.6 & E4.8 and AS 2293.1.
Sound systems and intercom systems for emergency purposes	A building occupant warning system must be provided to the requirements of AS 1670.4.

3.4 – Health & Amenity (Section F, BCA)

Item	Comment
Sanitary & Other Facilities	A sanitary facility is to be provided for building workers at or near ground level.
Ceiling height	The following minimum building ceiling heights must be maintained. • Common kitchen, laundry or the like – 2.1m • Corridor, passageway or the like – 2.1m • Bathroom, shower, sanitary compartment or the like – 2.1m • Habitable rooms including common areas – 2.4m • Commercial kitchens – 2.4m • Stairways – 2.0m • Car parking areas – 2.2m • Disabled car parks – 2.5m
Ventilation	The building is required to be provided with ventilation in accordance with the provisions of Clause F4.5 of the BCA. Ventilation may be provided by natural means or a mechanical system complying with AS 1668.2. The residential areas of the building must be provided with natural or mechanical ventilation as required by Part F4 of the BCA. In that regard, where natural ventilation cannot be provided to some bedrooms as a result of the protection of window openings ventilation must be provided where necessary by mechanical systems complying with AS 1668.2-1991.
Lighting	Artificial lighting must be provided throughout the building in accordance with the provisions of Clause F4.4 of the BCA and AS/NZS1680.0-1998. Natural lighting must be provided to the habitable areas of the residential apartments to the requirements of BCA Part F4, being by way of openings of not less than 10% of the floor area of the space they serve. The current design provides for adequate natural light to habitable rooms.
Sound insulation	The floor separating the residential units and separating the sole occupancy units from public areas must achieve a sound insulation rating of Rw+Ctr (airborne) of not less than 50 and an Ln,w+Ci (impact) not more than 62.

	Walls separating units must achieve a sound insulation rating of Rw+Ctr (airborne) of not less than 50. Walls separating units from plant rooms, lift shafts, stairways corridors or other public areas must have an insulation rating of Rw (airborne) not less than 50. Walls separating a bathroom, sanitary compartment, laundry or kitchen in one sole occupancy unit from a habitable room in another or separating a unit from a lift shaft must be of discontinuous construction. The doorway separating to sole occupancy unit from the public area must have an Rw not less than 30 Soil, waste & stormwater services must be separated by construction having an Rw+Ctr (airborne) not less than ▪ 40 if the room is a habitable room ▪ 25 if the room is a non-habitable room

3.5 – Ancillary provisions (Section G, BCA)

Item	**Comment**
Cleaning of windows	Provision must be made for the cleaning of windows located 3 or more storeys above ground level to the requirements of the Occupational Health & Safety Act 2000.
Atrium construction	Not applicable.

3.6 – Energy Efficiency (Section J, BCA)

The class 2 portions of the building are to comply with the BASIX Certificate referenced with the Development Consent for the project.

The portions of the building of classes other than 2 (car park and storage) must comply with all relevant Part J provisions noted below.

J1 – Building fabric
J2 – Glazing
J3 – Building sealing
J5 – Air Conditioning and ventilation systems
J6 – Artificial light and power
J7 – Hot water supply
J8 – Access for maintenance and facilities for monitoring

4.0 Fire safety and other measures

4.1 – Proposed Fire Safety Measures

In terms of the proposed building the following fire safety measures may be required:

Fire Safety Measure	Standard of Performance
Access panels, doors and hoppers to fire-resisting shafts	BCA 2016 Clause C3.13
Automatic fail safe devices	BCA 2016 Clause C3.4, D2.19, D2.21, D2.22, Spec C3.4, AS 1670.1- 2015
Automatic fire detection and alarm system	BCA 2016 Clause C3.5, C3.7, C3.8, C3.11, E2.2, Spec. C3.4, Spec. E2.2a, AS 1670.1-2015,
Automatic fire suppression system (Sprinkler)	BCA 2016 Clause E1.5, E2.2, Spec. E1.5, Spec. E2.2, AS 2118.1-1999,
Emergency lighting	BCA 2016 Clause E4.2 & E4.4, AS 2293.1-2005
Emergency lift	BCA 2016 Clause E3.4
Exit and directional signage	BCA 2016 Clause E4.4, E4.5, (NSW E4.6) & E4.8, AS 2293.1-2005
Fire alarm monitoring system	BCA 2016 Spec E2.2a, AS 1670.3-2004
Fire control room	BCA 2016 Clause E1.8, Spec E1.8
Fire dampers	BCA 2016 Clause E2.2, AS/NZS 1668.1-2015, AS 1682.2-2015
Fire door sets	BCA 2016 Clause C2.12, C2.13, C3.4, C3.8, C3.11, Spec C3.4, AS 1905.1-2015
Fire Engineering Report	Report prepared by:
Fire hydrant systems	BCA 2016 Clause E1.3, AS 2419.1-2005
Fire hose reel systems	BCA 2016 Clause E1.4, AS 2441-2005
Fire seals (protecting openings and service penetrations in fire resisting components of the building)	BCA 2016 Clause C3.15, Spec C3.15, Manufacturer's specifications
Lightweight construction	BCA 2016 Clause C1.8, Spec A2.3, Spec C1.8, Manufacturer's specifications
Mechanical air handling systems	BCA 2016 Clause E2.2, Spec. E1.8 (fire control rooms), Table E2.2a, AS/NZS 1668.1-2015, AS 1668.2-2012 (clause 5.5 car park exhaust operation)
Openings in fire-isolated lift shafts	BCA 2016 Clause C3.10, AS 1735.11-1986
Occupant warning system	BCA 2016 Clause E2.2, Spec E2.2a (clause 6), AS 1670.1-2015
Portable fire extinguishers	BCA 2016 Clause E1.6, AS 2444-2001
Power operated exit doors	BCA 2016 Clause D2.19, D2.21
Pressurising systems	BCA 2016 Clause E2.2, Table E2.2a, Spec E2.2a, AS/NZS 1668.1-2015
Smoke dampers	BCA 2016 Clause E2.2, C2.5, Spec C2.5, AS/NZS 1668.1-2015
Smoke doors	BCA 2016 Clause C2.5, C2.14, Spec C3.4
Sound systems and intercom systems for emergency purposes	BCA 2016 Clause E4.9, AS 1670.4-2015
Wall wetting sprinkler and drencher systems	BCA 2016 Clause C3.4, Spec G3.8, AS2118.1-1999
Warning and operational signs	BCA 2016 Clause D2.23, E3.3, Spec E1.8, Clause 183 of the Environmental Planning and Assessment Regulation 2000

5.0 Conclusion

5.1 – Conclusion

It is the opinion of this office that, the proposed building is capable of achieving compliance with the requirements of the Building Code of Australia (BCA) 2016 Volume 1, and relevant adopted standards without undue modification to the design or appearance of the building.

Whilst the above recommendations have been made as a means of achieving compliance with the various provisions of the Performance Requirements of the BCA, their acceptability has not been verified at this time. It will be necessary for the design to be reviewed by an appropriately qualified person prior to the issue of a Construction Certificate for the works.

This report does not imply, nor make reference to structural design or operating capability or design of any electrical, fire, hydraulic or mechanical services.

Except as mentioned in the report, the following matters were not addressed-

(1) Structural adequacy;
(2) Fire resistance of primary structural elements;
(3) Design basis or operating capability of the installed electrical, fire, hydraulic or mechanical services;
(4) Compliance with the *Disability Discrimination Act 1992;*

Prepared by:

Gary Rafferty
Vic Lilli and Partners Consulting Pty Ltd

6.0 References

6.1 – Basis of Report

This BCA Capability report has been prepared on the basis of the following-

(i) Architectural Plans as prepared by Turner Architects. Project No. 16001
(ii) Building Code of Australia (BCA) 2016, including NSW Variations and relevant Australian Standards;
(iii) Environmental Planning and Assessment Act, 1979, and Regulations.

Drawing No.	Title	Revision
DA-100-030	Site Plan	S
DA-100-040	Site Plan FSR Diagram	S
DA-105-B04	Basement 04	S
DA-105-B03	Basement 03	S
DA-105-B02	Basement 02	S
DA-105-B01	Basement 01	S
DA-110-001	Lower Ground Floor	S
DA-110-002	Ground Floor	S
DA-110-010	Level 01	S
DA-110-020	Level 02-05	S
DA-110-060	Level 06	S
DA-110-070	Level 07	S
DA-110-080	Level 08	S
DA-110-090	Level 09	S
DA-110-100	Level 10-12	S
DA-110-130	Level 13-17	S
DA-110-180	Level 18	S
DA-110-190	Level 19	S
DA-110-200	Level 20 Plant and Roof	S
DA-110-210	Level 21 Roof	S
DA-110-220	Level 22 Overall Roof Plan	S
DA-210-001	North Elevation	S
DA-210-002	East Elevation	S
DA-210-003	South Elevation	S
DA-210-004	West Elevation	S
DA-310-001	Section A-A	S
DA-310-002	Section B-B	S