Building Code of Australia 2019 Compliance Report

25-27 Warriewood Road NSW 2102

Prepared by:	**McKenzie Group Consulting (NSW)**
Prepared for:	**Knowles Group**
Date:	**May 2020**
Revision:	**C**

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Date	Rev No	No. of Pages	Issue or Description of Amendment	Checked By	Approved By	Date Approved
12 May 2020	A	29	Draft – Report	Ahmad Sammani	Vijay Perumal	18 May 2020
22 May 2020	B	28	Final DA Report	Ahmad Sammani	Vijay Perumal	22 May 2020
27 May 2020	C	28	Final DA Report	Ahmad Sammani	Vijay Perumal	27 May 2020

1. Executive Summary

Development Overview

The proposed development is a residential development, to be located at 25-27 Warriewood Road, Warriewood.

Compliance Summary

As Accredited Certificate we have reviewed the architectural design documents prepared by VIA Architects for compliance with the current building assessment provisions, including (but not limited to) the following:

- Building Code of Australia 2019 and
- The Disability Access to Premises (Buildings) Standard 2010

The report is intended as an overview of the relevant provisions of the BCA. Detailed drawings and associated review will still be required as the final design is developed.

Performance Solutions

The assessment of the design documentation has revealed that the following areas are expected to be assessed against the relevant performance requirements of the BCA.

Fire Safety Items			
1	**Rationalisation of Fire Resistant Level's (FRL)** It is anticipated that a fire engineered solution will be proposed to reduce the required FRL's as detailed in Spec C1.1, from the following locations: ▪ Storage areas (Class 7b portions) from remainder of building	Spec C1.1, C2.8, C2.9	CP1 & CP2
2	**Public Corridors** Public corridors on ground floor currently measuring 67m and not proposed to be smoke separated to less than 40m as per C2.14 of the BCA. This corridor has been flagged as an issue due to the connectivity of each corridors of each building on the ground floor.	C2.14	DP4, EP2.2
3	**Extended Travel Distance:** The following travel distances will be required to be addressed through a performance solution in the event that they are not reduced through design: Basement ▪ Up to 27m to a point of choice in lieu of 20m and total of 41m in lieu of 40m to an exit Ground Floor ▪ Up to 38m to a single exit in lieu of 30m from Bike Store (with Spec E1.5a concession)	D1.4	DP4, EP2.2

	▪ Up to 33m to a single exit in lieu of 30m from G.05 (with Spec E1.5a concession) Level 1 ▪ Up to 15m to a single exit in lieu of 12m (with Spec E1.5a concession)		
4	**Travel via fire-isolated exits:** The fire isolated exits/stairs serving the basement currently discharge into the ground floor being a covered area, not strictly in accordance with D1.7 (b) and will required occupants to egress past opening within the external wall not proposed to be protected in accordance with C3.4	D1.7	CP2, DP4, DP5, EP2.2
5	**Rising and Descending Stairs** Stairways serving the residential portions do not provide adequate separation as per D2.4 of the BCA	D2.4	DP4, DP5, EP2.2
6	**Hydrant Booster** As the proposal will have multiple entrances, the hydrant booster will not be located within sight of the main entrance and will be assessed through a performance solution.	E1.3	EP1.3
7	**Jet fans** Where It is proposed to incorporate impulse fans in the car park area to address isolated stagnant areas, in an otherwise naturally ventilated car park, instead of traditional ducted mechanical ventilation in accordance with AS1668.	E2.2, Table E2.2a, E1.5, Spec E1.5	EP2.2, EP1.4
Miscellaneous Items			
8	Performance Requirement FP1.4 which relates to the prevention of the penetration of water through external walls, must be complied with. It is noted that there are no Deemed-to-Satisfy Provisions for this Performance Requirement in respect of external walls	F1.0	FP1.4

The fire engineered solution relating to the Category 2 Performance Requirements will need to be approved after consultation with the NSW Fire Brigade as part of the Construction Certificate process.

The following key fire safety services are required to meet the minimum DTS requirements.

Fire Safety Services	
1.	Sprinklers system throughout
2.	Fire hydrant system throughout
3.	Fire hose reels (except in the class 2 portion)
4.	Fire precautions during construction

5.	Automatic smoke detection and alarm system to BCA Specification E2.2 (only to the class 3 hotel parts)
6.	Carpark ventilation systems must comply with Clause 5.5 of AS/NZS1668.1-2015 except that fans with metal blades suitable for operation at normal temperature may be used and the electrical power and control cabling need not be fire rated

The assessment of the design documentation has also revealed that the following additional information is required in order to complete the assessment, or the following areas need to be reviewed.

No.	Items for review	Responsibility
1.	Please advise if there are any proposed alternative building solutions with regard to design of the building services for the project.	Services Consultants
2	Please confirm if any Hydrant Valves will be located on the mid-landings of the fire stairs (where provided to be included as a fire engineered solution)	
3	Fire compartment drawings detailing proposed FRL's of all walls, columns and floors to be submitted for review to finalise the BCA review	Architect
4	Floor area calculation to be provided of all storage cage. Where the floor area equals or is greater than 10% of the floor area the storage cages are deemed Class 7b buildings, where fire separation of these areas to the remainder of the car park will need to be addressed through a fire engineered performance solution	Architect
5	Services engineer required to mark-up floor plans confirming intended use of all services & plant rooms within the building. Where these areas are proposed not to be separated in accordance with C2.12 & C2.13 of the BCA, a fire engineered solution will be required to be obtained	Services engineers
6	Section J Report or JV3 assessment report required to be submitted for review	ESD consultant
7	Final stair details required to be provided for review	Architect
8	The utilisation of Curtain Walls on the project is to be confirmed	
9	Confirmation required from structural engineer whether Dincel wall construction will be utilized within fire stairs and/or external walls (where proposed will need to be captured as a fire engineered performance solution)	Architect / Structural Engineer
10	Confirmation should be given of the non-combustibility of materials of external walls and attachments, common walls, lifts framing and pits, internal loadbearing walls and fire walls in accordance with C1.9 and C1.14 of the BCA	Architect
11	Details of the compliance with D2.7 of the BCA for EDBs, and other installations provided in the path of travel to be provided.	Architect
12	Details of the protection to windows must be provided with protection where the floor below the window is 2m or more above the surface beneath to a bedroom in a Class 2 building.	Architect
13	Details of condensation management for external walls and exhaust systems to the Class 2 part to be provided for compliance with F6.4.	Architect
14	Importance level of the building to be nominated by the Structural Engineer	Structural Engineer
15	Fire Service Engineer to confirm the following ▪ Sprinklers will be provided to residential balconies	Fire Services Engineer

	▪ Sprinklers will be provided to the lift shafts ▪ Sprinklers will be provided to the bin chute and bin room	
16	A fire indicator panel is required as part of the detection system. This panel is to be located within 4m of the main entry and should be incorporated within the fire control room. Any variation to the prescriptive provisions will require the consent of the fire brigade and should form part of the fire safety engineering report to verify the performance requirements of the BCA.	Fire Services Engineer
17	The current design does not indicate a sanitary facility at the ground floor, available to apartment maintenance staff – as required by Table F2.1 of the BCA	Architect
18	Where bathrooms or rooms containing water closets have the WC within 1200mm of the doorway, the door shall be either sliding, open outwards, or be provided with removable hinges.	Architect
19	Floor wastes to be provided within bathrooms and laundries where located above another sole occupancy unit. The floor shall be sloped towards these wastes.	Architect
20	The use of a syphonic stormwater drainage system is not covered by Australian Standards and an appropriate performance solution will need to be documented by the hydraulic consultant addressing the system compliance against BCA Performance Requirements FP1.2 & FP1.3. Please confirm if this is proposed to be utilised	Civil / Hydraulic Engineer
21	Confirmation of the location of the Hydrant Booster and Hydrant Pump room to be shown on plans	Fire Service Engineer / Architect
22	Egress from roof plant areas to be confirmed	Architect

The application for Construction Certificate shall be assessed under the relevant provisions of the Environmental Planning & Assessment Act 1979 (As Amended) and the Environmental Planning & Assessment Regulation 2000.

Assessed by

Ahmad Sammani
Building Surveyor
McKenzie Group Consulting (NSW) Pty Ltd

2. Introduction

The proposed development is a residential development, to be located at 25-27 Warriewood Road, Warriewood.

This report is based upon the review of the design documentation listed in Appendix A of this Report

The report is intended as an overview of the relevant provisions of the Building Code of Australia for assistance only. Detailed drawings and associated review will still be required as the final design is developed.

The applicable legislation governing the design of buildings is the Environmental Planning and Assessment Act 1979. This Act requires that all new building works must be designed to comply with the BCA.

The version of the BCA applicable to the development, is version that in place at the time of the application to the Certifying authority for the Construction Certificate. For the purposes of this Report, BCA 2019 has been utilised as the version of the BCA applicable at the time of preparation this Report.

3. Preliminaries

3.1. Building Assessment Data

Summary of Construction Determination:

Part of Project	Building
Classification	2, 7a, 7b
Number of Storeys	4
Rise In Storeys	4
Type of Construction	A
Effective Height (m)	<12m

Note: The effective height of the project now includes all stories included in the rise in stories of the project.

3.2. Structural Provisions (BCA B1):

The importance level of the building is to be confirmed by the project Structural Engineer

Any new structural works are to comply with the applicable requirements of BCA Part B1, including the new verification method BV2, and AS/NZS 1170.0-2002, AS/NZS 1170-1-2002, AS/NZS1170.2-2011.

Glazing is to comply with AS1288-2006, and AS2047-2014.

Prior to the issue of the Construction Certificate structural certification is required to be provided.

4. Fire Protection

4.1. Fire Compartmentation (BCA C1.1)

The BCA stipulates three levels of fire resistant construction, which is based upon the rise in storeys and classification of the building. Each of these types of construction has maximum floor area and volume limitations as per BCA Table C2.2.

Based upon the rise in storeys and use of the building, it is required to be constructed in accordance with the requirements of Type A Construction, in accordance with Table 3 & 3.9 of Specification C1.1 of the Building Code of Australia 2019.

The building has been assessed on the basis of the following fire separation / compartmentation within the development:

- Bounding construction to the sole occupancy units of 90 minutes,
- Separation between the carpark levels and the residential portions of 120 minutes,
- Separation of loading dock/storage areas to be reduced through a fire engineered solution
- Fire compartmentation of the building at each floor level,

It is anticipated that a fire engineered solution will be proposed to reduce the required FRL's as detailed in Spec C1.1, from the following locations:

- Storage areas (Class 7b portions) from remainder of building

The maximum floor area and volume limitations of a fire compartment as nominated in the deemed to satisfy provisions as determined via Table C2.2 of the BCA

The Building complies with the parameters nominated above as detailed for Type A construction.

4.2. Fire Resistance (BCA C1.1)

The building should be constructed generally in accordance with the relevant provisions of Specification C1.1 of the BCA applicable to Type AConstruction, Please refer to Appendix C which outlines the required fire rating to be achieved by the development.

Other passive fire protection issues that will need to be addressed in detailed documentation phase include:

- Lift Motor Rooms;
- Emergency Power Supply;
- Electricity Supply;
- Hydrant Pump Rooms;
- Sprinkler Pump Rooms;

The above areas are to be separated from the remainder of the building by construction achieving a minimum fire resistance level of 120 minutes.

4.3. Fire Hazard Properties (BCA C1.10 and BCA C1.9)

The fire hazard properties of fixed surface linings and mechanical ductwork will also need to be addressed within the detailed documentation phase pursuant to Specification C1.10 Building Code of Australia. The following requirements apply:

<u>Sprinkler Protected Areas</u>

a) Floor Coverings – Critical radiant Flux not less than 1.2 kW/m^2
b) Wall and Ceiling Linings – Material Group No. 1, 2, 3 to the Class 2 part (except that the fire-isolated exits wall & ceiling linings should achieve Material Group 1)
c) Wall and Ceiling Linings – Material Group No. 1, 2, 3 to the Class 6 part

Rigid and flexible air handling ductwork must comply with AS4254 Parts 1 & 2 2012.

Floor linings and floor coverings used in lift cars must have a critical radiant flux not less than 2.2, and wall and ceiling linings must be a Material Group No. 1 or 2 in accordance with AS 5637.1

It is also noted that there are occupiable outdoor areas (i.e. communal terraces and at roof area). These are required to comply with the following compliance for fire hazard properties:

Subject to the below, a lining, material or assembly in an occupiable outdoor areas must comply with C1.10 as for an internal element. The following fire hazard properties of a lining, material or assembly in an occupiable outdoor area are not required to comply with C1.10:-

(i) Average specific extinction area
(ii) Smoke-developed index
(iii) Smoke development rate
(iv) Smoke growth rate index

External Wall Cladding

Since the building is of Type A construction, the following components are required to be completely non-combustible:

- External walls, including façade coverings, framing, insulation;
- Flooring and framing of lift pits;
- Non-loadbearing internal walls required to have an FRL;
- All non-loadbearing shafts;
- All loadbearing internal walls and loadbearing fire walls, including those that are part of loadbearing shafts.

Please provide product specifications and test reports to AS 1530.1-1994 for all materials to demonstrate compliance

For materials and assemblies that are required to be non-combustible, the material or system must be not deemed combustible when tested in accordance with AS 1530.1-1994.

Combustible Materials

The following materials, though combustible or containing combustible fibres, may be used wherever a non-combustible material is required:
a) Plasterboard.
b) Perforated gypsum lath with a normal paper finish.
c) Fibrous-plaster sheet.
d) Fibre-reinforced cement sheeting.
e) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0.
f) Sarking type materials that do not exceed 1mm in thickness and have a Flammability Index not greater than 5.
g) Bonded laminated materials where -
   (i) each laminate is non-combustible; and
   (ii) each adhesive layer does not exceed 1 mm in thickness; and
   (iii) the total thickness of the adhesive layers does not exceed 2 mm; and
   (iv) the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole does not exceed 0 and 3 respectively.

It is recommended that once material selections are made, copies of the fire test certificates/reports be provided for review and approval.

The BCA does nominate that ancillary elements may not be fixed to an external wall that is required to be non-combustible unless they comprise of the following:

a) An ancillary element that is non-combustible.
b) A gutter, downpipe or other plumbing fixture or fitting.
c) A flashing.
d) A grate or grille not more than 2 m² in area associated with a building service.
e) An electrical switch, socket-outlet, cover plate or the like.
f) A light fitting.
g) A required sign.
h) A sign other than one provided under (a) or (g) that—
   i) achieves a group number of 1 or 2; and
   ii) does not extend beyond one storey; and
   iii) does not extend beyond one fire compartment; and
   iv) is separated vertically from other signs permitted under (h) by at least 2 storeys.

Please provide fire hazard properties reports for any proposed signs and confirm their extent i.e. not spanning more than one storey or fire compartment:

4.4. **Separation of equipment (C2.12)**

Equipment listed below must be separated from the remainder of the building providing a FRL as required by Spec C1.1 but not less than 120/120/120 with a self-closing fire door with an FRL or not less than -/120/30. When separating a lift shaft and life motor room, an FRL of not less than 120/120/120is required.

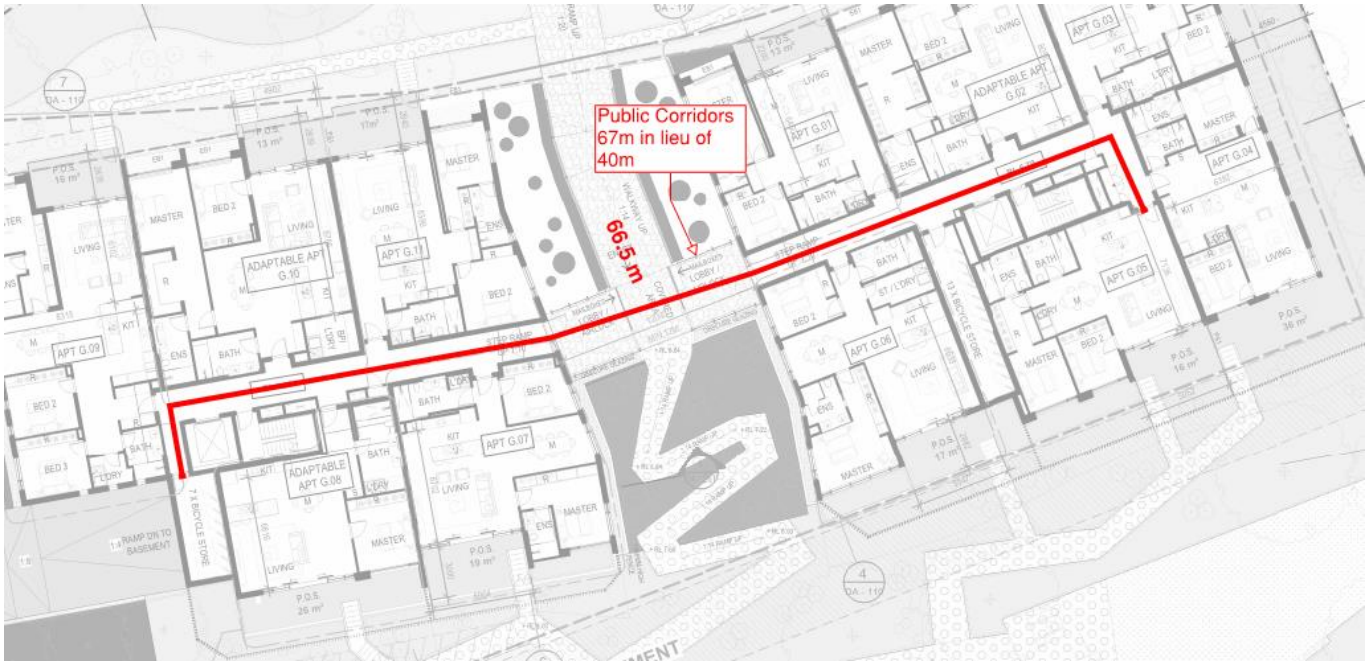
a) Lift motors and lift control panels; or
b) Emergency generators used to sustain emergency equipment operating in the emergency mode; or
c) Central smoke control plant; or
d) Boilers; or
e) A battery system installed in that building that has total voltage of 12 volts or more and a storage capacity of 200kWh or more.

4.5. **Public Corridors: Class 2 and 3 Buildings (BCA C2.14)**

Public corridors exceeding 40m in length to be divided into intervals of not more than 40m by smoke proof walls complying with Clause 2 of BCA Specification C2.5

Public corridors on ground floor currently measuring 67m and not proposed to be smoke separated to less than 40m as per C2.14 of the BCA.

This corridor has been flagged as an issue due to the connectivity of each corridors of each building on the ground floor. As such it will be required to be addressed through design amendment of through a Performance Solution.



4.6. **Protection of Openings in External Walls (BCA C3.2 / C3.3 / C3.4)**

The prescriptive provisions of the BCA stipulate that any external opening within 3m of the boundary requires protection by -/60/- fire rated construction, or externally located wall wetting sprinklers.

Where a building is separated into fire compartments, the distance between parts of external walls and openings within them must be not less than the table below unless those parts of each external wall has an FRL not less than 60/60/60 and openings are protected.

Angle Between Walls	Minimum Distance
0º (walls opposite)	6m
More than 0º to 45º	5m
More than 45º to 90º	4m
More than 90º to 135º	3m
More than 135º to 180º	2m
More than 180º	Nil

Fire Compartment drawings to be submitted to review compliance with the above.

Fire source feature is defined as;

a) The far boundary of a road, river, lake or the like adjoining an allotment,
b) The side or rear boundary of the allotment,
c) The external wall of another building on the allotment which is not a class 10 building.

4.7. Protection of Openings fire rated building elements (BCA C3.5 and BCA C3.10)

The prescriptive provisions of the BCA stipulate that openings within building elements required to have an FRL shall be protected as follows:

a) Penetrations through fire rated floors to be protected either by a tested prototype (e.g. fire collar, fire damper, etc) or be installed within a fire rated shaft achieving the required FRL

b) Any penetration through a wall or room required to have an FRL (e.g. substation, boiler room, apartment separating wall etc) is to be protected either by a tested prototype (e.g. fire collar, fire damper, etc) or be installed within a shaft achieving the required (or 120/120/120 where it is a room such as a substation);

c) Self-closing -/60/30 fire doors to the doors opening to the fire isolated stairs (note that this also includes the access doors to the condenser units on the plant platforms).

Note that where fire dampers, fire collars, etc are utilised, allowance needs to be made for access hatches to be provided within the walls / ceilings to ensure that maintenance access is provided.

As the design develops, details will need to be included in relation to sealing of penetrations / construction of fire rated shafts.

5. Access and Egress

5.1. Provision for Escape (BCA D1)

The egress provisions for the proposed building are provided by the following:

- Fire isolated stairways
- External perimeter doorways
- Required non-fire isolated stairways
- External Doors

Detailing issues that will need to be addressed as the design develops include:

- Door Hardware
- Exit Door Operation
- Stair Construction
- Handrail and Balustrade construction
- Details of Separation of Rising and Descending Stairs
- Discharge from Fire Isolated Exits
- Details of the egress provisions to the Road.
- Door swings

5.2. Travel via Fire Isolated Exits (BCA D1.7)

The proposed exits are required to be fire isolated.

The BCA requires each fire isolated stairway to provide independent egress from each storey served and discharge directly, or by way of its own fire isolated passageway to:

- A road or open space; or
- To a point in a storey within the confines of the building, that is used only for pedestrian movement, car parking or the like and is open for at least 2/3 of its perimeter, and an unimpeded path of travel not more than 20m to a road or open space; or
- A covered area that adjoins a road or open space, is open for at least 1/3 of its perimeter, has an unobstructed clear height throughout of not less than 3m, and provides an unimpeded path of travel to a road or open space of not less than 6m.

Additionally, where the path of travel from the point of discharge requires occupants to pass within 6m of any part of the external wall of the same building (measured horizontally), that external wall must have a 60/60/60 FRL and have any openings protected internally for a distance of 3m above or below the path of travel.

The fire isolated exits/stairs serving the basement currently discharge into the ground floor being a covered area, not strictly in accordance with D1.7 (b) and will required occupants to egress past opening within the external wall not proposed to be protected in accordance with C3.4

Where design amendments are not afforded the above DTS departures are to be addressed through a Fire Engineered Performance Solution confirming compliance with the relevant Performance Requirements of the BCA

5.3. **Exit Travel Distances (BCA D1.4)**

The locations of the proposed exits would appear to indicate that the deemed to satisfy requirements in terms of travel distances, distances between alternative exits and egress widths would be satisfied.

The travel distances to exits should not exceed:

Class 7

- no point on the floor must be more than 20m to a single exit or point of choice and where two exits are provided, a maximum of 40m to one of those exits; and
- exits shall be located to not be more than 60m apart and not closer than 9m

Class 2 & 3

- 6m from an exit or from a point of choice from the entrance doorway of a sole occupancy unit
- 20m from a single exit at the level of egress to a road or open space
- Alternate exits not more than 45m apart

The locations of the proposed exits indicate that the deemed to satisfy requirements in terms of travel distances would be satisfied, with the exception of the following:

Basement

- Up to 27m to a point of choice in lieu of 20m and total of 41m in lieu of 40m to an exit

Ground Floor

- Up to 38m to a single exit in lieu of 30m from the store (with Spec E1.5a concession)
- Up to 33m to a single exit in lieu of 30m from G.05 (with Spec E1.5a concession)

Level 1

- Up to 15m to a single exit in lieu of 12m (with Spec E1.5a concession)

Where design amendments are not afforded the above DTS departures are to be addressed through a Fire Engineered Performance Solution confirming compliance with the relevant Performance Requirements of the BCA

5.4. **Dimensions of Exits (BCA D1.6)**

Minimum dimensions of 1000mm and 2000mm height to be provided within exits, with the paths of travel should provide a minimum width of 1000mm (note that all maintenance access, cat walks, etc may comply with AS1657-2018 in which case a 600mm clear width is required).

Doorways are permitted to contain a clear opening width of the required width of the exit minus 250mm, with a height of 1980mm as part of egress requirements. Access for persons with disabilities however requires a clear doorway opening width of 850mm (i.e. minimum 920 mm doors).

5.5. **Balustrades and Handrails (BCA D2.16 / BCA D2.17 / D2.24)**

Generally

Balustrading to a minimum height of 1000mm with a maximum opening of 124mm in any direction should be provided adjacent to balconies, landings, corridors etc where located adjacent to a change in level exceeding 1000mm, or where it is possible to fall through an openable window located more than 4m above the surface beneath.

Where it is possible to fall more than 4m to the surface below, the balustrade shall not contain any horizontal or near horizontal members that facilitate climbing between 150 – 760mm above the floor.

Handrails should generally be provided at a minimum height of 865mm alongside of all ramps and stairs.

The public stairs and ramps located along an accessible path of travel should be designed in accordance with the requirements of AS1428.1 for persons with disabilities. This requires a handrail on each side of the stair and ramp and for the handrail to extend approximately 550mm – 600mm past the last tread / end of ramp.

Intermediate rails located between 665mm and 750 mm should be provided within Class 9b Primary Schools.

Fire Isolated Stairways

Balustrades in the fire isolated stairways and Class 7b of buildings are permitted to contain a 3 rail system, with a bottom rail situated at not more than 150mm above the nosings. The distance between the rails shall not exceed 460mm.

Handrails are required on both sides of all stairways except for fire isolated stairways used only for emergency egress purposes.

Note: in a required exit serving an area required to be accessible, handrails must be designed and constructed to comply with Clause 12 of AS1428.1-2009

Openable Windows in Bedrooms

In bedrooms of Class 2 buildings where the distance from the floor level to the level below exceeds 2m, window openings shall be provided with protection in accordance with BCA Clause D2.24.

Where the lowest part of the window opening is less than 1.7m above a floor, the window opening must be:

a) Fitted with a device to restrict the opening; or
b) Fitted with a screen with secure fittings

The device or screen required must –

a) Not permit a 125mm sphere to pass through it; and
b) Resist an outward horizontal action of 250N; and
c) Have a child resistant release mechanism if the screen or device is able to be removed, unlocked or overridden

Further review will be undertaken to ensure compliance as the design develops.

5.6. **Slip Resistance**

The adoption of BCA 2014 introduced a requirement for slip resistance of stairway treads and ramp surfaces. The requirements are as follows:

Table D2.14 SLIP-RESISTANCE CLASSIFICATION

Application	Surface conditions	
	Dry	**Wet**
Ramp steeper than 1:14	*P4 or R11*	*P5 or R12*
Ramp steeper than 1:20 but not steeper than 1:14	*P3 or R10*	*P4 or R11*
Tread or landing surface	*P3 or R10*	*P4 or R11*
Nosing or landing edge strip	*P3*	*P4*

6. Services and Equipment

The following section of this report describes the essential fire safety measures and the minimum performance requirements of those measures. A draft essential fire safety schedule can be found in Appendix B.

6.1. **Fire Hydrants (BCA E1.3)**

A system of Fire Hydrants is required to be provided in accordance with BCA Clause E1.3 and AS2419.1-2005.

Pressure and flow information will be required to confirm the required pressures and flow to the system, depending on the type of hydrant to be utilized;

- Feed hydrants (within 20m of hard stand for pumping appliance), 200 kPa NSW - 150
- Attack hydrant (within 50m of hard stand) 350 kPa NSW - 250
- Hydrants on a pump station, 700 kPa

The building is required to be provided with a booster assembly as part of the fire hydrant requirements. The booster is required to be located attached to the building at the main entry. If remote from the building, the booster is to be located at the main vehicle entry or with sight of the main entry of the building within 20m of a hardstand area.

As the proposal will have multiple entrances, the hydrant booster will not be located within sight of the main entrance and will be assessed through a performance solution.

The fire pump location is satisfactory.

6.2. **Fire Hose Reels**

A Fire Hose Reel System is required to BCA Clause E1.4 and AS2441-2005.

Fire hose reels are to be located within 4m of exits and provide coverage within the building based on a 36m hose length and 4m of water spray. Where required, additional fire hose reels shall be located internally as required to provide coverage. These hose reels are to be located adjacent to internal hydrants.

Fire hose reel cupboards must not contain any other services such as water meters, etc., and doors to fire hose reel cupboards are not to impede the path of egress unless an alternative solution is developed under BCA Performance Requirement EP1.1

Fire Hose reel are not to extend through Fire and Smoke Walls.

As the design develops, details will need to be included confirming compliance with the above.

6.3. **Fire Extinguishers (BCA E1.6)**

The provision of portable fire extinguishers is required to BCA Clause E1.6 and AS2444 - 2001 to provide coverage.

Table E.6 details when portable fire extinguishers are required:

Occupancy Class	Risk Class (as defined in AS 2444)
General provisions – Class 2 to 9 buildings (except within sole-occupancy units of a Class 9c building)	a) To cover Class AE or E fire risks associated with emergency services switchboards. (Note 1) b) To cover Class F fire risks involving cooking oils and fats in kitchens. c) To cover Class B fire risks in locations where flammable liquids in excess of 50 litres are stored or used (not excluding that held in fuel tanks of vehicles). d) To cover Class A fire risks in normally occupied fire compartments less than 500m^2 not provided with fire hose reels (excluding open deck carparks). e) To cover Class A fire risks in classrooms and associated schools not provided with fire hose reels. f) To cover Class A fire risks associated with Class 2 or 3 building or class 4 part of building.

In addition, extinguishers are to be provided to the class 2/3 portions of the building in accordance with the below:

- an ABE type fire extinguisher is to be installed with a minimum size of 2.5 kg; and
- extinguishers are to be distributed outside a sole-occupancy unit

a) to serve only the storey at which they are located; and
b) so that the travel distance from the entrance doorway of any sole-occupancy unit to the nearest fire extinguisher is not more than 10 m.

Fire extinguishers are to be located in accordance with AS 2444 - 2001, often collocated with fire hydrants and/or fire hose reels.

As the design develops, details will need to be included confirming compliance with the above.

6.4. **Automatic Sprinkler Protection (BCA E1.5)**

Automatic sprinkler protection is required to Specification E1.5 and AS2118.1-2017 to the basement carparking levels.

The sprinkler system shall be connected to and activate an occupant warning system complying with BCA Specification E2.2a.

A sprinkler system shall be provided in a Class 2 or 3 building (excluding a residential care building) with a rise in storeys of 4 or more in accordance with the relevant parts of Specification E1.5 and Specification E1.5a.

As the design develops, details will need to be included confirming compliance with the above.

6.5. **Smoke Hazard Management (BCA E2.2)**

Smoke hazard management shall be provided throughout the building by means of the following systems:

- Automatic Shutdown of Mechanical Systems in accordance with the requirements of AS/NZS 1668.1-2015 Amendment 1;
- Automatic Smoke Detection and Alarm System in accordance with the requirements of BCA Spec E2.2a and AS 1670.1-2018;
- Natural smoke venting with ventilation openings distributed as evenly as practicable and comprising permanent openings at roof level with a free area comprising not less than 1.5% of the floor area, and low level openings which may be permanent or readily openable with a free area not less than 1.5% of floor area;
- Carpark ventilation systems must comply with Clause 5.5 of AS/NZS1668.1-2015 Amendment 1 except that fans with metal blades suitable for operation at normal temperature may be used and the electrical power and control cabling need not be fire rated

It is proposed to incorporate impulse fans in the car park area to address isolated stagnant areas, in an otherwise naturally ventilated car park, instead of traditional ducted mechanical ventilation in accordance with AS1668.

A fire indicator panel is required as part of the detection system. This panel is to be located within 4m of the main entry and should be incorporated within the fire control room. Any variation to the prescriptive provisions will require the consent of the fire brigade and should form part of the fire safety engineering report to verify the performance requirements of the BCA.

As the design develops, details will need to be included confirming compliance with the above.

6.6. **Lift Services (BCA E3.4 and BCA E3.6)**

The passenger lifts to be installed are to be:-

- Fitted with warning signs, fire service controls in accordance with Clauses E3.3, Figure E3.3, E3.7, E3.9 and E3.10 of the BCA.
- Stretcher facilities are to be provided within the lifts with minimum dimensions of 600m wide, 2000mm long and 1400mm high;
- Be provided with the following in order to satisfy accessibility requirements:
  - A handrail in accordance with AS1735.12-1999,
  - Minimum internal floor dimensions of 1400 x 1600mm for lifts which travel more than 12m, or 1100 x 1400mm for lifts which travel not more than 12m,
  - Fitted with a series of door opening sensory devices which will detect a 75mm diameter or across the door opening between 50mm and 1550mm above floor level,
  - Have a set of buttons for operating the lift located at heights above level complying with AS1735.12 - 1999

- For lifts serving more than 2 levels, automatic audible information within the lift car identifying the level each time the car stops, and audible and visual indication at each lift landing to indicate the arrival of a car

As the design develops, details will need to be included confirming compliance with the above.

6.7. Exit Signs and Emergency Lighting (BCA E4.2 and BCA E4.5)

Emergency Lighting and Exit Signs indicating exit location paths of travel to exits to be provided in accordance with BCA Part E4 and AS/NZS 2293.1-2018, including the potential use of photo luminescent exit signs.

As the design develops, details will need to be included confirming compliance with the above.

6.8. Fire Precautions During Construction (BCA E1.9)

After the building has reached an effective height of 12m, the following fire services are required to be operational:

- Required fire hydrants and fire hose reels on every storey covered by the roof/floor structure (except the 2 uppermost storeys); and
- Booster connections installed.

Due to the height of the building this will need to be considered and implemented during construction.

7. Health and Amenity

7.1. Sanitary Facilities (BCA F2.2 and BCA F2.3)

Apartments

The building contains more than 10 apartments. Accordingly, a sanitary facility comprising a WC and wash basin is to be provided for employees at ground floor level, and be accessible to employees without having to enter an apartment.

The current design does not indicate a sanitary facility at the ground floor, available to apartment maintenance staff – as required by Table F2.1 of the BCA

Each apartment is required to be provided with the following:

- A kitchen sink and facilities for the preparation and cooking of food; and
- A bath or shower; and
- A closet pan and wash basin; and
- Clothes washing facilities comprising at least one wash tub and space for a washing machine; and
- Clothes line of at least 7.5m, or space for one heat operated drying device within the same space as the clothes washing.

The design submitted indicates that each apartment should satisfy the above requirements.

Detailed designs will need to be developed as to the layout, dimensions, etc of the sanitary facilities.

Bathroom Construction

Where bathrooms or rooms containing water closets have the WC within 1200mm of the doorway, the door shall be either sliding, open outwards, or be provided with removable hinges.

7.2. **Floor Wastes**

Floor wastes to be provided within bathrooms and laundries where located above another sole occupancy unit. The floor shall be sloped towards these wastes.

7.3. **Light and Ventilation (BCA Part F4)**

Class 2

Natural light and ventilation is to be provided to all habitable rooms at a rate of 10% and 5% of the floor area of the rooms respectively.

A required window that faces a boundary of an adjoining allotment or a wall of the same building or another building on the allotment must not be less than a horizontal distance from that boundary or wall that is the greater of:

(i) generally — 1 m; and
(ii) 50% of the square root of the exterior height of the wall in which the window is located, measured in metres from its sill.

Class 7

Natural Ventilation is required to be provided to rooms at a rate of 5% of the floor area in openings. Alternatively, mechanical ventilation is required in accordance with AS1668.2-2012

Artificial lighting complying with AS/NZS1680.0-2009 is to be incorporated with the final detailed design to be developed to confirm this.

7.4. **Sound Transmission and Insulation (BCA F5)**

Building elements within Class 2 buildings should provide the following sound insulation levels.

Location	**Notes**	**Sound Insulation Requirement**
Walls separating habitable rooms		$R_w + C_{tr} \geq 50$
Walls separating habitable room and kitchen or bathroom	Wall must be of Discontinuous Construction	$R_w + C_{tr} \geq 50$
Floor separating habitable rooms	Impact isolation required	$R_w + C_{tr} \geq 50$ $L_{n,w} + C_l \leq 62$
Duct, soil, waste or water supply pipe, including pipes that is located in a floor or wall cavity, serves or passes through more than one room	Adjacent habitable room or Adjacent non-habitable room	$R_w + C_{tr} \geq 40$ or $R_w + C_{tr} \geq 25$
Door to habitable room		$R_w \geq 30$

Please provide a report from the acoustic engineer verifying design compliance with the provisions of part F5 of the BCA.

7.5. **Condensation management (BCA Part F6)**

Pliable building membranes installed to an external wall must achieve compliance with AS 4200.1, be installed in accordance with AS4200.2, be located on the exterior side of the primary insulation layer or the wall assembly and except for the single skin mason and single sin concrete be separated from water sensitive materials.

Exhaust systems must achieve 25L/s for bathrooms and sanitary compartment with discharge directly or via a duct to our door air or to a roof space that is ventilated. Kitchens and laundries to achieve 40L/s and discharge directly or via a shaft or duct to outdoor air.

Exhaust systems discharging directly or via a shaft or a duct to a roof space must be through evenly distributed systems. Opening for minimum flow requirements must have a total unobstructed area of 1/300 of the respective ceiling area if the roof pitch is greater than 22º. 30% of the total unobstructed area required for exhaust being discharged directly or via a shaft or duct to outdoor air must be located not more than 900 mm below the ridge or highest point of the roof space.

7.6. **Waterproofing (BCA FP1.4)**

Performance Requirement FP1.4 which relates to the prevention of the penetration of water through external walls, must be complied with. It is noted that there are no Deemed-to-Satisfy Provisions for this Performance Requirement in respect of external walls.

As such, a performance solution is to be prepared by a suitably qualified professional that demonstrates that the external walls of the proposed building complies with Performance Requirement FP1.4 which reads as follows:

A roof and external wall (including openings around windows and doors) must prevent the penetration of water that could cause—

a) unhealthy or dangerous conditions, or loss of amenity for occupants; and
b) undue dampness or deterioration of building elements.

External above Ground Membranes

All external above ground areas (roof slabs, balconies etc.) shall be protected by a waterproofing system in accordance with AS4654 Parts 1 and 2 – 2012.

For external balconies the waterproofing membrane must have a vertical upward termination height in accordance with the table below dependant on the wind class of the site. The wind class is determined by the structural engineer.

Wind Class Regions A & B	Wind Class Regions C & D	Ultimate Limit State Wind Speed	Termination Height (mm)
N1	-	34	40
N2	-	40	50
N3	C1	50	70
N4	C2	61	100
N5	C3	74	150
N6	C4	86	180

Wet Areas

Internal wet areas throughout the development (e.g. bathrooms, laundries) shall be waterproofed in accordance with AS3740 - 2010 requirements.

Further review will be undertaken as the design develops with respect to the specification of waterproofing membrane, provision of water-stops at doorways etc.

7.7. **Stormwater Drainage**

Stormwater drainage systems serving the building are to comply with AS3500.3 - 2018.

The use of a syphonic stormwater drainage system is not covered by Australian Standards and an appropriate performance solution will need to be documented by the hydraulic consultant addressing the system compliance against BCA Performance Requirements FP1.2 & FP1.3.

8. Energy Efficiency

The deemed-to-satisfy provisions of the BCA only apply to thermal insulation in a class 2 building where development consent or a Complying Development certificate specifies that the insulation is to be provided as part of the development.

The residential (Class 2) portions of the building are subject to BASIX, and a BASIX Certificate will be required prior to the issuance of the Construction Certificate for the works.

8.1. **SECTION J (Transition Period)**

A transition period applies to Section J requirements, from 1 May 2019 to 30 April 2020 Section J of NCC 2016 may apply instead of Section J of NCC 2019. From 1 May 2020 Section J of NCC 2019 will apply.

8.2. **SECTION J (JP1 Energy Use)**

Efficient energy use must be achieved appropriate to the function and use of the building, level of human comfort, solar radiation, energy source of the services and sealing of the building envelope. To achieve this JV1, JV2, JV3 and JV4 verification methods have been introduced.

- JV2 Green Star
  - To achieve compliance with JP1 for Class 3,4,5,6, 7, 8, 9 and common area of Class 2 buildings Green Star can be used as a verification method when the calculation method complies with ANSI/ASHRAE Standard, Specification JVb and when:
    - The building complies with simulation requirements and is registers for a Green Star – Design & As-Built rating; and
    - The annual greenhouse gas emissions of the proposed building are less than 90% of the annual greenhouse gas emissions of the reference building; and
    - In the proposed building, a thermal comfort level of between predicted mean vote of -1 to +1 is achieve across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building; and
    - The building complies with the additional requirements of Specification JVa.
- JV3 Verification Using a Reference Building
  - To achieve compliance with JP1 for Class 3,4,5,6, 7, 8, 9 and common area of Class 2 buildings verification using a reference building can be used when the calculation method complies with ANSI/ASHRAE Standard, Specification JVb and when:
    - It is determined that the annual greenhouse gas emissions of the proposed building are not more than the annual greenhouse gas emissions of a reference building when the proposed building is modeled with the proposed services and the proposed building is modelled with the same services as the reference building. The proposed building thermal comfort level is to be between predicted mean vote of -1 to +1 across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation; and
    - The building achieves the additional requirements in Specification JVa; and
    - The greenhouse gas emissions of the proposed building may be offset by renewable energy generated and use on site and another process such as reclaimed energy used on site.
- JV4 Building Envelope Sealing

- Compliance with sealing of the building against air leakage is verified when the envelope is sealed at an air permeability rate tested in accordance with Method 1 of AS/NZS ISO 9972, of not more than –
  - For a class 2 building or a class 4 part of a building, 10m³hr.m² at 50 Pa reference pressure; or
  - For a class 5, 6, 8, 9a or 9b building other than a ward area in climate zones 1, 7 and 8, 5 m³/hr.m² at 50 Pa reference pressure; or
  - For class 3 or 9c building, or a class 9a ward area in climate zones 1, 3, 4, 6, 7 and 8 5m³/hr.m² at 50 Pa reference pressure.
- Part J3 and performance solution that uses on of the other NCC assessment Methods which verifies that compliance with JP1 (e) will be achieve can also be used as verification methods.

In addition to the verification methods noted above, a deemed-to-satisfy solution may be developed to demonstrate compliance.

Facilites for energy monitoring is to be provided to the building in accordance with the requirements of BCA Part J8.

Due to special nature of the building some energy provisions may not be appropriate.

Certification from an appropriately qualified engineer should be provided for either option with a report / computations outlining how compliance is achieved.

9. Access for People with Disabilities

The development is required to comply with the accessibility provisions contained within:

- The Building Code of Australia 2019;
- The Access to Premises Standard;
- AS1428.1-2009 General Requirements for Access – New Building Work;
- AS1428.4.1 -2009 Tactile Ground Surface Indicators
- AS2890.6-2009 Car Parking for People with Disabilities

9.1. General Building Access Requirements (BCA D3.1)

Access for people with disabilities shall be provided to and within the building in accordance with the requirements of Clause D3.2, D3.3 and D3.4 of the BCA 2019 1. Parts of the building required to be accessible shall comply with the requirements of:-

- AS1428.1-2009 General Requirements for Access – New Building Work;
- AS1428.4.1 -2009 Tactile Ground Surface Indicators
- AS2890.6-2009 Car Parking for People with Disabilities

Access for persons with a disability is to be provided as follows:

Apartment (Class 2 Buildings)

- From the pedestrian entrance to at least 1 floor containing Sole Occupancy Units and to the entrance door of all Sole Occupancy Units on that floor, and to at least one type of each common facility, such as gyms, shops, laundries (shared), gaming rooms etc.
- Where an AS1428.1 compliant lift or ramp is provided in addition to the above and access is required to and within all spaces, and to the entrance of doors to single occupancy units on the levels, served by the lift or ramp.

Car parks (Class 7a buildings)

To and within any level containing accessible car parking spaces.

9.2. **Stairs (BCA D3.3 inter Alia AS1428.1)**

Stairs shall be constructed as follows:

a) Where the intersection is at the property boundary, the stair shall be set back by a minimum of 900mm so that the handrail TGSIs do not protrude into the transverse path of travel.

b) Where the intersection is at an internal corridor, the stair shall be set back in 300mm, so the handrails do not protrude into transverse path of travel.

c) Stairs shall have opaque risers.

d) Stair nosing shall not project beyond the face of the riser and the riser may be vertical or have a splay backwards up to a maximum 25mm.

e) Stair nosing profiles shall;

- Have a sharp intersection;
- Be rounded up to 5mm radius; or
- Be chamfered up to 5mm x 5mm

f) All stairs, including fire isolated stairs shall, at the nosing of each tread have a strip not less than 50mm and not more than 75mm deep across the full width of the path of travel. The strip may be set back a maximum of 15mm from the front of the nosing. The strip shall have a minimum luminance contrast of 30% to the background. Where the luminous contrasting strip is affixed to the surface of the tread, any change in level shall not exceed a difference of 5mm.

9.3. **Accessible Sanitary Facilities (BCA F2.4)**

Unisex Accessible Sanitary Facilities

An accessible unisex sanitary facility must be located so that it can be entered without crossing an area reserved for one sex only and provided in accordance with AS 1428.1-2009 and must contain a closet pan, washbasin, shelf or bench top and adequate means of disposal of sanitary products and as per following.

Building Type	Minimum accessible unisex sanitary compartments to be provided
Residential apartments	Where sanitary compartments are provided in common areas, not less than 1.

9.4. **Signage (BCA D3.6)**

As part of the detailed design package, specifications will need to be developed indicating:

- Sanitary Facility Identification Signs (note that they are to comply with BCA Specification D3.6 and include the use of Braille, Tactile, etc and be placed on the wall on the latch side of the facility);
- Directional / Way Finding signs to the Lifts, Sanitary Facilities, etc;
- Hearing Augmentation System;
- Identify each door required by BCA Clause E4.5 to be provided with an exit sign, stating ‘EXIT’ and ‘Level” number

9.5. **Lifts (BCA E3.6)**

Lifts compliant to BCA E3.6 and BCA E3.7 must be provided, where required to be provided, with a minimum size of 1400 x 1600mm or 1100mm x 1400mm (whichever is appropriate) in size – with appropriate handrails and auditory commands.

10. Appendix A - Reference Documentation

The following documentation was used in the assessment and preparation of this report:

Issue	Title	Date	Prepared by
DA5	Warriewood DA drawing set	18 May 2020	VIA Architects

11. Appendix B - Draft Fire Safety Schedule

	Essential Fire Safety Measures	Standard of Performance
1.	Access Panels, Doors and Hoppers	BCA Clause C3.13
2.	Automatic Fail Safe Devices	BCA Clause D2.19 & D2.21
3.	Automatic Fire Detection and Alarm System	BCA Spec. E2.2a & AS 1670 – 2015, AS/NZS 1668.1 - 2015
4.	Automatic Fire Suppression System	BCA Spec. E1.5 & AS 2118.1 – 2017, AS 2118.4 – 2012 (Residential) AS 2118.6 – 2012 (Combined sprinkler & hydrant)
5.	Building Occupant Warning System activated by the Sprinkler System	BCA Spec. E1.5 & AS 1670 – 2018 & AS 1670.1 – 2018 – Clause 3.22
6.	Emergency Lighting	BCA Clause E4.2, E4.4 & AS/NZS 2293.1 – 2018 Amdt 1 & 2
7.	EWIS	BCA Clause E4.9 & AS 1670.4 - 2018
8.	Exit Signs	BCA Clauses E4.5, E4.6 & E4.8 and AS/NZS 2293.1 – 2018 Amdt 1 & 2
9.	Fire Dampers	BCA Clause C3.15, AS 1668.1 – 2015 & AS 1682 2 – 2012
10.	Fire Doors	BCA Clause C3.2, C3.4, C3.5, C3.6, C3.7 & C3.8 and AS 1905.1 – 2015
11.	Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 2005 Amdt 1
12.	Fire Hydrant System	Clause E1.3 & AS 2419.1 – 2005 Amdt 1
13.	Fire Seals	BCA Clause C3.15 & AS 1530.4 – 2005
14.	Lightweight Construction	BCA Clause C1.8
15.	Mechanical Air Handling System	BCA Clause E2.2, AS/NZS 1668.1 – 2015 & AS 1668.2 – 2012
16.	Paths of Travel	EP&A Reg 2000 Clause 186
17.	Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 – 2001
18.	Required Exit Doors (power operated)	BCA Clause D2.19(d)
19.	Smoke Dampers	AS/NZS 1668.1 – 2015
20.	Smoke Doors	BCA Spec. C3.4
21.	Wall-Wetting Sprinklers	BCA Clause C3.4 & AS 2118.2 – 2010
22.	Warning and Operational Signs	Section 183 of the EP & A Regulations 2000, AS 1905.1 – 2005, BCA Clause C3.6, D2.23, E3.3

12. Appendix C - Fire Resistance Levels

The table below represents the Fire resistance levels required in accordance with BCA 2019:

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

Table 3.9 REQUIREMENTS FOR CARPARKS			**FRL (not less than) Structural adequacy/Integrity/Insulation** **ESA/M (not greater than)**
Wall			
(a)	*external wall*		
	(i)	less than 3 m from a *fire-source feature* to which it is exposed:	
		Loadbearing	60/60/60
		Non-*loadbearing*	–/60/60
	(ii)	3 m or more from a *fire-source feature* to which it is exposed	–/–/–
(b)	*internal wall*		
	(i)	*loadbearing*, other than one supporting only the roof (not used for carparking)	60/–/–
	(ii)	supporting only the roof (not used for carparking)	–/–/–
	(iii)	non-*loadbearing*	–/–/–
(c)	*fire wall*		
	(i)	from the direction used as a *carpark*	60/60/60
	(ii)	from the direction not used as a *carpark*	as *required* by Table 3
Column			
(a)	supporting only the roof (not used for carparking) and 3 m or more from a *fire-source feature* to which it is exposed		–/–/–
(b)	steel column, other than one covered by (a) and one that does not support a part of a building that is not used as a *carpark*		60/–/– or 26 m^2/tonne
(c)	any other column not covered by (a) or (b)		60/–/–
Beam			
(a)	steel floor beam in continuous contact with a concrete floor slab		60/–/– or 30 m^2/tonne
(b)	any other beam		60/–/–
Fire-resisting lift and stair shaft (within the *carpark* only)			60/60/60
Floor slab and vehicle ramp			60/60/60
Roof (not used for carparking)			–/–/–
Notes:	1.	ESA/M means the ratio of exposed surface area to mass per unit length.	
	2.	Refer to Specification E1.5 for special requirements for a sprinkler system in a *carpark* complying with Table 3.9 and located within a multi-classified building.	