



**BUILDING CODE OF AUSTRALIA
REPORT**

Revision: 3

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**Proposed Building C1
Ivanhoe Estate, Macquarie Park, NSW**

**Prepared for:
Frasers Property Australia**

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Executive Summary

Development Overview

The proposed development known as Building C1 is a 22 storey, predominantly residential building including a basement carpark and also a retail component located at lower ground floor level.

Compliance Summary / Statement

As Accredited Certifiers, we have reviewed architectural design documents prepared by Candalepas & Associates (refer appendix A) for compliance with the Building Code of Australia 2016.

We confirm that, based on the documentation reviewed, the development is capable of complying with the performance requirements of the Building Code of Australia 2016 Amendment 1.

In this regard the following areas in particular require further review as the project develops:

No.	Items for review	Responsibility
1.	<p>Discharge of fire exits – paths of travel after discharging from fire isolated stairways are exposed to openings within 6m. Openings are to be either:</p> <ul style="list-style-type: none"> protected per BCA clause D1.7 & C3.4 subject to a performance solution from a suitably accredited fire engineer 	Architect / Services Consultants / Fire Engineer
2.	<p>Fire Separation – The design documentation is to be updated to indicate fire separation between the following areas:</p> <ul style="list-style-type: none"> the Carpark and Residential Lobby (2 hours) the Retail and Residential Lobby (3 hours) 	Architect / Structural Engineer
3.	<p>Future Basement 3 Connection to Building C2 – Sliding fire doors will be required at the boundary opening. Smoke detection will be required both sides of doors to initiate automatic closing. Detection will need to interface with the Fire Indicator Panels for both Building C1 & C2.</p>	Architect / Services Consultants
4.	<p>Carpark egress routes – paths of travel to fire exits in the carpark levels need to be clarified for assessment purposes.</p>	Architect

The assessment of the design documentation has revealed that the following areas are required to be assessed against the relevant performance requirements of the BCA. The submission for Construction Certificate will need to include verification from a suitably accredited fire engineer: -

No.	Alternative Solution Description	DTS Clause	Performance Requirement
Fire Safety Items			
1.	<p>Fire Control Room – the Location of the Fire Control Room for the development design will be assessed through performance based means in consultation with FRNSW.</p>	E1.8	EP1.6
2.	<p>Travel Distances – the Residential floors present travel distances in excess of the deemed-to-satisfy provisions of the BCA and will be assessed by the Fire Engineer for compliance with the performance requirement of the BCA.</p>	D1.4, D1.5	DP4 & EP2.2

Travel from the Ground floor pump room is subject to review and by the fire engineer as access is afforded to a single exit presenting travel distance in excess of DtS requirements.

3.	Number of exits – All storeys of the building are to be afforded with access to two (2) exits. Areas on Lower Ground Floor and Upper Ground Floor are afforded with access to a single exit. This is to be reviewed by the fire engineer through a performance based assessment.	D1.2	DP2, DP4 & DP5
5.	Combined Hydrant and Sprinkler System – the location of the booster assembly and associated infrastructure is subject to further design review and consultation with FRNSW on items which form part of the performance based solution.	E1.3 & E1.5	EP1.3 & EP1.4
Non-Fire Safety Items			
6.	Natural Light – The provision of natural light to some bedrooms in parts of the development is proposed to meet the performance requirements of the BCA.	F4.2	FP4.1
7.	Accessibility Provisions – Subject to Ongoing review by the Access Consultant as design progresses	D3	
8.	Weatherproofing of Façade – The weatherproofing of the façade is to be verified against the performance requirements of the BCA, in lieu of DtS provisions.	-	

The fire engineered solution relating to EP1.3 & EP2.2 will be subject to consultation with the NSW Fire Brigade as part of the Construction Certificate process under Clause 144 of the Environmental Planning & Assessment Regulation 2000.

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.

1.0 Introduction

This report supports a Development Application for Stage 1 of the Ivanhoe Estate redevelopment, a State Significant Development (SSD) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). It has been prepared for Aspire Consortium on behalf of NSW Land and Housing Corporation.

The proposed Stage 1 Development Application seeks consent for the first stage of detailed works within the Ivanhoe Estate, pursuant to the Ivanhoe Estate Masterplan under Section 4.22 of the EP&A Act. The Masterplan establishes the planning and development framework against which this Stage 1 Development Application will be assessed.

The Stage 1 Development Application seeks approval for:

- site preparation works, including tree removal, demolition of roads, services, and earthworks across the Ivanhoe Estate;
- the provision and augmentation of utilities and services infrastructure across the Ivanhoe Estate;
- the construction of all internal roads including public domain within the road reserves, and the bridge crossing and road connection to Lyonpark Road;
- the consolidation of existing lots and subdivision of the Ivanhoe Estate to reflect the revised road layout, open space, and provide superblocks corresponding to the Masterplan;
- the construction and use of Buildings A1 and C1 comprising residential uses (including social housing), a childcare centre, and retail / community spaces.

An image of the Masterplan, identifying Buildings A1 and C1 and illustrating the road network, is provided at **Figure 1** below.



Figure 1- Ivanhoe Estate Masterplan

The proposed development known as Building C1 is a 22 storey, predominantly residential building including a basement carpark and also a retail component located at lower ground floor level.

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.

1.1 Current Legislation

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 2016 has been utilised as the version of the BCA applicable at the time of preparation this Report.

2.0 PRELIMINARIES

2.1 Building Assessment Data

Summary of Construction Determination: -

Part of Project	Building C1
Classification	Class 2 Residential Class 6 Retail Class 7a Carpark Class 7b Storage
Number of Storeys	24
Rise In Storeys	21
Type of Construction	A
Effective Height (m)	>50m

Summary of the floor areas and relevant populations where applicable: -

Part of Project	BCA Classification	Approx. Floor Area (m ²)	Approximate Volume (m ³)	Assumed Population
Basement 3	7a	5681	TBA	190
Basement 2	7a	5681	TBA	190
Basement 1	2,7a	148 (residential) 2071 (carpark)	TBA	2 units 69
Lower Ground	2,6	728 (residential) 534 (retail)	TBA	9 units 178
Upper Ground	2	1819	TBA	26 units
Level 1	2	1918	TBA	22 units
Level 2	2	1994	TBA	28 units
Level 3	2	1994	TBA	28 units
Level 4	2	1994	TBA	28 units
Level 5→12	2	1986	TBA	30 units
Level 13	2	932	TBA	12 units
Level 14→19	2	887	TBA	12 units

Notes:

1. The above populations have been based on the floor areas and calculations in accordance with Table D1.13 of the BCA.
2. The floor areas have been adjusted without ancillary areas such as sanitary facilities, corridors, shelving and or racking layouts in storage areas.
3. The carpark areas have been considered ancillary to the use for the purposes of population numbers

2.2 Structural Provisions (BCA B1)

Any new structural works are to comply with the applicable requirements of AS/NZS 1170.1.

Glazing is to comply with AS1288, and AS2047.

Prior to the issue of the Construction Certificate structural certification is required to be provided, including determination of the importance level of the development.

This is to include assessment against the provisions of BCA Clause B1.6 – Construction of Buildings in Flood Areas

3.0 FIRE PROTECTION

3.1 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, the building is required to be Type A Construction in accordance with Table 3 & 3.9 of Specification C1.1 of the Building Code of Australia 2016.

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 between the retail areas and the residential lobbies of 180 minutes,
- Separation between the storage areas and various lobbies of 240 minutes,

The maximum floor area and volume limitations of a fire compartment as nominated in the deemed to satisfy provisions are as follows:

Classification		Type of Construction		
		A	B	C
5, 9b or 9c aged care building	max floor area—	8 000 m ²	5 500 m ²	3 000 m ²
	max volume—	48 000 m ³	33 000 m ³	18 000 m ³
6, 7, 8 or 9a (except for patient care areas)	max floor area—	5 000 m ²	3 500 m ²	2 000 m ²
	max volume—	30 000 m ³	21 000 m ³	12 000 m ³

3.2 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 A Construction, Please refer to Appendix C which outlines the required fire rating to be achieved by the development. These fire ratings are summarised below:-

Building Element		Class 2 Residential	Class 7a carpark	Class 6 Retail
External Walls	Loadbearing	90/90/90	120/120/120	180/180/180
	Non-loadbearing	-/90/90	-/120/120	-/180/180

External Columns	Loadbearing	90/-/-	120/-/-	180/-/-
	Non-loadbearing	-/-/-	-/-/-	-/-/-
Fire Walls	Loadbearing	90/90/90	120/120/120	180/180/180
Fire Stair / Shaft Walls	Loadbearing	90/90/90	120/120/120	180/120/120
	Non-loadbearing	-/90/90	-/120/120	-/120/120
Public Corridors	Loadbearing	90/90/90	120/-/-	180/-/-
	Non-loadbearing	-/60/60	-/-/-	-/-/-
Walls Bounding Apartments	Loadbearing	90/90/90	N/A	N/A
	Non-loadbearing	-/60/60	N/A	N/A
Service Shaft Walls	Loadbearing	90/90/90	120/90/90	180/120/120
	Non-loadbearing	-/90/90	-/90/90	-/120/120
Floors		90/90/90	120/120/120	180/180/180
Walls, Beams, Columns Supporting Floors		90/90/90	120/120/120	180/180/180
Walls, Beams, Columns Supporting Roof		90/-/-	120/-/-	180/-/-
Roof		<i>Non-combustible concession applies</i>		N/A

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

- Lift Motor Rooms,
- Emergency Power Supply,
- Emergency Generators,
- Electricity Supply,
- Boilers or Batteries,
- Hydrant Pump Rooms,
- Sprinkler Pump Rooms,
- Fire Control Room

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

3.3 Fire Hazard Properties (BCA C1.10 and BCA C1.12)

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:

Sprinkler Protected Areas

- a) Floor Coverings – Critical radiant Flux not less than 1.2 kW/m²
- b) Wall and Ceiling Linings – Material Group No. 1,2,3
- c) Other Materials – Spread of Flame Index not exceeding 9 and Smoke Developed Index not exceeding 8 (if Spread of Flame if >5)

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.

External Wall Cladding

As the building is of Type A construction the external walls including any cladding & lining must be non-combustible as determined by AS1530.1. 1994.

The BCA does afford the following exceptions to the above:

1. Attachments not to Impair Fire Resistance

- a) A combustible material may be used as a finish or lining to a wall or roof, or in a sign, sunscreen or blind, awning, or other attachment to a building element which has the required FRL if—
 - i. the material is exempted under C1.10 or complies with the fire hazard properties prescribed in Specification C1.10; and
 - ii. it is not located near or directly above a required exit so as to make the exit unusable in a fire; and
 - iii. it does not otherwise constitute an undue risk of fire spread via the facade of the building.
- b) The attachment of a facing or finish, or the installation of ducting or any other service, to a part of a building required to have an FRL must not impair the required FRL of that part.

Where this option is adopted, confirmation of compliance with part (a) (ii) and (iii) above will be required by an accredited fire safety engineer, or a CertMark certificate will be required that addresses these items and is signed by an authorised representative. A test report is to be provided to verify part (a) (i)

It is also noted that this option is appropriate only if the cladding is aesthetic and does not perform the functions of an external wall e.g. weatherproofing.

2. 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) 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 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.

3.4 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.

3.5 Protection of Openings in External Walls (BCA C3.2)

The prescriptive provisions of the BCA stipulate that any external opening within 3m of the fire source feature 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
0° (walls opposite)	6m
More than 0° to 45°	5m
More than 45° to 90°	4m
More than 90° to 135°	3m
More than 135° to 180°	2m
More than 180°	Nil

Fire source feature is defined as;

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

3.6 Protection of Openings in 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:

- 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 an FRL of 90 minutes / 2 hours;
- 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 an FRL of 90 minutes / 2 hours (or 120/120/120 where it is a room such as a substation);
- Self-closing -/60/30 fire doors to the doors opening to the fire isolated stairs.

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.

4.0 EGRESS PROVISIONS

4.1 Provisions for Escape (BCA D1)

The egress provisions from the proposed building are provided by:

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

All stories of the development as to be served by two (2) exits, there are areas on the Lower Ground Floor and Upper Ground floor which are served by a single exit this deviation from DtS complication is to be resolved through a performance based solution prepared by the fire engineer.

Other detailing issues that will need to be addressed include:

- Door Hardware
- Exit door operation
- Stair construction
- Handrail and balustrade construction
- Details of Separation of rising & descending stairs
- Discharge from the Fire Isolated Exits
- Details of the egress provisions to the Road.

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

The proposed exits are required to be fire isolated; with the exception of the 3B2 Terraces at upper ground floor level.

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. This matter may require further verification by the Fire Engineer which will be addressed in the Construction Certificate documentation.

Fire Stair Re-Entry

The doors of a fire isolated exit must not be locked from the inside so as to allow provision for fire stair re-entry in fire isolated exits serving any storey above any effective height of 25m.

The requirement for doors to remain unlocked do not apply to a door fitted with a failsafe device that automatically unlocks the door upon activation of a fire alarm and –

- a) On at least every fourth storey the doors are not able to be locked and a sign is fixed on such doors stating that re-entry is available; or
- b) An intercommunication system, or an audible or visual alarm system operated from within the enclosure is provided, and a sign is fixed adjacent to such doors explaining its purpose and method of operation

4.3 Exit Travel Distances (BCA D1.4)

The travel distances to exits should not exceed:

Class 5-9

- 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
- 20m from a single exit at the level of egress to a road or open space
- Alternative exits not more than 45m apart and not closer than 9m

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:

- Residential Levels – up to 11.1m to an exit or point of choice in lieu of 6m
- Residential Levels – alternative exits are less than 9m apart (4.3m)

4.4 Dimensions of Exits (BCA D1.6)

Minimum dimensions of 1000mm width 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 in which case a 600mm clear width is required).

Swinging doors in a required exit or forming part of a required exit must swing in the direction of egress as per BCA clause D2.20.

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).

Details are to be submitted at Construction Certificate stage.

4.5 Balustrading and Handrails (BCA D2.16 and BCA D2.17)

Generally

Balustrading to a height of 1000mm with a maximum opening of 125mm in any direction should be provided adjacent to balconies, landings, corridors etc where located adjacent to a change in level exceeding 1000mm.

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.

Details are to be submitted at Construction Certificate stage.

Fire Isolated Stairways

Balustrades in the fire isolated stairways 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.

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

Details are to be submitted at Construction Certificate stage.

Openable Windows in Residential Buildings

In bedrooms of Class 2 and 3 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.

4.6 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

<u>Application</u>	<u>Surface conditions</u>	
	<i>Dry</i>	<i>Wet</i>
<i>Ramp steeper than 1:14</i>	<i>P4 or R11</i>	<i>P5 or R12</i>
<i>Ramp not steeper than 1:14</i>	<i>P3 or R10</i>	<i>P4 or R11</i>
<i>Tread or landing surface</i>	<i>P3 or R10</i>	<i>P4 or R11</i>
<i>Nosing or landing edge strip</i>	<i>P3</i>	<i>P4</i>

Details are to be submitted at Construction Certificate stage.

5.0 ACCESS FOR PEOPLE WITH DISABILITIES

5.1 General Building Access Requirements (BCA D3.1)

See separate report by project Access Consultant.

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 2016. Parts of the building required to be accessible shall comply with the requirements of:-

- AS1428.1-2009 General Requirements for Access – New Building Work;
- AS1428.4-2009 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 Single Occupancy Units and to the entrance door of all Single 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 a 1428.1 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.

Office/shops (Class 5/Class 6 buildings)

To and within all areas normally used by the occupants.

Car parks (Class 7a buildings)

To and within any level containing accessible car parking spaces.

5.2 Provision for Access to Buildings

The BCA prescribes access to be provided to and within the building as follows:

- Via the principal public entry and at least 50% of all other entrances
- From designated car parking spaces for the use of occupants with a disability.
- From another accessible building connected by a pedestrian link.
- All areas used by the public.

In buildings over 500m² in floor area, a non-accessible entrance must not be located more than 50m from an accessible entrance.

And where a pedestrian entry contains multiple doors, the following is required;

- Entrance containing not more than 3 doors, at least one of the door leaves must be accessible.
- Where an entrance contains more than 3 doors, not less than 50% of the door leaves must be accessible.

A door is considered to be accessible if it is automatic (open and closing) or is more than 850mm in clear opening width and contains the required door circulation space.

5.3 Provisions for Access within Buildings (BCA D3.3)

A building required to be accessible is required to be equipped with either a 1428.1 compliant lift or 1428.1 compliant ramp, (but the maximum vertical rise of a ramp must not exceed 3.6m).

Within the building the following are required;

- Door circulation space as per AS1428.1 Clause 13.3 and as attached in appendix 1;
- Doorways must have a clear opening of 850mm;
- Passing spaces (1.8m wide passages) must be provided at maximum of 20m intervals
- Within 2.0m of end access ways/corridors, turning areas spaces are required to be provided.
- Carpet pile height of not more than 11mm to an adjacent surface
- Any glazed capable of being mistaken for a doorway or opening must be clearly marked (or contain chair rail, hand rail or transom as per AS 1288 requirements)

Further details are to be provided or access to these areas is to be assessed by an access consultant.

5.4 Car Parking (BCA D3.5)

Accessible car parking spaces are required to comply with AS 2890.6-2009 at the rate of 1 space per every 50 or part.

A 'shared zone' of minimum 5400mm x 2400mm is required adjacent to accessible car parking spaces, protected with a bollard.

5.5 Tactile Indicators (BCA D3.8)

Tactile indicators are required to be provided to warn occupants of all stairs (except Fire Isolated stairs) and ramps regardless of public nature or private environment and where an overhead obstruction occurs less than 2.0m above the finished floor level.

5.6 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.

5.7 Provisions for 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 towels 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.
Office, industrial, assembly building, schools, health care except for within a ward area of a Class 9a health-care building	<ol style="list-style-type: none"> a) 1 on every storey containing sanitary compartments; and b) Where a storey has more than 1 bank of sanitary compartments containing male and female sanitary compartments, at not less than 50% of those banks.

Ambulant Facilities

At each bank of toilets where there is one or more toilets in addition to an accessible unisex sanitary compartment, a sanitary compartment suitable for a person with an ambulant disability in accordance with AS 1428.1-2009 must be provided for use by males and females.

Where male sanitary facilities are provided at a separate location to female sanitary facilities, accessible unisex sanitary facilities are only required at one of those locations.

An accessible unisex sanitary compartment or an accessible unisex shower need not be provided on a storey or level that is not provided with a passenger lift or ramp complying with AS1428.1-2009

Accessible unisex showers

Accessible unisex showers must be provided in accordance with 1428.1 and at the following rates

Building	Minimum accessible unisex showers to be provided
Residential apartments	Where showers are provided in common areas, not less than 1
Office, industrial, assembly building, schools, health care except for within a ward area of a Class 9a health-care building	1 for every 10 showers or part thereof provided

5.8 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;
- Identify each door required by BCA Clause E4.5 to be provided with an exit sign, stating 'EXIT' and 'Level' number

5.9 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 in size – with appropriate handrails and auditory commands.

6.0 FIRE 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, please provide pressure and flow calculations for review.

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), 150 kPa
- Attack hydrant (within 50m of hard stand) 250 kPa
- 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 adjacent to the building at the main entry. If remote from the building, the booster is to be located at the main vehicle entry and within sight of the main entry of the building within 20m of a hardstand area.

A fire ring main is required.

6.2 Fire Hose Reels (BCA E1.4)

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

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

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

Details are to be submitted with the Construction Certificate application.

6.3 Fire Extinguishers (BCA E1.6)

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

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

Occupancy Class	Risk Class (as defined in AS 2444)
<p>General provisions – Class 2 to 9 buildings (except within sole-occupancy units of a Class 9c building)</p>	<ul style="list-style-type: none"> (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 500m² 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.
<p>Specific provisions (in addition to general provisions) –</p> <ul style="list-style-type: none"> (a) Class 9a health care building (b) Class 3 parts of detention and correctional occupancies (c) Class 3 accommodation for children, aged persons and people with disabilities (d) Class 9c building 	<p>To cover class A and E fire risks. (Note 2)</p>

In addition, extinguishers are to be provided to the class 2 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, often collocated with fire hydrants and/or fire hose reels.

Details are to be submitted with the Construction Certificate application.

6.4 Automatic Sprinkler Protection (BCA E1.5)

Automatic sprinkler protection is required to Specification E1.5 and AS2118.1-1999 to the following areas:

- Throughout the entire building where the effective height exceeds 25m;
- Throughout any Class 7a car park (other than open deck car parks) containing accommodation for more than 40 vehicles;

Location of pumps, tanks, FIP, control valves and booster assemblies will be subject to review.

An occupant warning system should be provided in accordance with BCA Specification E1.5.

Details are to be submitted with the Construction Certificate application.

6.5 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 AS2293.1-2005

Details are required to be provided for review.

6.6 Sound Systems and Intercom Systems for Emergency Purposes (BCA E4.9)

A Sound System and Intercom System is required in accordance with AS1670.4-2015 and BCA Clause E4.9

Details are to be provided for our review.

6.7 Fire Control Centre (BCA E1.8)

As the building has an effective height of greater than 25m, a fire control centre is required. As the effective height of the building also exceeds 50m, the fire control centre must be located within a dedicated room in accordance with the requirements of BCA Specification E1.8

Details are to be submitted with the Construction Certificate application.

6.8 Smoke Hazard Management (BCA E2.2)

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

- Automatic Smoke Detection and Alarm System in accordance with the requirements of BCA Spec E2.2a and AS 1670.1-2015

- Automatic Pressurisation to Fire Isolated Exits in accordance with the requirements of AS/NZS 1668.1-2015

A fire indicator panel is required as part of the detection system. This panel is to 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.

6.9 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, E3.7, E3.9 and E3.10 of the BCA.
- Stretcher facilities are to be provided within the lifts with minimum dimensions of 600mm wide, 2000mm long and 1400mm high.
- At least two emergency lifts with stretcher facilities in accordance with part E3.4 of the BCA. The two emergency lifts shall be located in separate shafts. These lifts are to serve all storeys that are served by passenger lifts and must be provided with the following: -
 - A handrail in accordance with AS 1735.12;
 - Minimum internal floor dimensions as specified in Table E3.6b of the BCA i.e. 1,400mm x 1,600mm;
 - Minimum clear door opening complying with AS 1735.12;
 - Passenger protection system complying with AS 1735.12;
 - Have a set of buttons for operating the lift located at heights above level complying with AS 1735.12;
 - Lighting in accordance with AS 1735.12;
 - Automatic audible information within the lift car to identify the level each time the car stops; and
 - Audible and visual indication at each lift landing to indicate the arrival of the lift car.

6.10 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.

7.0 HEALTH AND AMENITY

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

Retail

Sanitary facilities are required to be provided for employees. In relation to the public, sanitary facilities are required to be provided either where more than 600 persons can be accommodated (standard shops) or for café / restaurant where there are more than 20 seats.

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 that such a sanitary facility is to be provided through the provision of a sanitary facility at ground floor for the retail (note that confirmation will be required that these facilities will be available to apartment maintenance staff).

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.

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 (BCA F1.11)

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

Floor wastes are required to be provided where wall hung urinals are provided and the floor shall be sloped towards these wastes.

Details are to be submitted with the Construction Certificate application.

7.3 Light and Ventilation (BCA Part F4)

Class 2, 3 & 4

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.

A performance solution will need to be provided as part of the Construction Certificate documentation. The development is capable of complying with the performance requirements of the BCA in this regard.

Class 5, 6, 7, 8 & 9

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. The architect is to provide calculations to verify compliance is achieved.

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	$R_w + C_{tr} \geq 50$ $L_{n,w} + C_i \leq 62$
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 note for walls requiring impact resistance an air gap between leafs of the wall construction is required to be provided.

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

7.5 Weatherproofing of External Walls (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 comply 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.*

8.0 ENERGY EFFICIENCY

Refer to separate assessment by the project energy efficiency consultant.

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.

The proposed class 6 & 7 parts of the development shall comply with Part J of the BCA. To achieve compliance, there are two options available:

1. The building can comply with the deemed-to-satisfy provisions of the BCA, relating to the following areas:
 - Building Fabric
 - Glazing
 - Building Sealing
 - Air Conditioning & Ventilation Systems
 - Artificial Lighting & Power
 - Hot Water Supply
2. The building can be verified against a reference building as per Verification Method JV3. This requires that the proposed building and its services be shown to have an annual energy consumption of equal or less than the reference building which has been modelled as per the requirements of Part J of the BCA.

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

Access for maintenance is to be provided to the building in accordance with the requirements of BCA Part J8.

The proposed site will be located in a climate zone 5.

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

Details are to be submitted with the construction certificate application.

Appendix A - Design Documentation

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

Architectural plans by Candalepas Associates, project number 5800, dated 25.09.18 noted as follows;

Drawing Schedule

DA 1000	COVER SHEET
DA 1050	SITE PLAN
DA 1102	BASEMENT 3 FLOOR PLAN
DA 1103	BASEMENT 2 FLOOR PLAN
DA 1104	BASEMENT 1 FLOOR PLAN
DA 1105	LOWER GROUND FLOOR PLAN
DA 1106	UPPER GROUND FLOOR PLAN
DA 1107	LEVEL 1 FLOOR PLAN
DA 1108	LEVEL 2 FLOOR PLAN
DA 1109	LEVEL 3 – 4 FLOOR PLAN
DA 1110	LEVEL 5 – 12 FLOOR PLAN
DA 1111	LEVEL 13 FLOOR PLAN
DA 1112	LEVEL 14 – 19 FLOOR PLAN
DA 1113	ROOF PLAN
DA 1150	ADAPTABLE UNIT FLOOR PLANS
DA 1200	SECTION A
DA 1201	SECTION B
DA 1202	SECTION C
DA 1300	NORTH EAST ELEVATION
DA 1301	NORTH WEST ELEVATION
DA 1302	NORTH WEST INTERNAL ELEVATION
DA 1303	SOUTH EAST ELEVATION
DA 1304	SOUTH EAST INTERNAL ELEVATION
DA 1305	SOUTH WEST ELEVATION
DA 1600	SOLAR & VENTILATION DIAGRAMS – SHEET 1
DA 1601	SOLAR & VENTILATION DIAGRAMS – SHEET 2
DA 1602	SOLAR & VENTILATION DIAGRAMS – SHEET 3
DA 1850	AREA CALCULATIONS

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, AS1670.1–2015 & AS/NZS1668.1-2015
4 Automatic Fire Suppression System	BCA Spec. E1.5, AS2118.1–1999 Amdt 1, AS2118.6–2012 (Combined sprinkler & hydrant)
5 Building Occupant Warning System	BCA Spec. E1.5, BCA Spec. E2.2a & AS 1670.1 – 2015 – Clause 3.22
6 Emergency Lifts	BCA Clause E3.4 & AS 1735.2 – 2001
7 Emergency Lighting	BCA Clause E4.2, E4.4 & AS/NZS2293.1–2005 Amdt 1 & 2
8 EWIS (Sound Systems and Intercom Systems for Emergency Purpose)	BCA Clause E4.9 & AS 1670.4 - 2015 & AS4428.4-2004
9 Exit Signs	BCA Clauses E4.5, NSW E4.6 & E4.8 and AS/NZS 2293.1 – 2005 Amdt 1 & 2
1 Fire Control Centres and Rooms	BCA Spec. E1.8
1 Fire Dampers	BCA Clause C3.15, AS/NZS 1668.1 – 2015 & AS 1682.1&2 - 1990
1 Fire Doors	BCA Clause C3.2, C3.4, C3.5, C3.6, C3.7 & C3.8, Spec C3.4 and AS 1905.1 – 2015
1 Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 2005 Amdt 1
1 Fire Hydrant System	BCA Clause E1.3 & AS 2419.1 – 2005 Amdt 1
1 Fire Seals, Collars	BCA Clause C3.15, C3.16 & AS 1530.4 – 2014
1 Lightweight Construction	BCA Clause C1.8, C3.17 & AS 1530.3 – 1999
1 Mechanical Air Handling System	BCA Clause E2.2, AS/NZS 1668.1 – 2015
1 Paths of Travel	EP&A Reg 2000 Clause 186
1 Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 – 2001
2 Pressurising Systems	BCA Clause E2.2 & AS/NZS 1668.1 – 2015
2 Required Exit Doors (power operated)	BCA Clause D2.19
2 Self-Closing Fire Hoppers	BCA Clause C3.13 & AS 1530.4 – 2015
2 Smoke Hazard Management System	BCA Part E2 & AS/NZS 1668.1 – 2015
2 Smoke Detectors and Heat Detectors	BCA Spec E2.2a & AS 1670.1-2015, AS/NZS 1668.1-2015
2 Smoke Doors	BCA Spec. C3.4
2 Wall-Wetting Sprinkler and Drencher Systems	BCA Clause C3.4 & AS 2118.2 – 2010
2 Warning and Operational Signs	EP&A Reg 2000 Clause 183, BCA Clause C3.6, D2.23, E3.3

Appendix C - Fire Resistance Levels

The table below represents the Fire resistance levels required in accordance with BCA 2016:

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

Building element	Class of building — FRL: (in minutes)			
	<i>Structural adequacy/Integrity/Insulation</i>			
	2, 3 or 4 part	5, 7a or 9	6	7b or 8
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any <i>fire-source feature</i> to which it is exposed is—				
For <i>loadbearing</i> 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 <i>non-loadbearing</i> 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 <i>external wall</i> , where the distance from any <i>fire-source feature</i> 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—				
<i>Fire-resisting lift and stair shafts—</i>				
<i>Loadbearing</i>	90/ 90/ 90	120/120/120	180/120/120	240/120/120
<i>Non-loadbearing</i>	–/ 90/ 90	–/120/120	–/120/120	–/120/120
Bounding <i>public corridors</i> , public lobbies and the like—				
<i>Loadbearing</i>	90/ 90/ 90	120/–/–	180/–/–	240/–/–
<i>Non-loadbearing</i>	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Between or bounding <i>sole-occupancy units—</i>				
<i>Loadbearing</i>	90/ 90/ 90	120/–/–	180/–/–	240/–/–
<i>Non-loadbearing</i>	–/ 60/ 60	–/–/–	–/–/–	–/–/–
Ventilating, pipe, garbage, and like <i>shafts</i> not used for the discharge of hot products of combustion—				
<i>Loadbearing</i>	90/ 90/ 90	120/ 90/ 90	180/120/120	240/120/120
<i>Non-loadbearing</i>	–/ 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

Building element	FRL (not less than) Structural adequacy/Integrity/Insulation	ESA/M (not greater than)
Wall		
(a) external wall		
(i) less than 3 m from a <i>fire-source feature</i> to which it is exposed:		
<i>Loadbearing</i>	60/60/60	
<i>Non-loadbearing</i>	–/60/60	
(ii) 3 m or more from a <i>fire-source feature</i> to which it is exposed	–/–/–	
(b) internal wall		
(i) <i>loadbearing</i> , other than one supporting only the roof (not used for carparking)	60/–/–	
(ii) supporting only the roof (not used for carparking)	–/–/–	
(iii) <i>non-loadbearing</i>	–/–/–	
(c) fire wall		
(i) from the direction used as a <i>carpark</i>	60/60/60	
(ii) from the direction not used as a <i>carpark</i>	as required by Table 3	
Column		
(a) supporting only the roof (not used for carparking) and 3 m or more from a <i>fire-source feature</i> 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 <i>carpark</i>	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 <i>carpark</i> only)	60/60/60	
Floor slab and vehicle ramp	60/60/60	
Roof (not used for carparking)	–/–/–	
Notes:	<ol style="list-style-type: none"> 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 <i>carpark</i> complying with Table 3.9 and located within a multi-classified building. 	