



A Bureau Veritas Group Company

BUILDING CODE OF AUSTRALIA REPORT

Barangaroo South
Residential Building R5

Prepared for:	Lendlease
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9.11.20	B	39	Final Report for S4.55 submission	Alison Brown	Paul Curjak	9.11.20
26.11.20	C	39	Revised Final Report for S4.55 submission	Alison Brown	Paul Curjak	26.11.20
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1. Executive Summary

Compliance Summary

As Registered Certifiers we have reviewed the architectural design documents prepared by RPBW and PTW Architects respectively (refer appendix A) for compliance with the current building assessment provisions, i.e. the Building Code of Australia 2019 Amendment 1 (BCA).

We confirm that, based on the documentation provided, the project is capable of complying with the Building Code of Australia 2019 Amendment 1 (BCA).

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

Deviations from the Deemed-to-Satisfy Provisions

The assessment of the design documentation, with confirmation from the design team, 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:-

The below is the noted deviations from the DTS in the Base Building Report (detailed in BCA report 068048-21BCA Rev F by McKenzie Group dated 28.05.18:

No.	Description	DTS Clause	Performance Requirements
Fire Safety Items			
1	Separation of Buildings It is proposed to consider the R5 Residential Building as a separate building to the basement below and any other buildings connected to that basement. Effective height is to be measured from the ground floor slab which separates the basement from Residential Building R5.	C1.1, Spec C1.1, E2.2	CP1, CP2, EP2.2
2	Reduction of FRLs - Retail Reduction of fire rating in ground floor retail to 2 hours in lieu of 3 hours. This includes the following: - Fire separation between the retail and residential portions on the ground floor. - Fire separation between the retail ground floor and the residential storeys above.	C1.1, C2.7, C2.8, Spec C1.1	CP1, CP2
3	Reduction of FRLs – Wet Areas Reduction of structural adequacy to 60 minutes in lieu of 90 minutes for floor slabs in wet areas.	C1.1, Spec C1.1	CP1, CP2
4	Fire Separation Between Storeys Fire separation between storeys is not proposed to extend to the outer skin of the double façade.	C1.1, Spec C1.1	CP2
5	Combustible building elements The blinds system incorporated within the double skin which forms part of the external walls does not meet the combustibility requirements.	C1.9	CP2
6	Extended Travel Distance – Non-Residential Areas	D1.4	DP4, EP2.2

No.	Description	DTS Clause	Performance Requirements
	Extended travel distance to point of choice of up to 30m in lieu of 20m – from non-residential areas including residential terraces.		
7	Extended Travel Distance – Residential Areas Extended travel distance to point of choice of up to 12m in lieu of 6m – from residential areas.	D1.4	DP4, EP2.2
8	Hydrant Booster Assembly – Location The hydrant booster assembly is not within sight of the main building entry.	E1.3	EP1.3
9	Hydrant Booster Assembly – Radiant Heat Protection The fire rated protection around the booster assembly does not extend 2m on each side of and 3m above the upper hose connections in accordance with AS 2419.1-2005.	E1.3	EP1.3
10	Fire Control Room Location The fire control room is located within the basement and does not have an entry directly off the main entrance.	E1.8	EP1.6
11	Zone Smoke to Retail Zone smoke control is not proposed within the ground floor retail areas.	E2.2	EP2.2
12	Speech Intelligibility The sound systems and intercom systems for emergency purposes do not comply as the speech intelligibility (STI) requirement of ≥ 0.5 is not achieved in the bathrooms and balconies of the sole-occupancy units and the plant rooms.	E4.9	EP4.3

Performance Solutions

The assessment of the design documentation has revealed that the following additional items are proposed as part of this Section 4.55 application and as part of the BCA 2019 Amendment 1 provisions, are proposed to be assessed against the relevant performance requirements of the BCA, as they deviate from the deemed-to-satisfy provisions of the BCA.

In principle we support the below Performance solutions as being capable of achieving compliance with the performance requirements subject to the detailed analysis by a suitably qualified persons at the time of application for Construction Certificate and associated process including referral with Fire & Rescue NSW.

No.	Description	DTS Clause	Performance Requirements
Fire Safety Items			
1	Reduction of FRLs - Retail Reduction of fire rating in ground floor retail to 2 hours in lieu of 3 hours. This includes the following: - Fire separation between the retail and residential portions on P1 - Level P1/P2 & Level 00/P1 between the retail and the residential portions floor FRL requirements	C1.1, C2.7, C2.8, C2.9, Spec C1.1	CP1, CP2

No.	Description	DTS Clause	Performance Requirements
2	Number of exits required - Level 00 Gas meter room has only access to one exit. - Level 27 – Access only indicated to one exit - Level 28 – lift motor room access only indicated to one exit	D1.2	DP4, EP2.2
3	Extended Travel Distance – occupiable outdoor space - Level 26 - greater than 20m to a point of choice (21.5m) - Level 27 – Greater than 20m to an exit from the furthest point on the corridor (24.5m)	D1.4/ G6.4	DP2, DP4
4	Discharge from exits The discharge point of alternative exits must be as far apart as practical. The fire-isolated stairs from the towers discharge adjacent to each other.	D1.10	DP4
5	Re-entry to fire-isolated stairs Re-entry provisions are such that audible/visual alarm is provided every fourth floor in lieu of every floor.	D2.22	DP5, EP2.2
6	Sprinkler omissions To permit the omission of sprinklers from cupboards, robes and shower recesses	E1.5 and Spec E1.5	EP1.4
Miscellaneous Items			
7	Weatherproofing of External Walls As there are no deemed to satisfy provisions relating to the weatherproofing of external walls, a performance solution is to be provided by the façade engineer/registered architect demonstrating that the external walls comply with the requirements of Performance Requirement FP1.4.	-	FP1.4

The feasibility and any additional requirements that will apply as a result of the performance solution will need to be confirmed by the professional preparing the performance solution. Any performance solution will need to be prepared by a suitably qualified/accredited professional.

Fire Safety Services

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

1.	Sprinklers system throughout the building
2.	Fire hydrant system throughout the building
3.	Fire hose reels throughout the building/(except to the residential portions)
4.	Fire precautions during construction
5.	Air-pressurization throughout the fire isolated stairs throughout the building
6.	Automatic smoke detection and alarm system throughout the building to common areas, interconnected hard wired AS3786 smoke alarms within apartments

7.	Sound System and Intercom System for Emergency Purposes
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Refer to part 7 of this report for further details regarding the required services.

Any fire engineered solution relating to EP1.3, EP1.6 and EP2.2 will need to be approved after consultation with the NSW Fire Brigade as part of the Construction Certificate process.

Further Assessment

The assessment of the design documentation for the Section 4.55 has also revealed that the following additional information is required in order to complete the assessment, and/or the following areas need to be further reviewed. However, the below queries are intended to be resolved throughout the design documentation period and it is not envisioned that the solutions will impact on the current design.

No.	Further Information / Review Required	Report Reference
1	Clarification to be provided that adequate bounding public corridor construction is provided at Level P2 between the communal space and the public corridor to the Class 2 units.	7.1
2	The following access to exits to be clarified: Egress doors to be indicated to Level 00	8.2, 8.4
3	The following areas to be clarified as having access to suitable alternatives. - Level 00 retail egress areas to be indicated to ensure access to 2 exits - Level P2 - Egress to be clarified for KWH communal space as how access is gained to exits and that access is provided to 2 exits. - Level 27, and 28– Clarification on egress access to alternatives, as only access to one stair from the storey	8.2
4	To determine the compliance of the non-fire-isolated exits: Non fire-isolated stair connects P1 and Level 00 to retail to discharge. The location of the egress doors at retail level to be identified	8.4
5	Egress doors do not swing in the direction of egress at Level 00 to the key worker lobby. The design to be altered to comply.	12.2
6	Accessibility for people with disabilities to be clarified and assessed by the access consultant to the following areas: - Retail access doors have not been indicated to Level 00 to determine compliance. - Level P2 KWH communal space is to be clarified at how access is gained to this space. - access to be clarified to gas meter room on Level 00; - L01 Adequate turning space is not provided to the end of the southerly most end corridor in accordance with AS1428.1 Figure 5 - Level 02-14 - Adequate turning space is not provided to the end of the southerly most end corridor in accordance with AS1428.1 Figure 5	12.2, 12.3

7	Natural ventilation requirements to be considered in the following location: Level P2 - noting that openings into P05-06 2A bedroom opening onto the KWH communal space would be contained in fire wall (opening into basement shaft/fire wall separation between the communal space and Class 2 residences).	12.2
8	Sanitary facilities to these portions will be provided in accordance with the requirements of the BCA for their respective areas. Details to be provided of the sanitary provision for the retail and assembly areas.	10.1

Documentation to enable assessment and demonstrate compliance will be required to address the above items prior to approval.

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.

2. Introduction

This report supports a modification application submitted to the Department of Planning, Infrastructure and Environment (DPIE) pursuant to section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify Development Consent SSD 6966 relating to Residential Building R5, Barangaroo South (the site).

Site Description

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development containing large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Central and Barangaroo South. The Residential Building R5 site is located within Barangaroo South. The site of this proposed modification application is located on land generally known and identified in the approved Concept Plan (as modified) as Block 4B, as shown in **Figure 1** below.

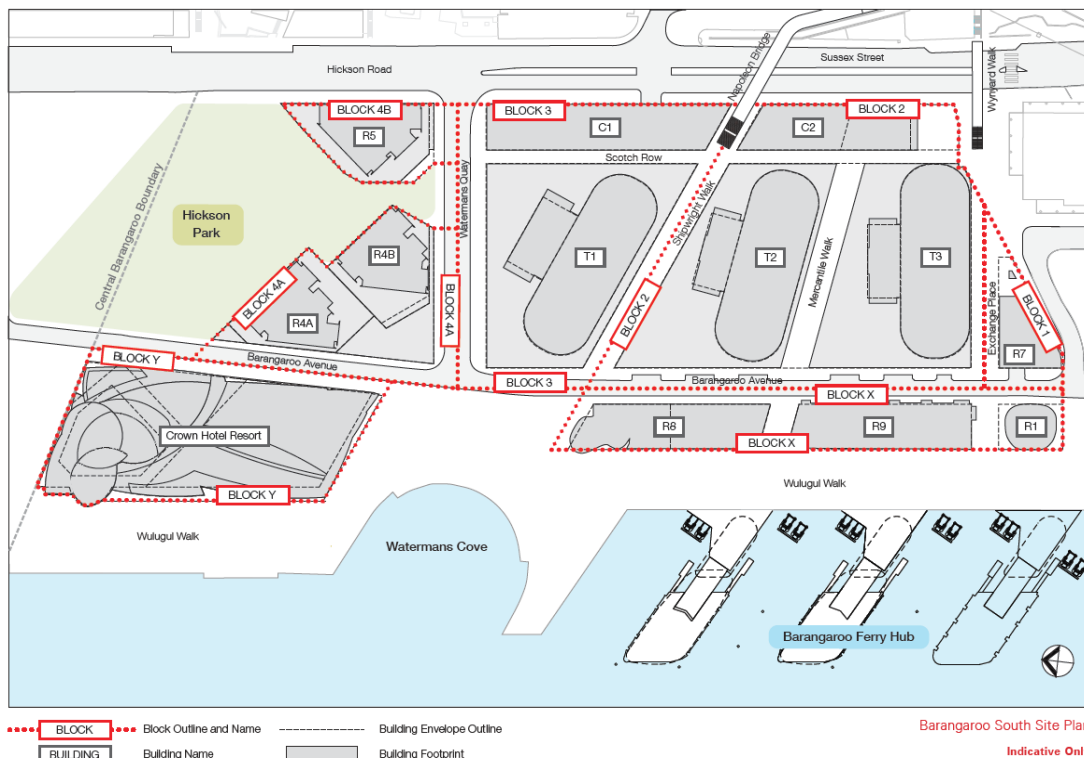


Figure 1 Block 4B in relation to Barangaroo South

Source: Lendlease

Background

Barangaroo South Concept Plan (as modified)

The approved Barangaroo South Concept Plan (MP06_0162) (as modified), includes approval for the following:

- A mixed use development involving a maximum of 602,354 sqm gross floor area (GFA), comprised of:
 - a maximum of 191,031 sqm of residential GFA of which a maximum of 162,031 sqm will be in Barangaroo South;
 - a maximum of 76,000 sqm of GFA for tourist uses of which a maximum of 59,000 sqm will be in Barangaroo South;
 - a maximum of 34,000sqm of GFA for retail uses of which a maximum of 30,000 sqm will be in Barangaroo South;
 - a maximum of 5,000 sqm of GFA for active uses in the Public Recreation zone of which 3,500 will be in Barangaroo South; and
 - a minimum of 12,000sqm GFA for community uses.
- Approximately 11 hectares of new public open space/public domain, with a range of formal and informal open spaces serving separate recreational functions and including an approximate 2.2km public foreshore promenade.
- Built form design principles, maximum building heights and GFA for each development block within the mixed use zone.
- Public domain landscape concept, including parks, streets and pedestrian connections.
- Alteration of the existing seawalls and creation of a partial new shoreline to the harbour.
- Construction, operation and maintenance of a concrete batching plant to supply concrete for construction of future development under this Concept Plan at Barangaroo South.
- No approval is granted or implied for the future use of a heliport and/or a helipad.

This modification seeks to implement the maximum GFA for Residential Building R5 approved through the latest modification to the Concept Plan (Modification 10). This modification will result in a building generally consistent with the Concept Plan (as modified).

Residential Building R5 - Development Consent SSD 6966

Development consent SSD 6966 was granted by the Independent Planning Commission of NSW (IPC) on 3 October 2019 for Residential Building R5, comprising a 30-storey mixed use building, with 210 residential units (including Key Worker Housing) and retail floor space at ground level. This included a total gross floor area (GFA) of 19,158 sqm, 18,287 sqm of which was approved for residential floor space, and the remaining 871sqm was approved for retail floorspace.

Consent was also provided for associated building public domain works, demolition of interim basement elements, fit-out and use of the basement and associated building identification signage zone.

Overview of Proposed Modifications

This modification application seeks consent for an increase in the gross floor area up to a maximum 21,508 sqm, amendments to the total number of apartments and internal apartment layouts. Design modifications are also proposed to the fenestration and alignment of the façade and to the podium rooftop landscaping. Broadly, the following amendments are sought as part of this modification application:

- increase the number of Key Worker Housing apartments from 48 to 50;
- internal apartment layout changes;
- changes to the landscaped podium layout and amenities area;
- changes to the façade, including slight realignment;
- reallocation of nine Key Worker Housing car spaces to On Market car spaces.
- amendments to car parking

A further detailed description of the proposed modifications is contained in the supporting letter to the modification application prepared by Ethos Urban.

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 Registered Certifier for the Construction Certificate. For the purposes of this Report, BCA 2019 Amendment 1 has been utilised as the version of the BCA applicable at the time of preparation this Report.

3. Compliance with the Building Code of Australia

The Building Code of Australia is a performance based document, whereby compliance is achieved by complying with the Governing Requirements and the Performance Requirements.

Performance Requirements are satisfied by one of the following:

- 1) A Performance Solution
- 2) A Deemed-to-Satisfy Solution
- 3) A combination of (1) and (2)

4. Documentation of Performance Solutions

A Performance Solution must demonstrate compliance with all relevant Performance Requirements, or the solution must be at least equivalent to the Deemed-to-Satisfy provisions.

Compliance with the Performance Requirements is to be demonstrated through one or a combination of the following:

- a) Evidence of suitability in accordance with Part A5 of the BCA that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.
- b) A Verification Method including the following:
 - i. The Verification Methods provided in the NCC.
 - ii. Other Verification Methods, accepted by the appropriate authority that show compliance with the relevant Performance Requirements
- c) Expert Judgement
- d) Comparison with the Deemed-to-Satisfy Provisions

Where a Performance Solution is proposed as the method to achieve compliance, the following steps must be undertaken:

- a) Prepare a performance-based design brief in consultation with relevant stakeholders
- b) Carry out analysis, using one or more of the assessment methods nominated above, as proposed by the performance-based design brief.
- c) Evaluate results from (b) against the acceptance criteria in the performance-based design brief
- d) Prepare a final report that includes:
 - i. All Performance Requirements and/or Deemed-to-Satisfy Provisions identified as applicable
 - ii. Identification of all assessment methods used
 - iii. Details of required steps above
 - iv. Confirmation that the Performance Requirement has been met; and
 - v. Details of conditions or limitations, if any exist, regarding the Performance Solution.

This process will come into effect on 1 July 2021.

5. Preliminaries

5.1. Building Assessment Data

Summary of Construction Determination:

Part of Project	Building 1
Classification	2, 6, 9b
Number of Storeys	36*
Rise In Storeys	31*
Type of Construction	A
Effective Height (m)	>50m

**Note: The effective height of the project includes all stories included in the rise in stories of the project. There is no change proposed to the building details above, therefore the details above are as depicted in BCA report 068048-21BCA Rev F by Mckenzie Group dated 28.05.18*

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

Part of Project	BCA Classification	GFA (m ²)	Assumed Population
Level 00	6	664m ²	162
Level P1	2, 6	425.1m ²	66
Level P2	2	727m ²	249*
Level 01	2	747.6m ²	<100
Level L02-14	2	747.6 m ²	<100
Level 15-16	2	748m ²	<100
L17	2	748.3m ²	<100
L18-19	2	759.8m ²	<100
L20-L25	2	759.8m ²	<100
L26	2	467.9m ²	<100
L27	2	344.9m ²	<100

Notes:

- The above populations have been based on floor areas and calculations in accordance with Table D1.13 of the BCA.
- The floor areas to retail portions have been adjusted without ancillary areas such as sanitary facilities, corridors, shelving and or racking layouts in storage areas.
- Level P2 has a communal occupiable outdoor area for the KWH residents and to be used by on-mkt residents therefore the worst case occupancy indicated is likely to not occur for this area.

Occupiable Outdoor Areas

BCA 2019 introduced specific provisions regarding occupiable outdoor areas. These provisions outline requirements with regards to fire ratings, egress provisions and coverage from essential services and are contained in this report.

An occupiable outdoor area is defined in the BCA as follows:

'a space on a roof, balcony or similar part of a building:

- a) That is open to the sky; and*
- b) To which access is provided, other than access only for maintenance; and*
- c) That is not open space or directly connected with open space'*

Occupiable outdoor areas have been identified to Level P2 KWH community space and to L26. Applicable BCA provisions have been detailed in the report below.

6. Structure

6.1. Structural Provisions (BCA B1):

New structural works are to comply with the applicable requirements of BCA Part B1, including AS/NZS 1170.0-2002, AS/NZS 1170-1-2002, AS/NZS 1170.2-2011 and AS 1170.4-2007.

Depending on the importance level of the building as determined by AS/NZS 1170.0-2002, the non-structural elements of the building, including partitions (and non-structural fire walls), ceilings, services and racking/shelving may be required to comply with the seismic restraint requirements of AS 1170.4-2007. Where this is required, certification will be required confirming that the design of the seismic restraints comply with AS 1170.4-2002. This may be provided by a specialist seismic consultant or by the architect and services design engineers.

It is noted that BCA 2019 introduced a new Verification Method, BV2, which is a pathway available to verify compliance with BCA Performance Requirement BP1.1(a)(iii).

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 by a Professional Engineer registered on the National Engineering Register.

7. Fire Protection

7.1. 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 Amendment 1.

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/retails portions of 120 minutes (please note rationalisation of FRLs to retail has been proposed in performance solutions),
- Fire compartmentation of the building at each floor level,

The building also contains different classifications on some of the levels as discussed below. In instances of different classifications in the same storey either the highest FRL associated with most onerous classification should be provided throughout, or a fire wall separation should be provided. Alternatively, a fire engineered solution meeting the performance clauses of the BCA could be provided.

Where different classifications are contained in different adjoining storeys the floor between the storeys must have the FRL of not less than that prescribed in Specification C1.1 for the classification of the lower storey.

The following clarification is to be provided in respect of compartmentation / separation :

- **Level P1** – Class 2 & 6 (plant situated on side of both but has been considered in this case as part of the Class 6 compartment) uses are contained in the storey. Class 6 requires a 180- minute FRL. It is noted that in the base building that a rationalisation of the retail has been proposed to 120 minutes. This may be proposed to be extended to this part. However, it is noted that separation in all instances is need from the Class 2 through bounding construction as 90 minute construction.
- **Level P2** –Outdoor occupiable spaces requirements are now in place under BCA 2019 Amendment 1 provisions and this communal outdoor area would not have been assessed as such in the previous legislation.
Please note that in all instances Class 2 uses would require separation from this outdoor occupiable space through bounding construction as 90 minute construction and as such clarification to be provided that adequate bounding public corridor construction is provided at Level P2 between the communal space and the public corridor to the Class 2 units.
- **Level 00/B0** - Between the Level 00 retail & basement carpark area underneath (B0) – noting that the retail has extended on Level 00. This just requires that FRL of 120 minutes is achieved.
- **Level P1/ Level 00**
Level 00 below is retail and Level P1 has class 2. Therefore higher FRL of floor below is required unless this is rationalised as part of any proposed performance solution.
- Level P1/P2 higher FRL needed where plant on P1 sits under Class 2 element on P2 as plant has been considered as an extension of Class 6 retail. Therefore higher FRL of floor below is required unless this is rationalised as part of any proposed performance solution.

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

7.2. 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.

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.

Please note that with regards to fire separation, the provisions and required FRL's that apply to the building also apply to an occupiable outdoor space associated with the building.

7.3. 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 of the 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 – Class 2 parts: Material Group No. for fire-isolated exits/fire control rooms 1, public corridors 1, 2 within sole-occupancy units 1, 2, 3 and other areas 1, 2, 3
 Class 6 parts: Material Group No. for fire-isolated exits/fire control rooms 1, public corridors 1, 2, 3, for shops with a minimum floor dimension / floor to ceiling height ratio >5 -1, 2, 3 within sole-occupancy units 1, 2, 3 and other areas 1, 2, 3
 Class 9b part: Material Group No. for fire-isolated exits/fire control rooms 1, public corridors 1, 2, specific areas; 1, 2, 3 and other areas 1, 2, 3
- c) Other Materials –
 - (i) Fire control rooms subject to Specification E1.8 and fire-isolated exits, other than a sarking type material used in a ceiling or used as an attachment or part of an attachment to a building element Spread of Flame Index not exceeding 0 and Smoke Developed Index not exceeding 2,
 - (ii) Sarking type materials in other locations: Flammability Index 0,
 - (iii) Other materials or locations and insulation materials other sarking-type materials Spread of Flame Index not exceeding 9 and Smoke Developed Index not exceeding 8 if the Spread of flame Index is more than 4

Occupiable outdoor areas:

Subject to the below a lining, material or assembly in a occupiable outdoor area must comply with C1.10 as for an internal element except for the fire hazard properties are not required to comply with C1.10 - the average specific extinction area, smoke-developed index, smoke development rate, and smoke growth rate index to a lining, material or assembly in a occupiable outdoor area

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.

Any Aluminium Composite Panels must be labelled in accordance with SA TS 5344.

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:

It is noted that the blinds system incorporated within the double skin which forms part of the external walls does not meet the combustibility requirements. a performance solution through fire engineering principles is proposed to consider the blinds incorporation in the external wall meeting the performance provisions of the BCA.

7.4. 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 12/-/- is 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.

7.5. 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. The building is indicated with doors breaking up the corridors into intervals of no more than 40m.

7.6. 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, within 6m of the far boundary of a road, river, lake or the like that adjoins the allotment, or within 6m of another building on the allotment requires protection by -/60/- fire rated construction, or externally located wall wetting sprinklers.

The building has no openings exposed to the following fire source features in these distances.

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.*

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

It is noted that the building may provide fire rated walls to separate the different classifications on the storey as discussed above. In this instance openings may be exposed as above. Compartmentation drawings to be provided during design development to determine openings to protected as required.

7.7. 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 an FRL the same as the FRL of the floor it is passing through;
- 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 an FRL the same as the FRL of the floor it is passing through; (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.

8. Access and Egress

8.1. 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

The egress provisions that apply to the building also apply to any occupiable outdoor areas.

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

8.2. Number of exits required (BCA D1.2)

Every building is required to have access to at least one exit from each storey. In addition, not less than 2 exits, must be provided from a building with an effective height of over 25m. Without passing through another sole-occupancy unit every occupant of a storey or part of a storey must have access to at least 2 exits.

The following areas to be clarified as having access to suitable alternatives.

- Level 00 Gas meter room has only access to one exit.
- Level 00 retail egress areas to be indicated to ensure access to 2 exits
- Level P2 - Egress to be clarified for KWH open communal space as access to exit and access to 2 exits.
- Level 27 access only indicated to one exit
- Level 28 lift motor room access only indicated to one exit

Where the design team provides for only one access arrangement, access to a single exit may be able to be considered under a fire engineered solution meeting the performance provisions of the BCA.

8.3. Travel via Fire Isolated Exits (BCA D1.3 / 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.

If more than 2 access doorways, not from a sanitary compartment of the like, open to a required fire-isolated exit in the same storey –

- (a) A smoke lobby in accordance with D2.6 must be provided; or
- (b) The exit must be pressurised in accordance with AS 1668.1

The discharge point of alternative exits must be as far apart as practical under D1.10 of the BCA.

The fire-isolated stairs from the towers discharge adjacent to each other. Where it is not proposed by the design team to adjust the current layout, a performance solution through fire engineering principles could be used to consider the discharge meets the performance provisions of the BCA.

8.4. Travel by non-fire-isolated exits (BCA D1.9)

A non-fire-isolated stairway serving as a required exit must provide a continuous means of travel by its own flights and landing from every storey served to the level at which egress to a road or open space is provided.

In a Class 6/9b part of building the distance from any point on a floor to a point of egress to a road or open space by way of a required non-fire-isolated stairway must not exceed 80m. Furthermore, it should not discharge at a point not more than –

- (a) 20m from a doorway providing egress to a road or open space or from a fire-isolated passageway leading to a road/open space;
- (b) 40m of one of two doorways is travel to each of them from the non-fire-isolated stairway is in opposite or approximately opposite directions.

There is one non fire-isolated exits indicated in the Section 4.55 proposal:

- Non fire-isolated stair connects P1 and Level 00 to retail to discharge. The location of the egress doors at retail level to be clarified.

8.5. Fire Stair Re-Entry (BCA D2.22)

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 Class 9a and 9c buildings or parts, or within 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 fail-safe device that automatically unlocks the door upon activation of a fire alarm and –

- 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
- 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.

A common performance solution for the above prescriptive compliance is for the re-entry provisions to be rationalised so that audible/visual alarm is provided every fourth floor in lieu of every floor. This can be considered under a fire engineered solution meeting the performance provisions of the BCA.

8.6. 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 6/9

- 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 deemed to satisfy requirements in terms of travel distances would be satisfied, with the exception of the following areas:

- Level P2 Egress to communal open space to clarified – no access to the fire -isolated stairs yet indicated.
- Level P2 greater than 6m to a point of choice to SOU (11m worst case)
- Level P1 greater than 20m to a point of choice to plant area (26m)
- Level 01 - Travel to a point of choice for SOU greater than 6m (10m worst case)
- Level 02-14- greater than 6m to a point of choice to SOU (11m worst case)
- Level 15-16 - greater than 6m to a point of choice to SOU (11m worst case)
- Level 17 - greater than 6m to a point of choice to SOU (11m worst case)
- Level 18-19 - greater than 6m to a point of choice to SOU (11m worst case)
- Level 20-25 -greater than 6m to a point of choice to SOU (11m worst case)
- Level 26 Access is provided to outdoor occupiable space and greater than 20m to a point of choice (21.5m)
- Level 27 – Greater than 20m to an exit from the furthest point on the corridor (24.5m)

The extended travel distances and distance between the exit stairs will need to be addressed to comply with the requirements of the deemed to satisfy provisions noted above, or be assessed as performance solutions by the Fire Safety Engineer using BCA Performance Requirements DP4 & EP2.2.

It is noted that the existing base building assessment proposed performance solutions have already raised the majority of the areas below as being able to be considered under a performance solution. Where the existing assessment could be extended into this performance solution, or where additional clarification is required, has been indicated above.

8.7. Swinging doors (BCA D2.20)

A swinging door in a required exit must swing in the direction of egress and must not otherwise impede the path or direction of egress.

Egress doors do not swing in the direction of egress at Level 00 to the key worker lobby. The design to be altered to comply.

8.8. 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).

Generally the building is able to comply with the required egress width however further clarification is required in the following areas during design development:

- Level 00 – Egress doors to be indicated out of retail area;
- Level P2 – The occupancy levels have been assessed under D1.13 of the BCA which would require 2.5m width for the 250 persons in that level with only 2m provided. However the KWH communal occupancy is what has increased the population levels due to the occupiable outdoor areas provisions coming into place under BCA 2019 provisions. KWH communal area to be clarified that the total occupancy on the level will never be more than 200 persons.

8.9. 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.

In addition to the above, handrails are required to both sides of all stairs with a width of 2m or more.

Fire Isolated Stairways

Balustrades in the fire isolated stairways and Class 7b or 8 parts 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, 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.

8.10. 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

9. 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.

It is noted that the provisions below also apply to occupiable outdoor areas.

9.1. 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;

The fire services/hydraulic engineer is to confirm the required flow rates for the development.

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.

The hydrant booster has already been identified in the base building report to be subject to a performance solution as it's location is not within sight of the main building entry. Furthermore, it is not proposed to have protection around the assembly provided in accordance with AS2419.1-2005.

Clarification to be provided in detailed design documentation about how coverage is to be provided in accordance with AS 2419.1-2005.

9.2. Fire Hose Reels

A Fire Hose Reel System is required to all areas except the residential parts of the building 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 a performance solution is developed under BCA Performance Requirement EP1.1

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

9.3. Fire Extinguishers (BCA E1.6)

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

Table E1.6 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).

Occupancy Class	Risk Class (as defined in AS 2444)
	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 car parks). 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.
Specific provisions (in addition to general provisions) – 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	To cover class A and E fire risks. (Note 2)

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 - 2001, often collocated with fire hydrants and/or fire hose reels.

9.4. Automatic Sprinkler Protection (BCA E1.5)

Automatic sprinkler protection is required to Specification E1.5 and AS2118.1-2017 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;

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

Details of the proposed sprinkler system design will need to be reviewed as the design develops.

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

It is considered that a common omission in sprinkler provisions in residential buildings relates to the omission of sprinklers from cupboards, robes and shower recesses. This may be considered under a fire engineered solution meeting the performance provisions of the BCA.

9.5. Smoke Hazard Management (BCA E2.2)

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

- Zone Smoke Control in accordance with the requirements of AS/NZS 1668.1-2015 Amendment 1 (noting that a Performance Solution is proposed under the base building report for the removal of the Zone smoke control within the ground floor retail areas.)
- 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;
- Automatic Pressurisation to Fire Isolated Exits in accordance with the requirements of AS/NZS 1668.1-2015 Amendment 1
- 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

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.

9.6. 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 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.
- 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

9.7. 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.

Where exit signs are proposed to be above 2.7m to avoid potential damage by forklifts in the warehousing areas, this will need to be documented as a performance solution by an accredited fire safety engineer. This would need to be assessed to BCA Performance Requirement EP4.2.

Details are required to be provided for review.

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

A Sound System and Intercom System is required in accordance with AS1670.4-2018 and BCA Clause E4.9

It is noted under the base building original proposals that the proposed SSIE does not comply as follows:

- The sound systems and intercom systems for emergency purposes do not comply as the speech intelligibility (STI) requirement of ≥ 0.5 is not achieved in the bathrooms and balconies of the sole-occupancy units and the plant rooms.

9.9. Fire Control Centre (BCA E1.8)

As the Class 6, 7, 8 or 9 building contains a floor area of greater than 18,000m², a fire control centre is required in accordance with BCA Specification E1.8.

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

It is noted under the base building original proposals that the proposed Fire Control Room does not comply as follows:

- The fire control room is located within the basement and does not have an entry directly off the main entrance.

9.10. 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.

10. Health and Amenity

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

Retail and assembly uses

Separate sanitary facilities are required to be provided for male & female 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.

Sanitary facilities to these portions will be provided in accordance with the requirements of the BCA for their respective areas. Details to be provided of the sanitary provision for the retail and assembly areas.

Apartments

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.

Note: The Unisex facilities provided for people with disabilities may be counted once for each sex. These facilities are to be provided in accordance with AS1428.1-2009.

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.

10.2. 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.

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

Floor wastes are not indicated. Details to be provided in the detailed documentation stage.

10.3. 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.

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

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

These provisions also apply to areas considered as occupiable outdoor areas.

The following areas to be clarified that adequate provision is provided:

- Level P2 – noting that openings into P05-06 2A bedroom opening onto the KWH communal space would be contained in fire wall (opening into basement shaft/fire wall separation between the communal space and Class 2 residences). Thus, there could be a conflict with fire operation and the provision of natural ventilation.

10.4. 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.

Details to be provided in detailed design documentation.

10.5. Condensation management (BCA Part F6)

Pliable building membranes installed to an external wall must:

- achieve compliance with AS 4200.1, and
- be installed in accordance with AS4200.2, and
- be a vapour permeable membrane (applicable as the development is in climate zone 7); and
- 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 a minimum flow rate of 25L/s for bathrooms and sanitary compartments must discharge directly or via a duct to outdoor air or to a roof space that is ventilated.

Kitchens and laundries to achieve a minimum flow rate 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. Openings 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 22°. 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.

10.6. 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.

10.7. Stormwater Drainage

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

Details of compliance to be provided in detailed design documentation.

11. Energy Efficiency

11.1. 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 as options available to achieve compliance.

It is noted that a deemed to satisfy pathway is still available.

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

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

Verification Methods

The Verification Methods available to demonstrate compliance with the BCA on a performance basis are as follows:

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 achieved 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 JVb.

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 JVb; 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.

12. Access for People with Disabilities

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

- The Building Code of Australia 2019 Amendment 1;
- Disability (Access to Premises – Buildings) Standards 2010;
- 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

Note: With the introduction of the Commonwealth *Disability Discrimination Act (DDA)* in 1992 (enacted in 1993), all organisations have a responsibility to provide equitable and dignified access to goods, services and premises used by occupants. Organisations and individuals since its introduction, are required to work to the objects of the Act which are to eliminate, as far as possible, discrimination against persons on the ground of disability in the **areas of work, accommodation, education, access to premises, clubs and sports, and the provision of goods, facilities, services and land, existing laws and the administration of Commonwealth laws and programs.**

This report assesses against the requirements contained with the Building Code of Australia (and documents referred to therein) and is not considered to be a full assessment against the Disability Discrimination Act.

12.1. 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 Amdt 1 and AS 1428.1. 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.

Retail and Assembly (Class 6/9b parts of the building)

To and within all areas normally used by the occupants

12.2. Provision for Access to Buildings

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

- Via the principle pedestrian entry and at least 50% of all other entrances from the allotment boundary
- 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 occupants.

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

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

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

The following areas access is to be clarified:-

- Retail access doors have not been indicated to Level 00 is provided to determine compliance.
- Level P2 KWH outdoor communal space is to be clarified at how access is gained to this space.
- access to be clarified to gas meter room on Level 00

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

12.3. Accessibility within Building (BCA D3.3)

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

An exemption to not provide either a lift or ramp exists for class 5, 6, 7b, or 8 buildings, where a building contains;

- a) Less than 3 storeys; and
- b) Floor area of each storey (excluding the entrance level) is not more than 200m².

Within the building the following are required;

- Door circulation space as per AS1428.1 Clause 13.3;
- 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 and backing <4mm
- Any glazing 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)

The design would generally comply with the prescriptive provisions of the BCA with additional ongoing review being undertaken as to door widths, circulation, etc. It is noted the following areas do not currently indicate prescriptive compliance with AS1428.1:

- L01 Adequate turning space is not provided to the end of the southerly most end corridor in accordance with AS1428.1 Figure 5
- Level 02-14 - Adequate turning space is not provided to the end of the southerly most end corridor in accordance with AS1428.1 Figure 5

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

12.4. 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.

12.5. Stairs (BCA D3.3 inter Alia AS1428.1)

Stairs shall be constructed as follows:

- Where the intersection is at the property boundary, the stair shall be set back by a minimum of 900mm so that the handrail and TGSIs do not protrude into the transverse path of travel.
- Where the intersection is at an internal corridor, the stair shall be set back one tread width plus 300mm (nominally 700mm as per AS 1428.1-2009 Fig 26(b)), so the handrails do not protrude into transverse path of travel.
- Stairs shall have opaque risers.
- 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.
- Stair nosing profiles shall;
 - Have a sharp intersection;
 - Be rounded up to 5mm radius; or
 - Be chamfered up to 5mm x 5mm
- 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.

12.6. 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
Bed and breakfast, holiday houses, hostels, boarding houses or the like	a) Not less than 1; and b) Where private accessible unisex sanitary compartments are provided for every accessible bedroom, common accessible unisex sanitary compartments need not be provided.
Residential apartments	Where sanitary compartments are provided in common areas, not less than 1.
Hotels Class 3 and Class 9c aged care building	a) In every accessible sole-occupancy unit provided with sanitary compartments within the accessible sole-occupancy unit, not less than 1; and b) At each bank of sanitary compartments containing male and female sanitary compartments 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	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 AS 1428.1-2009

Sanitary facilities to these portions will be provided in accordance with the requirements of the BCA for their respective areas. Details to be provided of the sanitary provision for the retail and assembly areas. Access to these areas is to be assessed by an access consultant.

12.7. 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
- Braille and tactile signs must be illuminated to ensure *luminance contrast* requirements are met at all times during which the sign is required to be read.

12.8. 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.

13. Appendix A - Reference Documentation

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

Drawing No.	Title	Date	Revision
BR5_ASD_PA1_01_0000	Title Sheet & Drawing List	3 November 2020	19
BR5_ASD_PA1_01_0001	R5 Context Plan	3 November 2020	20
BR5_ASD_PA1_01_0002	R5 Site Plan	3 November 2020	20
BR5_ASD_PA1_01_0004	R5 Setting Out	3 November 2020	20
BR5_ASD_PA1_01_2000	R5 Plan Ground Level 00	3 November 2020	21
BR5_ASD_PA1_01_2000	R5 Plan Podium Level P1	3 November 2020	19
BR5_ASD_PA1_01_2002	R5 Plan Podium Level P2	3 November 2020	20
BR5_ASD_PA1_01_3001	R5 Plan Lower Plate Level 01	3 November 2020	20
BR5_ASD_PA1_01_3002	R5 Plan Lower Plate Level 02-14	3 November 2020	20
BR5_ASD_PA1_01_3015	R5 Plan Mid Plate Level 15-16	3 November 2020	20
BR5_ASD_PA1_01_3017	R5 Plan Lift Overrun Level 17	3 November 2020	20
BR5_ASD_PA1_01_3018	R5 Plan Upper Plate Level 18-19	3 November 2020	20
BR5_ASD_PA1_01_3020	R5 Plan Upper Plate Level 20-25	3 November 2020	20
BR5_ASD_PA1_01_3026	R5 Plan Skyhomes Level 26	3 November 2020	19
BR5_ASD_PA1_01_3027	R5 Plan Skyhomes Level 27	3 November 2020	19
BR5_ASD_PA1_01_3028	R5 Plan Roof Level 28	3 November 2020	19
BR5_ASD_PA1_01_9000	R5 GFA Calculation	3 November 2020	19
BR5_ASD_PA1_01_9002	R5 GFA Calculation Plan – Sheet 2	3 November 2020	20
BR5_ASD_PA1_01_9003	R5 GFA Calculation Plan – Sheet 3	3 November 2020	20
BR5_ASD_PA1_01_9004	R5 GFA Calculation Plan – Sheet 4	3 November 2020	20

14. 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 Smoke Detection and Alarm System	Clause 3 or 4 or 5 BCA Spec. E2.2a, AS 1670.1 – 2018, AS/NZS 1668.1 – 2015, AS 3786-2014
4.	Automatic Fire Suppression System	BCA Spec. E1.5 & AS 2118.1 – 2017 Amdt 1, AS 2118.6 – 2012 (Combined sprinkler & hydrant)
5.	Building Occupant Warning System activated by the Sprinkler System	BCA Spec. E1.5 & Specification E2.2a Clause 7
6.	Emergency Lifts	BCA Clause E3.4
7.	Emergency Lighting	BCA Clause E4.2, E4.4 & AS/NZS 2293.1 – 2018
8.	EWIS	BCA Clause E4.9 & AS 1670.4 - 2018
9.	Exit Signs	BCA Clauses E4.5, E4.6 & E4.8 and AS/NZS 2293.1 – 2018
10.	Exit Signs (non-illuminated)	BCA Clause E4.7
11.	Fire Control Centres and Rooms	BCA Spec. E1.8
12.	Fire Blankets	BCA Clause E1.6, and AS 2444 – 2001
13.	Fire Dampers	BCA Clause C2.12, C3.15, Spec C2.5, , E2.2, E2.3, F4.12, Spec E2.2, E2.3, Spec E2.2b, & AS 1668.1 – 2015
14.	Fire Doors	BCA Clause C3.4, & C3.8 and AS 1905.1 – 2015
15.	Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 2005 Amdt 1
16.	Fire Hydrant System	Clause C2.12, E1.3, , & AS 2419.1 – 2005 Amdt 1
17.	Fire Seals	BCA Clause C3.15, C3.16, Spec C3.15, Spec D1.12, & AS 1530.4 –2014
18.	Fire Shutters	BCA Spec. C3.4 & AS 1905.2 – 2005
19.	Fire Windows	BCA Spec. C3.4
20.	Lightweight Construction	BCA Clause C1.8, Spec C1.8
21.	Mechanical Air Handling System	BCA Clause E2.2, AS/NZS 1668.1 – 2015 & AS 1668.2 – 2012
22.	Paths of Travel	EP&A Reg 2000 Clause 186
23.	Portable Fire Extinguishers	BCA Clause E1.6 & H3.11, AS 2444 – 2001
24.	Pressurising Systems	BCA Clause E2.2 & AS/NZS 1668.1 – 2015
25.	Required Exit Doors (power operated)	BCA Clause D2.19 (b)(iv)
26.	Smoke Alarms	AS 3786
27.	Smoke Hazard Management System	BCA Part E2 & AS/NZS 1668.1 – 2015
28.	Smoke Dampers	BCA Clause Spec E2.2, E2.3, Spec E2.2b, & AS/NZS 1668.1 – 2015
29.	Smoke Doors	BCA Spec. C3.4

	Essential Fire Safety Measures	Standard of Performance
30.	Wall-Wetting Sprinklers	BCA Clause C3.4
31.	Warning and Operational Signs	AS 1905.1 –2015; BCA Clause D2.23, E3.3

15. Appendix C - Fire Resistance Levels

The table below represents the Fire resistance levels required in accordance with BCA 2019 Amendment 1:

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS	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 within it) or other external building element, where the distance from any fire-source feature to which it is exposed is -				
<i>For loadbearing parts-</i>				
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
<i>For non-loadbearing parts -</i>				
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
<i>Bounding public corridors, public lobbies and the like</i>				
<i>Loadbearing</i>	90/ 90/ 90	120/-/-	180/-/-	240/-/-
<i>Non-loadbearing</i>	-/ 60/ 60	-/-/-	-/-/-	-/-/-
<i>Between or bounding sole-occupancy units</i>				
<i>Loadbearing</i>	90/ 90/ 90	120/-/-	180/-/-	240/-/-
<i>Non-loadbearing</i>	-/ 60/ 60	-/-/-	-/-/-	-/-/-
<i>Ventilating, pipe, garbage, and like shafts not used for the discharge of hot products of combustion</i>				
<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
FRL (not less than) Structural adequacy/Integrity/Insulation
ESA/M (not greater than)
Wall

(a)	<i>external wall</i>	
(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)	<i>internal wall</i>	
(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)	<i>fire wall</i>	
(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 *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.