REF: 07048-BCAReport (Rev, C) -250514

BUILDING CODE OF AUSTRALIA REPORT

SPD Residential
185 Fox Valley Way, Wahroonga

Table of Contents

Executive Summary 3
1.0 Introduction 5
2.0 Building Assessment Data 6
3.0 Structural Provisions 6
4.0 Fire Resistance 6
1.0 Compartmentation and Separation 7
5.0 Provision for Escape 8
2.0 Construction of Exits 10
3.0 Fire Services & Equipment 12
4.0 Smoke Hazard Management 12
5.0 Lift Installations 13
6.0 Emergency Lighting and Exit Signs 13
7.0 Sound System and Intercom Systems for Emergency Purposes 14
8.0 Sanitary Facilities 14
9.0 Light and Ventilation 14
10.0 Sound Transmission & Insulation 14
11.0 Energy Efficiency 15
Appendix A - Design Documentation 264
Appendix B - Draft Fire Safety Schedule 26
Appendix D- Fire Resistance Levels 27

Date	Revision Number	No. of pages	Issue or Description of Amendment	Checked By	Approved By	Date Approved
22.05.12	A	23	Scheme Design Review	Mike Gooley	Stephen Natilli	22.05.12
10.01.13	B	23	DA Submission	Mike Gooley	Stephen Natilli	10.01.13
8.05.14	C	26	DA Revision	Mike Gooley	Stephen Natilli	8.05.14

Executive Summary

we have reviewed architectural design documents prepared by MBMO (refer appendix A) for compliance with the Building Code of Australia 2014.

This report nominates relevant BCA prescriptive ('deemed-to-satisfy) provisions together with areas in which an alternative performance based solution will need to be developed to comply with the performance requirements of the BCA.

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: -

DTS Clause	Description of Non-Compliance	Performance Requirement
C2.6	Spandrel Separation: Building A will be provided with a 600 mm horizontal projection between vertical openings in an external wall in lieu of a 900 mm spandrel separation.	CP2 & CP8
D1.4 & D1.5	Extended Travel Distances: The travel distances within the basement carpark levels and the residential unit levels (ground to level 6) will exceed the DTS provisions of the BCA. Refer to summary of extended travel distances within section 5.1 of this report.	DP4 & EP2.2
D1.7	Path of Travel to Road: The Fire stair to Building A discharges into a covered area that is not open for 1/3 of its perimeter. Compliance will not be achieved with Clause D1.7 of the BCA. The path of travel to the road after discharge from the fire-isolated stairway will be situated within 6.0m to glazed doors and windows. Rather than protecting the openings by internal wall-wetting drenchers. An alternative solution will be developed to comply with the performance requirements of the BCA.	DP4 & DP5
D2.4	Separation of Rising and Descending Stairways: The fire-isolated stairway from the basement carpark levels and from the residential levels will not be separated by non-combustible construction with separate access to open space	DP5

Melbourne | Sydney | Brisbane | Gold Coast | www.mckenzie-group.com.au | Incorporating One Group id
mckenzie group

DTS Clause	Description of Non-Compliance	Performance Requirement
Sec. E2.2a (sub-clause 6)	Building Occupant Warning System: A building occupant warning system provided as part of a smoke hazard management system must sound through all occupied area, except class 2 – sole-occupancy unit that comply with Clause 3 of specification E2.2a. The following will be assessed as an alternative solution: a). Allow domestic smoke alarms (AS 3786) with addressable heat detectors to SOU of class 2 and 3; b). The building occupant warning system will be configured to activate in Building A, B, C and D based upon the origin of the fire alarm. Detection in the basement will evacuate all buildings.	EP2.2.
F4.5 and F4.11	Mechanical Ventilation System: a). Clause 4.5 – discharge points of bathroom exhaust will be situated less than prescribed in AS 1668.1-1991. AS 1668.2-2002 will be used in lieu of AS 1668.2-1991; b). Clause 4.11 - The designer of the carpark exhaust system shall be utilising AS 1668.2-2002 in lieu of the BCA referenced standard of AS 1668.2-1991. The Mechanical Engineer will document an alternative solution in relation to performance requirements FP4.5.	EP2.2 & FP4.5

The fire engineered solution relating to category 2 items will need to be referred to the NSW Fire Brigade for comment as part of the Construction Certificate process.

The information contained within this report is a preliminary assessment of the architectural drawings being submitted with the development application.

The documentation will need further detailing such as architectural design specifications, service design, etc as outlined within this report. These matters will be suitable assessed at the Construction Certificate stage.

Nothing in this report precludes a development consent being issued as the proposed building generally complies with the DTS provisions of the BCA 2012. Minor departures from the DTS provisions will be suitably addressed by a fire engineering assessment.

Assessed By

Mike Gooley
Director
Accredited Certifier – Grade 1.
McKenzie Group Consulting

1.0 Introduction

The report is for the assessment of a residential apartment building complex at Precinct C – Stage 1 (Buildings A, B, C & D) to assess compliance with the Building Code of Australia 2014 ("BCA").

The purpose of this report is to provide a general overview of the proposed residential apartment building in terms of compliance with the provisions of the BCA (2014).

The issues within this report should be used as an early guide to the compliance of the proposed new building with the BCA and is generic insofar as the design has progressed. Further checking is required throughout the design process.

Limitations and Exclusions

The information contained within this report is based upon a review of the architectural drawings (refer to appendix A) and is specific to the provisions of the Building Code of Australian 2012.

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.

1.2 Project Description

The project works are located within Sydney Adventist Hospital (SAH) Campus.

The proposal consists of the construction of 3 basement carpark levels connected to 4 residential apartment buildings (known as Building A, B, C and D). These include:

- Building A – comprises 7 levels of residential apartments (student accommodation);
- Building B – comprises 4 levels of residential apartments (student accommodation);
- Building C – comprises 7 levels of residential apartments;
- Building D – comprises 4 levels of residential apartments.

Each of the residential buildings will have access to entrance lobbies via open courtyard with pedestrian link from adjacent buildings, internal roadway link with Comennara Parkway and Fox Valley Road.

2.0 Building Assessment Data

The following BCA Parameters will apply to the residential apartment buildings: -

Building Number	A	B	C	D
Building Use	Residential (student accommodation)	Residential (student accommodation)	Residential units	Residential units
Classification	3	3	2	2
Number of Storeys Contained	10	7	10	7
Rise In Storeys	7	4	7	4
Type of Construction	A	A	A	A
Effective Height (m)	Less than 25.0m	Less than 25.0m	Less than 25.0m	Less than 25.0m

Determination of the effective height for the building has been assessed on the basis that the lowest level (basement 3 – RL 148.45) where access from the building is provided and the topmost occupied floor of the building (level 6 – RL 176.90). The effective height has been assessed as less than 25.0m (i.e. measured as 24.0m).

BCA Assessment

The following assessment will provide an overview of compliance with the BCA and identify issues that require further details at the construction certificate stage.

3.0 Structural Provisions

Any new structural works are to comply with the applicable requirements of AS/NZS 1170.1. Please note that with the adoption of BCA2012, AS1170.2-2011 is applicable to the development.

Glazing is to comply with AS1288, and AS2047.

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

4.0 Fire Resistance

The building must be designed to comply with Type A Construction with the fire resistance of building elements complying with Table 3 of specification C1.1 (refer to summary of FRL's - Appendix 2).

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.

1.0 Compartmentation and Separation

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

- Bounding construction to the sole occupancy units and public corridors must achieve an FRL of not less than -/60/60 minutes,
- Common rooms opening into public corridors must be separated by construction that achieves an FRL of not less than -/60/60 minutes;
- Separation between the carpark levels and the residential portions of must achieve an FRL of not less than 120/120/120 minutes,
- Fire compartmentation of the building at each floor level.

Please note the substation is required to have 180 minutes fire separation/ compartmentation in accordance with Energy Australia requirements.

Other passive fire protection issues that will need to be addressed in detailed documentation phase include
emergency power supply and electricity supply which must be separated from the remainder of the building by construction achieving a minimum fire resistance level of not less than -/120/120 minutes.

4.1 Protection of Openings

The DTS provisions (Clause C3.2) requires that openings in the external walls less than 3.0m from the fire-source feature (i.e. side boundaries) or 6.0m from the boundary on the opposite side of the roadway must be suitably protected in accordance with Clause C3.4 of the BCA.

The openings in the external walls will not be exposed to the fire-source feature. Compliance will be achieved with the provisions of the BCA.

The entrance doors to fire-isolated stairways/passageways must be protected by self-closing -/60/30 fire doors.

The entrance doors to apartments together with ancillary rooms opening into public corridor must be suitable protected with self-closing -/60/30 fire doors.

Services that pass through floors within the buildings must be contained within a fire-rated shaft or suitably protected in accordance with Clause C3.15 and spec. C3.15 of the BCA.

4.2 Vertical Separation of openings in external walls:

A building of Type A construction must be provided with spandrel separation between opening on different storeys unless the building is sprinkler protected throughout. Spandrels are required in accordance with BCA Clause C2.6, which stipulates a 900mm high spandrel; with 600mm of this spandrel being above the finished floor level. Alternatively, an 1100mm horizontal slab may be utilized. The spandrel material is required to achieve an FRL of 60/60/60.

Detailed elevations will be required to enable a full check and assessment to be undertaken of the spandrels proposed.

4.3 Passive Fire Protection

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,

To be separated from the remainder of the building by construction achieving a minimum fire resistance level of 120 minutes.

4.4 Fire Hazard Properties

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.

5.0 Provision for Escape

The building has been assessed as a building with an effective height of less than 25.0m. Each Residential storey must be served by at least 1 required exits/stairway. The carpark basement storeys must be served by not less than 2 exits.

5.1 Exit Travel Distances

The travel distances to exits must be provided in accordance with the following design criteria:

<u>Class 2-3</u>

- 6m from the entrance door of sole occupancy units to required exits or point of choice to alternative exits;
- 20m from a single exit at the level of egress to a road or open space;
- Alternate exits not more than 45m apart and 60m within carpark levels.

The following areas exceed the maximum allowable travel distance:

<u>Basement Carpark Levels:</u>

Basement 1	• Travel distances from furthest point on the floor to point of choice to alternative exits exceeds 20.0m (i.e. measured up to 27.0m); • Travel distances to required exits exceed 40.0m (i.e. measured up to 63.0m)
Basement 2	• Travel distances from furthest point on the floor to point of choice to alternative exits exceeds 20.0m (i.e. measured up to 30.0m from lift lobbies); • Travel distances to required exits exceed 40.0m (i.e. measured up to 53.0m)

Basement 3	• Travel distances from furthest point on the floor to point of choice to alternative exits exceeds 20.0m (i.e. measured up to 30.0m from lift lobby to Building B); • Travel distances to required exits exceed 40.0m (i.e. measured up to 53.0m)

Class 2 and 3:

Ground Floor	• Travel distance from plant room (Building C) to required exit exceeds 20.0m (i.e. measured up to 28.0m); • Travel distance from entrance doorway to SOU (Building A) to required exit exceeds 20.0m (i.e. measured up to 28.0m)
Levels 1 to 6	• The travel distance from the entry doors of sole-occupancy units to the required exit within Building A, B and C exceeds 6.0m (i.e. measured between 14.0m to 20.0.0m).

The extended travel distances to required exits must be addressed by the documentation of performance based assessment by the fire engineer.

The vehicular ramps within carparks can be utilised as path of travel to required exits, subject to maximum gradient of 1:8. Based upon the gradient of ramps being steeper than 1:8 a flight of stairs will be required to connect between the higher and lower carpark levels on each storey. Architectural plans being suitably amended to achieve compliance with the provisions of the BCA.

Each of the fire-isolated stairways discharge to open space which is connected with the public roadway. Compliance will be achieved with the provisions of the BCA.

5.2 Dimensions of Exits

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 in which case a 600mm clear width is required) measured clear of handrails.

Doorways are permitted to contain a clear opening width of 750mm 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 870 mm doors).

5.3 Fire Isolated Exits

Each fire-isolated stairway or fire-isolated ramp must 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 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 from which an unimpeded path of travel, not further than 20 m, is available to a road or open space; or
- Into 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, including the perimeter openings, of not less than 3 m and provides an unimpeded path of travel from the point of discharge to the road or open space of not more than 6 m.

Where a path of travel from the point of discharge of a fire-isolated exit necessitates passing within 6m of any part of an external wall of the same building, measured horizontally at right angles to the path of travel, that part of the wall must have an FRL of not less than 60/60/60 and any openings protected internally in accordance with C3.4, for a distance of 3 m above or below, as appropriate, the level of the path of travel, or for the height of the wall, whichever is the lesser.

The path of travel to the road after discharge from the fire-isolated stairway will be situated within 6.0m to glazed doors and windows. Rather than protecting the openings by internal wall-wetting drenchers. An alternative solution will be developed to comply with the performance requirements of the BCA.

2.0 Construction of Exits

It is considered that compliance can be generally achieved with Part D2 of the BCA. This will be assessed at the construction certificate stage.

There must be no direct connection between a stairway rising from a storey below the lowest level of access to a road or open space and a stairway descending from a storey above that level. Architectural plans being suitable detailed to indicate the separation between the basement carpark fire stairs and the fire stairs serving the residential cores.

Electrical distribution boards and switchboards along the path of travel to required exits must be enclosed in non-combustible construction with doorways suitably sealed against the smoke spreading from the enclosure.

The pedestrian ramp that provides access into the buildings must comply with the requirements of AS 1428.1-2009.

Other detailing issues that will need to be addressed at the Construction Certificate stage include:

- Door Hardware
- Exit door operation and swing
- Stair construction
- Handrail and balustrade construction

5.4 Balustrading and Handrail

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 finished floor, the balustrade shall not contain any horizontal or near horizontal members that facilitate climbing.

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

Handrails are to be provided to each side of the stair, where the stair exceeds a width of 2m. Where an egress stair exceeds 2m in width, an additional handrail is required to ensure that the egress width of 2m is accounted.

The main public stairs and ramps 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.

5.5 Access for Persons with a Disability

The BCA requires access for people with disabilities from the main point of a pedestrian entry at the allotment boundary and through not less than 50% of all pedestrian entrances including the principal pedestrian entrances. A pedestrian entrance which is not accessible must not be located more than 50.0m from an accessible entrance.

Class 2 building:
Access for people with disabilities must be provided to common areas of a class 2 building, from a pedestrian entrance required to be accessible to the entrance doorway of each sole-occupancy unit and to within rooms or spaces for use in common by the residences.

Clause 3 building:
Where the main public entrance is via a ramp, tactile indicators shall be provided in accordance with AS 1428.4 at the top and bottom. Facilities, services and features of the building accessible to people with disabilities shall be identified by signage complying with Clause D3.6 of the BCA.

Clause D3.5 of the BCA require accessible carparking for people with disabilities in a class 3 building. 1 space for every 100 cararking spaces or part thereof.

The carpark levels have nominated accessible carparking spaces which will be designed in accordance with AS 2890.1 & AS4299.

AS 1428.1 requires passenger lifts to comply with AS 1735.12 (Facilities for people with disabilities).

A review of the architectural plans indicates compliance can be readily achieved with Part D3 of the BCA and AS 1428.1-2009.

General

Access to be provided to and within the building pursuant to AS1428.1-2009 as follows:
- Via the principle 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.

Note that entrances that are not accessible are to be located within 50m of an entrance that is accessible.

3.0 Fire Services & Equipment

The building has been assessed as a building with an effective height of less than 25.0m. The following fire fighting services are required to be provided throughout the building:

- An automatic sprinkler system (Carpark only);
- Fire hydrants system;
- Fire hose reel system;
- Portable Fire Extinguishers.

Each of these fire fighting services must be designed to comply with the standard of performance nominated within the attached fire safety schedule for the building.

Water Supply:

The grade of water supply to a required sprinkler system must be not less than Grade 3 in accordance with specification E1.5 of the BCA.

Booster Assembly:

The hospital site booster assembly will be utilised for the proposed new residential building. The location of the booster assembly has been subject to a fire engineering assessment as part of the site wide infrastructure.

Fire Hydrants System

Internal fire hydrants system is required to serve the building. The fire hydrants being situated within the fire-isolated stairways. The terrace units with direct access to the road, entrance lobbies and associated areas at the ground floor level may be served by external fire hydrants to achieve coverage to satisfy the requirements of AS 2419.1-2005.

Fire Hose Reels:

Fire hose reels will be provided to carpark levels only in accordance with AS2441-2005.

Internal fire hose reels are not required to be provided to class 2 and 3 portion of the building.

Location of Sprinkler Value/Pump Room:

Sprinkler alarm valves and pump rooms must be located in a secure room or enclosure which has direct egress to a road or open space. The location of the enclosure will comply with the requirements of AS 2419.1-2005.

Fire Indicator Panel

Fire Indicator Panel is required by AS1670.1 to be situated within the entrance lobby of the building or centrally located enclosure to be accessible to the NSWFB. Mimic Panels are to be situated within each lobby core to Building 1A, 1B, 1C and 1D.

4.0 Smoke Hazard Management

The building has an effective height less than 25.0m and must be served by the following smoke hazard management systems.

- A class 2 and 3 part of the building must be provided with an automatic smoke detection and alarm system complying with specification E2.2a;
- The basement levels fire-isolated stairways must be served by an automatic air pressurisation system in accordance with AS/NZS 1668.1.
- The basement carpark levels provided with a mechanical ventilation system in accordance with AS 1668.2 must comply with Clause 5.5 of AS/NZS 1668.1, except that
  (i) Fans with metal blades suitable for operation at normal temperature may be used; and
  (ii) The electrical power and control cabling need not be fire rated.

<u>Building Occupant Warning System:</u>

A required sprinkler system must be connected to and activate a building occupant warning system complying with Clause 6 of Specification E2.2a. Where a smoke hazard management system is installed and is actuated by smoke detectors, the sprinkler system must, wherever practical, be arranged to also activate the smoke hazard management system.

A building occupant warning system provided as part of a smoke hazard management system must sound through all occupied area, except class 2 – sole-occupancy unit that comply with Clause 3 of specification E2.2a.

The following will be assessed as an alternative solution:

a). Allow domestic smoke alarms (AS 3786) with addressable heat detectors to SOU of class 2 and 3;
b). The building occupant warning system will be configured to activate in Building A, B, C and D based upon the origin of the fire alarm. Detection in the basement will evacuate all buildings.

5.0 Lift Installations

Where passenger lifts are installed that serves the storey then at least one stretcher facility must be provided in accordance with part E3.2 & E3.4 of the BCA and AS 1735.2.

The passenger lifts to be installed are to be: -

- fitted with warning signs, fire service controls in accordance with AS 1735.2
- Be provided with the following:-
  - A handrail in accordance with AS 1735.12
  - Minimum internal floor dimensions as specified in AS 1735.12,
  - 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 complying with AS 1735.12.

6.0 Emergency Lighting and Exit Signs

Emergency lighting and exit signs are required to be installed throughout the building in accordance with the provisions of the BCA and the relevant Australian Standards.

7.0 Sound System and Intercom Systems for Emergency Purposes

A sound system and intercom system for emergency purposes complying where applicable with AS 1670.4 must be provided to the class 3 portion of the building.

8.0 Sanitary Facilities

Class 2:

The Class 2(apartments) are provided with sanitary facilities together with laundry facilities that will satisfy the provisions of the BCA.

Class 3:

The Class 3 (sole occupancy units) are provided with sanitary facilities within each unit that will satisfy the provisions of the BCA.

Facilities for employees consisting of closet pan and washbasin must be provided in a separate room at or near ground level and accessible to employees without entering a sole occupancy unit. Architectural plans to indicate location of designated employee's toilet.

9.0 Light and Ventilation

Natural or mechanical ventilation is required to all habitable rooms in accordance with F4.5 Building Code of Australia and AS 1668 and AS/NZS 3666.1.

Mechanical Ventilation to the Carpark:

The designer shall be utilising AS 1668.2-2002 in lieu of the BCA referenced standard of AS 1668.2-1991.

The Alternative Solution to be developed for the utilisation of this standard, which is not adopted by the BCA.

10.0 Sound Transmission & Insulation

The sound transmission and insulation requirements for the Class 2 parts shall be provided in accordance with Part F 5 of the *BCA for* the following elements:

- Floors
- Walls
- Services
- Pumps

We will rely upon developed details and a report from an Acoustic Consultant, which will be assessed as part of the Construction Certificate approval process.

11.0 Energy Efficiency

Class 2 (apartments):

The proposed development shall be provided with insulation building sealing and services in accordance with NSW Part J of the BCA 2012.

The deemed-to-satisfy provisions of the BCA only apply to thermal insulation in a class 2 building or class 4 parts where development consent specifies that the insulation is to be provided as part of the development. The class 2 building will subject to BASIX Assessment.

We will rely upon the BASIX Assessment together with confirmation that the commitments made under BASIX have been incorporated into the design prior to the issue of the Construction Certificate.

Class 3 (apartments):

The class 3 portion of the building must be designed to comply with Section 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.

10.1 Roof and Ceiling Construction

Roofs and or Ceilings are to be constructed to provide an R rating of 3.2.

Where the layer of insulation is penetrated by the percentages as tabled below, additional upgrading of the remainder of the insulation level is required to be provided as follows:

Percentage of ceiling are uninsulated	**Minimum *R-Value* of ceiling insulation required to satisfy J1.3(a)**							
	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
	Adjusted minimum *R-Value* of ceiling insulation required to compensate for loss of ceiling area insulation							
0.5% to less than 1.0%	2.8	3.4	*4.0*	*4.7*	*5.4*	*6.2*	*6.9*	
1.0% to less than 1.5%	2.9	3.6	*4.4*	*5.2*	*6.1*	*7.0*		
1.5% to less than 2.0%	3.1	3.9	*4.8*	*5.8*	*6.8*			
2.0% to less than 2.5%	3.3	4.2	*5.3*	*6.5*				
2.5% to less than 3.0%	3.6	4.6	*5.9*					
3.0% to less than 4.0%	4.5	5.7						
4.0% to less than 5.0%	5.0							
5.0% or more								

Not permitted

Where roof lights are installed, we will require the size of roof lights and the depth of the shaft to work out the roof light shaft index and extent of glazing as per the table below which would dictate the glazing to be used.

Roof light shaft index (see Note 1)	**Constant**	**Total area of roof lights serving the room or space as a percentage of the floor area of the room or space**			
		Up to 2%	**More than 2% and up to 3%**	**More than 3% and up to 4%**	**More than 4% and up to 5%**
Less than 0.5	SHGC	Not more than 0.83	Not more than 0.57	Not more than 0.43	Not more than 0.34
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
0.5 to less than 1.0	SHGC	Not more than 0.83	Not more than 0.72	Not more than 0.54	Not more than 0.43

	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
1.0 to less than 2.5	SHGC	Not more than 0.83	Not more than 0.83	Not more than 0.69	Not more than 0.55
	Total U-Value	Not more than8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
2.5 or more	SHGC	Not more than 0.83	Not more than 0.83	Not more than 0.83	Not more than 0.83
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4

10.2 External Walls

External Walls are to be constructed to provide the following:

(a) (i) Achieve a minimum Total R-Value of 2.8

(ii) The minimum total R-Value in (i) is reduced

(A) For a wall with a surface density of not less than 220 kg/m^2, by 0.5; and

(B) For a wall that is –

(aa) Facing the south orientation by 0.5; or

(bb) Shaded with a projection shade angle in accordance of

(AA) 30 degrees to not more than 60 degrees, by 0.5; or

(BB) More than 60 degrees, by 1.0

(b) Where the only space for insulation is provided by a furring channel, top hat section, batten or the like –

(i) Achieve a minimum Total R-Value of 1.4; and

(ii) Satisfy glazing energy index increase in glazing performance

10.3 Floors

Floors are to achieve an R rating of 2.0.

10.4 Glazing

This section relates to the conductance and solar heat gain of the windows, taking into consideration of the type of window frame, orientation and whether there are overhangs / shadings.

A glazing calculator will be required to be undertaken and results provided for assessment.

10.5 Building Sealing

A Seal to restrict air infiltration must be fitted to each edge of the external doors and openable windows. The seals may be foam or compressible strip, fibrous seal or the like. The main entry doors must have either an airlock, or self-closing doors, or a revolving door.

Miscellaneous exhaust fans must be fitted with a sealing device such as a self-closing damper.

An evaporative cooler must be fitted with a self-closing damper.

10.6 Air Conditioning

- Be capable of being inactivated in each Sole Occupancy Unit.
- Where motorised dampers, be close when system is inactivated
- Have any supply and return ductwork installed
  - Heating or Cooling only R1.0
  - Heating and Cooling R1.5
  - Where ductwork is conveying cold air, a vapour barrier must be installed on the outside of the insulation.

When an air conditioning system provides mechanical ventilation as well and the capacity exceeds 35 kwr (in climate zone 4-8), the system must be equipped with an outdoor air economy cycle.

Class 3 Buildings:

Be capable of controlling the temperature of Sole Occupant units between different times of the day, i.e sleeping periods etc.

And note operate when any external door, including doors to outdoor areas such as verandas, balconies etc and kept open for a 1 minute duration.

Serving more than 1 Sole Occupant Unit:

Each Sole Occupant Unit to be able to thermostatically control the temperature of each zone or Sole Occupant Unit.

Not control temperature by actively mixing heated or chilled air by more than a change in temperature of 7.5k.

Air Flow Rate:

When the air flow rate exceeds 1000L/s, it must be designed so the total motor shaft power of the fans do not exceed the following;

Air-conditioning sensible heat load (W/m^2 of the floor area of the conditioned space)	**Maximum fan power (W/m^2 of the floor area of the conditioned space**	
	For an air-conditioning system serving not more than 500m^2	**For an air-conditioning system serving more than 500m^2**
Up to 100	4.1	6.4
101 to 150	7.3	10.4
151 to 200	10.5	14.1
201 to 300	17.1	21.5
-301 to 400	23.6	28.4

Requirements do not apply to packaged Air Conditioned Units, exhaust systems, high efficiency air filters, or energy reclaim systems.

Mechanical:

- Be capable of being inactivated.
- When serving a conditioned space, not provide ventilation in excess of 20% of the rate of required (as determined) other than to;
  - (i) Balance the required ventilation, due to exhaust ventilation
  - (ii) Part of an exhaust system in a health care building
  - (iii) As free cooling, with air conditioner switched off i.e. when external temperature is less than indoor temperature.

Air Flow Rate in Excess of 1000 L/S

- Comply with the fan to motor shaft power to air flow ratio.
  - (i) an energy reclaim system that preconditions outside air or L/s without filters;
  - (ii) the ability to modulate the system in pursuant to the number of occupants in lieu of the maximum or 0.75 L/s where filters are installed.

Car Park Ventilation

- when serving more than 40 cars in a car park;
  - (i) be controlled by an atmospheric containment maintaining system or;
  - (ii) maintain an average air change rate of 0.5 air changes per hour, other than when car park is not occupied for more than 2.0 hours.

Air Conditioned Packaged Units

- Must have an energy efficiency ratio of (Watts);
  - 65 kWr to 95 kWr 2.7
  - 95 kWr to more 2.8

Heating and Cooling systems

Systems that provide heating or cooling for mechanical or air conditioning systems must –

(i) Have any *piping*, vessels, heat exchangers or tanks containing heated or chilled fluid, other than those with insulation levels covered by Minimum Energy Performance Standards (MEPS) must be insulated in accordance with Specification J5.4

(ii) Where water is circulated by pumping at greater than 2 L/s

Be designed in accordance to the following table:

Maximum Pump Power

Cooling or heating load (W/m^2 of the *floor area* of the *conditioned space*)	**Maximum *pump power* (W/m^2 of the floor area of the *conditioned space*)**		
	Chilled water	**Condenser water**	**Heating water**
Up to 100	1.3	0.9	1.0
101 to 150	1.9	1.2	1.3
151 to 200	2.2	2.2	1.7
201 to 300	4.3	3.0	2.5
301 to 400	5.0	3.6	3.2
More than 400	5.6	5.6	3.6

- have the pump capable of varying its speed in response to varying load when it is rated at more than 3kW of pump power, except where the pump is needed to run at full speed for safe or efficient operation; and
- if the system contains more than one water heater used for heating a building, chiller or coil, be capable of stopping the flow of water to those not operating.

Heaters

Boilers used to heat space via water must be:-

a) In accordance with the following table and
b) Where reticulated gas is available at the allotment boundary

Minimum Thermal Efficiency of a water heater

Fuel Type	**Rated capacity ($kW_{heating}$)**	**Minimum gross thermal efficiency (%)**
Gas	Not more than 750	80
	More than 750	83
Oil	All capacities	80

For heating a space other than via water, must be –

- A solar heater; or
- A gas heater; or
- An oil heater if reticulated gas is not available at the allotment boundary; or
- A heat pump heater; or
- A solid-fuel burning heater; or
- A heater using reclaimed heat from another process such as reject heat from refrigeration plant; or
- A combination of 2 or more of the above.

Where a fixed space heating appliance is installed outdoors (such as wall mount heaters), it must be controlled to automatically turn off when not needed by an outdoor air temperature sensor, timer, motion detector, or the like.

Refrigerant chillers

A refrigerant chiller up to 350 kWr capacity that is part of an air-conditioning system, must have an energy efficiency ratio as per:

Equipment	**Minimum energy efficiency ratio ($W_r/W_{input\ power}$)**	
	For full load operation	**For integrated part load**
Water cooled chiller	4.2	5.2
Air cooled or evaporative cooled chiller	2.5	3.4

Air Condensers

The fan motor of an air cooled condenser that is part of an air-conditioning system, other than one that is part of package air-conditioning equipment in or part of a Liquid Chilling Package, must not use more than 42 W of fan power, for each kW of heat rejected from the refrigerant.

Cooling Towers

The fan of a cooling tower that is part of an air-conditioning system must not use more than-

- If a propeller or axial fan, 310 W of fan power for each L/s of cooling water circulated.
- If a centrifugal fan, 590 W of fan power for each L/s of cooling water circulated.

Closed Circuit coolers

The fan of a closed circuit cooler that is part of an air-conditioning system must not sue more than –

i) If a propeller or axial fan, 500 W of fan power for each L/s of cooled fluid circulated; and
ii) If a centrifugal fan, 670 W of *fan power* for each L/s of cooled fluid circulated.

Evaporative condenser

The fan of an evaporative condenser that is part of an air-conditioning system must not use more than-

- If a propeller or axial fan, 18 W of fan power for each kW of heat rejected; and
- If a centrifugal fan, 22 W of fan power for each kW of heat rejected.

Water pumps

The spray water pump of a closed circuit cooler or evaporative condenser that is part of an air-conditioning system must not use more than 150 W of pump power for each L/s of spray water circulated.

Time Switch

Time switch must be provided to control each of the following;
(i) Air Conditioning system of more than 10 Kw
(ii) Ventilation system with an air flow rate of 1000 L/S
(iii) Heating system of more than 10 Kw heating.

10.7 Interior Artificial Lighting

The maximum design illumination load is not to exceed;

Office 9W/m2	Retail 22W/m2	Lobbies W/m2
Warehouse 10W/m2	School 8W/m2	Health Care 13W/m2
Patient care 13W/m2	Car parks 6W/m2	Auditoriums 10W/m2
Other…W/m2		

Artificial Lighting must be controlled by a time switch, occupant sensor or a security swipe pass system. Each light control in a building must not operate lights within an area of more than;

- 250m2 for a space of not more than 2000m2
- 1000m2 for a space of more than 2000m2

Artificial lighting around the lighting. If it exceeds a total of 100W must;

- Be controlled by a day light sensor or time switch and
- Be controlled by motion detection or have an average light source efficiency of not less than 60 Watts / Lumens.

10.8 Access for Maintenance

Access if to be provided to all plant, equipment and components associated with the provision of the above energy requirements i.e.

- Adjustable or monitored shading devices
- Time switches and motion detectors
- Room temperature thermostats
- Plant thermostats such as boilers or refrigeration units
- Motorised air dampers and central valves
- Reflectors, Lenses and Diffusers of light fittings
- Heat transfer equipment

Appendix A - Design Documentation

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

Drawing No.	Title	Date	Revision
A-0000	COVER SHEET	07.05.14	[P02]
A-1100	BASEMENT 3 - BUILDING A + C	08.05.14	[P04]
A-1101	BASEMENT 3 - BUILDING B + D	08.05.14	[P04]
A-1102	BASEMENT 2 - BUILDING A + C	08.05.14	[P04]
A-1103	BASEMENT 2 - BUILDING B + D	08.05.14	[P04]
A-1104	BASEMENT 1 - BUILDING A + C	08.05.14	[P05]
A-1105	BASEMENT 1 - BUILDING B + D	08.05.14	[P03]
A-1106	GROUND LEVEL - BUILDING A + C	08.05.14	[P04]
A-1107	GROUND LEVEL - BUILDING B + D	08.05.14	[P04]
A-1108	LEVEL 1 - BUILDING A + C	08.05.14	[P04]
A-1109	LEVEL 1 - BUILDING B + D	08.05.14	[P04]
A-1110	LEVEL 2 - BUILDING A + C	08.05.14	[P04]
A-1111	LEVEL 2 - BUILDING B + D	08.05.14	[P04]
A-1112	LEVEL 3 - BUILDING A + C	08.05.14	[P04]
A-1113	LEVEL 3 - BUILDING B + D	08.05.14	[P04]
A-1114	LEVEL 4 - BUILDING A + C	08.05.14	[P04]
A-1115	LEVEL 4 - BUILDING B + D	08.05.14	[P04]
A-1116	LEVEL 5 - BUILDING A + C	08.05.14	[P04]
A-1117	LEVEL 5 - BUILDING B + D	08.05.14	[P04]
A-1118	LEVEL 6 - BUILDING A + C	08.05.14	[P04]
A-1119	LEVEL 7 - BUILDING A + C	08.05.14	[P04]

A-1400	SECTION A - BUILDING A + B	08.05.14	[P04]
A-1401	SECTION B - BUILDING A + B	08.05.14	[P04]
A-1402	SECTION C - COURTYARD NORTH / SOUTH	08.05.14	[P04]
A-1403	SECTION D - BUILDING C + D	08.05.14	[P04]
A-1404	SECTION E - BUILDING C + D	08.05.14	[P04]
A-1405	SECTION F - BUILDING A + B	08.05.14	[P04]
A-1406	SECTION G - COURTYARD EAST / WEST	08.05.14	[P04]
A-1407	SECTION H - BUILDING B + D	08.05.14	[P04]
A-1500	NORTH ELEVATION - BUILDING A + C	08.05.14	[P04]
A-1501	NORTH ELEVATION - BUILDING B + D	08.05.14	[P02]
A-1502	WEST ELEVATION - BUILDING A + B	08.05.14	[P02]
A-1503	WEST ELEVATION - BUILDING C + D	08.05.14	[P02]
A-1504	SOUTH ELEVATION - BUILDING A + C	08.05.14	[P02]
A-1505	SOUTH ELEVATION - BUILDING B + D	08.05.14	[P02]
A-1506	EAST ELEVATION - BUILDING C + D	08.05.14	[P02]
A-1507	EAST ELEVATION - BUILDING A + B	08.05.14	[P02]
A-2000	CONCRETE SETOUT PLAN	08.05.14	[P02]
A-5400	PARTITION SCHEDULE	08.05.14	[P02]
A-5401	PARTITION SCHEDULE	08.05.14	[P02]
A-5402	PARTITION SCHEDULE	08.05.14	[P02]
A-5403	PARTITION SCHEDULE	08.05.14	[P02]
A-5404	PARTITION SCHEDULE	08.05.14	[P02]
A-5405	PARTITION SCHEDULE	08.05.14	[P02]
A-5406	PARTITION SCHEDULE	08.05.14	[P02]
A-5407	PARTITION SCHEDULE	08.05.14	[P02]

A-5408	PARTITION SCHEDULE	08.05.14	[P02]
A-5409	PARTITION SCHEDULE	08.05.14	[P02]

Appendix B - Draft Fire Safety Schedule

Based upon the documentation reviewed to date, the following schedule of essential fire safety measures and other measures must be installed within the building.

	Fire Safety Measures	Standard of Performance (i.e. BCA and relevant AS)
1.	Access Panels, Doors and Hoppers	BCA Clause C3.13
2.	Automatic Fire Detection and Alarm System	BCA Spec. E2.2a, AS 3786-1993 & AS 1670 – 2004
3.	Automatic Fire Suppression System (carpark levels only)	BCA Spec. E1.5 & AS 2118.1 – 1999,
4.	Emergency Lighting	BCA Clause E4.2, E4.4 & AS/NZS 2293.1 – 1998
5.	Sound Systems and Intercom Systems for Emergency Purposes	BCA Clause E4.9 & AS 1670.4 - 2004 & AS 4428.2 – 2004
6.	Exit Signs	BCA Clauses E4.5, E4.6 & E4.8 and AS/NZS 2293.1 – 1998
7.	Fire Dampers	BCA Clause C3.15, AS 1668.1 – 1998 & AS 1682.1 & 2 – 1990
8.	Fire Doors	BCA Clause C3.2, C3.4, C3.5, C3.6, C3.7 & C3.8 and AS 1905.1 – 1997
9.	Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 1988
10.	Fire Hydrant System	Clause E1.3 & AS 2419.1 – 2005
11.	Fire Seals	BCA Clause C3.15 & AS 1530.4 – 1997
12.	Lightweight Construction	BCA Clause C1.8 & AS 1530.3 – 1999
13.	Mechanical Air Handling System	BCA Clause E2.2, AS/NZS 1668.1 – 1998 & AS 1668.2 – 1991
14.	Paths of Travel	EP&A Reg 2000 Clause 186
15.	Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 – 2001
16.	Warning and Operational Signs	Section 183 of the EP & A Regulations 2000, AS 1905.1 – 1997, BCA Clause C3.6, D2.23, E3.3

Notes:	A Fire Safety Engineering Assessment will be developed. There maybe additional measures added to the above schedule prior to the issue of the construction certificate.

Appendix C- Fire Resistance Levels

The table below represents the Fire resistance levels required in accordance with BCA 2011:

Table 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

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

Table 3.9 REQUIREMENTS FOR CARPARKS

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 *fire-source feature* to which it is exposed:	
Loadbearing	60/60/60
Non-*loadbearing*	–/60/60
(ii) 3 m or more from a *fire-source feature* to which it is exposed	–/–/–
(b) *internal wall*	
(i) *loadbearing*, other than one supporting only the roof (not used for carparking)	60/–/–
(ii) supporting only the roof (not used for carparking)	–/–/–
(iii) non-*loadbearing*	–/–/–
(c) *fire wall*	
(i) from the direction used as a *carpark*	60/60/60
(ii) from the direction not used as a *carpark*	as *required* by Table 3
Column	
(a) supporting only the roof (not used for carparking) and 3 m or more from a *fire-source feature* to which it is exposed	–/–/–
(b) steel column, other than one covered by (a) and one that does not support a part of a building that is not used as a *carpark*	60/–/– or 26 m^2/tonne
(c) any other column not covered by (a) or (b)	60/–/–
Beam	
(a) steel floor beam in continuous contact with a concrete floor slab	60/–/– or 30 m^2/tonne
(b) any other beam	60/–/–
Fire-resisting lift and stair shaft (within the *carpark* only)	60/60/60
Floor slab and vehicle ramp	60/60/60
Roof (not used for carparking)	–/–/–

Notes:
1. ESA/M means the ratio of exposed surface area to mass per unit length.
2. Refer to Specification E1.5 for special requirements for a sprinkler system in a *carpark* complying with Table 3.9 and located within a multi-classified building.

Melbourne | Sydney | Brisbane | Gold Coast | www.mckenzie-group.com.au | Incorporating One Group id
mckenzie group