REF: 062958-05BCA

BUILDING CODE OF AUSTRALIA REPORT

SPD Commercial
172 Fox Valley Road, Wahroonga

Table of Contents

Executive Summary 3
1.0 Introduction 5
2.0 Building Assessment Data 5
3.0 Structural Provisions 6
4.0 Fire Resistance 6
5.0 Egress 8
6.0 Fire Services & Equipment 10
7.0 Ventilation and Smoke Hazard Management 11
8.0 Emergency Lighting, Exit Signs and Warning Systems 12
9.0 Lift Services 12
10.0 Sanitary Facilities 12
11.0 Atrium Construction 13
12.0 Energy Efficiency 18
Appendix A - Design Documentation 19
Appendix B - Draft Fire Safety Schedule 20
Appendix C- Fire Resistance Levels 21

Date	Revision Number	No. of pages	Issue or Description of Amendment	Checked By	Approved By	Date Approved
20.12.12	1	19	Draft for discussion	Heath McNab	Mike Gooley	20.12.12
29.01.13	2	19	Draft DA submission	Heath McNab	Mike Gooley	29.01.13
14.02.13	3	19	DA Submission	Heath McNab	Mike Gooley	14.02.13
08.05.14	4	22	S96 Submission	Ryan Dillon	Mike Gooley	08.05.14
19.05.14	5	22	DA Revision	Ryan Dillon	Mike Gooley	19.05.14

Executive Summary

We have reviewed architectural design documents prepared by MBMO (refer appendix A) for compliance with the Building Code of Australia 2014 (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
C2.10	Lift connecting basement and remainder of building is required to be in a fire-isolated shaft. This will be required to be addressed as part of the fire engineered strategy.	CP1,CP2
D1.4	Extended distances of travel to exits will be required. This will be required to be addressed as part of the fire engineered assessment as follows: <u>Basement car parking levels</u>: • Travel distance to an exit where two or more are available: Up to 61m in lieu of 40m <u>Upper levels:</u> • Travel distance to a point of choice: Up to 31m in lieu of 20m; • Travel distance to an exit where two or more are available: Up to 60m in lieu of 40m • Travel distance from the roof area to required exits exceeds 40.0m (i.e. measured up to 60.0m).	DP4, EP2.2
G3.2	Due to the triangular shape of the atrium void the dimensions of the atrium well will be less than 6.0m wide. This will be required to be addressed as part of the fire engineered strategy.	CP2, CP4
G3.3	Bounding construction setback greater than permitted 3.5m from perimeter of atrium well. This will be required to be addressed as part of the fire engineered solution	CP2, CP4, EP2.2
Spec. G3.8	The design of the smoke exhaust system to the atrium will be subject to a fire engineering assessment.	EP2.2
Spec. G3.8	Speech intelligibility rating within the basement carpark area is envisaged to be less than that prescribed by AS1670.4. This will be required to be addressed as part of the fire engineered strategy.	EP4.3
Spec. G3.8	Visual warning devices, within the atrium, displaying 'EVACUATE' in red will not be relied upon. This will be required to be addressed as part of the fire engineered strategy.	EP4.2

The fire engineered solution relating to Extended Travel Distances (EP2.2) and Smoke Hazard Management (EP2.2) will need to be approved after consultation with the NSW Fire Brigade as part of the Construction Certificate process.

The documentation will need further detailing such as door hardware, specifications, service design, as outlined in Appendix D of this report.

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

Assessed By

Mike Gooley
Director
Accredited Certifier – Grade 1
McKenzie Group Consulting (NSW) Pty Ltd

1.0 Introduction

The proposed development is a 4 storey office building with basement car parking beneath. The building comprises 3 wings connected via a central atrium extending from ground to level three with a glazed roof covering the atrium.

The use of the building is for office premises used for professional activities. Located on the ground floor is a small cafe less than 10% of the floor area to which it is located, therefore permitting the adoption of Class 5 classification in lieu of a Class 6 as per Clause A3.3 of the BCA.

The site is located at 172 Fox Valley Road, Wahroonga. The principal pedestrian access to the building is from Fox Valley Road while there is a vehicular access road around the proposed building.

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 the version that is in place at the time of the application to the Certifying Authority for the Construction Certificate.

2.0 Building Assessment Data

Summary of Construction Determination: -

	Basement Car Parking & Office Building
Classification	7a, 5
Number of Storeys Contained	7
Rise In Storeys	5
Type of Construction	Type A
Effective Height (m)	<25m

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

Part of Project	**BCA Classification**	**Approx. Floor Area (m^2)**	**Assumed Population**
Basement Car Parking	7a	9166	Ancillary
Ground to Level 3	5	6575	658
	Total	**15,741m²**	**658**

Notes:
1. The above populations have been based on the floor areas and calculations in accordance with Table D1.1.3 of the BCA.
2. The Carpark areas have been considered ancillary to the use for the purposes of population numbers;

3. The area of the café is less than 10% of the floor area of the ground floor level. Therefore – the café is deemed to have the same classification as the main use.

3.0 Structural Provisions

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

Glazing is to comply with AS1288, and AS2047.

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

4.0 Fire Resistance

The buildings should be constructed generally in accordance with Table 3 & 3.9 of Specification C1.1 of the BCA. The building is required to be Type A Construction.

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

- Separation between the car park levels and the office portions of not less than 120/120/120;
- Atrium connects each floor level of the office building. Refer to atrium assessment.

Fire resistance levels for building structural members are as follows:
- Office portion 120 minutes
- Car park levels 60 minutes*

*Note: based upon the basement carpark being sprinkler protected, table 3.9 of Specification C1.1 permits a reduction in the FRL's for structural members within the carpark to 60 minutes.

4.1 General floor area and volume limitations

Clause C2.2 (a), (b) and (c), stipulates the floor area and volume limitations as follows:-

(a) The size of any *fire compartment* or *atrium* in a Class 5 building must not exceed the relevant maximum *floor area* nor the relevant maximum volume set out in Table C2.2 except as permitted in C2.3.

(b) A part of a building which contains only heating, ventilating, or lift equipment, water tanks, or similar service units is not counted in the *floor area* or volume of a *fire compartment* or *atrium* if it is situated at the top of the building.

(c) In a building containing an *atrium*, the part of the *atrium well* bounded by the perimeter of the openings in the floors and extending from the level of the first floor above the *atrium* floor to the roof covering is not counted in the volume of the *atrium* for the purposes of this clause.

The proposed floor area of the office fire compartment is not more than 8,000m^2 nor is the volume in excess of 48,000m^3. The size of the fire compartments will comply with the provisions of the BCA.

4.2 Protection of Openings

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

1. Penetrations through fire rated floors to be protected either by a tested prototype (e.g. fire collar, fire damper, etc) or be installed within a fire rated shaft achieving an FRL of 120/120/120;
2. Any penetration through a wall or room required to have an FRL (e.g. substation, boiler room, apartment separating wall etc) is to be protected either by a tested prototype (e.g. fire collar, fire damper, etc) or be installed within a shaft achieving an FRL of 120/120/120 (or 120/120/120 where it is a room such as a substation);
3. 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.

4.3 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. As the building is subject to G3 – Atrium Construction, G3.8 requires sprinklers be provided in accordance with Spec E1.5, therefore satisfying these requirement.

4.4 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.

4.5 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 Egress

The egress provisions from the proposed building are provided by:

- Fire isolated stairways
- External perimeter doorways

Other detailing issues that will need to be addressed include:

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

5.1 Exit Travel Distances

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 will be exceeded.

For compliance with the deemed to satisfy requirements the travel distances to exits should not exceed:

Class 5 & 7a

- 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

The following areas exceed the maximum allowable travel distance:

<u>Basement Levels:</u>

- The travel distance to an exit where two or more exits available 61.0m in lieu of 40.0m;

<u>Upper levels:</u>

- The travel distance to point of choice has been measured up to 31.0m in lieu of 20.0m;
- The travel distance to an exit where two or more exits available 60.0m in lieu of 40.0m;
- Travel distance from the roof area to required exits exceeds 40.0m (i.e. measured up to 60.0m).

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).

The following table summarises the exit widths required:

Floor Level	Exit Width Provided	Number of people (as provided)	Exit Width required
Basement 3	2.0m	Ancillary	2.0m
Basement 2	2.0m	Ancillary	2.0m
Basement 1	2.0m	Ancillary	2.0m
Ground	3.0m	160	3.0m
Level 1	2.0m	160	2.0m
Level 2	2.0m	160	2.0m
Level 3	2.0m	160	2.0m

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.

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

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 2014. Parts of the building required to be accessible shall comply with the requirements of AS1428.1-2009.

The design would generally comply with the prescriptive provisions of the BCA with additional ongoing review being undertaken as to door widths, circulation, etc. Further details are to be provided or access to these areas is to be assessed by an access consultant.

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. Parking shall be provided for people with disabilities in accordance with in accordance with Clause D3.5 of the BCA. 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.

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.

It is noted that an access consultant has been appointed and a report is to be provided.

6.0 Fire Services & Equipment

The following fire services will need to be provided throughout the building:

- An automatic sprinkler system in accordance with the relevant provision of clause E1.5 of the BCA and AS 2118.1-1999, throughout all areas of the building.
- Fire hydrants in accordance with clause E1.3 of the BCA and AS 2419.1-2005,
- Fire hose reels in accordance with clause E1.4 of the BCA and AS 2441-2005,
- Portable Fire Extinguishers in accordance with Clause E1.6 of the BCA and AS 2444-2001,
- Emergency lighting, exit signage and directional exit signage is required throughout the building in accordance with Part E of the BCA and AS/NZS 2293.1-2005

6.1 Fire Hydrants

A system of Fire Hydrants is required to be provided to BCA Clause E1.3 and AS 2419.1-2005. We will reply upon design certificate from a Hydraulic Consultant.

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

Internal fire hydrants are to be provided within fire isolated stairs/within 4.0m of required exits.

6.2 Fire Hose Reels

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

To be located within 4m of exits and provide coverage within the building based on a 36m hose length.

Please note that fire hose reel coverage cannot pass through fire or smoke doors.

6.3 Automatic Sprinkler Protection

An Automatic Fire Suppression System is required to Specification E1.5 and AS2118 throughout the proposed building.

Location of fire pumps and sprinkler control valves must have direct access to outside the building.

7.0 Ventilation and Smoke Hazard Management

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

- Automatic Smoke Exhaust System to atrium to be activated by Automatic Smoke Detection & Alarm System in accordance with the requirements of BCA Spec E2.2b
- Automatic Smoke Detection and Alarm System in accordance with the requirements of BCA Spec E2.2a and AS 1670.1-2004
- Automatic Pressurisation to Fire Isolated Exits in accordance with the requirements of AS/NZS 1668.1-1998.

The design of the smoke exhaust system will be subject to a fire engineering assessment.

A fire indicator panel is required as part of the detection system. This panel is to be located within 4m of the main entry. 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.

Throughout the development the provision of natural or mechanical ventilation is required to all habitable rooms in accordance with F4.5 Building Code of Australia and AS 1668.

8.0 Emergency Lighting, Exit Signs and Warning Systems

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.

All buildings containing an *atrium* must be provided with a sound system and intercom system for emergency purposes which —

- complies with AS 1670.4; and
- incorporates visual warning devices that—
    - operate upon the evacuation signal; and
    - display the words "EVACUATE" in red with letters conforming with the requirements of the *Deemed-to-Satisfy Provisions* of Part E4 for *exit* signs.

As part of the fire engineered solution it is proposed to assess the need for a visual warning device, displaying the word "EVACUATE". As the evacuation approach shall be "one out all out", there is no need to evacuate the building in stages.

Also to form part of the fire engineered solution is the speech intelligibility rating within the basement carpark area. Within this area, it is envisaged, it will be difficult to achieve strict compliance with the required speech transmission index as specified by AS1670.4. As such an assessment against the performance requirements will be required to be as part of the fire engineered strategy.

9.0 Lift Services

The passenger lifts to be installed are to be: -

- fitted with warning signs, fire service controls in accordance with AS 1735.2
- Stretcher facilities are to be provided within the lifts with minimum dimensions of 600m wide, 2000mm long and 1400mm high.
- Be provided with the following: -
    - A handrail in accordance with AS 1735.12
    - Minimum internal floor dimensions as specified in Table E3.6b of the BCA i.e. 1,400mm x 1,600mm,
    - 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 AS 1735.12.

10.0 Sanitary Facilities

The sanitary & other facilities within the building must be provided based upon the calculated population of the building. Further details will be assessed during scheme design.

Please 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.

Detailed fitout is pending analysis, this will be undertaken once tenants and indicative layouts/tenant numbers are known.

11.0 Atrium Construction

As the proposed atrium connects more than 3 storeys, atrium construction shall comply with Part G3. The following will apply:

Dimension of atrium well:
The atrium well be provided a horizontal diameter of not less than 6m throughout.

Due to the triangular shape of the atrium void the dimensions of atrium well will be less than 6.0m wide. This will be required to be addressed as part of the fire engineered strategy. The proposed does not achieve compliance with this and shall form part of the Fire Engineered Assessment.

Separation of atrium by bounding construction:
An atrium must be separated by bounding construction by walls not more than 3.5m from the atrium well on level 3.
Portion of the bounding construction on level 3 will be greater than 3.5m from the atrium well.
The bounding separation of the atrium on level 4 will form part of the Fire Engineered assessment

Construction of bounding walls
At level 4, bounding walls shall achieve an FRL 60/60/60 and extend from the floor to the underside of the roof.

Any door openings within bounding walls shall be protected with self-closing or automatic -/60/30 fire doors or;

Be constructed of fixed toughened safety glass, or wired safety glass in non-combustible frames with door openings fitted with self-closing smoke door complying with Specification C3.4 and the walls and doors protected with wall-wetting systems in accordance with Specification G3.8 and a fire barrier with an FRL of not less than -/60/30 installed in any ceiling spaces above the wall.

The construction of the bounding construction will form part of the fire engineering assessment.

Construction at balconies:
The construction of any balustrade or other barrier along the perimeter of the atrium well to be non-combustible and imperforate for not less than 1m in height.

The glazed roof of the atrium shall comply with Clause G3.6, the structure and membrane must be protected by a sprinkler system complying with Specification E1.5.

Rationalisation of the required smoke control system, Clause G3.8, shall be addressed by the Fire Engineered Solution.

Protection of atrium roof:
A roof of an *atrium* which does not have the FRL prescribed in Specification C1.1 or the *Deemed-to-Satisfy Provisions* of Part C2 must be protected by *automatic* sprinklers arranged to wet both the covering membrane and supporting structure and the temperature rating of sprinkler heads providing roof protection must be within the range 79°C–100°C.

Atrium floor protection

The floor of the *atrium* must be protected by sprinklers with—

- the use of sidewall pattern sprinkler heads together with overhead sprinklers where dictated by the dimensions of the *atrium*; and
- sprinkler heads of the fast response type, installed with suitable *non-combustible* heat collector plates of 200 mm

  minimum diameter to ensure activation by a rising fire plume.

Sprinkler systems to glazed walls

Where an *atrium* is separated from the remainder of the building by walls or doors incorporating glazing, a wall wetting system with suitable *non-combustible* heat collector plates of 200 mm diameter must be provided to protect the glazing as follows:

- On the *atrium* side of the glazing — to all glazed walls which are set back more than 3.5 m from the *atrium well*.
- On the *atrium* side of the glazing — to all glazed walls which are not set back, or are set back 3.5 m or less, from the *atrium well*, for all levels which are less than—
  - 12 m above the floor of an *atrium* or the floor of the highest *storey* where the bounding wall is set back more than 3.5 m from the *atrium well* if a Class 5 of the building is open to the *atrium*;
- On the side of the glazing away from the *atrium well*—to all glazing forming part of the bounding wall at each *storey*.

Sprinklers must be located in positions allowing full wetting of the glazing surfaces without wetting adjacent sprinkler heads.

Sprinkler heads must be of the fast response type and have a maximum temperature rating of 74°C.

The rate of water discharge to protect glazing must be not less than—

- on the *atrium* side of the glazing—
  - 0.25 L/s.m^2 where glazing is not set back from the *atrium well*; or
  - 0.167 L/s.m^2 where glazing is set back from the *atrium well*; and
- on the side away from the *atrium well*—0.167 L/s.m^2.

In addition to that of the basic sprinkler protection for the building, the water supply to *required* wall wetting systems must be of adequate capacity to accommodate the following on the *atrium* side of the glazing:

Where the bounding walls are set back less than 3.5 m from the *atrium well*—wall wetting of a part not less than 6 m long for a height of not less than—

  - 12 m above the floor of an *atrium* or the floor of the highest *storey* where the bounding wall is set back more than 3.5 m from the *atrium well* if a Class 5 of the building is open to the *atrium*;

Where the walls are set back 3.5 m or more from the *atrium well* — wetting of a part not less than 12 m long on one *storey*.

Basic sprinkler and wall wetting systems protecting a building containing an *atrium* must be provided with easily accessible and identified stop valves.

Sprinkler and wall wetting systems must be provided with independent stop valves.

Sprinkler heads protecting the roof of the *atrium* must be provided with a stop valve.

Stop valve to wall wetting and roof sprinklers may be of the gate type.

All sprinkler and wall wetting stop valves must be monitored to detect unauthorised closure.

Smoke Control System

Mechanical air-handling systems in a building containing an *atrium* must comply with AS/NZS 1668.1 except where varied by the below provisions which supersede.

Mechanical air-handling systems serving an *atrium* must be designed to operate so that during a fire—

- a tenable atmosphere is maintained in all paths of travel along balconies to *required exits* during the period of evacuation; and
- smoke exhaust fans serving the *atrium* are only activated when smoke enters the *atrium*; and
- central plant systems do not use the *atrium* as a return air path; and
- central plant systems which use return air paths remote from the *atrium*—
    - cycle to the full outside air mode; and
    - stop supply air to the fire affected *storey* or *fire compartment*; and
    - continue to fully exhaust the fire affected *storey* or *fire compartment* and reduce the exhaust from other *storeys* or *fire compartments* by at least 75%; and
    - continue to supply air to *fire compartments* or *storeys* other than the fire affected *storey* or *fire compartment*; and
- fans performing relief or exhaust duty from the *atrium* stop normal operation; and
- floor by floor, or unitary, air-handling plant serving a single *fire compartment* or *storey*—
    - ceases normal operation in the fire affected *storey* or *fire compartment*; and
    - commences full relief or exhaust from that fire affected *storey* or *fire compartment*; and
    - continue to supply air to *fire compartments* or *storeys* other than the fire affected *storey* or *fire compartment*.

The smoke control system must be activated by—

- operation of an *automatic* fire alarm; or
- operation of the sprinkler system; or
- a manual start switch.

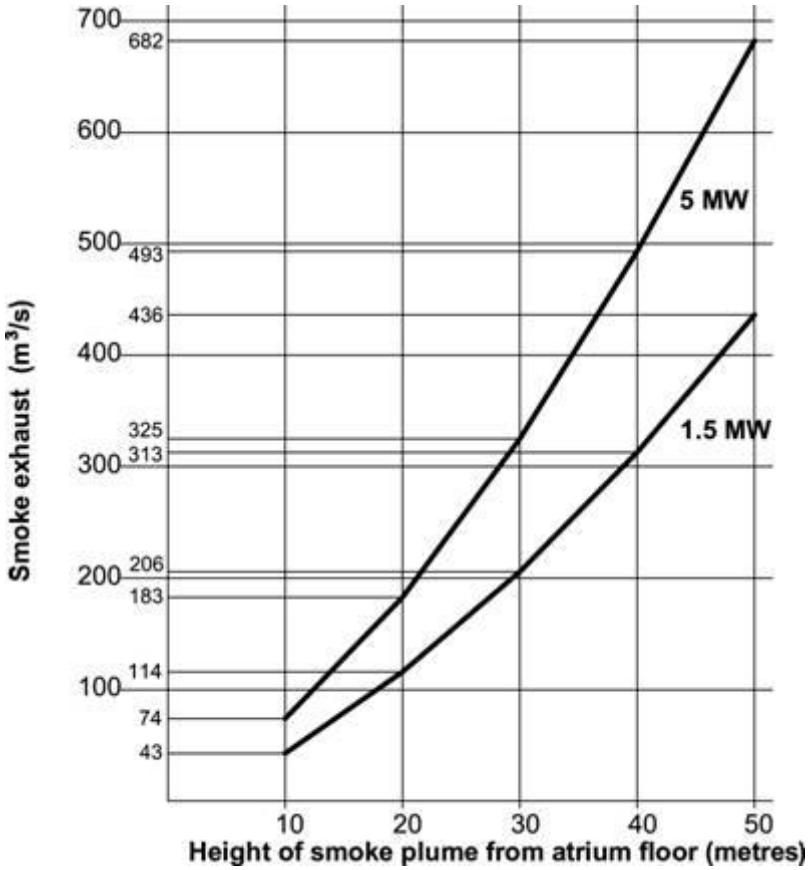
All controls for the smoke control system must be located—

- in the fire control room; or
- in the emergency control centre, (if any); or
- adjacent to the sprinkler control valves; or
- incorporated in the Fire Indicator Panel.

A smoke exhaust system serving an *atrium* must be designed on the basis of—

- the sprinkler system limiting the size of a fire to—
    - a heat output of 1.5 MW and perimeter of 7.5 m if a Class 5 of the building is open to the *atrium*; and

- a smoke plume reaching a level 3 m above the highest *storey* having a path of travel to a *required exit* along a balcony bounding the *atrium well*, and not less than—
    - 12 m above the floor of an *atrium* or the floor of the highest *storey* where the bounding wall is set back more than 3.5 m from the *atrium well* if a Class 5 of the building is open to the *atrium*; and
- the smoke exhaust system discharging smoke at a rate of not less than that for the appropriate height of smoke plume and fire size (refer to below diagram)—
    - from the top of the *atrium*; or
    - horizontally where calculations of wind velocity induced pressure profiles for the building verify that the exhaust system will operate effectively for all wind directions.



Notwithstanding the above point, the average upward air velocity in the *atrium*, due to the *required* smoke exhaust quantity must—

- be not less than 0.2 m/s at any level over an 18 m height above the floor of the *atrium*; and
- not exceed 3.5m/s maximum velocity for constant cross sectional plan area.

Smoke exhaust must be provided by fans capable of continuous and *required* operation for a period of not less than 1 hour when handling exhaust gases at 200°C.

The proposed *Atrium* must be provided with a minimum of 2 fans, each capable of 50% of the total *required* smoke exhaust capacity.

Uniformly distributed make-up air must be provided to the *atrium* exhaust system from—

- outside the *atrium* at or near the lowest *storey* level; and
- relief air from non-fire *storeys*.

A discharge volume sufficient to maintain a velocity of not less than 0.1 m/s towards the *atrium well* must be provided on all *storeys* where the bounding wall is set back from the *atrium well*.

The above requirement is satisfied if make-up air is provided to the *atrium* exhaust system in such a manner as to prevent, as far as possible, disturbance of the smoke layer due to turbulence created by the incoming air, through—

- openings directly from the outside air to the *atrium* and located as close as practicable to the lowest level of the *atrium*; or
- ducts from the outside air to the *atrium* which deliver air as close as practicable to the lowest level of the *atrium* and, where passing through any other *fire compartment* having an FRL of at least 60/60/60; or
- a combination of the above.

<u>Smoke detection system</u>

Automatic fire detection and alarm systems in a building containing an *atrium* shall comply with AS 1670.1 except where superseded by Specification G3.8.

Smoke detection within an *atrium*—

- must be provided within all outside air intakes and at individual floor return air intakes of all air-handling systems to initiate *automatic* fire mode operation, and where applicable, comply with the restart facilities in AS/NZS 1668.1; and
- must operate at an obscuration level not greater than 0.5% per metre with compensation for external airborne contamination as necessary; and
- must sample air within the *atrium* and in *storeys* where the bounding wall is set back more than 3.5 m from the *atrium well*; and
- must be calibrated to compensate for smoke dilution where sampling occurs within return air path common to more than one room; and

Smoke detection systems must be located at all return and relief air openings associated with the building air-handling systems and be—

- of the sampling type system as above; or
- of the point type photoelectric smoke detector.

A break-glass fire alarm point must be provided at each door to a *fire-isolated stairway*, *fire-isolated ramp*, or *fire-isolated passageway*.

A staged alarm must be provided where an air sampling type smoke detection system is provided for the *atrium*, and must operate as follows:

- Alert building management when abnormal smoke levels of 0.03% obscuration per metre are detected.
- Initiate a second alarm to management and start all smoke control systems including pressurisation of escape routes when smoke levels of 0.07% obscuration per metre are detected.
- Automatically call the *fire brigade*, activate the sound system and intercom system for emergency purposes, and de-activate all plant not necessary for fire safety within the building when smoke levels of 0.09% obscuration per metre are detected.

Beam and point type smoke detectors *required* must simultaneously operate all functions referred to above and activate at the level set out in AS/NZS 1668.1.

Standby power system

As *required* paths of travel to an *exit* are within an *atrium*, a suitable alternative power supply must be provided to operate *required* safety systems, including sprinkler systems and fire hydrant pumps, air handling systems, alarms, warning and communication systems and emergency lighting circuits.

The requirements of above are satisfied by—

- a single medium voltage supply taken from an electricity substation situated within, or adjacent to, the building concerned where the power supply to the substation consists of two or more high voltage cables each taking electricity from separate transformers; or
- two or more medium voltage supplies each taking electricity from separate electricity substations situated—
    - outside the building concerned; and
    - at a suitable distance from each other; or
- a single medium voltage supply taken from an electricity substation together with an electricity generating plant capable of—
    - generating a medium voltage supply; and
    - starting and taking the *required* electrical load within a period of not more than 30 seconds from the time of normal supply failure.

The alternative power supply must—

- be connected *automatically* if the normal power supply fails; and
- if located within the building, be separated from the remainder of the building by an enclosure with an FRL of at least 120/120/120; and
- be connected to the safety systems by means of cabling complying with C2.13(c)(iii) and (iv).

12.0 Energy Efficiency

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

1. The building can comply with the deemed-to-satisfy provisions of the BCA, relating to the following areas:
    - Building Fabric
    - Glazing
    - Building Sealing
    - Air Conditioning & Ventilation Systems
    - Artificial Lighting & Power
    - Hot Water Supply

2. The building can be verified against a reference building as per Verification Method JV3. This requires that the proposed building and its services be shown to have an annual energy consumption of equal or less than the reference building which has been modelled as per the requirements of Part J of the BCA.

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

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

Appendix A - Design Documentation

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

Drawing No.	Title	Date	Drawn By	Revision
DA-00	COVER SHEET	16/05/2014	MBMO	C
DA-01	LOCATION PLAN	16/05/2014	MBMO	C
DA-02	SITE ANALYSIS	16/05/2014	MBMO	C
DA-03	SITE PLAN	16/05/2014	MBMO	C
DA-04	DEMOLITION PLAN	16/05/2014	MBMO	C
DA-05	EXCAVATION PLAN	16/05/2014	MBMO	C
DA-06	BASEMENT 3 PLAN	16/05/2014	MBMO	C
DA-07	BASEMENT 2 PLAN	16/05/2014	MBMO	C
DA-08	BASEMENT 1 PLAN	16/05/2014	MBMO	C
DA-09	GROUND FLOOR PLAN	16/05/2014	MBMO	C
DA-10	LEVEL 01 PLAN	16/05/2014	MBMO	C
DA-11	LEVEL 02 PLAN	16/05/2014	MBMO	C
DA-12	LEVEL 03 PLAN	16/05/2014	MBMO	C
DA-13	ROOF PLAN	16/05/2014	MBMO	C
DA-14	INDICATIVE LAYOUT	16/05/2014	MBMO	C
DA-16	ELEVATIONS SHEET 1	16/05/2014	MBMO	C
DA-17	ELEVATIONS SHEET 2	16/05/2014	MBMO	C
DA-18	SECTIONS SHEET 1	16/05/2014	MBMO	C

Appendix B - Draft Fire Safety Schedule

	Essential Fire Safety Measures	Standard of Performance
1.	Automatic Fail Safe Devices	BCA Clause D2.19 & D2.21
2.	Automatic Fire Detection and Alarm System	BCA Spec. E2.2a & AS 1670 – 2004
3.	Automatic Fire Suppression System	BCA Spec. E1.5 & AS 2118.1 – 1999,
4.	Automatic Stair Pressurising Systems	BCA Clause E2.2 & AS/NZS 1668.1 – 1998
5.	Building Occupant Warning System activated by the Sprinkler System	BCA Spec. E1.5 & AS 1670 – 2004
6.	Emergency Lighting	BCA Clause E4.2, E4.4 & AS/NZS 2293.1 – 2005
7.	EWIS	BCA Clause Spec. G3.8 & AS 1670.4 - 2004
8.	Exit Signs	BCA Clauses E4.5, E4.6 & E4.8 and AS/NZS 2293.1 – 2005
9.	Fire Blankets	AS 2444 – 2001
10.	Fire Doors	BCA Clause C3.2, C3.4, C3.5, C3.6, C3.7 & C3.8 and AS 1905.1 – 2005
11.	Fire Hose Reels	BCA Clause E1.4 & AS 2441 – 2005
12.	Fire Hydrant System	Clause E1.3 & AS 2419.1 – 2005
13.	Fire Seals	BCA Clause C3.15 & AS 1530.4 – 1997
14.	Mechanical Air Handling System	BCA Clause E2.2, AS/NZS 1668.1 – 1998 & AS 1668.2 – 1991
15.	Paths of Travel	EP&A Reg 2000 Clause 186
16.	Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 – 2001
17.	Stand-by Power System	BCA Clause G3.8
18.	Wall-Wetting Sprinklers	BCA Clause C3.4 & AS 2118.2 – 1995
19.	Warning and Operational Signs	Section 183 of the EP & A Regulations 2000, AS 1905.1 – 2005, BCA Clause C3.6, D2.23, E3.3

Note:	The proposed new building will be subject to a fire engineering assessment. The fire schedule will be amended prior to the issue of the construction certificate to incorporate additional fire safety measures required by the fire engineering assessment.

Appendix C- Fire Resistance Levels

The table below represents the Fire resistance levels required in accordance with BCA 2014:

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.

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