DA Statement for Fire Engineering Compliance

Date: 10 September 2024

Project No: F4019

Address of property: Buildings 1 to 3, 2 Bowman Road, Mona Vale

Consent Authority: Wingecarribee Shire Council

Information

The basis of this statement is to provide a summary of the design of the building in relation to the Performance Solutions to be developed in the Performance Solutions Report and provide confidence to the Consent Authority that prior to the issue of the Development Application Consent that the building design shall fully comply with the Performance Requirements of the Building Code of Australia (BCA) through compliance with the Deemed-to-Satisfy provisions of the BCA and using Performance Solutions developed to comply with the relevant Performance Requirements of the BCA.

It is acknowledged that the proposed architectural plans submitted as part of the Development Application do not provide a design that shows full compliance with the Deemed-to-Satisfy (DtS) provisions of the BCA. As a result of the proposed design, the development of Performance Solutions will be utilised to ensure that the overall design will show full compliance with the BCA. To this effect the Performance Solution will be developed and issued in a Performance Solutions Report (PSR) by an accredited Certifier – Fire Safety. The Performance Solutions will be formulated in accordance with the Clause A2G2(4) of the Building Code of Australia and the guidance presented in the Australian Fire Engineering Guidelines[1] and the International Fire Engineering Guidelines[2].

In particular the fire safety assessment and Fire Engineering Design shall focus on significant issues of:

- Prevent the spread of fire between buildings and protect other property from physical damage caused by structural failure of a building as a result of fire;
- Safeguard people from illness or injury due to a fire in a building and safeguard occupants from illness or injury while evacuating a building during a fire; and
- Provide facilities for occupants and the fire brigade to undertake fire-fighting operations and facilitate the activities of emergency services personnel during a fire.

Reference Information and Documentation

This Fire Engineering Report is based on the following documentation:

- NCC 2022 Volume One – Building Code of Australia, Australian Building Codes Board (ABCB).
- NCC 2022 Volume One – Guide to the Building Code of Australia [Online], Australian Building Codes Board (ABCB).
- Australian Fire Engineering Guidelines (AFEG), 2021, Australian Building Codes Board (ABCB).
- International Fire Engineering Guidelines (IFEG), Edition 2005, Australian Building Codes Board (ABCB).
- Performance Solution Process, Australian Building Codes Board (ABCB).
- BCA Report for Bowman Road, Moss Vale, Ref no. BCA 22200, V2.0, prepared by National BCA and dated 31 July 2023.
- Travel distances markup for Buildings 1 to 3 by the BCA consultant; National BCA in the email dated 23/08/2024 and 13/08/2024.

The project documents depicted in the following have been reviewed in preparing this report.

Document reference	Author	Description	Revision
1.1 to 1.9	Jackson Environmental and Planning	Building 1 Architectural Plans	A
2.1 to 2.8	Jackson Environmental and Planning	Building 2 Architectural Plans	A
3.1 to 3.8	Jackson Environmental and Planning	Building 3 Architectural Plans	A

[1] Australian Building Codes Board (ABCB), 2021, Australian Fire Engineering Guidelines (AFEG).
[2] Australian Building Codes Board (ABCB), Edition 2005, International Fire Engineering Guidelines (IFEG).

Relevant Stakeholders

The relevant stakeholders for the project are as follows:

Organisation	Role
SAAS Aus Pty Ltd	Client
JEP Environmental & Planning	Project Manager
Wingecarribee Shire Council	Consent Authority
AED Fire	Fire Engineer
National BCA	BCA Consultant

Principal Building Characteristics

The following information outlined in the table below were derived from the BCA Report for Bowman Road, Moss Vale, Ref no. BCA 22200, V2.0, prepared by National BCA and dated 31 July 2023.

Building Characteristic	Description
Building Class:	7b (industrial part)
If more than one class	5 (office), 7a (carpark), 8 (workshop) and 10a (awning)
Type / use of premises:	Industrial Large-isolated buildings
Type of Construction	Building 1: Required to be of Type B construction Building 2: Required to be of Type C construction Building 3: Required to be of Type C construction
Effective Height:	Less than 12 m
Rise in Storeys	Building 1: 3 Building 2: 2 Building 3: 2
Levels Contained	Building 1: 3 Building 2: 2 Building 3: 2

Performance Solutions, Design Requirements and Compliance

AED Fire have reviewed the initial design and the BCA review and the initial design issues that may require Performance Solutions are as follows:

PS#	Proposed Performance Solutions	BCA DTS clause Determined in accordance with BCA Clause A2G4(3)(a)	BCA Performance Requirement Determined in accordance with BCA Clause		Assessment Method in accordance with Building Code of Australia Clause A2G2(2)	*AFEG Sub-system (s) (SS)**
			A2G4(3)(b)	A2G4(3)(c)		
1	**Building 1 Type of construction required** A Performance Solution will be developed to permit Building 1 to be constructed of Type C construction in lieu of the required Type B construction (because the office has a rise in storey of 3). The rear external wall of the building is located within 18 m of the side boundary of the allotment (fire source feature). We noted that the building will be defined as a large isolated and will be provided with a not less than 6 m perimeter access around all sides of the building (currently 10 m separation from the side boundary is shown on the plan at the rear of the building).	C2D2 S5C21	C1P1 C1P2 C1P9	E2P2	Absolute, Qualitative and Quantitative and Deterministic in accordance with Building Code of Australia clause A2G2(2) (b)(ii) [Other Verification Methods] (d) [Comparison with Deemed to Satisfy Provisions]	SS-C SS-F

Preliminary Design Requirements for PS1

1. The western external wall and northwestern and southwestern external walls of Building 1 located within 18 m of the western side boundary of the allotment do not need to achieve a Fire-resistance level provided all external walls located within 18 m of the western side boundary are as a whole constructed of non-combustible material.
2. The industrial part of Building 1 can be constructed of Type C construction however, the 3 storey office part of the building shall be constructed of Type B construction.
3. The western external wall of Building 1 shall be separated from the side boundary by a 6 m wide perimeter access complying with Clause C3D5 of the Building Code of Australia.
4. The Building 1 as a whole shall be sprinkler protected in accordance with Clause C3D4 and Specification 17 of the Building Code of Australia.
5. The non-fire-isolated stairway serving the office levels shall provide continuous means of travel from the ground floor to the top storey by way of its own flights and landings.

Acceptance Criteria:

The fire engineering analysis is considered acceptable if it can demonstrate that the subject building is provided with a level of fire safety that is considered to be at least equivalent to that of the Deemed to Satisfy Solution (i.e. a building that has a rise in storey of 3 and is construction of Type B construction).

Fire Scenarios:

The following design fire scenarios will be considered –

Design Scenarios	Performance Requirements	Outcome required	Method or solution
Fire Scenario 1 Horizontal fire spread (HS) A fully developed fire in a building on adjoining allotment exposes the external walls of a subject building and vice versa.	C1P2	Demonstrate that the risk of fire spread between buildings is not greater than buildings complying with the Deemed to Satisfy Solution.	C1V1

PS#	Proposed Performance Solutions	BCA DTS clause Determined in accordance with BCA Clause A2G4(3)(a)	BCA Performance Requirement Determined in accordance with BCA Clause		Assessment Method in accordance with Building Code of Australia Clause A2G2(2)	*AFEG Sub-system (s) (SS)**
			A2G4(3)(b)	A2G4(3)(c)		
	Fire Scenario 2 Robustness check (RC) Failure of a critical part of the fire safety systems will not result in the design not meeting the Objectives of the Building Code of Australia.	C1P1 C1P2 C1P9 E2P2	Demonstrate that if a key component of the fire safety system fails, the design is sufficiently robust that a disproportionate spread of fire does not occur; and Demonstrate that the level of safety is at least equivalent to the Deemed to Satisfy Provisions.		Undertake a review or risk assessment of critical elements within a building to determine unexpected catastrophic failure is unlikely.	

Proposed Method of Assessment:

The assessment will compare the risk of fire spread between the subject building and a building on adjoining allotment and exposure of external walls and columns incorporated in the external walls to fire source feature and the fire protection of the internal columns supporting the roof to a warehouse building that is required to be construction of Type B construction, i.e. complies with the Deemed to Satisfy Solution.

2	**Exit travel distances and distance between alternative exits**
	A Performance Solution will be developed to address the extended to nearest exit and distance between alternative exits as follows:
	• **Building 1 Basement Carpark:**
	  ○ up to 50 m to nearest exit; and
	  ○ up to 100 m between alternative exits (ramp is a required exit).
	• **Building 1:**
	  ○ up to 60 m to nearest exit;
	  ○ up to 120 m between alternative exits (between exit 5 and 10).
	• **Building 2:** up to 60 to nearest exit.
	• **Building 3:**
	  ○ Unit 3B(N):
	  ▪ up to 60 m to nearest exit; and
	  ▪ up to 90 m distance between alternative exits (between exit 3 and 6).
	  ○ Unit 3B(S):
	  ▪ up to 60 m to nearest exit; and
	  ▪ up to 120 m distance between alternative exits (between exit 1 and 8).
		D2D5(3)
		D2D6(c)(iii)
			D1P4
			D1P5
				E2P2	Absolute, Qualitative and Quantitative and Deterministic in accordance with Building Code of Australia clause A2G2(2)
					(b)(ii) [Other Verification Methods]
					(d) [Comparison with Deemed to Satisfy Provisions]
						SS-B
						SS-D
						SS-E

PS#	Proposed Performance Solutions	BCA DTS clause Determined in accordance with BCA Clause A2G4(3)(a)	BCA Performance Requirement Determined in accordance with BCA Clause		Assessment Method in accordance with Building Code of Australia Clause A2G2(2)	*AFEG Sub-system (s) (SS)**
			A2G4(3)(b)	A2G4(3)(c)		

Preliminary Design Requirements for PS2

Sprinkler system

6. The subject buildings shall be protected by a sprinkler system complying with Clause C3D4 and Specification 17 of the Building Code of Australia and AS 2118.1-2017.
7. The sprinklers in the basement carpark shall be fast response heads and have an operating temperature of 68°C.

Smoke detection and alarm system

8. The industrial parts of the subject buildings with extended travel distances may be required to be protected by a smoke detection system (at roof only) complying with Clause S20C4 of the Building Code of Australia (TBC by CFD modelling)
9. The subject buildings shall be provided with a building occupant warning system complying with Clause S20C7 and clause 3.22 of AS 1670.1-2018.

Smoke exhaust system

10. The subject buildings 1 to 3 have a volume of more than 108,000 m^3 and the ceiling height will exceed 12 m and therefore, the building will be required to be provided with a smoke exhaust system in accordance with Specification 21 of the Building Code of Australia.

Corridors and walkways

11. The installation and arrangement of racking and industrial equipment shall not create dead end corridors within the circulation space or result in the travel distance to point of choice to exceed 20 m from any point in the exhibit.

Acceptance Criteria:

The fire engineering analysis is considered acceptable if it can demonstrate that –

- the occupants in the basement carpark are provided with a level of fire safety that is considered to be at least equivalent to that of the DTS Solution; and
- the occupants in the industrial part of the building with extended travel distances would be able to evacuate the warehouses prior to the conditions become untenable (ASET ≥ RSET x safety factor of not less than 1.5).

The onset of untenable conditions (*environmental conditions associated with a fire in which human life is not sustained*) is considered to have been reached when any of the criteria (visibility, temperature, CO and FED)[3] listed in Table 0-1 are exceeded.

Table 0-1- Onset for untenable conditions

Onset of untenable conditions	Smoke layer height	Visibility	Temperature	CO	Fractional Effective Dose (FED)
Short term exposure	< 2 m (occupants exposed to smoke)	< 10 m for large space < 5 for small space or where occupants are queuing at exit	> 60°C	> 2,700 ppm	≤ 0.3[4]

Note: The modelling software Fire Dynamic Simulator (FDS) calculates FED based on the following quantities:

- [Species: CARBON MONOXIDE] Volume Fraction
- [Species: CARBON DIOXIDE] Volume Fraction
- [Species: OXYGEN] Volume Fraction

Fire Scenarios:

The following design fire scenarios will be considered –

[3] Practice Note for Tenability Criteria in Building Fires, Version 2.0, Society of Fire Safety NSW Chapter, Engineers Australia, 03.04.2014.
[4] Australian Building Codes Board (ABCB) 2019, Building Code of Australia (BCA) Volume One – Amendment 1, Schedule 7, Fire Safety Verification Method, Fire modelling to determine ASET.

PS#	Proposed Performance Solutions	BCA DTS clause Determined in accordance with BCA Clause A2G4(3)(a)	BCA Performance Requirement Determined in accordance with BCA Clause		Assessment Method in accordance with Building Code of Australia Clause A2G2(2)	*AFEG Sub-system (s) (SS)**
			A2G4(3)(b)	A2G4(3)(c)		

Design Scenarios	Performance Requirements	Outcome required	Method or solution
Fire Scenario 1 A fire blocks evacuation route (BE) A sprinkler-controlled fire in the building blocks an evacuation route.	D1P4 D1P5 E2P2	Demonstrate that the level of safety is at least equivalent to the deemed to satisfy provisions	$RSET_{dts}$ vs $RSET_{ps}$ comparison will demonstrate that a viable evacuation route (or multiple evacuation routes where necessary) has been provided for building occupants from the carpark. ASET / RSET analysis will demonstrate that a viable evacuation route (or multiple evacuation routes where necessary) has been provided for building occupants.

Proposed Method of Assessment:

The extended travel distances and distance between alternative exits in the parts of the subject building will be assessed as follows:

1. Extended travel distances and distance between alternative exits in carpark

An $RSET_{dts}$ vs $RSET_{ps}$ comparison will be carried out to demonstrate that the proposed design is at least equivalent to that of the DTS Solution.

The activation time of the sprinkler heads will be calculated using an excel spreadsheet.

2. Extended travel distances and distance between alternative exits in industrial part of the building

A comparison between the ASET and the RSET will be carried out to demonstrate that the occupants will be able to exit the building prior to the conditions become untenable.

The software Fire Dynamics Simulator (FDS) developed by the National Institute of Standards and Technology, U.S. Department of Commerce, will be used to determine the tenability conditions and the temperature for the design fire scenarios (To be determined at consultation stage with Fire and Rescue NSW).

The Required Safe Escape Time (RSET) will be determined in accordance with the method documented in the British Standards PB 7974-6 and the modelling software Pathfinder developed by Thunderhead Engineering Consultants, Inc. will be used to estimate the occupants travel time.

The above issues are only the preliminary issues that have been determined at this early stage in the project and it is possible that other issues may arise during the design development. These additional issues will be assessed and addressed with either additional Performance Solutions or redesign to comply with the relevant Deemed-to-Satisfy provisions of the BCA.

Limitations of the Letter

This report is based on the following limitations –

- This report does not determine full compliance with the Building Code of Australia, other than the matters identified in the executive summary of this report;
- This report does not address any matters that are outside the scope or limitations of the Building Code of Australia;
- This report is based on interpretations and assumptions in common practice at the time of the report and future changes in interpretations and assumptions cannot be retrospectively applied to this analysis and recommendations without re-assessment.
- The design measures required by this report do not replace the fire safety measures require by the Deemed to Satisfy provisions of the Building Code of Australia unless specifically stated.
- Amendments to the Performance Solution due to design changes or incapacity to comply with the Design Requirements shall be assessed by a Fire Engineer;
- This report is not a Part 4A compliance certificate under the Environmental Planning & Assessment Act 1979 or Regulation 2000;
- This report does not provide any consideration of any fire services operations (including hydraulic, electrical or other systems);
- This report does not provide any consideration of any structural elements or geotechnical matters relating to the building, including any structural or other assessment of the existing fire resistance levels of the building;
- This report does not provide concessions for any Performance Solution or exemptions from the requirements of the BCA, other than that identified in the Executive Summary of this report;
- This report does not determine compliance with the Disability Discrimination Act 1992 or Part D3 of the BCA;
- This report does not include reporting on hazardous materials, OH&S matters or site contamination;
- This report does not consider heritage issues or any energy efficiency assessment.
- This report does not consider reimbursement of losses caused by business interruption.
- This report does not consider protection of property (other than directly adjoining property).
- This report does not consider fires caused by arson (other than as a potential source of fire initiation) or terrorist attacks.
- This report does not consider Bushfire
- This report does not consider multiple ignition sources for fire initiation.
- This report does not include operational checks of the fire safety equipment unless specified in this report.

Conclusion

AED Fire are of the opinion that the non-compliances with the design can be resolved with Performance Solutions to show compliance with the relevant Performance Requirements of the BCA.

We trust that the above information is sufficient for Consent Authority's needs with respect to fire safety design and the possibility of the development of Performance Solutions through the Fire Engineering process.

Report By:

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