DESIGN ADVICE LETTER

57-71 STEPHENSON STREET CREMORNE, VIC

PREPARED FOR

ENDOR DEVELOPMENT PTY LTD

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VERSION C
9 JUNE 2026
PROJECT NUMBER: 10258
ISSUED BY: JAMES O'NEILL

CARBON
FIRE ENGINEERING

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1 INTRODUCTION

1.1 Overview

The project involves the proposed commercial development to be located at 57-71 Stephenson Street, Cremorne, VIC. Four separate lots are to be amalgamated to allow the client group to deliver a medium rise commercial building, with a focus on highly sustainable design.

The proposed building will incorporate a single level of basement carparking with an incorporated stacker (72 spaces) and service areas, retail spaces and end of trip facilities on Ground Level and Mezzanine, office areas from Level 1 to 14, and plant areas on the roof. The client team has opted to incorporate a unique structural design such that the development will utilise mass timber as the main structural material for the above ground structure. It is understood that the architectural design intent for the subject building may incorporate the internal timber structure (i.e., heavy frame and ceilings) being exposed to view. Carbon Fire Engineering believes this design intent is achievable, and this will form the basis of design.

The purpose of this Design Advice Letter is to inform all relevant stakeholders on the proposed approach to the mass timber design aspect of the development, such that a framework may be created to develop the fire safety design of the building through to practical completion.

The development is required to be designed in adherence to the Building Code of Australia 2022 Volume One (BCA) [1] and other modern statutory regulations. This will likely not be achievable through strict conformance to the prescriptive Deemed-to-Satisfy Provisions of the BCA and will require a performance-based fire engineering approach based on first principles with consideration of the anticipated use of the building, expected human behaviour and associated response to fire incidents, as well as the standard operating procedures of the fire service. Once the quantum of non-compliances with the BCA Deemed-to-Satisfy Provisions are formally identified, these will be incorporated into the relevant design process and holistic fire safety strategy.

This Letter has been based on the information provided to Carbon Fire Engineering from design team members and the drawings prepared by Edition Office (Town Planning issue prepared for DA lodgement, Project No. V25007, comprising drawings DA0.00 to DA8.106, dated 1 June 2026).

Carbon Fire Engineering has reviewed the above architectural documentation, which incorporates the extension of the fire-isolated stairs to the roof level, on 9 June 2026. Based on this review, we confirm that the fire safety strategies described in this Letter can be appropriately incorporated into the design at the detailed design stage.

2 PROPOSED FIRE SAFETY STRATEGY

The underlying philosophy for the proposed fire safety strategy is to reduce the risk of a fire occurring within the building, provide early detection of a fire occurring within the building to all building occupants, provide occupants with safe means of egress from the building, to prevent the growth of the fire via adequate suppression measures, to prevent catastrophic collapse due to a fire and to provide adequate facilities to allow for fire brigade intervention.

This is to achieve the objectives for the proposed Fire Engineered Solution which is to:

- Prevent fire,
- Suppress fire,
- Prevent the spread of fire;
- Prevent disproportionate and catastrophic collapse,

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- Facilitate fire brigade intervention; and
- Ensure or promote the safety of persons in the event of fire.

The underlying principles of the fire safety strategy focus on a separation of fire hazards, and implementation of redundancy within the building with regards to fire safety measures, such that the level of robustness in the design can be quantified.

2.1 Structural Fire Engineering Design Philosophy

Any appropriate structural fire engineering strategy is to be provided with the necessary level of redundancy commensurate with the level of perceived risk and potential consequence of a structural failure.

The proposed structural fire engineering design for the subject building is to incorporate a redundancy design strategy, where each proposed mechanism built into the design is to be fully redundant to the success of the previous mechanism. Figure 2-1 provides a visual representation of the redundancy strategy. Each stage of the strategy will be evaluated and shown to satisfy the intended outcome of the design being that structural stability is maintained regardless of the influence of other redundancy provisions provided. Ultimately the implementation of sufficient redundancy within the building is intended to adequately reduce the risk of complete fire safety strategy failure. The redundancy provided through the design process is also intended to address the potential sensitivities in methodologies and inputs considered throughout the analysis of each mechanism of design.

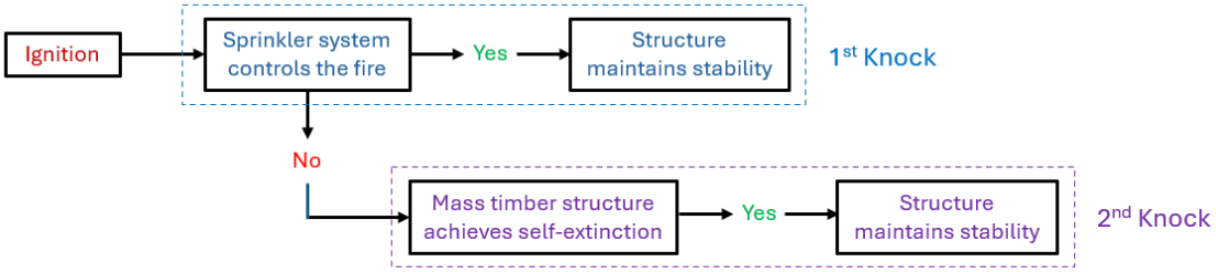

Figure 2-1: Visual representation of structural fire strategy

2.1.1 First Knock – Automatic Suppression System Design

Acceptance Criteria:

- The automatic suppression system is to control fire growth during the early stages of fire development,
- The automatic suppression system is to control the fire prior to the ignition of any mass timber structure.

Failure Mechanism:

- It is understood that the main result of sprinkler failure during a fire event is system isolation. This typically occurs during construction or maintenance works.
- Activation of the sprinkler system is delayed due to inadequate heat transfer to the sprinkler bulb and as a result the fire reaches a size which can no longer be controlled by the suppressing agent.
- Ignition of the mass timber structure occurs prior to activation of the sprinkler system. It is considered that in the event that the heat transfer to the mass timber structure results in ignition

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prior to the activation of the sprinkler system that the suppression system has failed its function and is unlikely to control any fire event.

Notes:

In the event of a fire occurring within the subject building it is expected that the sprinkler system will activate and control the burning rate of solid combustibles which have been introduced within the floor plate of the building (this will be evaluated herein).

It is expected that once the sprinkler system has activated in a fire scenario [2], and the fire is controlled by the discharge from the activated sprinkler heads, the average temperature of the upper smoke layer does not exceed the activation temperature of the sprinkler bulb. If this were not the case, additional sprinkler heads would be activated until the fire was controlled, or until the sprinkler system is overcome. Furthermore, according to research [3], [4], in the presence of sprinklers, the maximum temperature in a sprinkler protected room is generally low, in the order of 100°C – 200°C. This research is further supported by Technical Memoranda TM19:1995 [5], which states that the average smoke layer temperature of a sprinkler-controlled fire event is 100°C. On this basis it is considered that upon successful activation of the sprinkler system (prior to ignition of the timber structure) that the fire will be controlled and temperatures within the building will not result in fire spread throughout the building or the failure of any floor structures, inclusive of timber elements.

2.1.2 Second Knock – Mass Timber Structural Fire Design

Acceptance Criteria:

- The fundamental acceptance criteria to be achieved by the mass timber construction is to maintain structural stability and resistance to the spread of fire for the duration of a challenging fire scenario, this is excluding the impact of any active systems (i.e., sprinklers) and excluding any fire brigade intervention measures.
- Structural stability of the mass timber structure is considered to only be maintained if self-extinction can be demonstrated to occur. Furthermore, the structural design of the mass timber plate elements are required to maintain structural stability despite the overall loss of section capacity to all exposed surfaces (i.e., char damage).

Failure Mechanism:

- The thermal conditions imposed from the fire event onto the timber structure are such that self-extinction does not occur, resulting in second order effects such as char fall-off / lamella de-bonding (delamination). *It is noted that self-extinction is required to be shown to occur prior to the onset of second order effects, as the characteristic time scales are critical to the success of the fire safety strategy*.
- The extent of mass timber structure which is impacted by the fire event (i.e., the depth of char damage) is sufficient such that the mass timber elements are unable to support the design loading conditions.

Notes:

In the event of sprinkler system failure, it is acknowledged that the fire may reach a fully developed state. The thermal conditions within a fully developed fire are those which would result in the ignition of the mass timber structure. The '2nd knock' strategy addresses this design scenario.

With respect to the adoption of unprotected mass timber, self-extinction is required to satisfy performance objectives relating to compartmentation and structural stability. The process of self-extinction is defined as the cessation of flaming, which is either followed by smouldering or by the complete halt of combustion.

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Timber inherently has the potential for self-extinction given the flame cannot provide enough heat to the fuel to sustain burning.

Due to the characteristics of large fire events, self-extinction is only possible during the decay phase of the fire after the introduced fuel load has been consumed. For self-extinction to occur the heat losses from the compartment must overcome the energy required to sustain burning. Portions of the CLT will begin self-extinguishing prior to other areas and the phenomena is progressive depending on the heat losses to specific areas within the compartment.

If self-extinction cannot be attained, then continued burning of the timber elements can persist until the point of char fall-off / delamination which may be subsequently followed by structural failure. Char fall-off is defined as a bond failure between the charred lamella and the lamella beneath. Most glues will experience significant reduction in adhesion and cohesion at temperatures below char formation. The failure of the glue line and the onset of self-extinction need to be assessed simultaneously as each mechanism is time dependent.

On the above basis it is to be shown that self-extinction is likely to occur within the areas of the building where mass timber is adopted prior to char fall-off such that structural stability and integrity is maintained for the entire duration of the fire event, including the decay phase of the fire.

3 SUMMARY

This Design Advice Letter summarises the key fire safety design features and measures which are recommended to be included into the development located at 57-71 Stephenson Street, Cremorne, VIC.

The architectural documentation prepared by Edition Office for the DA lodgement (dated 1 June 2026) has been reviewed by Carbon Fire Engineering on 9 June 2026. On the basis of that review, Carbon Fire Engineering confirms that the fire safety strategies outlined herein can be incorporated into the design at the detailed design stage.

The risk profile for the building has been developed in light of the current building code environment, and the current state of the art in fire engineering design. The views expressed herein are retained by Carbon Fire Engineering to provide a proactive means for developing a fit-for-purpose solution for the project, with careful consideration to all project particulars and information that has been shared to date.

Do not hesitate to contact the authors directly to discuss or clarify any aspect herein.

Written By: **Reviewed By:**

[redacted]

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4 REFERENCES

[1] The Australian Buidling Codes Board, National Construction Code, Volume One, Building Code of Australia 2022, ACT, Australia: The Australian Building Codes Board, 2022.

[2] H. Morgan, B. Ghosh, G. Garrad, R. Pamlitschka, J. C. De Smedt and L. Scoonbaert, Design Methodologies for Smoke and Heat Exhuast Ventilation, London: BRE Publications, 1999.

[3] K. Notarianni, NISTIR 5240 Measurement of Room Conditions and Response of Sprinklers and Smoke Detectors During a Simulated Two-bed Hospital Patient Room Fire, Gaithersburg: National Institute of Standard and Testing, 1993.

[4] J. Rakic, The Performance of Unit Entry Doors When Exposed to Simulated Sprinkler Controlled FIre, Australia, 2000.

[5] CIBSE, Technical Memoranda TM19:1995, Relationships for Smoke Control Calculations, London: The Chartered Institution of Building Services Engineers, 1995.

[6] ABCB, "Australian Fire Engineering Guidelines," ABCB, 2021.

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