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Building Code of Australia Performance Solution Report

NormBuild
17 Hillview Avenue, Bankstown

20 April 2022

Our reference #: **2022037**
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Project details: 17 Hillview Avenue, Bankstown
Contact details: Norm Ayoub
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Revision History

Report number	Comments	Report date
01	Final issued	20 April 2022

Building Code of Australia Performance Solution Report

1. Introduction

1.1. General

(a) This Building Code of Australia (the **BCA**) Performance Solution Report (the **report**) has been prepared at the request of NormBuild.

(b) This report is based upon, and limited to, the information provided for assessment, and does not make any assumptions regarding 'design intention' or the like.

1.2. Report Basis, Limitations & Assumptions

(a) This report demonstrates that compliance with the performance requirements is achieved in relation to the variation with the Deemed-to-Satisfy (**DTS**) provisions of the BCA identified in Table 2 below.

(b) If there are any proposed building alterations or additions, a change in use or changes to the building in the future, a re-assessment will be needed to verify consistency with the assessment in this report.

(c) This report does not consider the accuracy of the information relied upon and we assume all information provided to us is true and correct. If any information relied upon, assumed, or supplied is incorrect in any way, this could fundamentally impact the assessment provided.

(d) This report does not include or relate to, in any way, matters not expressly addressed in this report, including any other report or solution addressed by any third party consultant who is not an employee of InCode Solutions.

1.3. Regulatory Framework

(a) The following legislation has been considered in the formulation of this report:

(i) Environmental Planning & Assessment Act 1979.

(ii) Environmental Planning & Assessment Regulation 2021.

(iii) Environmental Planning & Assessment (Development Certification and Fire Safety) Regulation 2021.

(iv) BCA 2019, Amendment 1, Australian Building Codes Board (**ABCB**), 2020.

(v) Guide to the BCA 2019, Amendment 1, ABCB, 2020 (the **Guide to the BCA**).

1.4. Information Sources

(a) The following information has been used as reference documents in the formulation of this report:

(i) Architectural Drawings prepared by Holmes Design (the **Architectural Drawings**).

(ii) Undated Survey Sketch prepared by Sydney Registered Surveyors (the **Survey Sketch**).

1.5. Stakeholders

(a) The project stakeholders are listed in Table 1 below.

Stakeholder	Organisation	Role
Norm Ayoub	NormBuild	Client

	Canterbury Bankstown Council	Consent Authority
Nehme Moujalli	InCode Solutions Pty Ltd	Fire Safety Engineer

Table 1 – Stakeholders

2. Objectives

(a) New building work is to be carried out inaccordance with the BCA.

(b) The relevant objective associated with the variation is to avoid the spread of fire.

3. Principal Characteristics

3.1. Building Characteristics

(a) The development consists of the construction of an attached dual occupancy building consisting of 2 attached dwellings.

(b) The dwellings have a Class 1a classification under the BCA.

(c) The external walls of the building are of masonry construction which are considered to have an FRL of not less than 60/60/60 when tested from the outside.

(d) The DTS variation contained in the building work that is the subject of this performance solution, concerns the west facing external wall of the subject building that is located within 900mm from the allotment boundary, being not less than ~850mm from the allotment boundary. The subject external wall is highlighted in red in the Figure below. Within this external wall are several window openings located at the ground and first floor storeys as show in the Architectural Drawings.

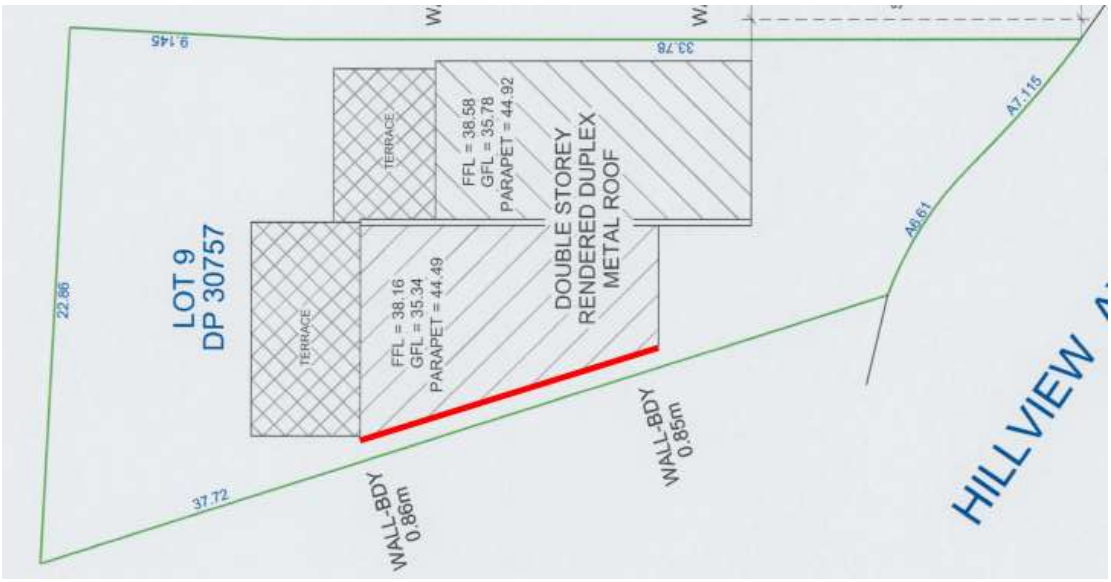

Figure 1 – External wall located less than 900mm from the allotment boundary

3.2. Occupant Characteristics

(a) Occupant characteristics within the building are representative of the general population, with no specific or unusual distributions in gender, age and physical or mental attributes.

(b) The most likely occupants include residents and possibly visitors.

4. Performance Requirements

4.1. Meeting the Performance Requirements

(a) The BCA states that the performance requirements are satisfied by one of the following:

(i) A performance solution;

(ii) A DTS solution; or

(iii) A combination of (i) and (ii).

4.2. Relevant Performance Requirements

(a) The variation for which the performance solution is proposed is listed in Table 2 below.

DTS provision	Variation	Performance requirement
3.7.2.4(c)	Windows within the external wall of the subject building located less than 900mm from the western allotment boundary are not to be protected (with the subject external wall being not less than ~850mm from the subject allotment boundary).	P2.3.1

Table 2 – Summary of matter

(b) Applicable parts of the above performance requirement are as follows:

(i) P2.3.1

(A) A Class 1 building must be protected from fire spread from the allotment boundary, other than a boundary adjoining a road or public space.

5. Adopted Assessment Method

5.1. General

(a) The acceptance criteria stipulated within Section 5.3 represents the benchmark for measuring compliance for the proposed performance solution.

5.2. Method of Analysis

(a) **Performance solution 1 – Window opening to external wall**

(i) This performance solution relies upon a qualitative and quantitative analysis to address A2.2(1)(b) of the BCA by following A2.2(2)(d) of the BCA.

5.3. Acceptance Criteria

(a) **Performance solution 1 – Window openings to external wall**

(i) This performance solution is acceptable if it is shown the window openings within the constructed external wall of the building facing the western allotment boundary (the **subject design**) will be able to resist fire spread to at least the same level as identical openings within an external wall of a DTS compliant building located 900mm from the allotment boundary.

6. Performance Solution

6.1. Preamble

(a) In accordance with A2.2(3) of the BCA, any performance solution must consider all relevant performance requirements.

(b) P2.3.1 of the BCA in this instance concerns itself with ensuring fire spread is prevented to the degree necessary.

6.2. Performance Solution 1 – Window Openings to External Wall

(a) **Intent of DTS provisions for protection of openings**

(i) The basis for regulatory control over the location of openings is to safeguard against fire spread from the allotment boundary.

(ii) 3.7.2.2 of the BCA requires external walls and openings within the external walls less than 900mm from the allotment boundary to be protected.

(iii) On this basis one can reasonably surmise that the BCA is concerned with fire spread via openings from the allotment boundary.

(iv) There are many ways that fire can spread to a building from an adjoining building, including by heat radiation, flying brands and direct flames.

(v) The analysis will be based on a comparison between the subject building, where the external wall containing the subject window openings, as shown on the Survey Sketch, being located not less than ~850mm from the allotment boundary, and a DTS compliant building where the external wall containing identical window openings as described in the assessment below being located 900mm from the allotment boundary.

(b) **Assessment**

(i) P2.3.1 of the BCA requires that the building be protected from the spread of fire from the allotment boundary. Hence, this assessment will consider fire spread from a fire within the adjoining allotment.

(ii) Fire can spread from a burning building to adjacent buildings by flame contact, by radiation from windows, or by flaming brands. Fire spread can be prevented by providing a fire resisting barrier or by providing sufficient separation distances. Therefore, separation distances for windows in external walls is necessary to ensure that the windows do not transmit a level of radiant heat flux that can ignite combustible materials inside the building.[1]

(iii) The subject window openings are located in the external wall of the building that is located less than 900mm from the adjoining western allotment boundary, the subject external wall shown highlighted in red in the Figure below.

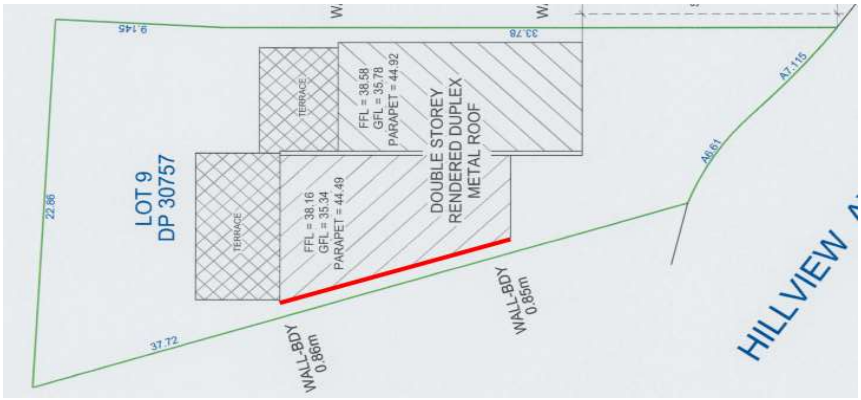

Figure 2 – External wall located less than 900mm from the allotment boundary

[1] Buchanan AH, Structural Design for Fire Safety. John Wiley and Sons, West Sussex, UK 2001

(iv) Although the BCA requires protection of openings within external walls located less than 900mm from the allotment boundary, it does not differentiate between different types of wall construction and the impact of the location of the openings in relation to the external face of the wall.

(v) The external walls where the openings are located within the subject design are understood to be of masonry construction achieving an FRL of not less than 60/60/60 as determined by the BCA. Furthermore, the frame and glazing of the subject openings are setback from the external face of the wall by ~60mm as shown in the Figure below.

Figure 3 – Setback of window framing and glazing from face of subject external wall (typical)

(vi) In the event of a fire occurring on the adjoining allotment, the area outside the glazing is not expected to cause fire spread, on the basis it does not incorporate any combustible elements.

(vii) The likelihood of fire spread will depend on the ability of radiant heat and flying embers or flames from a fire on the adjoining allotment to ignite items within the subject design located behind the glazing, on the basis there are no combustible items located outside the glazing.

(viii) To further demonstrate equivalence, the subject design will be compared to a DTS compliant design having the following elements and as shown in Figure below:

(A) External wall containing the window openings consists of a single stud frame construction (i.e. timber framing cladded with weatherboard cladding or the like); and

(B) Windows incorporated within the external wall are installed flush with the external face of the wall.

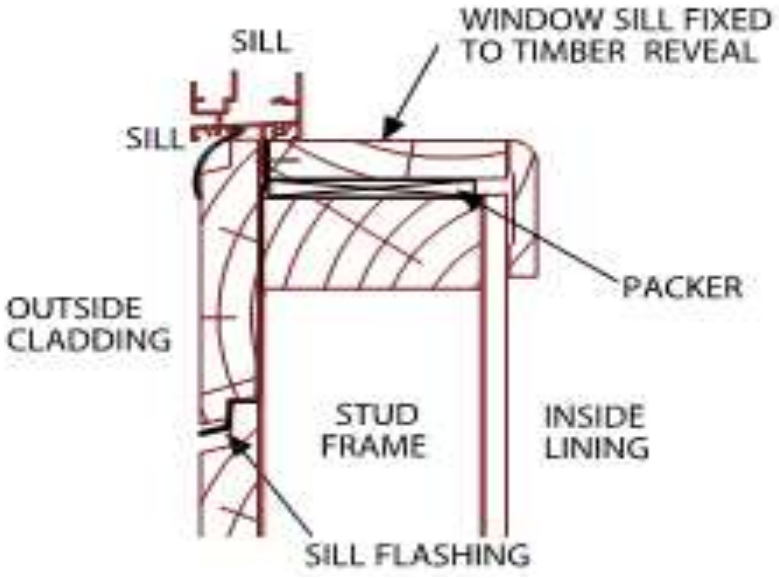

Figure 4 – DTS compliant design consisting of aluminum window installations in timber framed external wall

(ix) As can be seen in the Figure directly above, the glazing installed within the aluminium framing for each window opening, finishes flush with the external face of the outside cladding, and with relation to the setback from the boundary, the glazing is also considered to also have a setback of not more than 900mm from the allotment boundary when installed in the above lightweight framed external wall.

(x) In the subject design and based on the Survey Sketch the closest part of the subject external wall to the adjoining allotment boundary is ~850mm.

(xi) As the setback distance of the actual window openings within the subject design, from the allotment boundary is greater than that of the DTS compliant design (as the frame and glazing of the openings of the subject design are setback from the external face of the wall by not less than ~60mm), the risk of fire spread from the allotment boundary in the subject design is regarded as being the same as the risk of fire spread from the allotment boundary in the DTS compliant design.

(xii) Notwithstanding the above, and to provide a more robust solution, radiant heat flux calculations were conducted, by using a radiant panel which simulates the emitted radiant heat flux emitted from a window opening bounding the external wall of a room of a building on the adjoining allotment that is subject to a post-flashover fire, to compare the radiant heat flux received for both the subject design and the DTS compliant design as shown in Figures 2 and 4 above.

(xiii) The radiant heat flux calculation method is described in Drysdale.[2] The parameters used in modelling the fire consists of the following:

(A) Radiant panel located 900mm from the allotment boundary within the adjoining allotment, measuring 1.0m wide x 1.4m high and having a temperature of 1037°C, which may be reached during a fully developed fire within a residential dwelling fire.

(xiv) The performance solution will be acceptable if radiant heat received by the windows of the subject design is equal to or less than heat flux received by the windows of the DTS benchmark compliant design.

[2] Drysdale D, An Introduction to Fire Dynamics, Third Edition, John Wiley & Sons, Chichester, UK 2011

(xv) The exposed surface of the windows of the subject design for the worst case scenario is the opening closest to the part of the external wall that is setback ~850mm from the allotment boundary, and with the opening being recessed within the external face of the wall by ~60mm, the opening is located ~910mm from the allotment boundary.

(xvi) The exposed surface of the window of the DTS compliant design as shown in Figure 4 above, is not less than 900mm from the allotment boundary.

(xvii) Table 3 below summarises the performance of both designs when exposed to the radiant panels.

Design	Received heat flux at face of openings (kW/m^2)
Subject design (@ 910mm from allotment boundaries being 850mm + 60mm)	19.77
DTS compliant design (@ 900mm from the allotment boundary)	19.97

Table 3 – Performance of both designs

(xviii) As the radiant heat flux received by the window openings of the subject design is less than that received for the DTS compliant design, compliance with the acceptance criteria is considered to be achieved.

(xix) Furthermore, the subject design has a fire resisting external wall that will resist the spread of fire originating from the adjoining allotment, whereas the external wall construction of the DTS compliant design is not required to have a FRL and can be constructed of combustible materials.

(xx) Based on the above, it can be reasonably concluded that the avoidance of fire spread to the subject window openings in the subject design is at least equivalent to that of the DTS compliant design.

(c) **Summary**

(i) The assessment undertaken for the subject design demonstrates that the subject design will be at least equivalent to a DTS compliant design in avoiding fire spread.

(ii) There the subject design will satisfy the acceptance criteria nominated for this assessment in Section 5.3.

7. Conclusion

7.1. General

(a) The proposed performance solution described herein has been assessed against A2.2(1)(b) of the BCA by following A2.2(2)(d) of the BCA.

(b) It is the opinion of InCode Solutions Pty Ltd that the proposed performance solution satisfies P2.3.1 of the BCA, subject to the implementation of the requirements referred to below.

7.2. Requirements

(a) The following requirements are derived through the assessment performed, and are made to ensure the effectiveness of the performance solution:

(i) The window openings located in the external wall of the subject building as shown highlighted in red in the Figure below must be of aluminium or non-combustible framing with glazing.

(ii) The subject glazing and frame of the windows must be setback not less than 60mm in from the external face (inclusive of render or non-combustible textured finish) of the external wall of the building that faces the western allotment boundary.

(iii) No combustible elements are permitted outside the subject opening within the perimeter of the opening.

(iv) Any screens (i.e. security or fly screens) to the subject opening must be non-combustible.

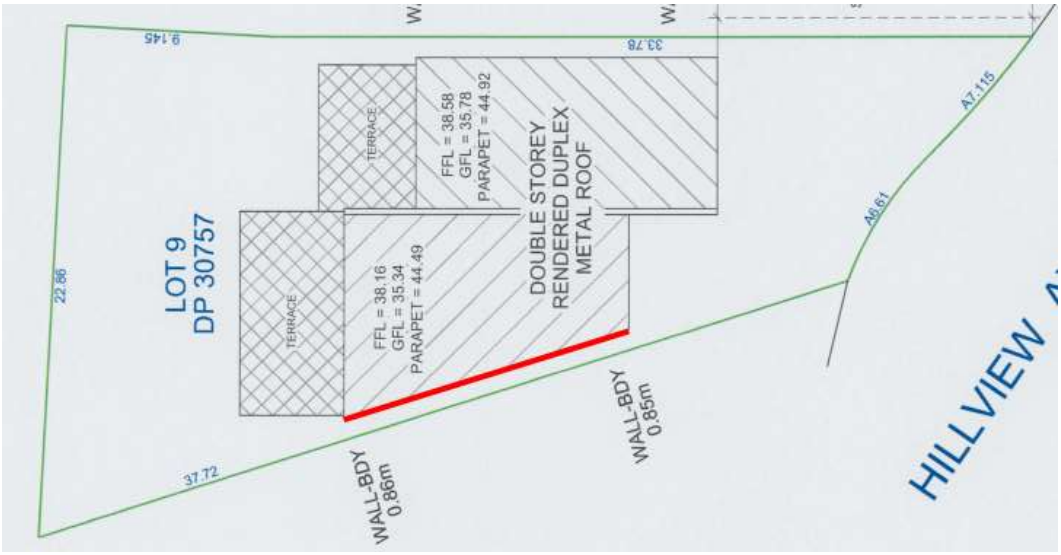

Figure 5 – External wall containing the subject window openings

If you require any further assistance or have any additional queries, please do not hesitate in contacting us directly.

Yours sincerely,

Nehme Moujalli
Director (Certifier – Fire Safety (BDC2930))
InCode Solutions Pty Ltd