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The Montefiore Home, Randwick

BCA Section J1 & J2 Deemed-to-Satisfy Review of Fabric & Glazing Requirements

Prepared for

Jackson Teece

Prepared by
CUNDALL
Level 7, 657 Pacific Highway
St Leonards NSW 2065
Phone: +61 2 8424 7000
Fax: +61 2 8424 7099

BCA Section J Deemed-To-Satisfy Review

This report has been prepared to demonstrate the minimum requirements for The Montefiore Home at Randwick for compliance with Section J1 (fabric) and Section J2 (glazing) of the Building Code of Australia (BCA) 2010 in order to obtain valid construction and operational certificates.

Contents

Introduction

The BCA 2010 Section J energy efficiency provisions are required to be included in the design of The Montefiore Home at Randwick.

The purpose of this review is to identify any major non-compliances and in particular check that glazing and shading meet the BCA Section J1 & J2 requirements.

Should there be conflicts in particular element of the BCA's deemed to satisfy provisions these can be proved by a performance-based solution under Section JV3. Often for developments seeking to include a large area of clear glazing, a performance verification (i.e. whole building energy simulation) is the best way to satisfy Section J requirements.

The general advice is to incorporate the minimum provisions where possible and that the performance based approach will only be used to prove equivalent performance for items that conflict with the design.

As such the designers are recommended to include the minimum performance standards and advise Cundall of any non-compliances that require validation using an alternative performance based approach.

1 Part J1 – Building Fabric

1.1 Overview

Insulation reduces the radiation and convection of heat between internal and external conditions reducing heating, cooling and thus total energy loads over the course of the building's life. This has a two fold saving through a smaller plant capacity along with direct energy consumption savings.

1.2 Responsible Designer

The responsible designers for this part of the BCA are the architect and the facade engineer (where applicable). The BCA minimum requirements for insulation are recommended to be incorporated as they will assist with improving thermal performance.

1.3 Summary of Requirements

Part J1 requires establishes minimum construction and performance requirements, which vary depending on the climate zone and type of building construction, for the following:

- Installation of insulation (J1.2)
- Roof / ceiling insulation (J1.3)
- Roof lights (J1.4)
- Wall insulation (J1.5)
- Floor insulation (J1.6)

Insulation to meet BCA deemed-to-satisfy requirements is recommended as it will generally assist with meeting the building's energy performance target.

1.4 Application of Part J1

This part is applicable to this project.

1.5 Installation of Insulation

Installation of insulation must comply with section J1.2 of the BCA. The installation must ensure that the insulation creates a continuous thermal barrier to reduce the energy losses. Additionally it is important that the insulation must not hinder the safe or effective operation of any service or fitting. Specific installations requirements are outlined in Part J1.2 for reflective and bulk insulation.

The insulation used must comply with AS4859.1.

1.6 Roof & Ceiling

The deemed-to-satisfy provisions for a Class 9c building in climate zone 5 specify insulation requirements to achieve:

Building class	Direction of heat flow	Minimum Total R-Value for Roof or Ceiling
9c Aged Care	Down	3.2

1.7 Roof Lights

Poorly designed roof lights will permit a significant amount of direct solar gain and as such roof lights that form part of the envelope of the building must comply with the following:

Table J1.4 ROOF LIGHTS - THERMAL PERFORMANCE OF TRANSPARENT AND TRANSLUCENT ELEMENTS

Roof light shaft index (see Note 1)	Constant	Total area of *roof lights* serving the room or space as a percentage of the *floor area* of the room or space			
		Up to 2%	More than 2% to and up to 3%	More than 3% and up to 4%	More than 4% and up to 5%
Less than 0.5	*SHGC*	Not more than 0.83	Not more than 0.57	Not more than 0.43	Not more than 0.34
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
0.5 to less than 1.0	*SHGC*	Not more than 0.83	Not more than 0.72	Not more than 0.54	Not more than 0.43
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
1.0 to less than 2.5	*SHGC*	Not more than 0.83	Not more than 0.83	Not more than 0.69	Not more than 0.55
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
2.5 and more	*SHGC*	Not more than 0.83	Not more than 0.83	Not more than 0.83	Not more than 0.83
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4

Notes:

1. The *roof light* shaft index is determined by measuring the distance from the centre of the shaft at the roof to the centre of the shaft at the ceiling level and dividing it by the average internal dimension of the shaft opening at the ceiling level (or the diameter for a circular shaft) in the same units of measurement.
2. The total area of *roof lights* is the combined area for all *roof lights* serving the room or space.
3. The area of a *roof light* is the area of the roof opening that allows light to enter the building.
4. The thermal performance of an imperforate ceiling diffuser may be included in the *Total U-Value* and *SHGC* of the *roof light*.
5. The total area of *roof lights* serving the room or space as a percentage of the *floor area* of the room or space must not exceed 5% unless allowed by J1.4(b).

With current design, the roof light shaft index is less than 0.5 and the total area of roof lights serving the space as a percentage of the floor area of the space is less than 2%. The roof light performance characteristics must comply with the following:

- A Maximum SHGC of 0.83
- A Maximum Total U-Value of 8.5

1.8 Walls

For each part of an external wall that is part of the envelope, the following must be satisfied:

Building class	Climate Zone	Minimum Total R-Value for Wall
9c Aged Care	5	2.8

- A minimum total R-value of 2.8

  Reductions in the total R-Value can be made:

  (i) The minimum R-value is reduced;

  - By 0.5 for walls with a surface density of not less than 220kg/ m^2
  - By 0.5 for walls facing south
  - By 0.5 if shaded with a projection shade angle from 30-60 degrees or by 1.0 if shaded with a projection angle of more than 60 degrees.

Note: Where the only space for insulation is provided by a furring channel, top hat section, batten or the like

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

(ii) Satisfy glazing energy index of 0.092

1.9 Floors

No insulation is required for slab on ground floors in Climate Zone 5 without an in-slab heating or cooling system.

Insulation with a minimum total R-Value of 1.0 is required for suspended floors without an in-slab heating or cooling system where the non-conditional space is enclosed. The underground car park is one such case for this.

These requirements are summarised in the below table:

Building class	Climate Zone	Minimum Total R-Value for Floor on Ground	Minimum Total R-Value for Suspended Floor
9c Aged Care	5	0	1

2 Part J2 – External Glazing

2.1 Overview

Glass impacts significantly on the energy performance of the building. The method of glazing analysis considers the area of the glass and orientation on a level by level basis. For buildings that are 2 storeys or greater in height will require each level to comply with the BCA requirements in Part J2.

2.2 Responsible Designer

The responsible designer for this part of the BCA is the architect.

2.3 Summary of Requirements

Part J2 requires established minimum glazing system performance requirements, which vary depending on the climate zone and the orientation, area and shading of the glazing.

The glazing conductance (U-value) and solar heat gain coefficient (SHGC) and shading devices are assessed together and calculated for each façade orientation. These are then added together to give an Air Conditioning Energy Value. To comply this must be less than the Energy Index target.

The calculation involves numerous factors and is typically undertaken using the glazing calculator developed by the Australian Building Codes Board (ABCB).

2.4 Application of Part J2

This part is applicable to this project.

2.5 Glazing Performance – Method 2

We have reviewed the current elevations for the development to assess what the performance characteristics would need to be to meet the Deemed to Satisfy Provisions for external glazing. The results for each elevation for a typical storey are summarised overleaf.

2.5.1 Glazing requirements summary

The architectural requirements can be summarised in the below table

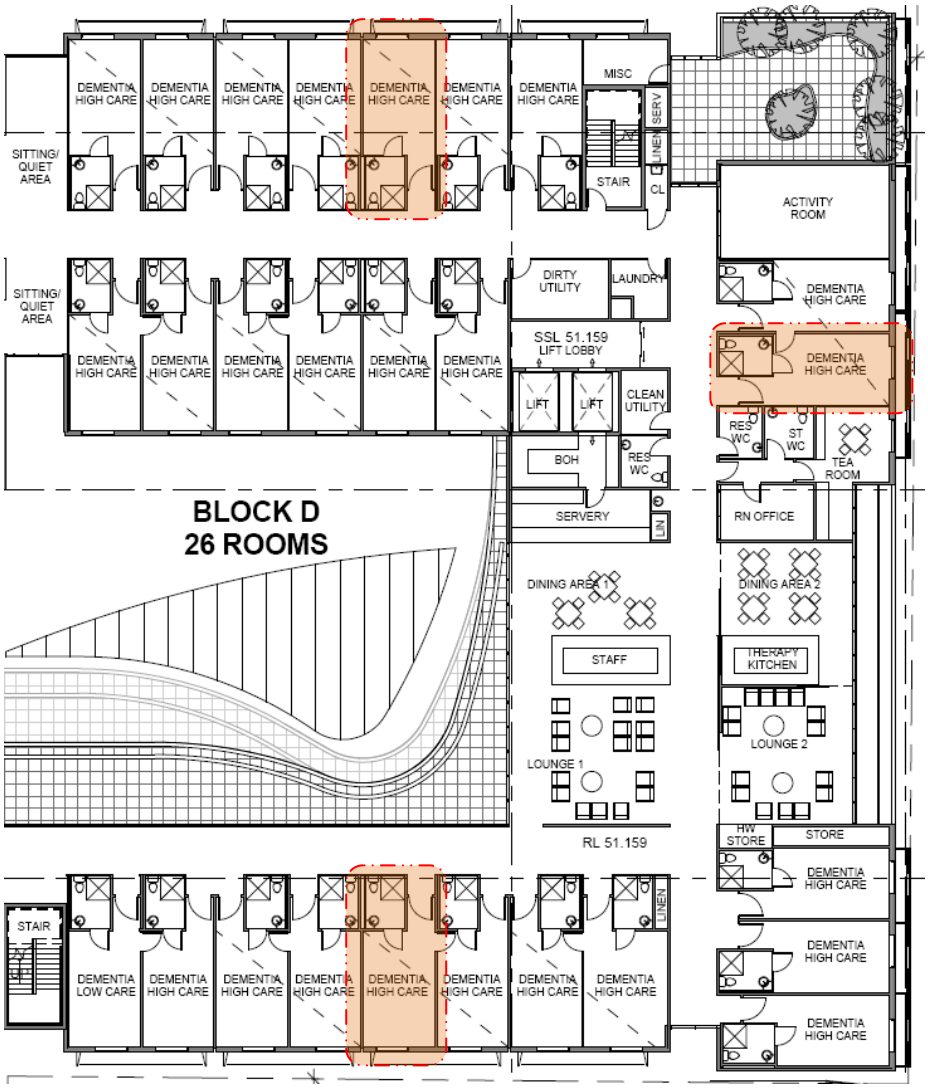
Facade Orientation	Location	U-value	SHGC
N	Stage 2 Block C,D	5.8	0.81
S	Stage 2 Block C,D	5.8	0.81
E	Stage 2 Block C,D	5.8	0.81
W	Stage 2 Block C,D	5.8	0.81

Note: Shading is as per architectural plans. Glazing performance characteristics are glass values only.

2.5.2 Glazing requirement details

All buildings will pass deemed-to-satisfy provisions with the current shading treatment assuming the following mentioned glazing performance figures:

Shading is as per detailed on architectural plans and elevations on a typical storey:



Note: West facade typical window configuration is assumed to be identical to East Facade of Block D.

Stage 1: Block C,D – Typical Floor

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010)

Building name/description: Montefiore Aged Care Facility
Application: Class 9c aged care
Climate zone: 5
Storey: Level 5

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	15.5m²		12.5m²		15.5m²		16.2m²		
Option B									n/a
Glazing area (A)	3.7m²	.....	3.6m²	.....	3.7m²	.....	3.6m²		

Number of rows preferred in table below: 4 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North Glass	N		2.30		3.70	5.8	0.81	device		2.00	0.00	0.00	0.19	3.70	100% of 29%
2	South Glass	S		2.30		3.70	5.8	0.81	device		2.00	0.00	0.64	0.54	3.70	100% of 89%
3	West Glass	W		2.30		3.60	5.8	0.81	device		2.00	0.00	0.00	0.26	3.60	100% of 86%
4	East Glass	E		2.30		3.60	5.8	0.81	device		2.00	0.00	0.00	0.25	3.60	100% of 84%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR
The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters.
While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all.
Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

if inputs are valid

Heat gain reduction can be further achieved to at least ~20% by a better selection of glazing material. Following are the comparison of glazing specifications with different types of frame for consideration:

North Facade - Comparison of Glass Performance				
Glazing Material	U value	SHGC	% of allowance used	% Improvement from Base
Single Glazing Clear Glass	5.8	0.81	29%	
	3.8	0.62	25%	4%
	4.2	0.61	23%	6%
	4.0	0.37	6%	23%

North Facade - Comparison of Glass+Frame Performance					
Vinyl Frame (% allowance used)	% Improvement from Base	Timber Frame (% allowance used)	% Improvement from Base	Aluminium Frame (% allowance used)	% Improvement from Base
24%		23%		22%	
21%	3%	21%	2%	18%	4%
18%	6%	18%	5%	16%	6%
6%	18%	5%	18%	3%	19%

South Facade - Comparison of Glass Performance				
Glazing Material	U value	SHGC	% of allowance used	% Improvement from Base
Single Glazing Clear Glass	5.8	0.81	89%	
	3.8	0.62	57%	32%
	4.2	0.61	64%	25%
	4.0	0.37	66%	23%

South Facade - Comparison of Glass+Frame Performance					
Vinyl Frame (% allowance used)	% Improvement from Base	Timber Frame (% allowance used)	% Improvement from Base	Aluminium Frame (% allowance used)	% Improvement from Base
74%		76%		102%	
48%	26%	50%	26%	75%	27%
54%	20%	56%	20%	81%	21%
55%	19%	57%	19%	82%	20%

West Facade - Comparison of Glass Performance				
Glazing Material	U value	SHGC	% of allowance used	% Improvement from Base
Single Glazing Clear Glass	5.8	0.81	86%	
	3.8	0.62	63%	23%
	4.2	0.61	64%	22%
	4.0	0.37	46%	40%

West Facade - Comparison of Glass+Frame Performance					
Vinyl Frame (% allowance used)	% Improvement from Base	Timber Frame (% allowance used)	% Improvement from Base	Aluminium Frame (% allowance used)	% Improvement from Base
71%		72%		86%	
52%	19%	54%	18%	65%	21%
53%	18%	53%	19%	66%	20%
39%	32%	39%	33%	51%	35%

East Facade - Comparison of Glass Performance				
Glazing Material	U value	SHGC	% of allowance used	% Improvement from Base
Single Glazing Clear Glass	5.8	0.81	84%	
	3.8	0.62	65%	19%
	4.2	0.61	64%	20%
	4.0	0.37	39%	45%

East Facade - Comparison of Glass+Frame Performance					
Vinyl Frame (% allowance used)	% Improvement from Base	Timber Frame (% allowance used)	% Improvement from Base	Aluminium Frame (% allowance used)	% Improvement from Base
70%		70%		79%	
53%	17%	54%	16%	62%	17%
52%	18%	52%	18%	61%	18%
33%	37%	33%	37%	40%	39%