EASTERN CREEK SHOPPING CENTRE

JV3 REPORT

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QUALITY MANAGEMENT

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1 Introduction

This JV3 report has been prepared to support State Significant Development Application SSD 8588 for the detailed design and construction of a convenience retail shopping centre, medical centre, gym and associated car parking on Lot 2, Rooty Hill Road South, Eastern Creek. The assessment undertaken in this report has been prepared to address the following Secretary's Environmental Assessment Requirements (dated 26 July 2017) and the relevant conditions of consent under Concept Approval SSD 5175

The analysis was completed and it has demonstrated that the building complies with Section J of the NCC 2015 based on the JV3 compliance and based on the assumptions outlined in this report.

The analysis involves a series of building energy simulations carried out in accordance with the BCC 2015 Volume One, verification method "JV3 using a reference building".

All building services are assumed to be compliant with the Section J DTS provisions in J5, J6 and J7. It is also assumed the building complies with the DTS provision in J3 and J8. The non-compliance with DTS provisions therefore relate only to the building fabric and as such, both the Reference and Proposed building have only been simulated with generic DTS compliant services.

1.1 Disclaimer

Computer building simulation provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised representation of the building that does not and cannot fully represent all of the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warrantee of building performance in practice can be based on simulation results alone.

1.2 Sources of information

The following sources of information have been used in this report:

- NCC 2015
- Architectural drawings Rev A

2 Building Class and Climate Zone

The proposed building is classified as Class 6 and 7a. This report only relates to the Class 6 portion of the building as the Class 7a carpark meets DTS requirements. The proposed building is located in BCA Climate Zone 6.

3 JV3 Compliance Path

The JV3 compliance path requires a comparison between a Reference Building model and a Proposed Building model. The proposed building model is a model of the actual design. The reference building model is based on the actual design but amended so that it complies with all DTS provision of Section J. It may also be amended to ensure that it does not exceed any requirements of the DTS provisions of Section J i.e. so that it only barely passes.

An energy simulation of both these models is required to show that the Proposed Building uses less energy than the reference building. The Reference Building model thus provides an energy benchmark.

It is the intent of Section J that high performing building services should not be used to off-set the effect of a poor performing building envelope. The reason for this is that the building structure will usually outlive the building services by several decades. For this reason a second trial is required where the Proposed Building envelope is combined with the same services as the reference building.

An energy simulation is then required to show that the Proposed Building model incorporating reference services uses less energy than the Reference Building model with reference services.

In the case of the Eastern Creek Shopping Centre design, all building services are assumed to be DTS compliant. Therefore only the second trial is required. For this reason, a detailed model of the building services is not required.

3.1 Proposed Building Overview

The shopping centre contains a single major retail tenant (Woolworths) and a number of specialty retail and food and beverage outlets.

The shopping centre features a naturally ventilated arcade and an internal mall area that is air conditioned. The open, naturally ventilated external arcade area provides shading and weather protection to the Specialty retail outlets (including pharmacy, gym and food and beverage outlets).

Glazing has been modelled as a high performance single glazing with standard aluminium frames.

All building services are assumed to meet NCC DTS requirements.

3.2 Reference Building Overview

The reference building has been configured to meet Section J DTS requirements for Class 6 buildings. It has also been amended to ensure that it does not exceed any DTS requirements.

4 Analysis Software Description

Table 1: Energy simulation analysis software reporting requirements

Parameter	
Software name and version	IES-VE (2017).
Software developer	Integrated Environmental Solutions Virtual Environment
Software validation standard (evidence of developer's compliance to be provided)	The IES software has passed the BESTEST validation test and is certified in accordance with ANSI/ASHRAE Standard 140-2001: "Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs". The software also calculates PMV levels in accordance with ISO7730.

4.1 General requirements

Table 2: General parameters reporting requirements

Parameter	
Climate zone	BCA Climate Zone 6
Number of building stores (below ground / above ground)	1 storey above ground.

4.1.1 CLIMATE DATA

The simulation climate data used is a typical meteorological year (TMY) of Richmond.

4.1.2 THERMAL CONDITIONS

The following internal loads were assumed for the reference and proposed building:

- Occupancy density: 1 person per 3 sqm
- Sensible occupancy load: 75 W per person - Section J assumption
- Latent occupancy load: 55 W per person - Section J assumption
- Equipment loads: 5 W/m²
- Lighting loads: 22W/m² - as Part J6 requirements
- Cooling Set point: 24°C
- Heating set point: 20°C
- Infiltration: for a perimeter zone of depth equal to the floor-to-ceiling height, when pressurising plant is operating, 1.0 air change per hour; and for the whole building, when pressurising plant is not operating, 1.5 air change per hour;
- Plant Operation + occupancy profiles: as per Section J Specification profiles in accordance with Table 2C Occupancy and Operational Profiles of a Class 6 Shop or Shopping Centre.

5 Assumptions and design requirements

In order for this JV3 analysis to be valid, the following performance levels for elements of the building envelope are required to be met. Note that these requirements are only relevant where the construction forms part of the building's thermal envelope:

Table 3: Building fabric requirements

Item	Reference	Proposed
External Walls	Minimum total R-Value of 2.8	Documentation should incorporate insulation to achieve a minimum total R-Value of 3.2 for the overall construction Refer to Section 5.1 for an example assembly
Walls Separating Conditioned Spaces from Non Conditioned Spaces	Minimum total R-Value of 1.8	Documentation should incorporate insulation to achieve a minimum R-Value of 1.9 for the overall construction Refer to Section 5.1 for an example assembly
External Roof over conditioned areas	Minimum total R-Value of 3.2, with an external surface should also achieve a solar absorptance of less than or equal to 0.4.	Documentation should incorporate insulation to achieve a minimum R-Value of 4.25 (average upwards and downwards) for the total construction. Refer to Section 5.1 for an example assembly
Glazing	Varied to meet minimum DTS requirements. See Appendix A for completed ABCB glazing calculators.	Documentation should specify that all windows panes should achieve U-value of less than or equal to 3.6 W/m².K and SHGC of less than or equal to 0.51. Note that these figures do not include the impact of the frames. Glazing product to all external windows: *Viridian 6.38mm ComfortPlus Neutral 51*
Glazing to internal mall	Varied to meet minimum DTS requirements. See Appendix A for completed ABCB glazing calculators.	Viridian 6.38 Clear Mid-pane SHGC: 0.7 Mid-Pane U-Value: 6.5
Roof light over internal mall	Modelled at 5% of the room area serviced by the roof light. Total SHGC: 0.83 Total U-Value: 3.4	*Viridian 10.38mm ComfortPlus Grey 40* Mid-pane SHGC: 0.50 Mid-Pane U-Value: 3.6
Roof Glazing (clerestory)	Total SHGC: 0.30 Total U-Value: 3.4	*Viridian 6.38mm Optiview* Mid-pane SHGC: 0.77 Mid-Pane U-Value: 4.6

Domestic hot water, lifts, and travelators have been excluded in the reference case and proposed case. The energy consumptions will have no impact on the HVAC energy consumption.

5.1 External Fabric details

External Walls (minimum requirement R2.8) example

	Layer	Description	R-Value	Insulation product
OUTSIDE	1	Outdoor air film (4 m/s)	0.04	
	2	13mm PBD wall lining (either timber or ceramic times externally facing)	0.07	
	2a	90 Air Gap	0.17	
	3	92mm nominal top hat zone	2.73	Bradford PIR Board Thin R 60mm
	4	13mm PBD wall lining	0.07	
	5	Indoor air film (still air)	0.12	
INSIDE		**TOTAL**	**3.2**	

Roof (minimum requirement R4.25 average for winter and summer) example

			R-Value		
	Layer	Description	Winter (upwards)	Summer (downwards)	Insulation product
OUTSIDE	1	Outdoor air film (4 m/s)	0.04	0.04	
	2	Sheet Metal Roofing (0.4 to 0.6 SRI)	0	0	
	3	Insulation - Thermal blanket with foil faced	3.3	3.3	Bradford Anticon Blanket 140 foil faced down. 140 mm
	4	Clearance zone Air gap Assumes an air cavity in the roof. Reflective foil is faced down.	0.49	1.06	
INSIDE	6	Indoor air film (still air)	0.11	0.16	
		TOTAL	**3.94**	**4.56**	

Walls Separating Conditioned Spaces from Non Conditioned Spaces (minimum requirement R1.8) example

			R-Value		
	Layer	Description	Hollow core with insulation	Solid concrete option with insulation	Insulation product
OUTSIDE	1	Outdoor air film (4 m/s)	0.04	0.04	
	2a	150mm thick precast concrete wall panels (hollowcore)	0.14		
	2a	150mm thick precast concrete wall panels (solid)		0.1	
	3	40mm nominal top hat zone	1.58	1.58	Bradford PIR Board Thin R 15mm and 20 mm
	4	9mm FC Wall Lining	0.036	0.036	
	5	Indoor air film (still air)	0.12	0.12	
INSIDE		**TOTAL**	**1.916**	**1.876**	

6 Simulation Results

The Reference Building uses 1,329 MWh of energy per year, this is considered to be the maximum energy consumption for a Section J compliant building. The proposed current design uses 1,328 MWh of energy per year.

Table 4: HVAC Energy

	Reference Case	Proposed Case
Heating Energy (MWh)	433	482
Cooling Energy (MWh)	760	723
Ancillary (fans + pumps) (MWh)	136	123
Total	1329	1328

7 Conclusion

The proposed building fabric is estimated to use 1% less energy compared to the reference building and therefore the building has met the requirements of Section J.

APPENDIX A

NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

HELP

Building name/description: Eastern Creek

Application: shop display

Climate zone: 6

Storey: Ground

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	627m²	115m²	683m²	239m²	488m²		711m²		
Option B									n/a
Glazing area (A)	*146m²*	*115m²*	*329m²*	*213m²*	*240m²*	.....	*225m²*		

Number of rows preferred in table below: 18 *(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 System U-Value (AFRC)	Total System 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	Shop	E		4.50	14.70		6.0	0.30				0.00	1.00	1.00	66.15	20% of 93%
2	Shop	E		4.50	13.50		6.0	0.30				0.00	1.00	1.00	60.75	18% of 93%
3	Shop	E		4.50	4.00		6.0	0.30				0.00	1.00	1.00	18.00	5% of 93%
4	Shop	E		3.50	52.70		6.0	0.30				0.00	1.00	1.00	######	56% of 93%
5	Shop	W		3.50	50.50		6.0	0.30				0.00	1.00	1.00	######	78% of 79%
6	Shop	W		4.50	10.80		6.0	0.30				0.00	1.00	1.00	48.60	22% of 79%
7	Shop	N		4.50	18.00		6.0	0.30				0.00	1.00	1.00	81.00	55% of 31%
8	Shop	N		4.50	14.50		6.0	0.30				0.00	1.00	1.00	65.25	45% of 31%
9	Entrance	S		4.50	8.00		4.2	0.60				0.00	1.00	1.00	36.00	11% of 100%
10	Shop	S		3.50	7.70		4.2	0.60				0.00	1.00	1.00	26.95	9% of 100%
11																*ROW SKIPPED (OK if intentional)*
12	Shop	S		3.50	23.50		4.2	0.30				0.00	1.00	1.00	82.25	37% of 100%
13	Shop	S		4.50	21.00		4.2	0.30				0.00	1.00	1.00	94.50	43% of 100%
14	Shop	SE		4.50	42.60		2.2	0.20				0.00	1.00	1.00	######	90% of 97%
15	Shop	SE		3.50	6.00		2.2	0.20	1.400	4.500	0.31	1.00	0.97	0.96	21.00	10% of 97%
16	Shop	NE		4.50	18.00		6.0	0.45	4.500	4.500	1.00	0.00	0.23	0.38	81.00	71% of 84%
17	Entrance	NE		4.50	7.50		6.0	0.45	6.000	4.500	1.33	0.00	0.01	0.33	33.75	29% of 84%
18																

if inputs are valid