

Concord Hospital Concept and Stage 1 Redevelopment

NCC Section J Compliance Report

Prepared for:

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Prepared by:

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Date: 27 June 2018

Level 6, Building B, 207 Pacific Highway, St Leonards NSW 2065

Revision

REVISION	DATE	COMMENT	APPROVED BY
1	28/03/2018	SD Issue	NCJ
2	07/06/2018	SSDA Issue	NCJ
3	22/06/2018	70% Design Development Issue	NCJ
4	27/06/2018	70% Design Development Issue	NCJ

Qualifications to this Report

The following qualifications apply to this report:

- Information has been based on our understanding of the proposed building and documentation provided, as noted.
- This report outlines the scope of works required for NCC Section J compliance only.
- The project design team (including the Architect) will be required to review and consider the implications of these recommendations on their design for the project.
- For example:
 - Glazing selections have considered the thermal rating to the glazing and frame configurations only. The design team should also coordinate these recommendations with any specific acoustic, wind, structural, safety (during design and installation) or Architectural Design requirements for a particular project.
 - Different insulation products will have varying spatial allowances. The design team should coordinate the proposed insulation types, with specified R-values required throughout this report.

Disclaimer

This energy model provides an estimate of the base building's energy performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all of the intricacies of the building and its operation. As a result, the energy model 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 energy modelling results alone.

The results generated from this analysis are based on specific criteria outlined in the NCC Volume One and are not considered to be a true representation of the actual operation of the building. The intent of these criteria is to permit the comparison of the estimated annual energy consumption of a Proposed Building against that of a Reference Building and therefore determine if a specific building has the ability to be energy efficient.

The thermal properties described in the following report are to meet the minimum energy efficiency requirements stated by the NCC provisions only. It does not directly account for any requirements for the following aspects: Thermal Comfort, Vapour Barriers and Condensation, Wind, Impact and Structural, Acoustic requirements, Fire Requirements.

Revision

File Records

For records the files used in this report are as follows:

• All modelling completed on the basis of the following documents:

Drawing #	Drawing Name	Revision
1	Design Development Issued for Coordination	15/06/2018

• The following inputs and outputs are the basis of assessment for this report:

Record	Reference	Proposed
IES Thermal Model:	35503_Reference_Rev02.mit	35503_Proposed_Rev06.mit
Apache Vista File:	35503_Reference_Rev02.aps	35503_Proposed_Rev06.aps
Energy Analysis Results	35503_JV3_Energy Model_Template Rev 6.4 (VE2017)_03.xlsm	
Reference Glazing Calculators	35503_Lower Ground_Class 6_CalculatorGlazingVolOne2014.xlsx 35503_Lower Ground_Class 9a_CalculatorGlazingVolOne2014_001.xlsx 35503_Ground_CalculatorGlazingVolOne2014_001.xlsx 35503_Level 1_CalculatorGlazingVolOne2014_001.xlsx 35503_Level 2_CalculatorGlazingVolOne2014_001.xlsx 35503_Level 3_CalculatorGlazingVolOne2014_001.xlsx 35503_Level 4_CalculatorGlazingVolOne2014_001.xlsx 35503_Level 4_CalculatorGlazingVolOne2014_001.xlsx	NA

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1. Executive Summary

This report has been prepared at the instruction of Concord Hospital Local Health District for the proposed development located at Hospital Road, Concord, NSW 2139.

1.1 Description of Works

This SSDA report seeks consent for the proposed redevelopment of Concord Repatriation General Hospital to improve and replace outmoded facilities to meet the substantial growth in clinical service demand across the hospital's catchment:

- Concept approval is sought for the redevelopment indicatively comprising 82,000sqm GFA, to be undertaken in two (2) stages including:
 - o Clinical Services Building (CSB) and multi storey carpark (Stage 1); and
 - Acute Services Building (ASB) and multistorey carpark (Stage 2).
- Detailed approval is sought for the Stage 1 construction of the proposed CSB (44,000sqm GFA) and the construction of a multi-storey car park located to the north of Hospital Road.

Detailed development approval for the proposed Stage 2 works will be completed at a later date and does not form part of this SSDA. The Stage 1 Detailed works are estimated to be completed by end 2021.

The proposed Concept redevelopment is in accordance with the concept architectural package prepared by Jacobs.

The proposed Stage 1 detailed development (CSB and multistorey carpark) is in accordance with the architectural drawings prepared by Jacobs.

The areas in the below staging plans have been assessed and are included within this report.

STAGE 1 PROPOSAL



STAGE 2 FUTURE EXPANSION



1.2 Secretary's Environmental Assessment Requirements (SEARs)

The thermal performance construction details and energy modelling results in this report describe measures that would be implemented to minimise consumption of energy. This is in direct response to Key Issue No.6 – Ecological Sustainable Development and the SEARs Concept – Item 7.

The purpose of this investigation is to review the development against the NCC (2016) Section J Requirements utilising the following methodology:

- Part J1 to J2 JV3 Performance Engineered Approach
- Part J3 Deemed-to-Satisfy Prescriptive requirements
- Demonstrate a 10% improvement compared to a Section J DTS solution.

1.3 Limitations

A Section J assessment can only be undertaken against the proposed detailed Stage 1 works. An assessment for the Stage 2 works is unable to be undertaken at this time. Further assessments will be undertaken as part of detailed design processes for the future Stage 2 works. Stage 2 is capable of complying with Section J and the method of compliance will be provided when the Section J assessment is completed.

1.4 Findings

Subject to the conditions and requirements noted in this report, the proposed development is considered to comply with the NCC Volume One Section J JV3 requirements.

It is noted that any variation to the conditions and requirements may impact the performance out comes and impact the level of compliance.

Table 1 Energy consumption summary and comparison.

Model	Energy Consumption (MWh)	Comparison	Compliance
Reference Building	3,416	-	-
Proposed Building	3,000	87.8%	Compliant

Where:

Reference Building = Building with Building Code of Australia minimum compliance constructions. Proposed Building = Building with proposed constructions.

1.5 Conditions and Requirements

1.5.1 Performance Requirements – Façade

The Façade shall comply with the performance requirements outlined within this report;

- Location of insulation and the building fabric thermal performance requirements
- Glazing thermal performance requirements

The thermal performance of all construction materials associated with this specification has been summarised in Section 3.1.3.

Reference is made to A.1.APPENDIX A for mark-up indicating extent of any added insulation included within the construction specifications.

1.5.2 Prescriptive Requirements

In addition to the performance related compliance requirements outlined above, there are further prescriptive Section J elements which must be complied with. These are outlined below and shall be complied with during the delivery phase of the project.

- A.1.APPENDIX E Part J1 Building Fabric
- A.1.APPENDIX F Part J3 Building Sealing

1.6 Building Fabric

1.6.1 Construction Thermal Performance

Overall thermal performance of the building fabric is shown below. Refer to A.1.APPENDIX A for the locations of insulation.

Table 2 Building fabric thermal performance requirements.

Roof Type	Ceiling Type	Solar Absorbtance	Total Roof R-value (m2K/W)	Minimum Typical Insulation (m2K/W)	Example insulation requirement
Metal	Horizontal Ceiling (reflective cavity)	0.4	4.42	3.00	e.g. Anticon 195 under roof
Concrete	Horizontal Ceiling (unreflective cavity)	0.7	0.43	None	
Concrete	Horizontal Ceiling (unreflective cavity)	0.7	4.2	3.70	e.g. Anticon 195 under roof

External Walls	Total Wall R-value (m ² K/W)	Typical Insulation R-value (m ² K/W)	Example insulation requirement
Airspace (non-reflective)	3.3	3.0	e.g. 165 mm glasswool batt

Internal Walls	Total Wall R-value (m ² K/W)	Typical Insulation R-value (m ² K/W)	Example insulation requirement
Airspace (non-reflective)	1.0	0.7	e.g. 140 mm glasswool batt or 25 mm rigid board

Floor Type	In-slab / Screed system	Total Floor R-value (m2K/W)	Typical Insulation R-value (m2K/W)	Example insulation requirement
Suspended Slab above enclosed space	No in-slab heating or cooling	1	0.78	e.g. 25 mm rigid board

Table 3 External glazing thermal performance requirements.

Window Type	Location	U-value (W/m ² K)	SHGC
Double Low-e Neutral Glass in Aluminium Frame	All	3.47	0.43
Single Clear Glass in Aluminium Frame	Internal windows	6.45	0.76

Table 4 Roof light thermal performance requirements.

Roof Light Type	Location	U-value (W/m ² K)	SHGC
Double Glazed in Aluminium Frame	Corridor atrium	3.4	0.34

2. Introduction

2.1 Section J Objective

It is understood that the objective is as follows:

- Confirm compliance with the Parts J1 to J2 of Section J of the NCC Volume One(2016) utilizing the "JV3 Verification using a Reference Building" method
- Confirm compliance with the Parts J3 Section J of the NCC Volume One(2016)
- Part J4 Section J of the NCC Volume One(2016) is not applicable.
- Demonstrate a 10% improvement compared to a Section J DTS solution.

It is noted that all modelling has been carried out in accordance with NCC Volume One Specification JV. Refer to A.1.APPENDIX D for Verification Using a Reference Building protocol.

This report should be read in conjunction with all relevant plans and specifications and any supplementary regulatory information.

2.2 Site Context

The JV3 solution applies to the development area highlighted in Figure 1.



Figure 1 Applicable location(s) of the JV3 solution.

2.3 Development Overview

Property Title	Concord Repatriation General Hospital
Address	Hospital Road, Concord, NSW 2139
Number of storeys	9
Building Description	Hospital
NCC Volume	2016
NCC Volume One Climate Zone	5
Name and Version of the Software used in the Analysis	IES Virtual Environment, v2017



Figure 2: BCA Climate Map (abcb.gov.au)

2.4 Building Function and BCA Classification

The following Building Classifications (As defined by BCA) have been identified for this development:

Table 5: BCA Building Function and BCA Classification

BCA Class	Included/Excluded
5	\checkmark
9a (Ward)	\checkmark

Carparks are excluded from Sections J1-J3 due as they do not require air-conditioning.

3. JV3 Methodology

Compliance is verified when it is determined that the estimated annual energy consumption of the Proposed Building with its services is not more than the estimated annual energy consumption of a (deemed-to-satisfy compliant) Reference Building when:

- i. The Proposed Building is modelled with the proposed services; and
- ii. The Proposed Building is modelled with the same services as the Reference Building.
- iii. The Proposed Building is modelled with the proposed services and is 10% less than the estimated annual energy consumption of a Reference Building.

3.1 Modelling Assumptions



Figure 3 Images of the JV3 model.

3.1.1 Internal Loads

The internal loads for both the Proposed and Reference Buildings are as per the design requirements stipulated in the NCC Volume One Section J.

Profiles

Occupancy, lighting, equipment and HVAC plant throughout the site were estimated to operate in accordance with the NCC Volume One JV Specifications.

Refer to A.1.APPENDIX B – Occupancy and Operational Profiles for complete summary of modelling inputs.

Lighting Levels

The lighting load allowances incorporated into the energy model were as per allowances within NCC Volume One Section J6.

Zone	Lighting Load (W/m ²)
IZ General_Circulation 12 hour	8
IZ General_COMMS and Data	9
General_Circulation 12 hour	8
IZ Class 5_Office	9
Class 5_Office	9
Class 5_Common Rooms	10
Class 9a Ward_Patient Care	7
General_COMMS and Data	9
Class 3_GYM	10
Class 5_Boardroom or Meeting Room	9

Occupant Density & Heat Gains

The occupant densities applied to the model are accordance with the requirements stipulated in the NCC Volume One Section D, Part D1, Table D1.13.

Description	Sensible Heat (W/person)	Latent Heat (W/person)
JV3 Allowance	75	55

Zone	Occupant Density (m ² per person)
IZ Class 5_Office	10
Class 5_Office	10
Class 5_Common Rooms	10
Class 9a Ward_Patient Care	10
Class 3_GYM	3
Class 5_Boardroom or Meeting Room	2

Appliances and Equipment

The allowances for sensible and latent heat gain from equipment to all heating and cooling zones throughout the site as per the requirements stipulated in NCC Volume One Section J, Specification JV, Table 2h.

Zone	Sensible (W/m ²)	Latent (W/m ²)
IZ Class 5_Office	15	0
Class 5_Office	15	0
Class 9a Ward_Patient Care	5	0
Class 5_Boardroom or Meeting Room	15	0

3.1.2 Reference Building with Reference Services

Construction Thermal Performance

Building fabric constructions are in accordance with the Deemed-to-Satisfy requirements in NCC Volume One Section J1.

Glazing Thermal Performance

The glazed areas used for the Reference Building were calculated using the NCC Volume One Section J2 Glazing Calculator (Method 2).

Building Services

Heating and Air Conditioning

The following attributes for the HVAC system are in accordance with the Deemed-to-Satisfy requirements in NCC Volume One Specifications J5.2d and J5.2e:

Cooling COP:	5.2
Heating Efficiency:	0.80
Cooling Fuel:	Grid Electricity
Heating Fuel:	Natural Gas

In accordance with Specification JV Clause 2 (a) (i) the space temperature of the Reference Building is within the range of 18° C DB to 26° C DB for 98% of the plant operation time.

Space Temperature Range Cooling Load Set-point: 24 Heating Load Set-point: 21

Mechanical Ventilation Rate – Outside Air

Mechanical ventilation has been modelled at the rates of introduction of outside air as per the design requirements stipulated in AS 1668.2.

Infiltration Air Change Rate

Infiltration air change rates have been modelled in accordance with NCC Volume One Section J JV3 (d) (i) (F).

Domestic Hot Water, Lifts, and Escalators

Domestic hot water energy consumption, lifts, and escalators have been excluded from the calculation in accordance with the NCC Volume One Specification JV3.

3.1.3 Proposed Building with Proposed Services

Construction Thermal Performance

Overall thermal performance of the building fabric is shown below. Refer to A.1.APPENDIX A for the locations of insulation.

Roof Type	Ceiling Type	Solar Absorbtance	Total Roof R-value (m2K/W)	Minimum Typical Insulation (m2K/W)	Example insulation requirement
Metal	Horizontal Ceiling (reflective cavity)	0.4	4.42	3.00	e.g. Anticon 195 under roof
Concrete	Horizontal Ceiling (unreflective cavity)	0.7	0.43	None	
Concrete	Horizontal Ceiling (unreflective cavity)	0.7	4.2	3.70	e.g. Anticon 195 under roof

Table 6 Building fabric thermal performance requirements.

External Walls	Total Wall R-value (m ² K/W)	Typical Insulation R-value (m ² K/W)	Example insulation requirement
Airspace (non-reflective)	3.3	3.0	e.g. 165 mm glasswool batt

Internal Walls	Total Wall R-value (m ² K/W)	Typical Insulation R-value (m ² K/W)	Example insulation requirement
Airspace (non-reflective)	1.0	0.7	e.g. 140 mm glasswool batt or 25 mm rigid board

Floor Type	In-slab / Screed system	Total Floor R-value (m2K/W)	Typical Insulation R-value (m2K/W)	Example insulation requirement
Suspended Slab above enclosed space	No in-slab heating or cooling	1	0.78	e.g. 25 mm rigid board

Refer to A.1.APPENDIX A for Insulation Mark-ups showing the location of each insulation type.

Glazing Thermal Performance

The project external glazing shall have the total thermal performance values as outlined in **Error! Reference source not f ound.**. These are whole of window properties and include the glass and frame combined. An indicative glass and frame type is provided for information only. Final glazing selection must comply with the performance limits set by the whole of window U-value and SHGC.

Table 7 External glazing thermal performance requirements.

Window Type	Location	U-value (W/m ² K)	SHGC
Double Low-e Neutral Glass in Aluminium Frame	All	3.47	0.43
Single Clear Glass in Aluminium Frame	Internal windows	6.45	0.76

Roof Light Thermal Performance

The project rooflights shall have the total thermal performance values as outlined in Table 7. These are whole of window properties and include the glass and frame combined. An indicative glass and frame type is provided for information only. Final glazing selection must comply with the performance limits set by the whole of window U-value and SHGC.

Table 8 Roof Light thermal performance requirements.

Window Type	Location	U-value (W/m ² K)	SHGC
Double Glazed in Aluminium Frame	Corridor atrium	3.4	0.34

Building Services

Heating and Air Conditioning				
Cooling COP:	5.2			
Heating Efficiency:	0.95			
Cooling Fuel:	Grid Electricity			
Heating Fuel:	Natural Gas			

Space Temperature Range

Cooling Load Set-point:	24
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Heating Load Set-point: 21

Mechanical Ventilation Rate – Outside Air

Mechanical ventilation has been modelled at the rates of introduction of outside air as per the design requirements stipulated in AS 1668.2.

<u>Lighting</u>

Lighting loads are assumed 10% lower than the BCA maximum allowable lighting loads. This is an assumption based on previous projects, which will be updated once proposed lighting loads are provided.

4. Modelling Results

The following annual energy consumption has been taken from the IES Virtual Environment Vista results file for the site:

Energy Consumption	Source	Energy Demand (MWh/annum)		Energy Demand Improvement on Reference	
		REFERENCE	PROPOSED		
Heating	Natural Gas	996.7	739.6	25.8%	
Cooling	Grid Electricity	1,020.0	978.0	4.1%	
Lighting	Grid Electricity	1,399.4	1,281.9	8.4%	
TOTAL		3,416	3,000	12.2%	





4.1 Model Verification

In accordance with Specification JV3 (d) (i) (D) the space temperature of the Reference Building must be within the range of 18°C DB to 26°C DB for 98% of the plant operation time and must be consistent between Reference and Proposed Buildings.

In order to verify this requirement, IES Virtual Environment's Vista analysis software module was utilised to assess the results for each of the nominated heating and cooling zones. A check was carried out to identify the percentage of total hours per annum (between this range) that the space temperature was outside this specified temperature band during the HVAC profile hours (refer to A.1.APPENDIX B - Occupancy and Operational Profiles). The results of this are noted below.

Table 10 Modelling Results – Model Verification Results

	Air temperature			
	<= 18.00	>18.00 to <=26.00	> 26.00	% Outside Range
REFERENCE PROJECT	0.0%	100.0%	0.0%	0.0%
PROPOSED PROJECT	0.0%	100.0%	0.0%	0.0%
	Section J Compliant	Yes		

4.2 Conclusion

The modelling results indicate that the proposed building with the reference services (case 2) will perform better than the reference (DTS) scenario.

Therefore, it can be confirmed that the proposed building with the design specification outlined within this report meets the requirements of the NCC Volume One Section J1 to J2 utilising the "JV3 – Verification using a Reference Building" method.

Professional Engineer / Appropriately Qualified Person

Name: Nicholas Johnson Date: 22/06/2018

APPENDIX A Insulation Mark-ups

INSULATION MARK-UPS

APPENDIX B Occupancy and Operational Profiles

The below tables are an extract from NCC Volume One Section J, Specification JV, Occupancy and Operational profiles.

Class 6 (Shop) Profiles

Hours of Day	Occupancy	Lighting	Equipment	HVAC
(Local Standard Time)	(Daily)	(Daily)	(Daily)	(Daily)
12:00am to 1:00am	0%	10%	10%	Off
1:00am to 2:00am	0%	10%	10%	Off
2:00am to 3:00am	0%	10%	10%	Off
3:00am to 4:00am	0%	10%	10%	Off
4:00am to 5:00am	0%	10%	10%	Off
5:00am to 6:00am	0%	10%	10%	Off
6:00am to 7:00am	0%	10%	10%	Off
7:00am to 8:00am	10%	100%	70%	On
8:00am to 9:00am	20%	100%	70%	On
9:00am to 10:00am	20%	100%	70%	On
10:00am to 11:00am	15%	100%	70%	On
11:00am to 12:00am	25%	100%	70%	On
12:00pm to 1:00pm	25%	100%	70%	On
1:00pm to 2:00pm	15%	100%	70%	On
2:00pm to 3:00pm	15%	100%	70%	On
3:00pm to 4:00pm	15%	100%	70%	On
4:00pm to 5:00pm	15%	100%	70%	On
5:00pm to 6:00pm	5%	100%	70%	On
6:00pm to 7:00pm	5%	100%	70%	Off
7:00pm to 8:00pm	0%	10%	10%	Off
8:00pm to 9:00pm	0%	10%	10%	Off
9:00pm to 10:00pm	0%	10%	10%	Off
10:00pm to 11:00pm	0%	10%	10%	Off
11:00pm to 12:00pm	0%	10%	10%	Off
Equivalent Peak Hours	1.9	13.2	9.6	11



Class 9a	Ward area	Profiles

Hours of Day	Occupancy	Lighting	Equipment	HVAC
(Local Standard Time)	Daily	Daily	Daily	Daily
12:00am to 1:00am	85%	5%	100%	On
1:00am to 2:00am	85%	5%	100%	On
2:00am to 3:00am	85%	25%	100%	On
3:00am to 4:00am	85%	80%	100%	On
4:00am to 5:00am	85%	80%	100%	On
5:00am to 6:00am	85%	50%	100%	On
6:00am to 7:00am	85%	20%	100%	On
7:00am to 8:00am	85%	20%	100%	On
8:00am to 9:00am	85%	20%	100%	On
9:00am to 10:00am	85%	20%	100%	On
10:00am to 11:00am	85%	20%	100%	On
11:00am to 12:00am	85%	20%	100%	On
12:00pm to 1:00pm	85%	20%	100%	On
1:00pm to 2:00pm	85%	20%	100%	On
2:00pm to 3:00pm	85%	20%	100%	On
3:00pm to 4:00pm	85%	20%	100%	On
4:00pm to 5:00pm	85%	20%	100%	On
5:00pm to 6:00pm	85%	50%	100%	On
6:00pm to 7:00pm	85%	50%	100%	On
7:00pm to 8:00pm	85%	50%	100%	On
8:00pm to 9:00pm	85%	50%	100%	On
9:00pm to 10:00pm	85%	50%	100%	On
10:00pm to 11:00pm	85%	50%	100%	On
11:00pm to 12:00pm	85%	5%	100%	On
Equivalent Peak Hours	20.4	7.7	24.0	24



APPENDIX C JV3 Verification Using a Reference Building

- (a) For a Class 3, 5, 6, 7, 8 or 9 building, compliance with JP1 is verified when it is determined that the annual energy consumption of the proposed building with its services is not more than the annual energy consumption of a reference building when—
 - (i) the proposed building is modelled with the proposed services; and
 - (ii) the proposed building is modelled with the same services as the reference building.
- (b) The annual energy consumption of the proposed building in (a) may be reduced by the amount of energy obtained from—
 - (i) an on-site renewable energy source; or
 - (ii) another process as reclaimed energy.
- (c) The annual energy consumption calculation method must comply with the ABCB Protocol for Building Energy Analysis Software.
- (d) The annual energy consumption in (a) must be calculated—
 - (i) for the reference building, using—
 - (A) the Deemed-to-Satisfy Provisions for Parts J1 to J7 but including only the minimum amount of mechanical ventilation required by Part F4; and
 - (B) a solar absorptance of 0.6 for external walls and 0.7 for roofs; and
 - (C) the maximum illumination power density without any increase for a control device illumination power density adjustment factor; and
 - (D) air-conditioning with the conditioned space temperature within the range of 18° CDB to 26°
 CDB for 98% of the plant operation time; and
 - (E) the profiles for occupancy, air-conditioning, lighting and internal heat gains from people, hot meals, appliances, equipment and heated water supply systems—
 - (aa) of the actual building—
 - (AA) if the operating hours per year are not less than 2 500; or
 - (BB) if the daily operating profiles are not listed in Specification JV; or
 - (bb) of Specification JV; and
 - (F) infiltration values—
 - (aa) 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
 - (bb) for the whole building, when pressurising plant is not operating, 1.5 air change per hour; and
 - (ii) for both the proposed building and the reference building using the same
 - (A) annual energy consumption calculation method; and
 - (B) location, being either the location where the building is to be constructed if appropriate climatic data is available, or the nearest location with similar climatic conditions, for which climatic data is available; and
 - (C) adjacent structures and features; and
 - (D) environmental conditions such as ground reflectivity, sky and ground form factors, temperature of external bounding surfaces, air velocities across external surfaces and the like; and
 - (E) orientation; and
 - (F) building form, including—
 - (aa) the roof geometry; and
 - (bb) the floor plan; and
 - (cc) the number of storeys; and
 - (dd) the ground to lowest floor arrangements; and (ee) the size and location of glazing; and

- (G) external doors; and
- (H) testing standards including for insulation, glazing, water heater and package air-conditioning equipment; and
- (I) thermal resistance of air films including any adjustment factors, moisture content of materials and the like; and
- (J) dimensions of external, internal and separating walls; and
- (K) surface density of envelope walls over 220 kg/m2; and
- (L) quality of insulation installation; and
- (M) assumptions and means of calculating the temperature difference across air- conditioning zone boundaries; and
- (N) floor coverings and furniture and fittings density; and
- (O) internal shading devices, their colour and their criteria for operation; and
- (P) number, sizes and floors served by lifts and escalators; and
- (Q) range and type of services and energy sources other than energy generated on-site from sources that do not emit greenhouse gases such as solar and wind power; and
- (R) internal artificial lighting levels; and
- (S) internal heat gains including people, lighting, appliances, meals and other electric power loads; and
- (T) air-conditioning system configuration and zones; and
- (U) daily and annual profiles of the-
 - (aa) building occupancy; and
 - (bb) operation of services; and
- (V) range of internal temperatures and plant operating times; and
- (W) supply heated water temperature and rate of use; and
- (X) infiltration values unless there are specific additional sealing provisions or pressure testing to be undertaken; and
- (Y) unit capacity and sequencing for water heaters, refrigeration chillers and heat rejection equipment such as cooling towers; and
- (Z) metabolic rate for people; and
- (iii) for the proposed building using a solar absorptance for the roof and walls 0.05 higher than that proposed; and
- (e) Where the annual energy consumption of the heated water supply or the lifts and escalators are the same in the proposed building and the reference building, they may be omitted from the calculation of both the proposed building and the reference building.
- (f) A lift in a building with more than one classification may be proportioned according to the number of storeys of the part for which the annual energy consumption is being calculated.
- (g) The design must include—
 - the ability to achieve all the criteria used in the annual energy consumption calculation method such as having an automatic operation controlling device capable of turning lighting, and air-conditioning plant on and off in accordance with the occupancy and operating profiles used; and
 - (ii) compliance with—
 - (A) J1.2 for general thermal construction; and
 - (B) J1.3(c) for compensation for a loss of ceiling insulation; and
 - (C) J1.6(a)(ii), J1.6(c), J1.6(d) and J1.6(e) for floor edge insulation; and
 - (D) BS 7190 for testing a water heater; and
 - (E) AS/NZS 3823.1.2 at test condition T1 for testing package air-conditioning equipment not less than 65 kWr; and
 - (F) AHRI 550/590 for testing a refrigeration chiller; and
 - (G) Part J8 for facilities for energy monitoring.

APPENDIX D Section J JV3 Modelling Parameters

	N		
Parameter	Verification	value	Comment
	Reference		
Thermostat Setpoint	JV3 (d)(i)(D)	18ºC to 26ºC (98% of time)	Confirmed. See Section 0: Model Verification
Daily Occupancy	JV2 (a)(i)	Profiles per BCA	As per BCA Class specification
Operating Profiles	JV2 (a)(i)	Profiles per BCA	As per BCA Class specification
Illumination power density	Table J6.2b	As per BCA provisions	See Section 2: Modelling Inputs
Ventilation	JV (2)(a)(iv)	As per BCA provisions	NCC BCA Part F4, and AS1668.2
Internal Heat Gains	JV (2)(a)(i)(iii)- A,B,C	As per BCA provisions	See Section 2: Modelling Inputs
Infiltration (perimeter)	JV3 (d)(i)(F)	1.0 Air Changes per Hour (ACH)	Plant on
		1.5 ACH	Plant off
Operation of blinds		Excluded from assessment	Reference and Proposed Models
Furniture and fitings		Excluded from assessment	Reference and Proposed Models
R-Value of air films		As per J1.2	As per Calculation methodology
Heat Migration		Migration across HVAC zones - On.	As per Calculation methodology
Artificial Lighting		As per BCA provisions	See Section 3: Modelling Inputs
Lifts		Excluded from assessment	Reference and Proposed Models
Hot Water		Excluded from assessment	Reference and Proposed Models
Non-Greenhouse Gas		Excluded from assessment	Reference and Proposed Models
enincing energy sources			
Thermal Calculation	JV3 (c), (d) (ii)	IES-VE, ASHRAE Perth TRY	Complies with the ABCB Protocol for Building
Method	(B)		Modelling and Analysis (Software).

APPENDIX E Part J1 – Building Fabric

The following prescriptive performance requirements for the façade must be adhered to, as per the NCC:

J1.2 – Thermal Construction General

Insulation must comply with AS/NZS 4859.1 and be installed so that it:

- Abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must butt against the member; and
- Forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and
- Does not affect the safe or effective operation of a service or fitting.
- Reflective insulation must be installed with:
 - The necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding; and
 - The reflective insulation closely fitted against any penetration, door or window opening; and
 - The reflective insulation adequately supported by framing members; and
 - Each adjoining sheet of roll membrane being:
 - Overlapped not less than 50mm; or
 - Taped together

Bulk insulation must be installed so that:

- It maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like; and
- In a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall by not less than 50mm

J1.3 (d) – Roof and ceiling construction

- A roof that
 - Is required to achieve a minimum Total R-Value; and
 - has a metal sheet roofing fixed to metal purlins, metal rafters or metal battens; and
 - does not have a ceiling lining or has a ceiling lining fixed directly to those metal purlins, metal rafters or metal battens

must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed between the metal sheet roofing and its supporting purlins, metal rafters or metal battens.

J1.5 (c) – Walls

- A wall that
 - Is required to achieve a minimum Total R-Value; and
 - has a lightweight external cladding such as weatherboards, fibre-cement or metal sheeting fixed to a metal fame; and
 - does not have a wall lining or has a wall lining fixed directly to the same metal frame

must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed between the metal sheet roofing and its supporting purlins, metal rafters or metal battens.

J1.6 (a) – Floors

A floor that is part of the envelope of a building, other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, including a floor above or below a carpark or a plant room –

- Must achieve the total R-Value specified in table J1.6; and
- With an in-slab or in-screed heating or cooling system, must be insulated around the vertical edge of its perimeter with insulation having an R-Value of not less than 1.0.

J1.6 (b) – Floors

In climate zones 1 to 6, the minimum Total R-Value required in (a) may be reduced by R0.5 provided R0.75 is added to the Total R-Value required for the roof and ceiling construction.

J1.6 (c) – Floors

A concrete slab-on-ground-

- With an in-slab or in-screed heating or cooling system; or
- Located in climate zone 8,

Must have insulation installed around the vertical edge of its perimeter.

J1.6 (d) – Floors

Insulation required by (c) must-

- Have an R-Value of not less than 1.0; and
- Be water resistant; and
- Be continuous from the adjacent finished ground level-
 - To a depth of not less than 300mm; or
 - For the full depth of the vertical edge of the concrete slab-on-ground.

J1.6 (e) – Floors

The requirements of (a)(ii) and (c)(i) do not apply to an in-screed heating or cooling system used solely in a bathroom, amenity area or the like.

APPENDIX F Part J3 – Building Sealing

The following prescriptive performance requirements for the façade must be adhered to, as per the NCC:

J3.4 – External Windows and Doors

A seal to restrict air infiltration must be fitted to each edge of all external doors, openable external windows or the like. A seal maybe a foam or rubber compressible strip, fibrous seal or the like.

These requirements do not apply to:

- A window complying with AS 2047; or
- An external louvre door, louvre window, or other such opening; or
- A fire door; or
- A roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security

All doors to the conditioned zone must have a self-closing device.

J3.5 – Exhaust Fans

Any miscellaneous exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving a conditional space. This requirement will be documented by the Mechanical Services consultant.

J3.6 – Construction of roofs, walls and floors

Roofs, external walls, external floors and any opening such as a window, door or the like must be constructed to minimise air leakage. All Constructions must be:

- Enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
- Sealed by caulking, skirting, architraves, cornices or the like.

These requirements do not apply to openings, grilles and the like required for smoke hazard management.