



Dural Group
Consulting

Section J Report(JV3)

11-13 Albert Road & 2-6 Pilgrim avenue
Stratified 2135

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1 EXECUTIVE SUMMARY

The proposed Shops in the mixed used development at 11-13 Albert Road & 2-6 Pilgrim Avenue, Stratified 2135, has been assessed utilizing computer simulation modelling against the requirements of Verification Method JV3 to determine the performance requirements for building fabric and external glazing to comply with Section J. The findings of the assessment are summarised below.

Total Annual Green House gas Emission ((kgCO ₂ -e/GJ))	
Run-1(Case 1) Reference Building	Run-2(Case 2/3) Proposed Building with Reference Building
59100	55736

The above table shows that the total annual Green House Gas Emission for the proposed building (Case 2/3) is less than the reference building (Case 1). Therefore the proposed building fabric (J1) is compliant with the performance requirement JP1 using JV3.

The DTS requirements for all services as noted in Section J Parts J3 – J7 must be complied with to satisfy performance requirement JP1.

1.1 Building Fabric

As per JV3 Verification Method Provisions of BCA 2019 Volume 1, compliance with Part J1 can be met subject to the following specifications:

Case 2/3 – Proposed Building Model			
Reference construction	Added Insulation	Total R (m ² K/W)	Insulation description
<i>Roof / Ceiling</i>			
RF-1	3.0	3.77	PIR foam or equivalent fix under the concrete roof
<i>External Walls</i>			
WT-1	2.0	2.55	70 mm Bulk insulation or equivalent PIR
<i>Internal Walls</i>			
WT-2	2.0	2.48	70 mm Bulk insulation or equivalent PIR
<i>Floor</i>			
F-1	Nil	0.52	Nil Requirement- Concrete Slab above carpark

It has been noted that all constructions including installed insulation must meet the general thermal construction requirements of Clause J1.2 that are outlined in Section 4.1.1.

1.2 Glazing

Compliant glazing system selections have been suggested based on actual certified products from the WERS website that comply with the requirements of Section J.

Glass Configuration	U-Value	SHGC
DbI Glazed High Solar Gain low-E Clear	2.9	0.51

Should a different product be selected for the development, the U-Value and SHGC to be equal or lower than that is outlined.

2 INTRODUCTION

Dural Group have been commissioned to assess the compliance with Section J of the National Construction code (NCC)-2019 of the proposed commercial component (Shop) of the mixed use development at 11-13 Albert Road& 2-6 Pilgrim avenue, Stratified 2135.

2.1 Purpose

The purpose of the report is to provide the minimum requirements of the building fabric and the glazing required for compliance with JP1 when applying the JV3 verification method. It is to note that the compliance requirements of Parts J5 – J8 are still need to achieve due to the scope of the assessment

2.2 Methodology

The methodology used in this report includes the following steps:

- Review Section J Deemed-to-Satisfy requirements and the Verification Method JV3 applicable to the development.
- Prepare computer simulation models as required for JV3 to calculate the energy consumption.
- Compare the energy consumption of the models to assess compliance with Section J.
- Provide recommendations to discover the most appropriate solution for adoption.

2.3 Limitations

The DTS requirements for all services in Section J Parts J3 – J7 of NCC 2019 must be complied with to satisfy performance requirement JP1.

2.4 Building Description

The 11-13 Albert Road& 2-6 Pilgrim Avenue development is a 12 storey mixed use development consisting of apartment unit (Residential) and 3 shops (Commercial).

2.5 Climate Zone & Building Classification



The proposed development falls within Climate Zone 5 according to Part A1 of the BCA.

The Building has been classified as Class 6 (Retail Shop) according to Part A6 of the BCA.

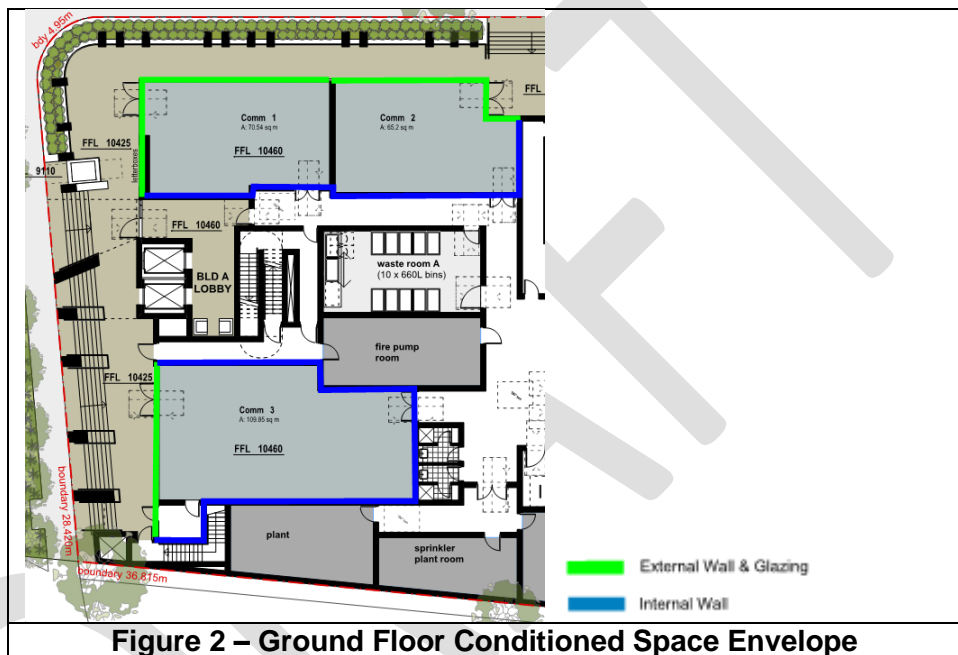
2.6 Documentation

The following documentation was used in the preparation of this report

- Latest Architectural Drawings: -Kenedy Associates Architects-(DA Issue-A, dated 17/12/2020)
- BCA 2019 – Volume One
- ASHRAE Fundamentals Handbook
- Viridian Glass Specifiers Guide

2.7 Conditioned Space Envelope of the Development

The following diagrams identify the conditioned space envelopes of the levels to determine the requirements under Section J.



3 ENERGY ANALYSIS: ALTERNATIVE METHOD (COMPUTER SIMULATION):

The following section describes the computer simulation modelling process to demonstrate compliance with Verification Method JV3.

3.1 Simulation Software

The Design Builder and Energy Plus whole building energy simulation software packages have been utilized for the purpose of predicting energy performance of the development. Energy Plus is a simulation program designed for modeling buildings with all their associated heating, cooling, lighting, ventilating, and other energy flows. Energy Plus is a stand-alone simulation engine without a 'user friendly' graphical interface. Energy Plus simulation software is certified in accordance with ANSI/ASHRAE Standard 140-2001: "Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs",

3.2 Weather Data

NATHERS Hourly data file for Sydney climate data has been used for the analysis . This data file was selected as it was the nearest available data set location to the development that is within the same BCA climate zone 5.

3.3 Analysis

To demonstrate compliance with Verification Method JV3, a thermal calculation method must be used to calculate the annual energy consumption of the proposed building not being more than the annual energy consumption of a reference building where the buildings have been modelled in accordance with the clauses of NCC Section J, JV3.

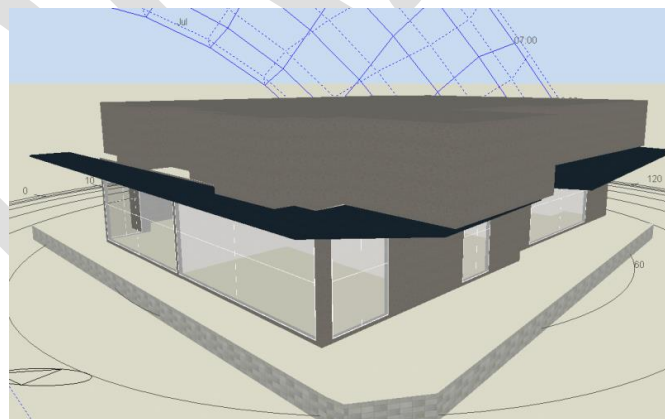


Figure 3 – DesignBuilder (DB) Dynamic Thermal Simulation Model (commercial part)

**Note: This is an DB model depiction of the commercial component of the mixed use development and does not indicate all architectural detail but necessary information were taken.*

The proposed mixed-use development consists of mainly residential areas (energy assessment will cover by NatHERS and BASIX assessment) in Level 1-12 and commercial tenancies (shops) on Ground Floor. As such, the JV3 assessment was carried out in accordance with the corresponding calculation inputs as outlined in Section 3.6 of this report.

3.4 Building – JV3

In accordance with JV3, following simulation cases are constructed for comparison to demonstrate compliance:

Modelling Case	Title	Description
Case 1	Reference Building+ Reference Services	All building elements and services are modelled as per the dimensional design and system type in compliance with the minimum DTS performance provisions.
Case 2	Proposed Building + Proposed Services	All building elements and services are modelled as per the proposed design.
Case 3	Proposed Building + Reference Services	All building elements are modelled as per the proposed design and the services are modelled the same as Case 1.

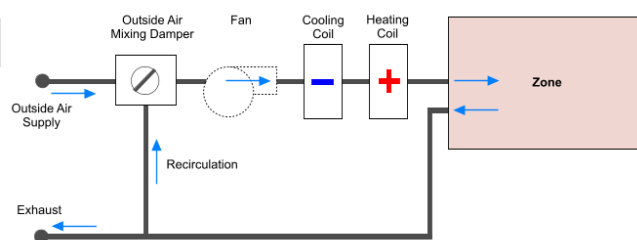
Table 2 – JV3 Simulation Modelling Cases

However we assumed that the proposed service will be equal or better than the reference services. Therefore only two models Case 1 and Case 2/3 will be constructed for comparison.

3.5 Air Conditioning System

It is assumed that reverse cycle Air-conditioning system will be used in the shop. The information below provides a summary of the key features of the air conditioning system modeled.

Fan Coil Compact HVAC Airflow Schematic



- Air-conditioning system selection: Reverse cycle Heat pump with COP of 2.7(Cooling) and COP of 3.0 (Heating).
- Conditioned space temperature with dead band: 21-24C±3
- Outside Air: In accordance with Part F4 (AS1668.2)

3.6 Simulation Input:

Location: Stratified, NSW 2135

Orientation : 290 deg from true north

External shading: As per detail Architectural drawing

External surfaces solar absorptions: 0.6 for external walls

No internal blind provided

Winter & Summer Clothing- 0.55/1.1

Occupant density: In accordance with Table D1.13

Internal heat gains from appliances and equipment: 5 W/m² for whole buildings

Internal heat gains from artificial lighting-As per J6 (14 W/m²)

Availability of plant: As per JV3 profile

Infiltration air change rate per hour when no mechanically supplied outdoor air: 0.7 ACH

Infiltration air change rate per hour when Conditioned: 0.35 ACH

Miscellaneous Mechanical Exhaust: Considered same in both cases.

Heated water supply : Shop - 4 L/person

Occupancy-5m²/P

Metabolic Rate- 75 W sensible heat gain and 55 W latent heat gain

Daily occupancy and operating profile: (JV3 Profile):

Weekdays				
Time Period	Occupancy	Lighting	Equipment	HVAC
0:00 - 1:00	0%	25%	25%	OFF
1:00 - 2:00	0%	25%	25%	OFF
2:00 - 3:00	0%	25%	25%	OFF
3:00 - 4:00	0%	25%	25%	OFF
4:00 - 5:00	0%	25%	25%	OFF
5:00 - 6:00	0%	25%	25%	OFF
6:00 - 7:00	0%	25%	25%	OFF
7:00 - 8:00	10%	100%	70%	ON
8:00 - 9:00	20%	100%	70%	ON
9:00 - 10:00	20%	100%	70%	ON
10:00 - 11:00	15%	100%	70%	ON
11:00 - 12:00	25%	100%	70%	ON
12:00 - 13:00	25%	100%	70%	ON
13:00 - 14:00	15%	100%	70%	ON
14:00 - 15:00	15%	100%	70%	ON
15:00 - 16:00	15%	100%	70%	ON
16:00 - 17:00	15%	100%	70%	ON
17:00 - 18:00	5%	100%	70%	ON
18:00 - 19:00	5%	100%	70%	OFF
19:00 - 20:00	0%	10%	10%	OFF
20:00 - 21:00	0%	10%	10%	OFF
21:00 - 22:00	0%	10%	10%	OFF
22:00 - 23:00	0%	10%	10%	OFF
23:00 - 24:00	0%	10%	10%	OFF

Table 3 – Load Profile for Occupancy, Lighting, Equipment and HVAC

Following are the data remain same for both DTS and proposed building:

- Annual GHG emissions calculation method
- Greenhouse gas emissions factors

- location where the building is to be constructed
- Adjacent structures and features
- Building orientation
- Building form

Testing standards-

- Quality of insulation installation
- Thermal resistance of air films
- Dimensions of external, internal and separating walls
- Internal shading devices

4 DTS PROVISIONS & ASSOCIATED MODEL INPUTS

4.1 Building Fabric:

Part J1 of Section J outlines the requirements for Building Fabric elements that form part of the envelope of conditioned spaces. Based on the architectural information received, Wall type, construction make-up of elements forming part of the envelope and the DTS total R value has shown in the table below.

	Proposed construction	DTS Total R (m ² K/W)
<i>Roof / Ceiling</i>		
RF-1	200mm Concrete Roof: Outside Air Film + Concrete + Insulation+ Ceiling Air Space+ Plasterboard + Inside Air Film	3.7
<i>External Walls</i>		
WT-1	140mm Concrete block: Outside Air Film +140mm Concrete Block+ Air Cavity+ Insulation + Plaster board+ Inside Air Film	1.5
<i>Internal Walls</i>		
WT-2	Single skin block : Outside Air Film + 140mm Concrete Block +Air Cavity+ Insulation +Plaster board+ Inside Air Film	1.5
<i>Floor</i>		
F-1	Concrete Floor: Outside Air film+ Tiles + Concrete block above carpark	2.0

4.2 Glazing detail:

The following table summarises the DTS compliant glazing system (Display Glazing) selections as used within the reference building (Case 1). The data has been obtained from the WERS website for actual certified products. Detail data input shown in the glazing calculator in Appendix.

Glass Configuration	Framing Material	U-Value (NFRC)	SHGC (NFRC)	Façade Use
Dbl Glazed Low E	Aluminium	4.5	0.35	South
Dbl Glazed Low E	Aluminium	4.5	0.32	West
Dbl Glazed Low E	Aluminium	4.5	0.5	North

Table 4 – DTS Compliant Glazing System Types – Case 1 Model

4.3 Hot Water Supply

Hot water systems have been considered equivalent between the simulation cases and therefore the energy consumption of such equipment has been excluded from the assessment.

5 PROPOSED BUILDING ENERGY CONSUMPTION ASSESSMENT

5.1 Proposed building Energy Model Inputs

The following section lists the inputs used within the computer simulation modelling cases.

5.2 Building Fabric

The following table summarizes the thermal performance of the building fabric utilised within the Case 2/3 proposed building model to achieve compliance.

Construction Case 1 Model Reference	DTS Total R (m2K/W)	Case 2/3 Proposed Building
<i>Roof / Ceiling</i>		
RF-1:200mm Concrete Roof:	3.7	3.7
<i>External Walls</i>		
WT-1:140mm Concrete block:	2.0	2.55
<i>Internal Walls</i>		
WT-2:140mm Concrete block:	1.5	1.55
<i>Floor</i>		
FT1: Concrete Floor:	2.0	0.32

Table 5 – Building Fabric Thermal Resistance

5.3 External Glazing

The glazing systems as utilised within the Case 1 reference building model can be found within Section 4.2.

The following table summarises the glazing types utilized within the Case 2/3 proposed building model as necessary in order to achieve compliance. The thermal performance values outlined are window system value.

Glass Configuration	U-Value	SHGC	VLТ	Façade Use
Thermally broken Dbl Glazed low E clear	2.9	0.51	0.65	All glazing in Commercial

Table 6 – Proposed Glazing

5.4 Other Compliance:

Clause JV3 (g) outlines that the building 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. The building design must also be in compliance with the following requirements:

- J1.2 for general thermal construction
- J1.6(a)(ii), J1.6(b) and J1.6(c) for floor edge insulation
- AS/NZS 3823.1.2 at test condition T1 for testing package air-conditioning equipment (See Section 4.4).

5.5 Thermal Comfort & Temperature Range Assessment

- The proposed building fabric was further assessed in conjunction with proposed services in order to satisfy the predicted mean vote requirements of the JV3 verification method. It shows that thermal comfort level of between a Predicted Mean Vote of -1 to +1 is achieved across not less than 95% of the floor area of all occupied zones.
- The temperature range of 21 to 24 degrees for the conditioned spaces on the reference model is compliant for 98% of the time.

5.6 Simulation Results

The following table summarises the total annual energy consumption for the simulation cases of the development.

Component	Annual Emission (kgCO ₂ -e/GJ)	
	Case 1	Case 2/3
Heating	2834.943	3440.314
Cooling	21316.54	17347.15
Lighting	23914.86	23914.86
Equipment	11033.71	11033.71
Total	59100.05	55736.03

Table 7 – Total Annual Energy Consumption

The results in Table 7.0 above show that the total annual green house gas emission of Case 2/3 is not more than Case 1.

5.7 Conclusion

The results outlined above show that the total annual Green House Emission of 55736 kgCO₂-e/GJ for Case 2/3 is not more than the annual energy consumption of 59100 kgCO₂-e/GJ for Case 1, therefore the proposed building fabric and glazing as outlined within the report are compliant with performance requirement JP1 using verification method JV3.

As a combined Case 2/3 model was utilised, the services designs must achieve all applicable DTS performance requirements for the development to comply with Section J as the services performance of proposed model Case 2/3 were set to the minimum DTS performance level. The simulation models used for the energy calculations are based on the design current at the time of this assessment including the assumptions and values listed within this report.

6 APPENDIX

6.1 Glazing Calculation Results – Case 1 Model (DTS)

U-Value Calculation:

	Window Width	Window Height	Glass Area	Glazing system U val	total wall-glazing construction	% of Wall of a wall-glazing construction	Wall U value	Wall-glazing construction (u)	Aggregate wall-glazing construction(u)	Compliance Achieved (<U5.8 Display Glazing)
South			Aw		Aw+wall					
Comm-1	3	4.5	13.5	4.5	35.7	62.18487	0.66666	75.55		
Comm-3	7.8	4.5	35.1	4.5	40.29	12.88161	0.66666	161.41		
			48.6		75.99	37		236.96	3.118305	YES
West										
Comm-1	11	4.5	49.5	4.5	56.1	11.76471	0.66666	227.15		
Comm-2	8.9	4.5	40.05	4.5	45.39	11.76471	0.66666	183.785		
			49.5		56.1	12		227.15	4.04902	YES
North										
Comm-2	2	4.5	9	4.5	22.95	60.78431	0.66666	49.8		
			9		22.95	60.78431		49.8	2.169935	YES
Internal										
Internal	1.4	4.5	6.3	0	346.8		1	340.5		
			6.3		346.8	99		340.5	0.981834	YES

SHGC Calculation:

	Window Width	Window Height	WallArea	Glazed Area	P/h	G/H	Shading Multiplier	Window system SHGC	wall-glazing construction solar
South			A wall	Aw1			Sw1	SHGCW1	SA
Comm-1	3	4.5	22.2	13.5	0.955556	0.066667	0.64	0.35	
Comm-3	7.8	4.5	5.19	35.1	0.666667	0.066667	0.71	0.35	
			27.39	48.6					0.154577576
West									
Comm-1	11	4.5	6.6	49.5	0.511111	0.066667	0.52	0.32	
Comm-2	8.9	4.5	5.34	40.05	0.511111	0.066667	0.52	0.32	
			11.94	89.55					0.146823529
North									
Comm-2	2	4.5	2.7	9	1.555556	0.066667	0.4	0.5	
			2.7	9					0.153846154
Internal									
Internal	0	0	340.5						

ER -Air-conditioning energy value(Method-2)

	A_n (Wall+Win)	Reference	Proposed	Compliance Achieved
		E_R	E_R	
South	75.99	12.19593	11.74635	
West	56.1	15.75648	14.4144	
North	22.95	8.398	8.050154	
		36.35041	34.2109	Yes

6.2 PMV & Temp Check –

ASHRAE55 90% Acceptability Limits [Hours]
Pass-PMV

Time Setpoint Not Met	During Occupied Heating [hr]	During Occupied Cooling [hr]
GROUND FLOOR:COMM3	0.00	3.5
GROUND FLOOR:COMM1	0.00	2
GROUND FLOOR:COMM2	0.00	2

6.3 Construction Detail (Proposed)

Roof Type -RF1 (Concrete Roof):

Construction Layer	Nominal Thickness (mm)	Thermal Resistance (m ² K/W)
Outside Air Film 3.0m/s wind	–	0.03
Concrete Slab	500	0.34
PIR foam	-	3.0
Ceiling Air Cavity	20	0.17
Plasterboard Ceiling	13	0.07
Inside Air Film (still air)	–	0.16
Total		3.77

Wall Type-WT-1 (140mm Block Wall):

Construction Layer	Nominal Thickness (mm)	Thermal Resistance (m ² K/W)
Outside Air Film (7.0m/s wind assumed)	–	0.03
Hollow Concrete Block Work (1250kg/m ³)	140	0.16
Insulation		2.0
Air Cavity*	24	0.17
Plasterboard Sheeting	13	0.07
Inside Air Film (still air assumed)	–	0.12
Total		2.55

Wall Type-WT-2 (Internal Single skin block):

Construction Layer	Nominal Thickness (mm)	Thermal Resistance (m ² K/W)
Outside Air Film (7.0m/s wind assumed)	–	0.03
Hollow Concrete Block Work (1250kg/m ³)	140	0.16
Insulation	-	1.0
Air Cavity		0.17
Plasterboard Sheeting	13	0.07
Inside Air Film (still air assumed)	–	0.12
Total		1.55

Floor Type- FT-1 (Concrete Slab above car park):

Construction Layer	Nominal Thickness (mm)	Thermal Resistance (m² K/W)
Outside Air Film (7.0m/s wind assumed)	–	0.03
Fibre Cement Sheeting (assumed)	13	0.05
Air Cavity	87	0.15
Insulation		1.5
Concrete Slab	200	0.13
Inside Air Film (still air assumed)	–	0.16
	Total	2.02