DORAN DRIVE, CASTLE HILL NSW

NCC Section J Report

Prepared for:

Deicorp Projects Showground Pty Ltd
Level 4,161 Redfern Street, Redfern NSW 2016

SLR Ref: 610.30132-R01
Version No: -v2.0
April 2022

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Deicorp Projects Showground Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30132-R01-v2.0	21 April 2022	LW	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
610.30132-R01-v1.2	8 April 2022	LW	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy
610.30132-R01-v1.1	2 July 2021	Horatio Cai	Dr Neihad Al-Khalidy	Dr Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia (SLR) has been engaged by Deicorp Projects Showground Pty Ltd to assess the proposed development Doran Drive, Castle Hill for compliance with the National Construction Code (NCC) 2016 provision for Energy Efficiency under Section J JV3 Verification method. The objective of NCC Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

JV3 - Verification method using a reference building is utilised to verify compliance with JP1 by determining 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:

- The proposed building is modelled with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

To achieve compliance with Section J1-J3 & JP1 as per NCC 2016, is required to have the following:

- All External walls have a total R-value of R2.8.
- All internal walls to unconditioned space have a total R-value of R1.8.
- All glazing requirements are listed in Table 2 in this report.
- Roof/ceiling system with a total R-value of 3.2.
- Upper ground concrete roof under the loading dock with insulation, Total R-value= R2.0.
- Suspended concrete floors above unconditioned space without floor insulation, except Level 02 Childcare and Community space.
- 120kW of PV solar system will be installed on the roofs to generate approximately 166 MWh per annum.

Modelling conducted for the above cases is sufficient to demonstrate compliance with JP1 associated with the thermal performance of the building for retail tenancies.

The results of simulations are summarised in the following table:

Electricity Usage	**Reference building (MWh)**	**Proposed building with same services as reference building (MWh)**
Heating	181.84	187.7
Cooling	300.0	305.46
Fans, pumps and Controls	147.78	148.8
PV	-	-166
Lighting	Same	Same
Equipment	Same	Same
DHW	Same	Same
Total	**629.6**	**476**

EXECUTIVE SUMMARY

The energy consumption of lighting, equipment and DHW is excluded from the calculation in accordance with the 2016 specification JV. Where the annual energy consumption of these is 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.

The annual energy consumption of the proposed building modelled with the same services as the reference building is less than that of the reference building and thus complies with JP1 as per NCC – JV3 Verification method. Modelling conducted for above cases is sufficient to demonstrate compliance with JP1 associated with the thermal performance of the building. Separate compliance certificates for building services (J5-J8) shall be issued by the relevant design consultants.

CONTENTS

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

SLR Consulting Australia (SLR) has been engaged by Deicorp Projects Showground Pty Ltd to assess the proposed development Doran Drive, Castle Hill for compliance with the National Construction Code (NCC) 2016 provision for Energy Efficiency under Section J JV3 Verification method. The objective of NCC Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

1.1 Development Description

The development site and building locations are illustrated in **Figure 1**. As part of the proposal, the proposed development comprises of:

- Six levels of basement carparks;
- Ground floor with supermarket, retail tenancies, entry lobby and plant rooms.
- Community spaces located on levels 1 and 2
- Retail tenancies from upper ground to level 01;
- Childcare centre/tenancy on level 02;
- Residential apartments from level 02 to level 20.

Figure 1 Aerial View of Location Site

2 NCC Energy Efficiency Requirements

Since the 2006 release of the Building Code of Australia (BCA) it is a mandatory requirement for all BCA class buildings, except Class 4 and Class 10 buildings, to achieve efficient use of energy.

This requirement has been defined in Volume 1 of the 2016 NCC under Section J and is titled *Energy Efficiency*. There are eight (7) Deemed-to-Satisfy subsections, J1 to J8, that focus on separate aspects of energy efficiency.

- J1 – Building Fabric.
- J2 – External Glazing.
- J3 – Building Sealing.
- J5 – Air Conditioning and Ventilation Systems.
- J6 – Artificial Lighting and Power.
- J7 –Swimming Pool and Spa Pool Plant.
- J8 – Access for Maintenance and facilities for Monitoring.

This report will provide advice about each subsection and identify how compliance with the NCC can be achieved for these new requirements in regard to the proposed development.

It shall remain the responsibility of the building designers to ensure that the installation meets the requirements of this report, and in turn the NCC.

2.1 Defining the Building Class

The sub classification for the proposed building is:

- Retail tenancies – Class 6
- Childcare centre – Class 9b
- Community spaces – Class 9b

2.2 Design Documents

The report is prepared based on the design set received in March 2022.

2.3 Defining the NCC Climate

As the proposed development is situated at Castle Hill, Sydney (NSW), relevant parts of the NCC requirements will be based on these climate characteristics. The NCC currently defines the development area as climate zone 6 (shown in Figure 2 and Figure 3).

Figure 2 Building Code of Australia Climate Zone Map for Sydney

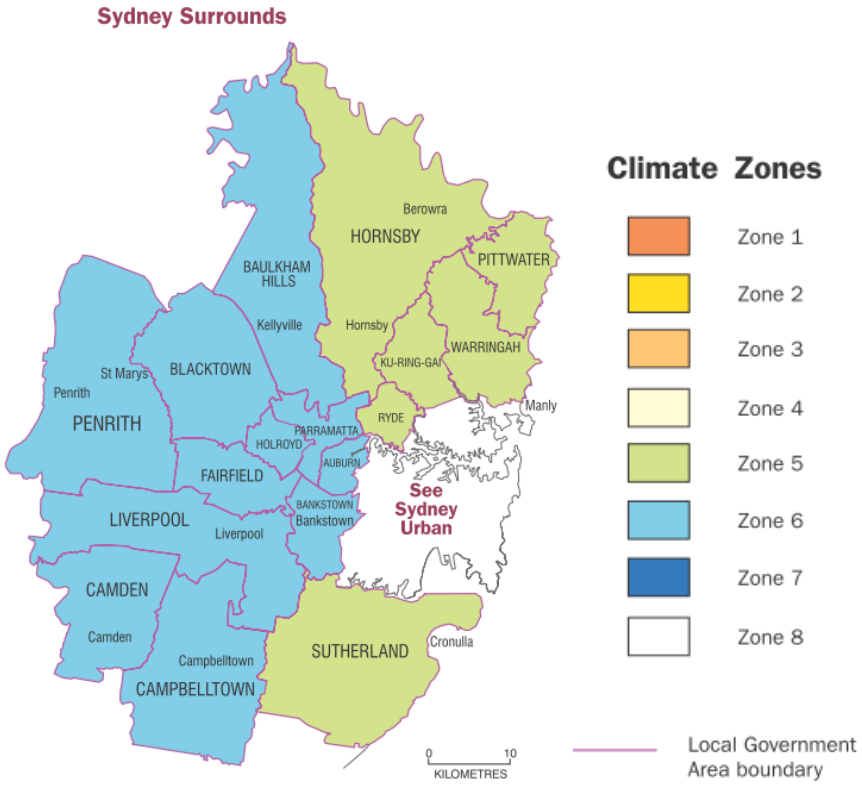
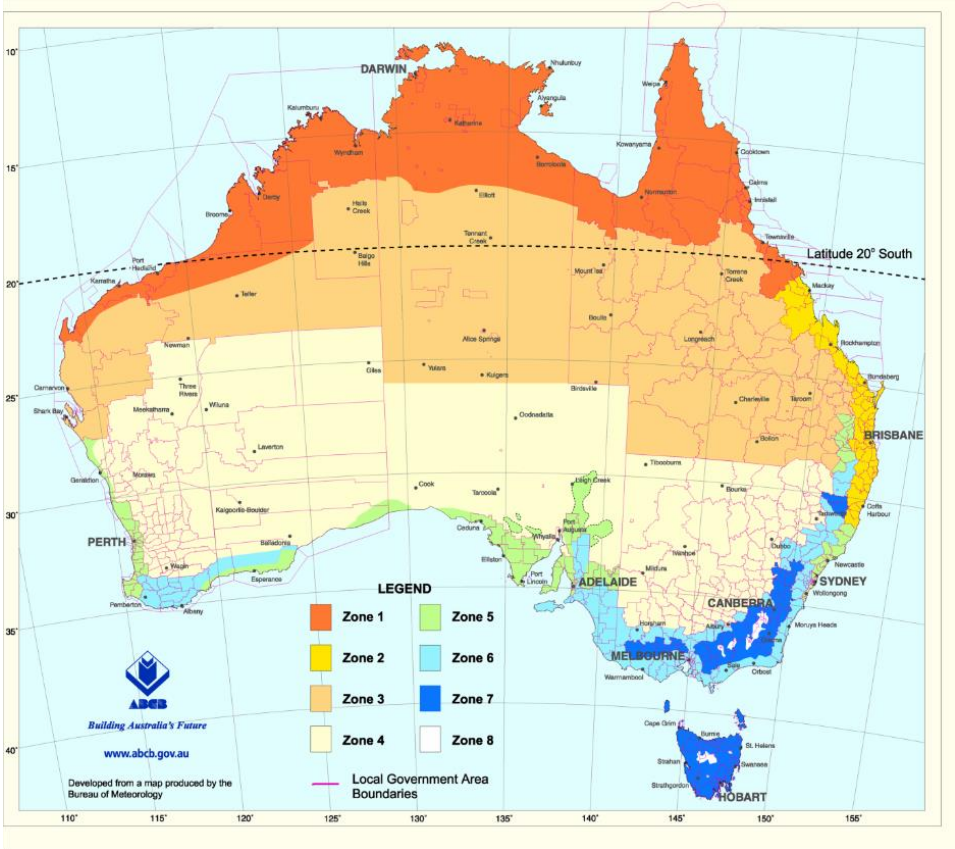


Figure 3 Building Code of Australia Climate Zone Map



3 JV3 – Verification method

JV3 – Verification method using a reference building is utilised to verify compliance with JP1 by determining 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:

- The proposed building is modelled with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

The annual energy consumption of the proposed building may be reduced by the amount of energy obtained from:

1. an on-site renewable energy source; or
2. another process as reclaimed energy.

The reference building uses:

a. The Deemed-to-Satisfy (DtS) Provision such as J1 Building Fabrics, J2 External glazing;

b. A solar absorptance of 0.6 for the external walls and 0.7 for roofs;

c. The maximum lamp power density without any increase for control device illumination power density adjustment factor;

d. Air-conditioning with the conditioned space temperature within the range 18°CDB to 26°CDB for 98% of the plant operation time;

e. The profiles for occupancy air-conditioning, lighting and internal heat gains for people, hot meals, equipment and hot water supply systems of Specifications JV; and

f. Infiltration values:

    a. for the perimeter zone depth equal to the floor-to-ceiling height when pressuring plant is operating, 1.0 air change per hour and

    b. for the whole building, when the pressuring plant is not operating, 1.5 air change per hour.

g. Both the proposed and the reference building will use the same annual energy consumption calculation method and building features such as:

    a. location, adjacent structures, building form

    b. internal heat gains including people, lighting, appliances, meals and other electric power loads

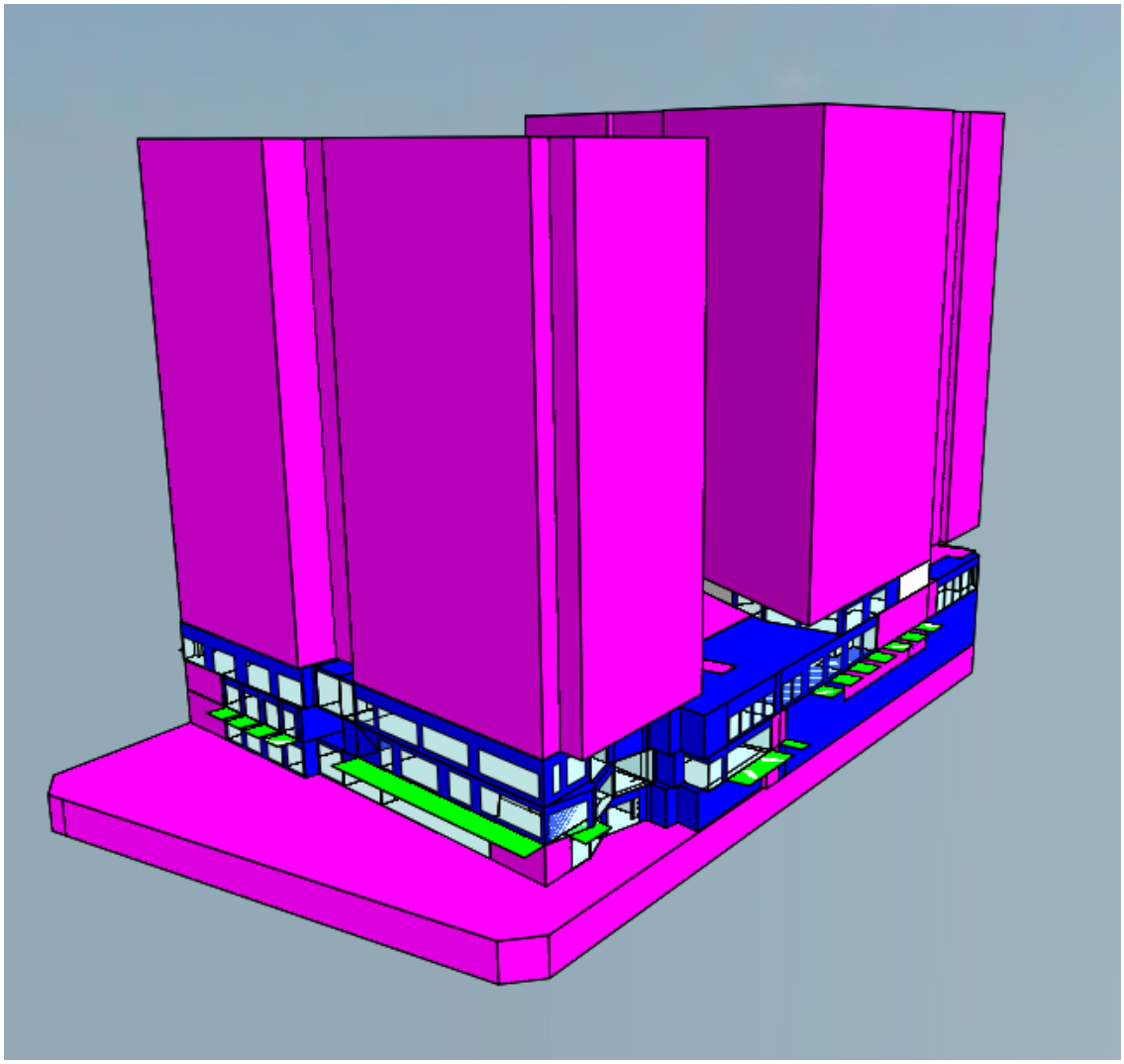
    c. and other features as specified in NCC JV3

3.1 Thermal Calculation of the Proposed and Reference Buildings

The Energy Simulation Program used in this study is the IES computer program Virtual Environment 2019(VE). The program is based on the ASHRAE response factor and the modifications included utilising Australian weather data and including building materials more appropriate to those used in Australia and enabling the input of metric data.

- SLR Consulting Pty Ltd (SLR) supports a perpetual license of the Energy Simulation Software package IES <VE>.
- IES <VE> has passed the BESTEST (ASHRAE Standard 140) external validation process.
- The weather data from ACADS-BSG 94768 Sydney RO 1981 Test Reference Year (TRY) is used for the modelling.
- IES<VE> assesses U-Value, SHGC, and shade coefficient when evaluating the effect of glazing. This will tend towards a more conservative outcome.

Figure 4 3D View of the Proposed Development in IES<VE>



4 Modelling Description

The proposed building is modelled in IES<VE> so as to compare the NCC compliance reference building in accordance to JV3 verification method.

4.1 Input Data for Reference Building

Table 1 Input Modelling Data for Reference Building

<table>
<tr><td>Climate Data</td><td>Weather data from ACADS-BSG, 94768 Sydney RO1981 Test Reference Year (TRY).</td></tr>
<tr><td>External Shade</td><td>Awnings from level above and vertical fins.</td></tr>
<tr><td>External wall</td><td>All external walls have a total R-value of R2.8 or R2.3 to comply with Section J1.5.</td></tr>
<tr><td>Internal wall</td><td>All internal walls to unconditioned space have a total R-value of R1.8.</td></tr>
<tr><td>Glazing</td><td>Glazing system (glass and frame) with U value & Solar Heat Gain Coefficient as per NCC Section J 2014 Part J2.4 external glazing calculator.
<table>
<tr><th>Area</th><th>Orientation</th><th>U-value</th><th>Solar Heat Gain Coefficient (SHGC)</th></tr>
<tr><td>All Tenancies</td><td>South</td><td>4.8</td><td>0.70</td></tr>
<tr><td>All Tenancies</td><td>West</td><td>3.8</td><td>0.42</td></tr>
<tr><td>All Tenancies</td><td>Northwest</td><td>3.8</td><td>0.42</td></tr>
<tr><td>All Tenancies</td><td>East</td><td>3.8</td><td>0.4</td></tr>
<tr><td>L2 Community</td><td>South</td><td>3.3</td><td>0.7</td></tr>
<tr><td>L2 Community</td><td>West</td><td>1.7</td><td>0.23</td></tr>
<tr><td>Childcare</td><td>South</td><td>3.5</td><td>0.7</td></tr>
<tr><td>Childcare</td><td>West</td><td>1.7</td><td>0.2</td></tr>
</table></td></tr>
<tr><td>Roof</td><td>Concrete roof with insulation, Total R-value= R3.2.
Upper ground concrete roof under the loading dock with insulation, Total R-value= R2.0.</td></tr>
<tr><td>External Floor</td><td>Concrete Floors above unconditioned spaces, Total R-value= R2.0.</td></tr>
<tr><td>Lighting Density</td><td>As per NCC 2016 Table J6.2a for different classification of building.</td></tr>
<tr><td>Lighting hours</td><td>Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See Appendix A.</td></tr>
<tr><td>Equipment density</td><td>Equipment load in the model is 5W / m² for 24 hours per day as per 2016 NCC Table 2h.</td></tr>
<tr><td>Occupant density</td><td>3 m² / person for retail.
4 m² / person for childcare and community spaces.</td></tr>
<tr><td>Occupancy Schedule</td><td>Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See Appendix A.</td></tr>
<tr><td>HVAC System type</td><td>No services documentation available at this stage. It is assumed the AC system modelled is packaged air-conditioning systems to all area.
The air-conditioning systems have an EER/COP of 2.7.</td></tr>
<tr><td>HVAC Hours</td><td>Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See Appendix A.</td></tr>
<tr><td>HVAC Control</td><td>Space temperature indoor conditions 22.5±1.5°CBD.</td></tr>
<tr><td>Document References</td><td>The report is prepared based on the design set received in March 2022.</td></tr>
</table>

4.2 Input Data for Proposed Building

The following data was used for the proposed building. The proposed option has the same commitments as the reference building as described in **Table 1**, except for the external floor and glazing construction.

Table 2 Input Modelling Data for Proposed Building

Climate Data	Weather data from ACADS-BSG, 94768 Sydney RO1981 Test Reference Year (TRY).
External Shade	Awnings from level above and vertical fins.
External wall	All external walls have a total R-value of R2.8.
Internal wall	All internal walls to unconditioned space have a total R-value of R1.8.
Glazing	Glazing system (glass and frame) with U value & Solar Heat Gain Coefficient as per table below.

Area	Orientation	U-value	Solar Heat Gain Coefficient (SHGC)
All Retail tenancies	All	4.8	0.6
All Community Space	All	4.8	0.6
Childcare Centre	All	4.8	0.6

Roof	Concrete roof with insulation, total R-value= R3.2. Upper ground concrete roof under the loading dock with insulation, Total R-value= R2.0.
Floor/Ceiling	Concrete Floors above unconditioned spaces without floor insulation. Level 02 Childcare centre and Community space, Total R-value = R2.0.
PV System	120kW of PV solar system will be installed on the roofs to generate approximately 166 MWh per annum.
Lighting Density	As per NCC 2016 Table J6.2a for different classification of building.
Lighting hours	Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See **Appendix A**.
Equipment density	Equipment load in the model is 5W / m² for 24 hours per day as per 2016 NCC Table 2h.
Occupant density	3 m² / person for retail. 4 m² / person for childcare and community spaces.
Occupancy Schedule	Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See **Appendix A**.
HVAC System type	No services documentation available at this stage. It is assumed the AC system modelled is packaged air-conditioning systems to all area. The air-conditioning systems have an EER/COP of 2.7.
HVAC Hours	Schedules used in study are as per Table 2a in 2016 NCC JV Specification. See **Appendix A**.
HVAC Control	Space temperature indoor conditions 22.5±1.5°CBD.
Document References	The report is prepared based on the design set received in March 2022.

5 Simulation results

The predicted Total Energy Consumed annually by the reference building and the proposed building with the reference services is summarised in **Table 3.**

The reference and proposed building with reference services temperature is within the range 18°CDB to 26°CDB for **100%** of the plant operation time.

Table 3 Comparison of Annual Energy Consumption between the Reference and Proposed building

Electricity Usage	Reference building (MWh)	Proposed building with same services as reference building (MWh)
Heating	181.84	187.7
Cooling	300.0	305.46
Fans, pumps and Controls	147.78	148.8
PV Solar System	-	-166
Lighting	Same	Same
Equipment	Same	Same
DHW	Same	Same
Total	**629.6**	**476**

6 Conclusion

SLR Consulting Australia (SLR) has been engaged by Deicorp Projects Showground to assess the proposed development Doran Drive, Castle Hill for compliance with the National Construction Code (NCC) 2016 provision for Energy Efficiency under Section J JV3 Verification method. The objective of NCC Section J is to reduce greenhouse gas emissions by efficiently using energy in buildings.

JV3 - Verification method using a reference building is utilised to verify compliance with JP1 by determining 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:

- The proposed building is modelled with the proposed services; and
- The proposed building is modelled with the same services as the reference building.

To achieve compliance with Section J1-J3 & JP1 as per NCC 2016, is required to have the following:

- All External walls have a total R-value of R2.8.
- All internal walls to unconditioned space have a total R-value of R1.8.
- All glazing requirements are listed in table 2 in this report.
- Roof/ceiling system with a total R-value of 3.2.
- Upper ground concrete roof under the loading dock with insulation, Total R-value= R2.0.
- Suspended concrete floors above unconditioned space without floor insulation, except Level 02 Childcare and Community space.
- 120kW of PV solar system will be installed on the roofs to generate approximately 166 MWh per annum.

Modelling conducted for above cases is sufficient to demonstrate compliance with JP1 associated with the thermal performance of the building for retail tenancies.

The Energy models results are as follows:

Electricity Usage	**Reference building (MWh)**	**Proposed building with same services as reference building (MWh)**
Heating	181.84	187.7
Cooling	300.0	305.46
Fans, pumps and Controls	147.78	148.8
PV	-	-166
Lighting	Same	Same
Equipment	Same	Same
DHW	Same	Same
Total	**629.6**	**476**

The energy consumption of lighting, equipment and DHW is excluded from the calculation in accordance with the 2016 specification JV. Where the annual energy consumption of these is 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.

The annual energy consumption of the proposed building modelled with the same services as the reference building is less than that of the reference building and thus complies with JP1 as per NCC – JV3 Verification method. Modelling conducted for above cases is sufficient to demonstrate compliance with JP1 associated with the thermal performance of the building. Separate compliance certificates for building services (J5-J8) shall be issued by the relevant design consultants.

APPENDIX A

NCC 2016 Occupancy and Operation Profiles

Table 2c OCCUPANCY AND OPERATION PROFILES OF A CLASS 6 SHOP OR SHOPPING CENTRE

Time period (local standard time)	Occupancy (Daily)	Artificial lighting (Daily)	Appliances and equipment (Daily)	*Air-conditioning* (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 12:00pm	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 12:00am	0%	10%	10%	Off

Note: The occupancy profile is expressed as a percentage of the maximum number of people that can be accommodated in the building. The artificial lighting profile is expressed as a percentage of the maximum *illumination power density* permitted under **Part J6**. The appliances and equipment profile is expressed as a percentage of the maximum internal heat gain in **Table 2h**. The *air-conditioning* profile is expressed as the plant status.

Table 2g OCCUPANCY AND OPERATION PROFILES OF A CLASS 9b SCHOOL

Time period (local standard time)	Occupancy (Monday to Friday)	Artificial lighting (Monday to Friday)	Appliances and equipment (Monday to Friday)	*Air-conditioning* (Monday to Friday)
12:00am to 1:00am	0%	5%	5%	Off
1:00am to 2:00am	0%	5%	5%	Off
2:00am to 3:00am	0%	5%	5%	Off
3:00am to 4:00am	0%	5%	5%	Off
4:00am to 5:00am	0%	5%	5%	Off
5:00am to 6:00am	0%	5%	5%	Off
6:00am to 7:00am	0%	5%	5%	Off
7:00am to 8:00am	5%	30%	30%	On
8:00am to 9:00am	75%	85%	85%	On
9:00am to 10:00am	90%	95%	95%	On
10:00am to 11:00am	90%	95%	95%	On
11:00am to 12:00pm	90%	95%	95%	On
12:00pm to 1:00pm	50%	80%	70%	On
1:00pm to 2:00pm	50%	80%	70%	On
2:00pm to 3:00pm	90%	95%	95%	On
3:00pm to 4:00pm	70%	90%	80%	On
4:00pm to 5:00pm	50%	70%	60%	On
5:00pm to 6:00pm	20%	20%	20%	Off
6:00pm to 7:00pm	20%	20%	20%	Off
7:00pm to 8:00pm	20%	20%	20%	Off
8:00pm to 9:00pm	10%	10%	10%	Off
9:00pm to 10:00pm	5%	5%	5%	Off
10:00pm to 11:00pm	5%	5%	5%	Off
11:00pm to 12:00am	5%	5%	5%	Off

Notes:

1. The occupancy profile is expressed as a percentage of the maximum number of people that can be accommodated in the building. The artificial lighting profile is expressed as a percentage of the maximum *illumination power density* permitted under **Part J6**. The appliances and equipment profile is expressed as a percentage of the maximum internal heat gain in **Table 2h**. The *air-conditioning* profile is expressed as the plant status.
2. Saturday and Sunday profiles are 5% continuous artificial lighting and 5% continuous appliances and equipment. There is no occupancy and the *air-conditioning* is "off".

APPENDIX B

NCC 2016 Glazing Calculator DTS Requirements

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

HELP

Building name/description: Doran Drive, Castle Hill

Application: shop display

Climate zone: 6

Storey: Ground

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A				29.7m²	136m²		224m²		
Option B									n/a
Glazing area (A)				*21.5m²*	*30.2m²*		*133m²*		

Number of rows preferred in table below: 10 *(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	T2	S		2.40	12.59		4.8	0.70				0.00	1.00	1.00	30.22	100% of 39%
2	T4	W		3.48	9.01		3.8	0.42	3.000	4.000	0.75	0.52	0.88	0.82	31.35	24% of 96%
3	T5	W		3.48	5.94		3.8	0.42	3.000	4.000	0.75	0.52	0.88	0.82	20.67	16% of 96%
4	T6	W		3.48	5.31		3.8	0.42	3.000	4.000	0.75	0.52	0.88	0.82	18.48	14% of 96%
5	T7	W		3.48	3.85		3.8	0.42	3.000	4.000	0.75	0.52	0.88	0.82	13.40	10% of 96%
6	T8	W		3.48	9.68		3.8	0.42	3.000	4.000	0.75	0.52	0.88	0.82	33.69	25% of 96%
7	Entry	W		3.80	4.00		3.8	0.42	5.080	4.000	1.27	0.20	0.49	0.49	15.20	11% of 96%
8	T3	SE		2.90	7.42		2.8	0.70				0.00	1.00	1.00	21.52	100% of 97%
9																
10																

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

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

HELP

Building name/description: **Doran Drive, Castle Hill**

Application: **shop display**

Climate zone: **6**

Storey: **Upper**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	52.1m²			27.1m²	109m²		274m²		
Option B									n/a
Glazing area (A)	*41.3m²*			*22.5m²*	*60.9m²*		*223m²*		

Number of rows preferred in table below: **13** *(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	T18		S		3.05	12.80		3.8	0.70	3.250	1.220	2.66	-1.83	0.55	0.55	39.04	64% of 97%
2	T18		W		3.60	2.61		2.7	0.27				0.00	1.00	1.00	9.40	4% of 99%
3	T19		SE		3.60	6.24		2.3	0.70				0.00	1.00	1.00	22.46	100% of 90%
4	T19		S		2.77	2.11		4.8	0.70				0.00	1.00	1.00	5.84	10% of 97%
5	T19		W		3.60	31.48		2.7	0.27	3.000	2.770	1.08	-0.83	0.36	0.43	######	49% of 99%
6	T8		W		3.60	2.81		2.7	0.27				0.00	1.00	1.00	10.12	5% of 99%
7	T8		W		3.60	8.16		2.7	0.27				0.00	1.00	1.00	29.38	14% of 99%
8	Lobby		S		3.60	4.44		4.8	0.70				0.00	1.00	1.00	15.98	26% of 97%
9	Lobby		W		3.60	3.69		2.7	0.27				0.00	1.00	1.00	13.28	6% of 99%
10	T13		W		3.60	13.29		2.7	0.27				0.00	1.00	1.00	47.84	22% of 99%
11	Lobby		N		3.60	3.63		4.8	0.37	*13.000*	7.450	*0.00*	*3.85*	*1.00*	*1.00*	13.07	47% of 94%
12	T19		N		3.60	2.43		4.8	0.37				0.00	1.00	1.00	8.75	31% of 94%
13	T12		N		4.92	3.97		4.8	0.37	5.040	2.650	1.90	-2.27	0.00	0.30	19.53	22% of 94%

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

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

HELP

Building name/description: Doran Drive, Castle Hill

Application: shop display

Climate zone: 6

Storey: First

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	242m²		132m²	27.1m²	262m²		320m²		
Option B									n/a
Glazing area (A)	145m²	.....	52.6m²	24.2m²	171m²	.....	265m²		

Number of rows preferred in table below: 25 *(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_W)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	T24	S		3.60	32.29		3.8	0.70				0.00	1.00	1.00	#####	49% of 94%
2	T25	S		3.60	2.09		4.8	0.70				0.00	1.00	1.00	7.52	5% of 94%
3	T28	S		2.10	13.00		4.8	0.70	device		2.00	0.00	0.55	0.55	27.30	27% of 94%
4	T28	S		1.50	13.00		4.8	0.70	2.800	1.500	1.87	0.00	0.57	0.56	19.50	19% of 94%
5	T24	W		3.60	2.66		2.7	0.27				0.00	1.00	1.00	9.58	4% of 100%
6	T28	W		2.10	1.59		2.7	0.27	device		2.00	0.00	0.05	0.31	3.34	1% of 100%
7	T28	W		1.50	1.59		2.7	0.27	2.800	1.500	1.87	0.00	0.09	0.32	2.39	1% of 100%
8	T25	W		3.60	31.87		2.7	0.27	0.880	2.400	0.37	-1.20	0.80	0.75	#####	41% of 100%
9	Lobby	W		3.60	3.66		2.7	0.27				0.00	1.00	1.00	13.18	5% of 100%
10	T26	W		3.60	17.10		2.7	0.27				0.00	1.00	1.00	61.56	24% of 100%
11	T20	W		3.60	16.68		2.7	0.27				0.00	1.00	1.00	60.05	24% of 100%
12	T25	SE		3.60	6.71		2.3	0.70				0.00	1.00	1.00	24.16	100% of 97%
13	T25	N		3.60	2.28		3.8	0.42				0.00	1.00	1.00	8.21	8% of 85%
14	T26	N		3.50	10.41		3.8	0.42				0.00	1.00	1.00	36.44	36% of 85%
15	T20	N		2.00	15.34		3.8	0.42	*4.800*	4.000	*0.00*	*2.00*	*1.00*	*1.00*	30.68	31% of 85%
16	Lobby	N		3.60	3.57		3.8	0.42	13.000	4.000	3.25	0.40	0.00	0.31	12.85	5% of 85%
17	Community Space	N		3.60	8.42		3.8	0.42	6.000	4.500	1.33	0.90	0.70	0.49	30.31	11% of 85%
18	T27	N		3.60	7.38		3.8	0.42	6.000	0.450	####	-3.15	0.00	0.30	26.57	9% of 85%
19	T27	E		3.16	2.30		3.8	0.42	3.000	4.500	0.67	1.34	0.96	0.91	7.27	18% of 58%
##	T28	E		4.15	1.46		3.8	0.42				0.00	1.00	1.00	6.06	16% of 58%
21	T26	E		3.60	10.92		3.8	0.42	15.000	4.000	3.75	0.40	0.17	0.36	39.31	68% of 58%
22																
23																
24																
25																

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

if inputs are valid

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.

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

HELP

Building name/description: Doran Drive, Castle Hill

Application: shop display

Climate zone: 6

Storey: 2nd

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A					52.1m²		70.8m²		
Option B									n/a
Glazing area (A)					20.7m²		32m²		

Number of rows preferred in table below: 12 *(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	Community Space 2	S		2.20	9.40		4.8	0.70				0.00	1.00	1.00	20.68	100% of 68%
2	Community Space 2	W		2.20	14.56		3.8	0.40				0.00	1.00	1.00	32.03	100% of 81%
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																

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

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

HELP

Building name/description: Doran Drive, Castle Hill

Application: other

Climate zone: 6

Storey: 2nd

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A							70.8m²		
Option B									n/a

Glazing area (A) 62.4m²

Number of rows preferred in table below: 12 *(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	Childcare	W		2.90	21.50		1.0	0.20				0.00	1.00	1.00	62.35	100% of 95%
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																

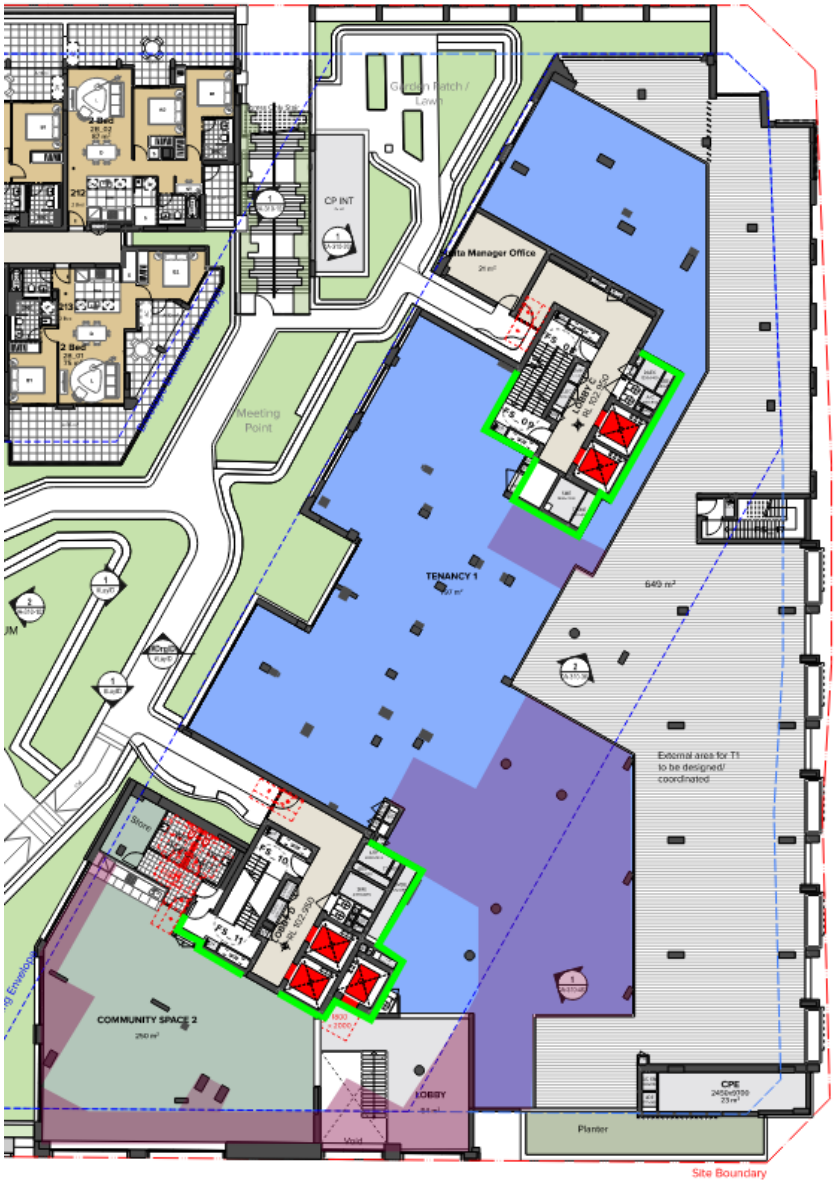
IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

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

APPENDIX C

Example Insulation Markup



Level 2 shown as an example

- **Red** = ROOF insulation (not required between community/childcare and residential apartments)
  - **Required to all tenancies**
- Green = R1.8 internal wall insulation (ie between conditioned areas and unconditioned rooms – e.g. stairwells)
  - Required to all tenancies.
- External wall insulation required to all external walls on all floors
  - **Required to all tenancies**
- Floor insulation required beneath level 2 Community Space and Child Care Only (entire floors)

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

GOLD COAST
Ground Floor, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

ROCKHAMPTON
rockhampton@slrconsulting.com
M: +61 407 810 417

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TAMWORTH
PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

NEW PLYMOUTH
Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695