NCC 2019
Section J
Energy Efficiency
Deemed-to-Satisfy Method

Section J – Doonside Investments,
55 Bay Street, Double Bay, NSW 2028

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QUALITY ASSURANCE

Date	Issue	Ver.	Compiled	Checked	Approved
21 Oct 2021	FINAL	8	VG	VG	VG
20 Oct 2021	FOF CLIENT COMMENT	7	VG	VG	VG
27 Jan 2021	FOF CLIENT COMMENT	6	VG	VG	VG
15 Jan 2021	FOF CLIENT COMMENT	5	VG	VG	VG
14 Jan 2021	FOF CLIENT COMMENT	4	VG	VG	VG
12 Jan 2021	FOF CLIENT COMMENT	3	VG	VG	VG
16 Dec 2020	FOF CLIENT COMMENT	2	RR	VG	VG
19 Nov 2020	FOF CLIENT COMMENT	1	RR	VG	VG

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Table of Contents

Abbreviations

BCA: Building code of Australia

DTS: Deemed-to-Satisfy

HVAC: Heating Ventilation and Air Conditioning

NCCS: National Construction Code Series

1. INTRODUCTION

The purpose of this report is to provide guidance to ensure the building is compliant with all of the provisions of NCC 2019 section J for the following building:

- **Doonside Holdings Building at 55 Bay Street, Double Bay, NSW 2028**

The building is to be used as:

- Existing retail purpose on ground level and level 1
- Offices on levels 2 to 4

This report covers the building complex classified as **Class 5 and Class 6** building in Building Code of Australia (BCA). Floor plans as well as elevation drawings may be found in the appendix of this document.

Building classification and climate zone:

Class 5 Building – An office building used for professional or commercial purpose.

Class 6 Building - A shop or other building for the sale of goods by retail or the supply of services direct to the public.

The building is located in BCA **climate zone 5** (Woollahra, NSW).

1.1 METHODOLOGY USED

Section J of the NCC 2019 sets regulations for the optimisation of energy efficiency for all types of buildings with respect to the building's nature, design and activity. The NCC offers five compliannce routes that differ in complexity and flexibility.

The five compliance routes are:

- Deemed to satisfy (DTS) compliance
- JV modelling method and associated submethods:
    - JV1 – NABERS Energy for Offices
    - JV2 – Green Star
    - JV3 – Verification using a referenced building
    - JV4 – Buliding envelope sealing

The method used to ensure the compliance with section J is the **Deemed-to-Satisfy (DTS)**.

The Deemed-to-Satisfy (DTS) method for energy efficiency prescribed in the BCA contains a range of practical, commonly used and cost effective building solutions such as insulation in walls, roofs and floors, glazing of low solar heat and conductance characteristics, shading, energy efficient air-conditioning plant and energy efficient lighting.

1.2 INFORMATION USED

The following architectural drawings were used:

- 201118_55 Bay St [preliminary]

1.3 BUILDING AREAS

The following areas were taken into consideration:

	Level	Space or building element	Area [m2]	Air- conditioned Area [m^2]	A/C Space
1	GF	GF - Retail 1	84.0	84.0	YES
2	GF	GF - Retail 2	67.6	67.6	YES
3	GF	GF - Retail 3	27.9	27.9	YES
4	GF	GF - toilet	5.7	-	NO
5	GF	GF - Car park lift	46.2	-	NO
6	GF	GF - Lift	5.0	-	NO
7	GF	GF - Service walkway	5.2	-	NO
8	GF	GF - Fire stairs	7.0	-	NO
9	GF	GF - Entry	28.2	28.2	YES
10	L1	L1 – Retail 1	170	174.7	YES
12	L1	L1 - Services Room	2.8	-	NO
13	L2	L1 - Lift	5.0	-	NO
13	L1	L1 - fire stairs	11.1	-	NO
14	L1	L1 – Cleaners Room	16.1	-	NO
15	L1	L1 - Plant room	22.2	-	NO
18	L2	L2 – Office	230.0	230.0	YES
19	L2	L2 - Kitchen	7.3	-	NO
21	L2	L2 - toilet 1	2.7	-	NO
22	L2	L2 - toilet 2	6.2	-	NO
23	L2	L2 - lift	5.0	-	NO
24	L2	L2 - Fire stairs	12.4	-	NO
25	L3	L3 – Office	230	230.0	YES
28	L3	L3 - Kitchen	7.3	-	NO
30	L3	L3 - toilet 1	2.7	-	NO
31	L3	L3 - toilet 2	6.2	-	NO
32	L3	L3 - lift	5.0	-	NO
33	L3	L3 - Fire stairs	12.4	-	NO
34	L4	L4 - Office	230	230.0	YES
37	L4	L4 - Kitchen	7.3	-	NO
39	L4	L4 - toilet 1	2.7	-	NO
40	L4	L4 - toilet 2	6.2	-	NO
41	L4	L4 - lift	5.0	-	NO
42	L4	L4 - Fire stairs	12.4	-	NO
TOTAL AREA [m2]			**1294.8**	**1072.4**	

J1 BUILDING FABRIC

J1.2 THERMAL CONSTRUCTION

(a) Insulation shall comply with AS/NZS 4859.1 and be installed so that:

1. abuts or overlaps adjoining insulation other than supporting members such as studs, nogging, joints, furring channels and the like where the insulation must be against the member;
2. forms a continuous barrier with the ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier;
3. does not affect the maintenance or effective operation of a service or fitting.

(b) Where required reflective insulation must be installed with:

1. the necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding;
2. the reflective insulation closelyfitted against any penetration door or window opening;
3. the reflective insulation adequately supported by framing members;
4. each adjoining sheet of roll membrane being overlapped not less than 50mm, or taped together.

(c) Where required bulk insulation must be installed so that:

1. It maintains it's position and thickness, other where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like;
2. In a ceiling, where there is no bulk insulation or reflective insulation, the wall beneath, it overlaps the wall by not less that 50mm.

J1.3 ROOF AND CEILING CONSTRUCTION

The roof and/or ceiling that is part of the building's envelope must achieve a total **R value of 3.7** for the downward direction of heat flow.

Thermal breaks shall be included in the ceiling. The thermal breaks shall be a minimum of R0.2.

Also solar absorptance of the upper surface of a roof must be not more than 0.45.

An example of a conventional insulated compliant **flat** ceiling may be described as follows:

Flat Ceiling or Roof construction	*Approximate R Value (Summer)*
Outdoor air film resistance	0.04
Metal Deck	0
RFL, Bright side facing down	0
Reflective air space (50mm)	1.42
Glasswool Blanket	2.32
Gypsum board (13mm)	0.077
Indoor air film resistance	0.16
Total R-Value*	**4.017**

Roof thermal breaks

For compliance with J0.2(c), a roof that—

(a) has metal sheet roofing fixed to metal purlins, metal rafters or metal battens; and

(b) 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 at all points of contact between the metal sheet roofing and its supporting metal purlins, metal rafters or metal battens.

J1.4 ROOF LIGHTS

Not applicable.

J1.5 WALLS AND GLAZING

a. External walls

Wall components of a wall-glazing construction must achieve :

(a) Minimum Total **R-value of 1.0** (where the wall is less than 80% of the area of the wall-glazing construction for this building).

(b) Minimum Total **R-value of 1.4** (where the wall is more than 80% of the area of the wall-glazing construction for this building).

Refer to Appendix D for wall area to wall-glazing area calculation.

The **solar admittance** of externally facing wall-glazing costruction must not be greater **0.13**.

External Wall Construction ***Option 1- 190mm Concrete block and 10 mm of bulk insulation***	***Approximate R Value (Summer)***
Outdoor air film	0.03
Concrete /Brick work (190mm)	0.17
Unventilated Airspace (20mm)	0.48
Aluminium Sheeting	0
EPS Bulk insulation	0.25
Gypsum Plasterboard (10mm)	0.06
Indoor air film	0.12
Thermal frame losses (there are no thermal frames)	0
Total R-Value*	**1.11**

External Wall Construction *Option 2- 190mm Concrete Block and 25 mm of bulk insulation*	*Approximate R Value (Summer)*
Outdoor air film	0.03
Concrete /Brick work (190mm)	0.17
Unventilated Airspace (20mm)	0.48
Aluminium Sheeting	0
EPS Bulk insulation	0.63
Gypsum Plasterboard (10mm)	0.06
Indoor air film	0.12
Thermal frame losses (there are no thermal frames)	0
Total R-Value*	**1.49**

b. Internal walls to conditioned spaces

Wall components of a wall-glazing consruction must achieve a minimum Total **R-value of 0.5** (where the wall is less than 80% of the area of the wall-glazing construction for this building).

Internal Wall Construction *Option 1*	*Approximate* *R Value* *(Summer)*
Indoor air film	0.12
Gypsum Plasterboard (10mm)	0.06
Non reflective airspace (75mm)	0.16
Gypsum Plasterboard (10mm)	0.06
Indoor air film	0.12
Thermal frame losses (there are no thermal frames)	0
Total R-Value*	**0.52**

c. Wall thermal breaks

For compliance with J0.2(c), a wall that—

(a) does not have a wall lining or has a wall lining that is fixed directly to the same metal frame; and

(b) has lightweight external cladding such as weatherboards, fibre-cement or metal sheeting fixed to a metal frame, must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed at all points of contact between the external cladding and the metal frame.

d. Glazing

1. All levels: **Comfort Plus Neutral 59 has U3.60 and SHGC 0.51**

The following glazing **overhangs** shall be installed:

Level	Minimum horizontal length of glazing overhangs [mm]
GF	2000
1	1080
2	330
3	330
4	330

J 1.6 FLOORS

The proposed floor construction consists of a slab on the ground.

(a) The floor must be insulated to an R value of 2.

(b) The floor must be insulated around the vertical edge of its perimeter with insulation having an R-Value greater than or equal to 1.0

Insulation required by (b) for a concrete slab-on-ground must—

1. be water resistant; and
2. be continuous from the adjacent finished ground level—

   (A)to a depth not less than 300 mm; or

   (B)for the full depth of the vertical edge of the concrete slab-on-ground.

Floor Construction (Ground)	*Approximate R Value (Summer)*
Indoor air film	0.12
Concrete Slab (100mm)	0.069
Airspace (20mm)	0.48
Soil	1.5
Total R-Value*	2.17

Refer to Appendix D for Soil R value calculations.

J2

Blank.

J3 BUILDING SEALING

An entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, rapid roller door, revolving door or the like.

A seal to restrict air infiltration must be fitted to each edge of a door, openable window or the like, forming part of the envelope of a conditioned space. This does not apply for windows complying with AS 2047 or fire or smoke doors.

Exhaust fans that serve conditioned spaces or habitable rooms must be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space.

Reed shitches, which disable heating and cooling must be installed to doors leading to the outside of the building (exludes fire exits).

J4

Blank.

J5 AIR-CONDITIONING AND VENTILATION SYSTEMS

J5.2 AIR-CONDITIONING SYSTEM CONTROL

(a) The air-conditioning system of the building-

1. must have the ability to be deactivated when the building is not occupied;
2. when serving more than one air-conditioning zone or area with different heating or cooling needs, must-
   (A) thermostatically control the temperature of each zone or area;
   (B) not control the temperature by mixing actively heated air and actively cooled air;
   (C) for a variable supply air rate, the limit reheating to not more than 7.5K rise in temperature at the normal supply air rate but increased or decreased at the same rate that the supply air rate is respectively decreased or increased;
3. Fans with an airflow of more than 1000 L/s, must have a variable speed fan when its supply air quantity is capable of being varied;
4. must have the ability to use direct signals from the control components responsible for the delivery of comfort conditions in the building to regulate the operation of central plant;
5. must have a control dead band of not less than 2°C, except where a smaller range is required for specialised applications;
6. must be provided with balancing dampers and balancing valves that ensure the maximum design air or fluid flow is achieved but not exceeded by more than 15% above design at each component;
7. when deactivated, must close any motorised outdoor air or return air damper that is not otherwise being actively controlled.

(b) A **time switch**, which has the capability of switching on and off electrical power to the air-conditioning system at variable preprogramed times and on variable preprogramed days must be provided to control each of the following:

1. An air- conditioning system of more than 2kWr;
2. A heater of more than 1kW used for air- conditioning;
3. The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre- programmed days.

J5.3 MECHANICAL VENTILATION SYSTEM CONTROL

(a) The mechanical ventilation system of the building must be capable of being deactivated when the building or part of the building served by that system is not occupied;

(b) A variable speed fan is required for an airflow of more than 1000 L/s;

(c) An exhaust system with an air flow rate of more than 1000 L/s must be capable of stopping the motor when the system is not needed;

(d) Time switches-

1. A time switch must be provided to a mechanical ventilation system with an air flow rate of more than 1000 L/s;
2. The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days;

J5.4 FAN SYSTEMS

(a) Fans in systems have an efficiency at full load operating point not less than the efficiency calculated with the following formula:

$$\eta_{min} = 13 \times \ln(p) - 30 = 13 \times \ln(40) - 30 = 17.96$$

Where-
η_{min} the minimum required system static efficiency for installation type B;
p the static pressure of the system (Pa)

(b) Ductwork-

1. The pressure drop in the index run across all straight sections of rigid ductwork and all sections of flexible ductwork must not exceed 1 Pa/m when averaged over the entire length of straight rigid duct and flexible duct. The pressure drop of flexible ductwork sections may be calculated as if the flexible ductwork is laid straight;
2. Flexible ductwork must not account for more than 6 m in length in any duct run;
3. The upstream connection to ductwork bends, elbows and tees in the index run must have an equivalent diameter to the connected duct;
4. Turning vanes must be included in all rigid ductwork elbows of 90° or more acute than 90° in the index run.

(c) Ductwork components in the index run-

1. The pressure drop across a coil must not exceed 90 Pa;
2. Where applicable, a high efficiency particulate arrestance (HEPA) air filter must not exceed the higher of a pressure drop of 200 Pa when clean;
3. The pressure drop across intake louvres must not exceed the higher of 30 Pa;
4. The pressure drop across a variable air volume box, with the damper in the fully open position, must not exceed 100 Pa;
5. Attenuators must not exceed a pressure drop of 40 Pa;
6. Fire dampers must not exceed a pressure drop of 15 Pa when open;
7. Balancing and control dampers in the index run must not exceed a pressure drop of 25 Pa when in the fully open position;
8. Supply air diffusers and grilles must not exceed a pressure drop of 40 Pa;
9. Exhaust grilles must not exceed a pressure drop of 30 Pa;
10. Transfer ducts must not exceed a pressure drop of 12 Pa;
11. Door grilles must not exceed a pressure drop of 12 Pa;
12. Active chilled beams must not exceed a pressure drop of 150 Pa.

J5.5 DUCTWORK INSULATION

The **insulation of ducts** for HVAC systems must comply with the following:

(a) R-Value of the duct insulation must be greater than 1.2 within a conditioned space, greater than 3 if exposed to sunlight and greater than 2 for all other locations;
(b) Insulation must be protected against the effects of weather and sunlight;
(c) Must be installed so that it maintains its position and thickness;
(d) A vapour barrier must be placed outside the insulation. Edges of the vapour barrier must be taped together.

J5.6 DUCTWORK SEALING

Ductwork in an air-conditioning system with a capacity of 3000 L/s or greater, not located within the only or last room served by the system, must be sealed against air loss in accordance with the duct sealing requirements of AS 4254.1 and AS 4254.2 for the static pressure in the system.

J5.7 PUMPS

Not applicable

J 5.8 PIPEWORK INSULATION

(a) For piping of heating and cooling fluids, insulation R-Value is 1.7;
(b) Insulation must be protected against the effects of weather and sunlight;
(c) Insulation provided to piping, vessels, heat exchangers or tanks containing cooling fluid must be protected by a vapour barrier on the outside of the insulation.

J 5.9 SPACE HEATING

Not applicable

J 5.10 REFRIGERANT CHILLERS

Not applicable

J5.11 UNITARY AIR-CONDITIONING EQUIPMENT

The capacity of unitary air-conditioning equipment including package air-conditioners, split systems, and variable refrigerant flow systems must be greater than or equal to 65 kWr. Water cooled, have a minimum energy efficiency ratio of 4.0 W_r / $W_{input\ power}$ for cooling when tested in accordance with AS/NZS 3823.1.2 at test condition T1. Input power includes both compressor and fan input power.

J 5.12 HEAT REJECTION EQUIPMENT

Not applicable

J6 ARTIFICIAL LIGHTING AND POWER

J6.2 ARTIFICIAL LIGHTING

(a) All lighting designs must comply with AS1680 and Maximum Illumination power densities are described as follows: detailed lighting calculator can be viewed in the Appendix A.

Space	Max. illumination power density (W/m^2)
Shops	14
Shop Entry	5
Office Rooms	4.5
Public/ Office Spaces	4
Kitchen	4
Lobby and Hallway	5
Toilets and Bathrooms	3
Storage Room	1.5
Plant Room	2
Lifts	3
Fire Stairs	2
Car Park	2

(b) Concessions on the above maximum power levels are allowed when:

1. Where timers a fitted in corridors the lighting power density may be increased by a factor of 1/0.7;
2. Where motion detectors control up to 6 lights the lighting power density may be increased by a factor of 1/0.7;
3. Where a manual dimming device is installed the lighting power density may be increased by a factor of 1/0.95;
4. Where an automatic dimming device is installed the lighting power density may be increased by a factor of 1/0.85;
5. Where an daylight sensor is installed the lighting power density may be increased by a factor of 1/0.5 (only applies to lights connected to the daylight sensor).

(c) Note that motion sensors must:

1. Be capable of detecting motion via infrared, ultrasonic, microwave or a combination of these means;

2. Be capable of detecting a person's movements before he/she passes a distance of 1m into the space;
3. Not control an area larger than 100 m^2;
4. Must switch off the equipment or lights within 30 minutes unless the motion sensor is reset;
5. Not have a manual override switch, where the manual override has the capability to be left on permanently.

(d) Note that daylight sensors must:
1. Be capable of having the switching level setpoint adjusted between 50 to 100 Lux;
2. Have a delay of more than two minutes;
3. Have a differential of more that 50 Lux for controlling lighting;
4. If the daylight switch has a manual override switch, the manual override must not have the capability of permanently being left on.

(e) Note that lighting timers must:
1. Be located within 2m of every entry door to the space;
2. Have an indicator light;
3. Not control more than an area of 100 m^2.

(f) Note that time switches:
1. shall have the capacity of switching on and off electrical power at variable preprogramed times and on variable preprogramed days;
2. Must have a manual override capability and manual off switch.

Decorative lighting must be controlled separately to the indoor artificial lighting. Where the decorative lighting power exceeds 1kW, a time switch must be installed.

J6.3 INTERIOR ARTIFICIAL LIGHTING AND POWER CONTROL

(a) All artificial lighting of a room or space must be individually operated by a switch or other control device;

(b) An artificial lighting switch or other control device must be located in a visible and easily accessed position;

(c) 95% of the light fittings in the building or storey of the building must be controlled by a time switch; **or** an occupant sensing device such as

- a security key card reader that registers a person entering and leaving the building; or
- a motion detector

(d) Artificial lighting in a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp, must be controlled by a motion detector;

(e) Artificial lighting in a foyer, corridor and other circulation spaces must be controlled by a daylight sensor and dynamic lighting control device.

Note that the ***motion detector***:

Sahll be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and

(ii) be capable of detecting

(A) a person before they have entered 1 m into the space; and

(B) movement of 500 mm within the useable part of the space; and

(iii) not control more than—

(A) in other than a carpark, an area of 500 m^2 with a single sensor or group of parallel sensors; and

(B) 75% of the lights in spaces using high intensity discharge; and

(iv) be configured so that the lights are turned off when the space is unoccupied for more than 15 minutes; and

(v) be capable of being overridden by a manual switch that only enables the lights to be turned off.

J6.4 INTERIOR DECORATIVE AND DISPLAY LIGHTING

Not applicable.

J6.5 EXTERIOR ARTIFICIAL LIGHTING

Exterior artificial lighting attached to or directed at the façade of the building must be controlled by a daylight sensor; when the total lighting load exceeds 100W, LED luminaires should be used for 90% of the total lighting load, and controlled by a motion detector; for decorative purposes, like façade lighting or signage lighting, a separate time switch is used.

J6.6 BOILING WATER AND CHILLED WATER STORAGE UNITS

Power supply to a boiling water or chilled water storage unit must be controlled by a time switch.

J6.7 LIFTS

(a) Lifts must be configured to ensure artificial lighting and ventilation in the car are turned off when it is unused for 15 minutes;
(b) Lift idle and standby energy performance level for building is 3;
(c) Lift energy efficiency class for the building is C.

J6.8 ESCALATORS AND MOVING WALKWAYS

Not applicable.

J7 HEATED WATER SUPPLY

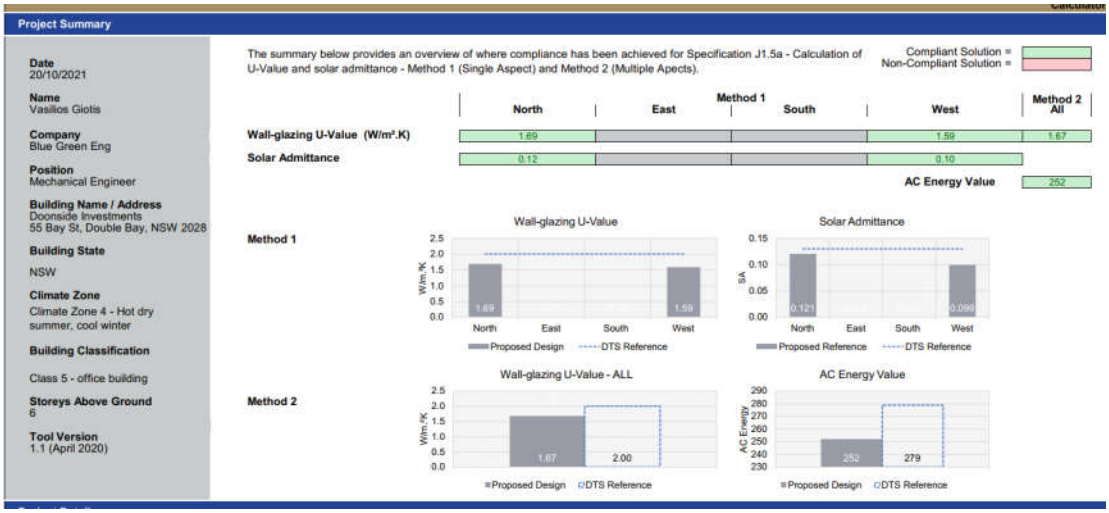
A heated water supply system for food preparation and sanitary purposes must be designed and installed in accordance with Part B2 of NCC Volume Three — Plumbing Code of Australia.

J8 FACILITIES FOR ENERGY MONITORING

The building must have an energy meter to record the time-of -use consumption of gas and electricity.

COMPLIANCE

If the recomndatations are adhered to in this report, the building shall achieve complaince via Method 1.



Please see the appendix for the detailed results from the façade calculator.

Appendix A: LIGHTING LEVELS

Figure 1. *Lighting calculator results*

ID	Description	Floor area of the space	Perimeter of the space	Floor to ceiling height	Design Illumination Power Load	Space
1	GF shop 1	84.0 m²			14 W	Retail space including a museum and gallery whose purpose is the sale of objects
2	GF entry	28.2 m²			5 W	Corridors
3	GF shop 2	67.6 m²			14 W	Retail space including a museum and gallery whose purpose is the sale of objects
4	GF shop 3	27.9 m²			14 W	Retail space including a museum and gallery whose purpose is the sale of objects
5	GF car park lift	46.2 m²			3 W	Lift cars
6	GF lift	5.1 m²			3 W	Lift cars
7	GF service walkway	5.2 m²			5 W	Corridors
8	GF toilet	5.7 m²			3 W	Toilet, locker room, staff room, rest room and the like
9	GF fire stair	7.0 m²			2 W	Stairways, including fire-isolated stairways
10	L1 entry	13.3 m²			5 W	Corridors
11	L1 office space	174.7 m²			5 W	Office - artificially lit to an ambient level of 200 lx or more
12	L1 shop store room	17.7 m²			2 W	Storage
13	L1 plant room	24.9 m²			2 W	Plant rooms with a horizontal illuminance target of 80 lx
14	L1 services room	2.8 m²			2 W	Service area, cleaner's room and the like
15	L1 lift	5.3 m²			3 W	Lift cars
16	L1 fire stair	11.1 m²			2 W	Stairways, including fire-isolated stairways
17	L2 office A	93.3 m²			5 W	Office - artificially lit to an ambient level of 200 lx or more
18	L2 office B	41.6 m²			5 W	Office - artificially lit to an ambient level of 200 lx or more
19	L2 kitchen	7.3 m²			4 W	Kitchen and food preparation area
20	L2 hallway	22.9 m²			5 W	Corridors
21	L2 toilet 2	6.2 m²			3 W	Toilet, locker room, staff room, rest room and the like
22	L2 toilet 1	2.7 m²			3 W	Toilet, locker room, staff room, rest room and the like
23	L2 lift	5.4 m²			3 W	Lift cars
24	L2 fire stair	12.4 m²			2 W	Stairways, including fire-isolated stairways
25	L2 office C	53.8 m²			5 W	Office - artificially lit to an ambient level of 200 lx or more

26	L3 office A	93.3 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
27	L3 office B	41.6 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
28	L3 kitchen	7.3 m²		4 W	Kitchen and food preparation area
29	L3 hallway	22.9 m²		5 W	Corridors
30	L3 toilet 2	6.2 m²		3 W	Toilet, locker room, staff room, rest room and the like
31	L3 toilet 1	2.7 m²		3 W	Toilet, locker room, staff room, rest room and the like
32	L3 lift	5.4 m²		3 W	Lift cars
33	L3 fire stair	12.4 m²		2 W	Stairways, including fire-isolated stairways
34	L3 office C	53.8 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
35	L4 office A	93.3 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
36	L4 office B	41.6 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
37	L4 kitchen	7.3 m²		4 W	Kitchen and food preparation area
38	L4 hallway	22.9 m²		5 W	Corridors
39	L4 toilet 2	6.2 m²		3 W	Toilet, locker room, staff room, rest room and the like
40	L4 toilet 1	2.7 m²		3 W	Toilet, locker room, staff room, rest room and the like
41	L4 lift	5.4 m²		3 W	Lift cars
42	L4 fire stair	12.4 m²		2 W	Stairways, including fire-isolated stairways
43	L4 office C	53.8 m²		5 W	Office - artificially lit to an ambient level of 200 lx or more
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					

Total	183 W

System Illumination Power Load Allowance	Lighting System Share of % of Aggregate Allowance Used	ID	Description	Location	Maximum Illumination Power Density	Power Load (*prior to use of any Adjustment Factors*)
1176 W	8% of 3%	1	GF shop 1	Retail space including a museum and gallery whose purpose is the sale of objects	14 W/m²	1176 W
141 W	3% of 3%	2	GF entry	Corridors	5 W/m²	141 W
946 W	8% of 3%	3	GF shop 2	Retail space including a museum and gallery whose purpose is the sale of objects	14 W/m²	946 W
391 W	8% of 3%	4	GF shop 3	Retail space including a museum and gallery whose purpose is the sale of objects	14 W/m²	391 W
139 W	2% of 3%	5	GF car park lift	Lift cars	3 W/m²	139 W
15 W	2% of 3%	6	GF lift	Lift cars	3 W/m²	15 W
26 W	3% of 3%	7	GF service walkway	Corridors	5 W/m²	26 W
17 W	2% of 3%	8	GF toilet	Toilet, locker room, staff room, rest room and the like	3 W/m²	17 W
14 W	1% of 3%	9	GF fire stair	Stairways, including fire-isolated stairways	2 W/m²	14 W
67 W	3% of 3%	10	L1 entry	Corridors	5 W/m²	67 W
786 W	2% of 3%	11	L1 office space	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	786 W
27 W	1% of 3%	12	L1 shop store room	Storage	1.5 W/m²	27 W
50 W	1% of 3%	13	L1 plant room	Plant rooms with a horizontal illuminance target of 80 lx	2 W/m²	50 W
4 W	1% of 3%	14	L1 services room	Service area, cleaner's room and the like	1.5 W/m²	4 W
16 W	2% of 3%	15	L1 lift	Lift cars	3 W/m²	16 W
22 W	1% of 3%	16	L1 fire stair	Stairways, including fire-isolated stairways	2 W/m²	22 W
420 W	2% of 3%	17	L2 office A	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	420 W
187 W	2% of 3%	18	L2 office B	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	187 W
29 W	2% of 3%	19	L2 kitchen	Kitchen and food preparation area	4 W/m²	29 W
115 W	3% of 3%	20	L2 hallway	Corridors	5 W/m²	115 W
19 W	2% of 3%	21	L2 toilet 2	Toilet, locker room, staff room, rest room and the like	3 W/m²	19 W
8 W	2% of 3%	22	L2 toilet 1	Toilet, locker room, staff room, rest room and the like	3 W/m²	8 W
16 W	2% of 3%	23	L2 lift	Lift cars	3 W/m²	16 W
25 W	1% of 3%	24	L2 fire stair	Stairways, including fire-isolated stairways	2 W/m²	25 W
242 W	2% of 3%	25	L2 office C	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	242 W
420 W	2% of 3%	26	L3 office A	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	420 W
187 W	2% of 3%	27	L3 office B	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	187 W
29 W	2% of 3%	28	L3 kitchen	Kitchen and food preparation area	4 W/m²	29 W
115 W	3% of 3%	29	L3 hallway	Corridors	5 W/m²	115 W
19 W	2% of 3%	30	L3 toilet 2	Toilet, locker room, staff room, rest room and the like	3 W/m²	19 W
8 W	2% of 3%	31	L3 toilet 1	Toilet, locker room, staff room, rest room and the like	3 W/m²	8 W
16 W	2% of 3%	32	L3 lift	Lift cars	3 W/m²	16 W
25 W	1% of 3%	33	L3 fire stair	Stairways, including fire-isolated stairways	2 W/m²	25 W
242 W	2% of 3%	34	L3 office C	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	242 W

420 W	2% of 3%	26	L3 office A	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	420 W
187 W	2% of 3%	27	L3 office B	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	187 W
29 W	2% of 3%	28	L3 kitchen	Kitchen and food preparation area	4 W/m²	29 W
115 W	3% of 3%	29	L3 hallway	Corridors	5 W/m²	115 W
19 W	2% of 3%	30	L3 toilet 2	Toilet, locker room, staff room, rest room and the like	3 W/m²	19 W
8 W	2% of 3%	31	L3 toilet 1	Toilet, locker room, staff room, rest room and the like	3 W/m²	8 W
16 W	2% of 3%	32	L3 lift	Lift cars	3 W/m²	16 W
25 W	1% of 3%	33	L3 fire stair	Stairways, including fire-isolated stairways	2 W/m²	25 W
242 W	2% of 3%	34	L3 office C	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	242 W
420 W	2% of 3%	35	L4 office A	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	420 W
187 W	2% of 3%	36	L4 office B	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	187 W
29 W	2% of 3%	37	L4 kitchen	Kitchen and food preparation area	4 W/m²	29 W
115 W	3% of 3%	38	L4 hallway	Corridors	5 W/m²	115 W
19 W	2% of 3%	39	L4 toilet 2	Toilet, locker room, staff room, rest room and the like	3 W/m²	19 W
8 W	2% of 3%	40	L4 toilet 1	Toilet, locker room, staff room, rest room and the like	3 W/m²	8 W
16 W	2% of 3%	41	L4 lift	Lift cars	3 W/m²	16 W
25 W	1% of 3%	42	L4 fire stair	Stairways, including fire-isolated stairways	2 W/m²	25 W
242 W	2% of 3%	43	L4 office C	Office - artificially lit to an ambient level of 200 lx or more	4.5 W/m²	242 W
		44				
		45				
		46				
		47				
		48				
		49				
		50				
		51				
		52				
		53				

7020 W

Appendix B: WINDOW MODELLING CONDITIONS

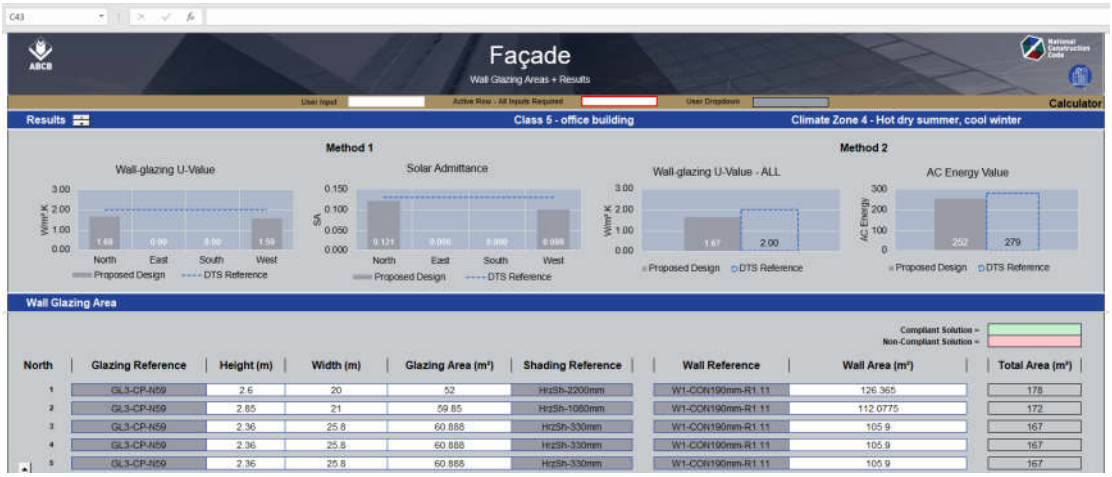
Not Applicable

Appendix C: BCA FAÇADE CALCULATOR

Wall Systems

	Wall Reference	Wall Type	Spandrel Methodology	Wall Construction	Wall Thickness (mm)	Total System R-Value (m^2.K/W)	Solar Absorptance
1	W1-CON190mm-R1.11	Wall		W1-CON-R1.11	240	1.11	0.45

Wall Glazing Area



North	Glazing Reference	Height (m)	Width (m)	Glazing Area (m^2)	Shading Reference	Wall Reference	Wall Area (m^2)	Total Area (m^2)
1	GL3-CP-N59	2.6	20	52	HrzSh-2200mm	W1-CON190mm-R1.11	126.365	178
2	GL3-CP-N59	2.85	21	59.85	HrzSh-1080mm	W1-CON190mm-R1.11	112.0775	172
3	GL3-CP-N59	2.36	25.8	60.888	HrzSh-330mm	W1-CON190mm-R1.11	105.9	167
4	GL3-CP-N59	2.36	25.8	60.888	HrzSh-330mm	W1-CON190mm-R1.11	105.9	167
5	GL3-CP-N59	2.36	25.8	60.888	HrzSh-330mm	W1-CON190mm-R1.11	105.9	167

West	Glazing Reference	Height (m)	Width (m)	Glazing Area (m^2)	Shading Reference	Wall Reference	Wall Area (m^2)	Total Area (m^2)
1	GL1-VFLOT-CLR	2.6	2.97	7.722	HrzSh-2200mm	W1-CON190mm-R1.11	29.054	37
2	GL3-CP-N59	2.85	2.98	8.493	HrzSh-1080mm	W1-CON190mm-R1.11	105.9	114
3	GL3-CP-N59	2.85	13.12	37.392	HrzSh-330mm	W1-CON190mm-R1.11	47.0196	84
4	GL3-CP-N59	2.85	13.12	37.392	HrzSh-330mm	R1.11	43.7	81
5	GL3-CP-N59	2.85	13.12	37.392	HrzSh-330mm	R1.11	43.7	81
6								0

Shading Reference Tip
Select a unique Shading Reference that is present on the vision system. Only one unique reference can be

Project Summary

Appendix D: J1.6 Floors

Soil R Value Calculation

	Level	Space or building element	Area [m2]	Air- conditioned Area [m²]	Space to be Air conditioned
1	GF	GF - Shop 1	84.0	84.0	YES
2	GF	GF - Shop 2	67.6	67.6	YES
3	GF	GF - Shop 3	27.9	27.9	YES
4	GF	GF - toilet	5.7	-	NO
5	GF	GF - Car park lift	46.2	-	NO
6	GF	GF - Lift	5.0	-	NO
7	GF	GF - Service walkway	5.2	-	YES
8	GF	GF - Fire stairs	7.0	-	NO
9	GF	GF - Entry	28.2	-	NO
		TOTAL AREA [m2]	**277**	**119**	

Ground Floor Area [m2] =	277
Ground Floor Air Conditioned Perimeter [m]=	91.8
Floor Area to perimeter ratio =	1.35
Wall thickness [mm] =	240
Soil R Value =	1.5

Table 2b details the R-Values considered to be achieved by the soil for floors that are in direct contact with the ground.

Table 2b R-Value of soil in contact with a floor

Ratio of *floor area* to floor perimeter (m)	Wall thickness of 50 mm	Wall thickness of 100 mm	Wall thickness of 150 mm	Wall thickness of 200 mm	Wall thickness of 250 mm	Wall thickness of 300 mm
1.0	0.4	0.5	0.5	0.6	0.7	0.8
1.5	0.6	0.7	0.7	0.8	0.9	1.0
2.0	0.7	0.8	0.9	1.0	1.1	1.3
2.5	0.9	1.0	1.1	1.2	1.3	1.5
3.0	1.0	1.2	1.3	1.4	1.5	1.7
3.5	1.2	1.3	1.5	1.6	1.7	1.9
4.0	1.3	1.5	1.6	1.7	1.9	2.2
4.5	1.5	1.7	1.8	1.9	2.1	2.4
5.0	1.6	1.8	2.0	2.1	2.3	2.6
5.5	1.8	2.0	2.1	2.2	2.4	2.8
6.0	1.9	2.1	2.3	2.4	2.6	2.9
6.5	2.0	2.3	2.4	2.6	2.8	3.1

Ratio of *floor area* to floor perimeter (m)	Wall thickness of 50 mm	Wall thickness of 100 mm	Wall thickness of 150 mm	Wall thickness of 200 mm	Wall thickness of 250 mm	Wall thickness of 300 mm
7.0	2.2	2.4	2.6	2.7	3.0	3.3

Table 2a Thermal conductivity of typical wall, roof/ceiling and floor materials

Material description		Material density (kg/m^3)	Thermal conductivity (W/m.K)
1.	**Framing**		
(a)	Steel	7850	47.5
(b)	Timber – kiln dried hardwood (across the grain)	677	0.16
(c)	Timber – Radiata pine (across the grain)	506	0.10
2.	**Roof Cladding**		
(a)	Aluminium sheeting	2680	210
(b)	Concrete or terra cotta tiles	1922	0.81
(c)	Steel sheeting	7850	47.5
3.	**Wall Cladding**		
(a)	Aluminium sheeting	2680	210
(b)	Autoclaved aerated concrete	350	0.10
		900	0.27
(c)	Cement render (1 cement : 4 sand)	1570	0.53
(d)	Clay bricks		
	(i) Clay brick – 2.75 kg	1430	0.55
	(ii) Clay brick – 3.25 kg	1690	0.65
	(iii) Clay brick – 3.75 kg	1950	0.78
(e)	Concrete blocks		
	(i) 190 mm dense or 90 mm dense solid	1100/2200	1.1
	(ii) 140 mm dense or 190 mm lightweight	1250/910	0.85
	(iii) 90 mm dense hollow or 90 mm lightweight solid	1650/1800	0.75
	(iv) 140 mm lightweight	1050	0.67
	(v) 90 mm lightweight	1360	0.55
(f)	Fibre-cement	1360	0.25
(g)	Gypsum plasterboard	880	0.17
(h)	Pine weatherboards	506	0.10
(i)	Plywood	530	0.14
(j)	Solid concrete	2400	1.44
(k)	Steel sheeting	7850	47.5
(l)	Prestressed hollow core concrete panel	1680	0.80

Notes to Table 2a:

1. For materials which incorporate cores or hollows in regular patterns (such as cored brickwork, hollow blockwork and cored floor or wall panels), the tabulated material densities and thermal conductivities are based on the gross density (mass divided by external dimensions).
2. The *R-Value* of a material is determined by dividing the thickness of the material in metres by the thermal conductivity in W/m.K.

   (b) Table 2b lists the *R-Values* considered to be achieved by air films and airspaces.

Appendix E: Drawings Used