BCA 2019 – Section J Compliance Report

Project Name:	Platypus Playground Child Care Centre
Address:	61 Wardell Drive SOUTH PENRITH NSW 2750
Building Classification:	9b – Assembly Building
Climate Zone:	6 – Mild Temperate

Prepared by;

Document Owner	Company
Brad Hoad	Thermal Performance

Version Control;

Version	Date	Description
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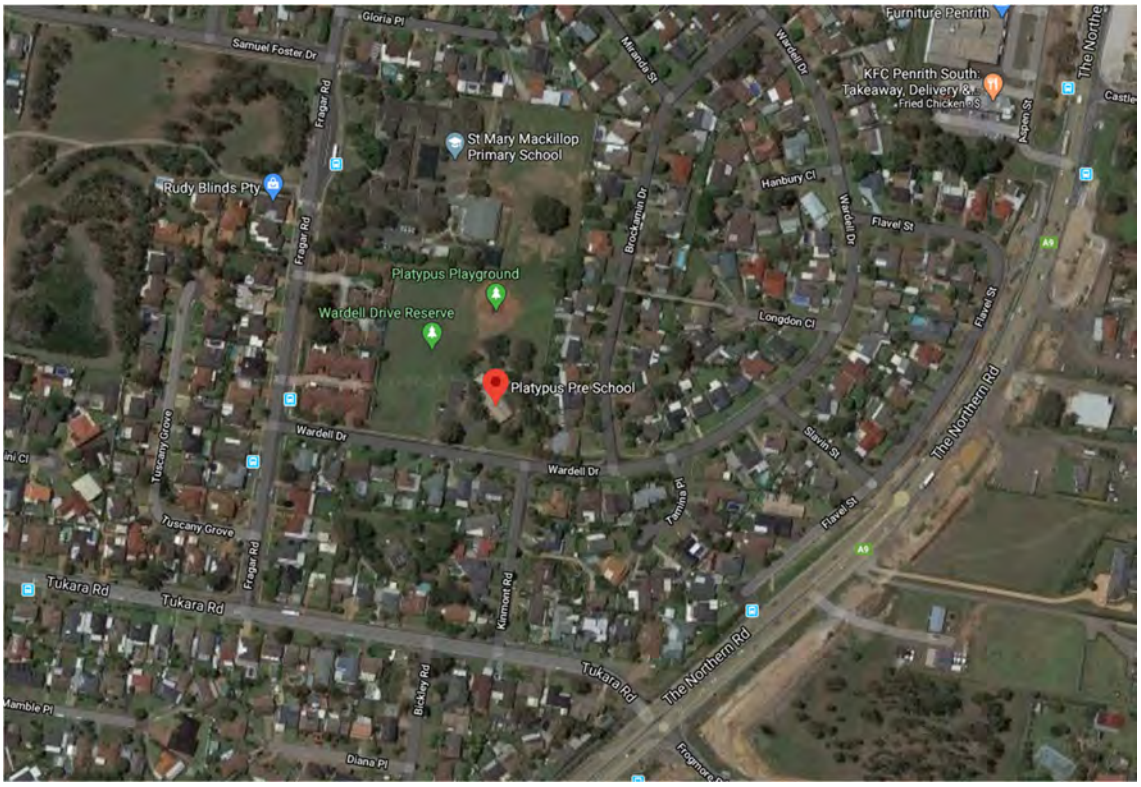

Location & surrounding area

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Report Purpose

The purpose of the report is to determine or outline the necessary requirements for the project to satisfy Section J of the 2019 Building Code of Australia (BCA) Volume 1 which forms part of the National Construction Code (NCC).

This report should be read in conjunction with and with reference to the BCA Volume 1 and compliance may rely on further details produced by specific contractors in accordance with this report.

Project Description

The proposal is for approval to carry out Alterations & Additions to an existing Child Care Centre.

Compliance with the NCC

There are various pathways for compliance with the NCC/BCA, compliance is achieved by complying with—

1. the Governing Requirements of the NCC; and
2. the Performance Requirements.

Compliance with the Performance Requirements

Performance Requirements are satisfied by one of the following;

1. A Performance Solution (PS)
2. A Deemed-to-Satisfy Solution (DtS)
3. A combination of (1) and (2)

This report aims to demonstrate compliance with the DtS however may rely on Expert Judgement and Comparison with the DtS as allowed as a combination of (1) & (2) above.

Suitability & Evidence of Suitability

Materials that buildings are constructed from must be fit for their intended purpose and may require forms of evidence, refer BCA Vol 1 A5.0. All skill, due care and known knowledge will be used in preparation of this report however it is assumed that the Builder in conjunction with the Manufacturer/Supplier will ensure that any materials specified or recommended are fit for purpose with respect to use/installation, fire resistance, fire hazard properties & resistance to the incipient spread of fire.

Section J

Objective of Section J is to reduce Greenhouse Gas emissions.

Performance Requirements - JP1 Energy use

A building, including its services, must have features that facilitate the efficient use of energy appropriate to—

(a) the function and use of the building; and
(b) the level of human comfort required for the building use; and
(c) solar radiation being—
  (i) utilised for heating; and
  (ii) controlled to minimise energy for cooling; and
(d) the energy source of the services; and
(e) the sealing of the building envelope against air leakage; and
(f) for a conditioned space, achieving an hourly regulated energy consumption, averaged over the annual hours of operation, of not more than—
  (i) for a Class 6 building, 80 kJ/m^2.hr; and
  (ii) for a Class 5, 7b, 8 or 9a building other than a ward area, or a Class 9b school, 43 kJ/m^2.hr; and
  (iii) for all other building classifications, other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, 15 kJ/m^2.hr.

Verification Methods – JV1, JV2, JV3 & JV4

This report uses the DtS pathway and doesn't rely on any Verification Method pre-construction however may use the JV4 verification for Building Sealing post-construction.

Part J0 – Energy Efficiency

J0.0 Deemed-to-Satisfy Provisions

(a) Where a Deemed-to-Satisfy Solution is proposed, Performance Requirement JP1 is satisfied by complying with—
  (i) J0.1 to J0.5; and
  (ii) J1.1 to J1.6; and
  (iii) J3.1 to J3.7; and
  (iv) J5.1 to J5.12; and
  (v) J6.1 to J6.8; and
  (vi) J7.1 to J7.4; and
  (vii) J8.1 to J8.3.
(b) Where a Performance Solution is proposed, the relevant Performance Requirements must be determined in accordance with BCA Vol 1. A2.2(3) and BCA Vol 1. A2.4(3) as applicable.

J0.1 Application of Section J

Performance Requirement JP1 is satisfied by complying with—

(a) for reducing the heating or cooling loads—
  (i) of sole-occupancy units of a Class 2 building or a Class 4 part of a building, J0.2 to J0.5; and

(ii) of a Class 2 to 9 building, other than the sole-occupancy units of a Class 2 building or a Class 4 part of a building, Parts J1 and J3; and

(b) for air-conditioning and ventilation, Part J5; and

(c) for artificial lighting and power, Part J6; and

(d) for heated water supply and swimming pool and spa pool plant, Part J7; and

(e) for facilities for monitoring, Part J8.

J0.2 Heating and cooling loads of sole-occupancy units of a Class 2 building or a Class 4 part

The sole-occupancy units of a Class 2 building or a Class 4 part of a building must—

(a) for reducing the heating or cooling loads—
  (i) collectively achieve an average energy rating of not less than 6 stars, including the separate heating and cooling load limits; and
  (ii) individually achieve an energy rating of not less than 5 stars, including the separate heating and cooling load limits,
  (iii) using house energy rating software and the load limits specified in the ABCB Standard for NatHERS Heating and Cooling Load Limits.
(b) for general thermal construction, comply with J1.2; and
(c) for thermal breaks, comply with J0.4 and J0.5; and
(d) for floor edge insulation, comply with J1.6(b) and J1.6(c); and
(e) for building sealing, comply with Part J3.

J0.3 Ceiling fans

Ceiling fans required as part of compliance with J0.2(a), must—

(a) be permanently installed; and
(b) have a speed controller; and
(c) serve the whole room, with the floor area that a single fan serves not exceeding—
  (i) 15 m2 if it has a blade rotation diameter of not less than 900 mm; and
  (ii) 25 m2 if it has a blade rotation diameter of not less than 1 200 mm.

J0.4 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.

J0.5 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.

Compliance Summary/Checklist

This is a brief summary, please refer to the details of the report of further information on the construction methods and assumptions used throughout the report.

Part	Name	Description
J1.3	Roof & ceiling construction	Existing metal roof
J1.4	Roof lights	Replace existing skylight with solartube
J1.5	Walls	Existing clad walls, if making good provide a breathable membrane & R1.5 insulation
		Existing cavity brick walls, if making good can be uninsulated
J1.5	Glazing	Existing windows
J1.6	Floors	Existing concrete slab on ground
J3	Building sealing	• Dampeners to any flues • Sealed skylights • Seals/weatherstripping to windows & doors • Self-closing doors • Dampener/Self closing device to exhaust fans
J5	Air conditioning & ventilation systems	Refer to section & specialist contractor
J6	Artificial light & power	Refer to section and ABCB lighting calculator
J7	Heated water supply, swimming pool & spa plant	9 litres/min fixtures
J8	Facilities for energy monitoring	No requirements

Compliance Details

J1.1 Application of Part

The DtS of this Part apply to building elements forming the Envelope of a Class 2 to 9 building unless noted otherwise.

Envelope

For the purposes of Section J, means the parts of a building's fabric that separate a conditioned space or habitable room from—

(a) the exterior of the building; or

(b) a non-conditioned space including—

(i) the floor of a rooftop plant room, lift-machine room or the like; and

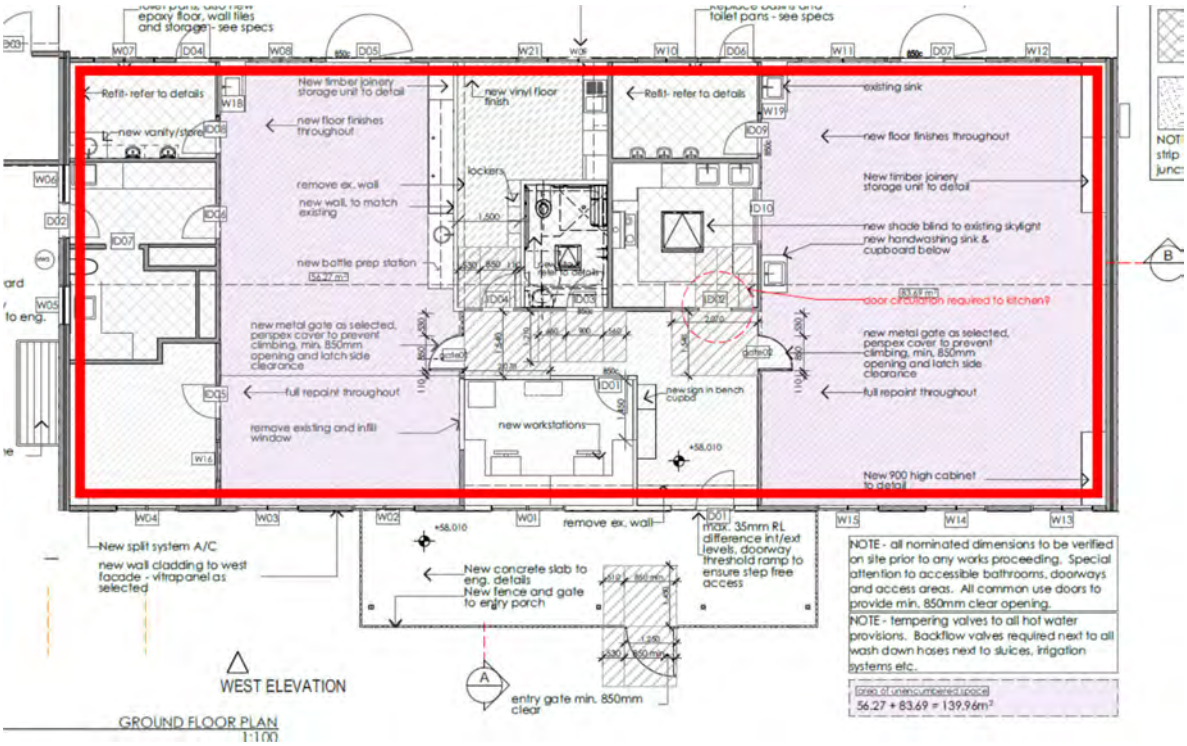
(ii) the floor above a carpark or warehouse; and

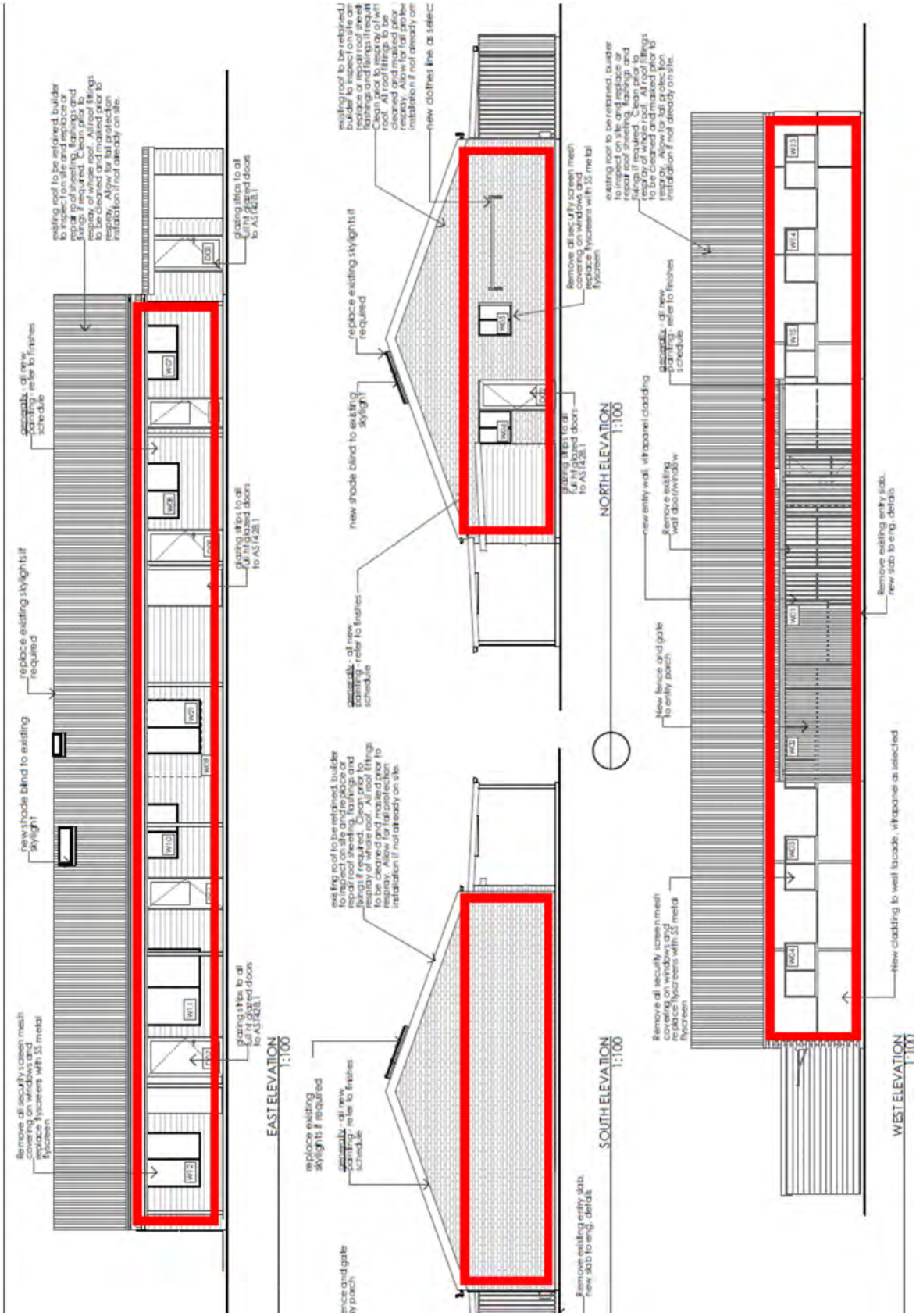
(iii) the common wall with a carpark, warehouse or the like.

Conditioned space

For the purposes of BCA Volume 1, means a space within a building, including a ceiling or under-floor supply air plenum or return air plenum, where the environment is likely, by the intended use of the space, to have its temperature controlled by air-conditioning.

For this project the Envelope and Conditioned Areas are identified as;





J1.2 Thermal construction — general

(a) Where required, insulation must comply with AS/NZS 4859.1 and be installed so that it—
  (i) abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must be against the member; and
  (ii) forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and
  (iii) does not affect the safe or effective operation of a service or fitting.

(b) Where required, reflective insulation must be installed with—
  (i) the necessary airspace to achieve the required R-Value between a reflective side of the reflective insulation and a building lining or cladding; and
  (ii) the reflective insulation closely fitted against any penetration, door or window opening; and
  (iii) the reflective insulation adequately supported by framing members; and
  (iv) each adjoining sheet of roll membrane being—
    A. overlapped not less than 50 mm; or
    B. taped together.

(c) Where required, bulk insulation must be installed so that—
  (i) it maintains its position and thickness, other than where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like; and
  (ii) in a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall by not less than 50 mm.

(d) Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in BCA Specification J1.2.

(e) The required Total R-Value and Total System U-Value, including allowance for thermal bridging, must be—
  (i) calculated in accordance with AS/NZS 4859.2 for a roof or floor; or
  (ii) determined in accordance with BCA Specification J1.5a for wall-glazing construction; or
  (iii) determined in accordance with BCA Specification J1.6 or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

J1.3 Roof and ceiling construction

(a) A roof or ceiling must achieve a Total R-Value greater than or equal to—
  (i) in climate zones 1, 2, 3, 4 and 5, R3.7 for a downward direction of heat flow; and
  (ii) in climate zone 6, R3.2 for a downward direction of heat flow; and
  (iii) in climate zone 7, R3.7 for an upward direction of heat flow; and
  (iv) in climate zone 8, R4.8 for an upward direction of heat flow.

(b) In climate zones 1, 2, 3, 4, 5, 6 and 7, the solar absorptance of the upper surface of a roof must be not more than 0.45.

Proposed roof construction method

The construction method for this project is a timber framed metal roof, however this is existing and it is anticipated that only minor making good sections be replaced.

The R value for this type of construction is;

	Item	R-Value
1	Outdoor air film	0.040
2	Metal Roof	0
3	Air space	0
4	Anticon blanket	1.216
5	Roof space	1.090
6	Ceiling Insulation	?
7	Plasterboard	0.059
8	Indoor air film	0.16
	Total construction R-Value	**2.565**

The required added R-Value is 3.2 – 2.565 = 0.635.

The most common or recommended way to achieve this is;

- ✓ R2.5 glass wool insulation (or higher) to areas that are uninsulated in the existing ceiling

Subject to the lighting specification it is recommended that if recessed downlights are installed then this R value is increased to;

- R3.0 glass wool for Fluro/LED downlights (assuming a loss of insulation for gaps of 1%)
- R5.0 glass wool for Halogen downlights (assuming a loss of insulation for gaps of 5%)

Proposed roof colour

The colour of the roof is;

- Light Green, most likely Colorbond Pale Eucalypt which has a solar absorptance of 0.6

The required solar absorptance is 0.45.

Hence it is recommended that the roof colour be changed to a colour with a solar absorption of 0.45 or less.

Roof Colour Comparison

	Colorbond Colour	Solar Absorptance
Compliant	Classic Cream	0.32
	Surfmist	0.32
	Paperbark	0.42
	Evening Haze	0.43
	Shale Grey	0.43
Non-Compliant	Dune	0.47
	Cove	0.54
	Windspray	0.58
	Pale Eucalypt	0.6
	Gully	0.63
	Mangrove	0.64
	Wallaby	0.64
	Jasper	0.68
	Terrain	0.69
	Basalt	0.69
	Manor Red	0.69
	Woodland Grey	0.71
	Monument	0.73
	Ironstone	0.74
	Cottage Green	0.75
	Deep Ocean	0.75
	Nightsky	0.96

J1.4 Roof lights

Roof lights must have—

(a) a total area of not more than 5% of the floor area of the room or space served; and

(b) transparent and translucent elements, including any imperforate ceiling diffuser, with a combined performance of—

  (i) for Total system SHGC, in accordance with Table J1.4; and

  (ii) for Total system U-Value, not more than U3.9.

Table J1.4 Roof lights - Total system SHGC

Roof light shaft index	Total area of roof lights upto 3.5% of the floor area of the room or space	Total area of roof lights more than 3.5% and up to 5% of the floor area of the room or space
<1.0	<= 0.45	<= 0.29
>= 1.0 to <2.5	<= 0.51	<= 0.33
>= 2.5	<= 0.76	<= 0.49

Proposed roof light

There is an existing skylight, it is proposed for this to be replaced with a solar tube or similar which shall be sealed at the roof for weather protection and sealed at the ceiling to prevent air leakage.

J1.5 Walls and glazing

(a) The Total System U-Value of wall-glazing construction must not be greater than—
  (i) for a Class 2 common area, a Class 5, 6, 7, 8 or 9b building or a Class 9a building other than a ward area, U2.0; and
  (ii) for a Class 3 or 9c building or a Class 9a ward area—
    A. in climate zones 1, 3, 4, 6 or 7, U1.1; or
    B. in climate zones 2 or 5, U2.0; or
    C. in climate zone 8, U0.9.

(b) The Total System U-Value of display glazing must not be greater than U5.8.

(c) The Total System U-Value of wall-glazing construction must be calculated in accordance with Specification J1.5a.

(d) Wall components of a wall-glazing construction must achieve a minimum Total R-Value of—
  (i) where the wall is less than 80% of the area of the wall-glazing construction, R1.0; or
  (ii) where the wall is 80% or more of the area of the wall-glazing construction, the value specified in Table J1.5a.

Table J1.5a Minimum wall Total R-Value - Wall area 80% or more of wall-glazing construction area

Climate zone	Class 2 common areas, Classes 5, 6, 7, 8, 9a or 9b other than a ward area	Class 3 or 9c or 9a ward area
1	2.4	3.3
2	1.4	1.4
3	1.4	3.3
4	1.4	2.8
5	1.4	1.4
6	1.4	2.8
7	1.4	2.8
8	1.4	3.8

(e) The solar admittance of externally facing wall-glazing construction must not be greater than—
  (i) for a Class 2 common area, a Class 5, 6, 7, 8 or 9b building or a Class 9a building other than a ward area, the values specified in Table J1.5b; and
  (ii) for a Class 3 or 9c building or a Class 9a ward area, the values specified in Table J1.5c.

(f) The solar admittance of a wall-glazing construction must be calculated in accordance with Specification J1.5a.

(g) The Total system SHGC of display glazing must not be greater than 0.81 divided by the applicable shading factor specified in Clause 7 of Specification J1.5a.

Table J1.5b Maximum wall-glazing construction solar admittance - Class 2 common area, Class 5, 6, 7, 8 or 9b building or Class 9a building other than a ward area

Climate zone	Eastern aspect solar admittance	Northern aspect solar admittance	Southern aspect solar admittance	Western aspect solar admittance
1	0.12	0.12	0.12	0.12
2	0.13	0.13	0.13	0.13
3	0.16	0.16	0.16	0.16
4	0.13	0.13	0.13	0.13
5	0.13	0.13	0.13	0.13
6	0.13	0.13	0.13	0.13
7	0.13	0.13	0.13	0.13
8	0.2	0.2	0.42	0.36

Table J1.5c Maximum wall-glazing construction solar admittance - Class 3 or 9b building or Class 9a ward area

Climate zone	Eastern aspect solar admittance	Northern aspect solar admittance	Southern aspect solar admittance	Western aspect solar admittance
1	0.07	0.07	0.10	0.07
2	0.10	0.10	0.10	0.10
3	0.07	0.07	0.07	0.07
4	0.07	0.07	0.07	0.07
5	0.10	0.10	0.10	0.10
6	0.07	0.07	0.07	0.07
7	0.07	0.07	0.08	0.07
8	0.08	0.08	0.08	0.08

Refer to Appendix, Compliance will be demonstrated with the Wall – Glazing Calculator.

Proposed wall construction method

All walls are existing with only minor make good repairs proposed hence remains as existing. For areas of walls that are made good the proposed construction methods are;

Clad Wall fixed to studs, The R value for this type of construction is;

	Item	R-Value
1	Outdoor air film	0.040
2	15mm fibre cement	0.060
3	Breathable membrane	0
4	R1.5 glass wool Insulation	1.591
5	Thermal bridge deduction as per NZS 4214	-0.151
6	10mm plasterboard	0.059
7	Indoor air film	0.120
	Total construction R-Value	**2.079**

Uninsulated cavity brick, The R value for this type of construction is;

	Item	R-Value
1	Outdoor air film	0.040
2	110mm brick	0.169
	Air space	0.140
4	110mm brick	0.169
5	10mm plasterboard	0.059
6	Indoor air film	0.120
	Total construction R-Value	**1.057**

The uninsulated cavity brick doesn't meet the requirements of J1.5 however any making good is minor and would not provide a continuous thermal barrier hence improving this wall construction would not improve the buildings thermal performance.

Proposed Glazing

All Glazing is existing, it is not proposed to be replaced during the renovation hence remains as existing.

As a advice, walls facing North, South & East achieve compliance with BCA 2019 Vol 1 J1.5, however the wall facing West fails the SHCG requirement, it is recommended that vertical shading or an applied film to reduce the SHGC which will have the effect of reducing the heat gain from western sun.

Please see the Appendix for calculations & exact Uw & SHGC requirements for each glazed assembly.

J1.6 Floors

(a) A floor must achieve the Total R-Value specified in Table J1.6.

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

- (i) is a concrete slab-on-ground in climate zone 8; or
- (ii) has an in-slab or in-screed heating or cooling system, except where used solely in a bathroom, amenity area or the like.

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

- (i) be water resistant; and
- (ii) 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.

Table J1.6 Floors - Minimum Total R-Value

Location	Climate zone 1 – upwards heat flow	Climate zones 2 & 3 – upwards & downwards heat flow	Climate zones 4, 5, 6 & 7 – downwards heat flow	Climate zone 8 – downwards heat flow
A floor without an in-slab heating or cooling system	2.0	2.0	2.0	3.5
A floor with an in-slab heating or cooling system	3.25	3.25	3.25	4.75

Proposed floor construction method

The existing concrete slab on ground is not affected by the renovation hence remains as existing.

Slab on ground, The R value for this type of construction is;

	Item	R-Value
1	Soil R-Value (from Soil Calculator)	1.700
2	100mm concrete	0.069
3	Vinyl floor	0.004
	Total construction R-Value	**1.773**

Part J3 Building sealing

J3.1 Application of Part

The DtS Provisions of this Part apply to elements forming the envelope of a Class 2 to 9 building, other than—

(a) a building in climate zones 1, 2, 3 and 5 where the only means of air-conditioning is by using an evaporative cooler; or

(b) a permanent building opening, in a space where a gas appliance is located, that is necessary for the safe operation of a gas appliance; or

(c) a building or space where the mechanical ventilation required by Part F4 provides sufficient pressurisation to prevent infiltration.

J3.2 Chimneys and flues

The chimney or flue of an open solid-fuel burning appliance must be provided with a damper or flap that can be closed to seal the chimney or flue.

J3.3 Roof lights

(a) A roof light must be sealed, or capable of being sealed, when serving—
  (i) a conditioned space; or
  (ii) a habitable room in climate zones 4, 5, 6, 7 or 8.

(b) A roof light required by (a) to be sealed, or capable of being sealed, must be constructed with—
  (i) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or
  (ii) a weatherproof seal; or
  (iii) a shutter system readily operated either manually, mechanically or electronically by the occupant.

J3.4 Windows and doors

(a) A door, openable window or the like must be sealed—
  (i) when forming part of the envelope; or
  (ii) in climate zones 4, 5, 6, 7 or 8.

(b) The requirements of (a) do not apply to—
  (i) a window complying with AS 2047; or
  (ii) a fire door or smoke door; or
  (iii) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.

(c) A seal to restrict air infiltration—
  (i) for the bottom edge of a door, must be a draft protection device; and
  (ii) for the other edges of a door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like.

(d) 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, other than—
  (i) where the conditioned space has a floor area of not more than 50 m2; or
  (ii) where a café, restaurant, open front shop or the like has—
    A. a 3 m deep un-conditioned zone between the main entrance, including an open front, and the conditioned space; and
    B. at all other entrances to the café, restaurant, open front shop or the like, self-closing doors.

(e) A loading dock entrance, if leading to a conditioned space, must be fitted with a rapid roller door or the like.

J3.5 Exhaust fans

(a) An exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving—
  (i) a conditioned space; or
  (ii) a habitable room in climate zones 4, 5, 6, 7 or 8.

J3.6 Construction of ceilings, walls and floors

(a) Ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like must be constructed to minimise air leakage in accordance with (b) when forming part of—
  (i) the envelope; or
  (ii) in climate zones 4, 5, 6, 7 or 8.

(b) Construction required by (a) must be—
  (i) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
  (ii) sealed at junctions and penetrations with—
    A. close fitting architrave, skirting or cornice; or
    B. expanding foam, rubber compressible strip, caulking or the like.

(c) The requirements of (a) do not apply to openings, grilles or the like required for smoke hazard management.

J3.7 Evaporative coolers

An evaporative cooler must be fitted with a self-closing damper or the like—
(a) when serving a heated space; or
(b) in climate zones 4, 5, 6, 7 or 8.

Part J5 Air-conditioning and ventilation systems

The following outlines the requirements of the BCA however we recommend that upon the project progressing past the approval process a specialist contractor be engaged to ensure the proposed design & equipment meet the following requirements.

J5.1 Application of Part

The Deemed-to-Satisfy Provisions of this Part do not apply to a Class 8 electricity network substation.

J5.2 Air-conditioning system control

(a) An air-conditioning system—

- (i) must be capable of being deactivated when the building or part of a building served by that system is not occupied; and
- (ii) 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; and
  - B. not control the temperature by mixing actively heated air and actively cooled air; and
  - C. limit reheating to not more than—
    - (a) for a fixed supply air rate, a 7.5 K rise in temperature; and
    - (b) for a variable supply air rate, a 7.5 K rise in temperature at the nominal supply air rate but increased or decreased at the same rate that the supply air rate is respectively decreased or increased; and
- (iii) which provides the required mechanical ventilation, other than in climate zone 1 or where dehumidification control is needed, must have an outdoor air economy cycle if the total air flow rate of any airside component of an air-conditioning system is greater than or equal to the figures in Table J5.2; and
- (iv) which contains more than one water heater, chiller or coil, must be capable of stopping the flow of water to those not operating; and
- (v) 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; and
- (vi))when serving a sole-occupancy unit in a Class 3 building, must not operate when any external door of the sole-occupancy unit that opens to a balcony or the like, is open for more than one minute; and
- (vii) 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; and
- (viii) must have a control dead band of not less than 2°C, except where a smaller range is required for specialised applications; and
- (ix) 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—
  - A. component; or
  - B. group of components operating under a common control in a system containing multiple components, as required to meet the needs of the system at its maximum operating condition; and

(x) must ensure that each independently operating space of more than 1 000 m2 and every separate floor of the building has provision to terminate airflow independently of the remainder of the system sufficient to allow for different operating times; and

(xi) must have automatic variable temperature operation of heated water and chilled water circuits; and

(xii) when deactivated, must close any motorised outdoor air or return air damper that is not otherwise being actively controlled.

Table J5.2 Requirement for an outdoor air economy cycle

Climate zone	Total air flow rate requiring an economy cycle (L/s)
2	9000
3	7500
4	3500
5	3000
6	2000
7	2500
8	4000

(b) When two or more air-conditioning systems serve the same space they must use control sequences that prevent the systems from operating in opposing heating and cooling modes.

(c) Time switches—

(i) A time switch must be provided to control—

A. an air-conditioning system of more than 2 kWr; and

B. a heater of more than 1 kW heating used for air-conditioning.

(ii) The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.

(iii) The requirements of (i) and (ii) do not apply to—

A. an air-conditioning system that serves—

(a) only one sole-occupancy unit in a Class 2, 3 or 9c building; or

(b) a Class 4 part of a building; or

B. a conditioned space where air-conditioning is needed for 24 hour continuous use.

J5.3 Mechanical ventilation system control

(a) **General** — A mechanical ventilation system, including one that is part of an air-conditioning system, except where the mechanical system serves only one sole-occupancy unit in a Class 2 building or serves only a Class 4 part of a building, must—

(i) be capable of being deactivated when the building or part of the building served by that system is not occupied; and

(ii) when serving a conditioned space, except in periods when evaporative cooling is being used—

A. where specified in Table J5.3, have—

(a) an energy reclaiming system that preconditions outdoor air at a minimum sensible heat transfer effectiveness of 60%; or

(b) demand control ventilation in accordance with AS 1668.2 if appropriate to the application; and

B. not exceed the minimum outdoor air quantity required by Part F4 by more than 20%, except where—

(a) additional unconditioned outdoor air is supplied for free cooling; or

(b) additional mechanical ventilation is needed to balance the required exhaust or process exhaust; or

(c) an energy reclaiming system preconditions all the outdoor air; and

(ii) for an airflow of more than 1000 L/s, have a variable speed fan unless the downstream airflow is required by Part F4 to be constant.

Table J5.3 Required outdoor air treatment

Climate zone	Outdoor air flow (L/s)	Required measure
1	>500	Modulating control
2	-	No require measure
3	>1000	Modulating control
4 & 6	>500	Modulating control or energy reclaiming system
5	>1000	Modulating control or energy reclaiming system
7 & 8	>250	Modulating control or energy reclaiming system

(b) **Exhaust systems —** 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, except for an exhaust system in a sole-occupancy unit in a Class 2, 3 or 9c building.

(c) **Carpark exhaust systems —** Carpark exhaust systems must have a control system in accordance with—

(i) 4.11.2 of AS 1668.2; or

(ii) 4.11.3 of AS 1668.2.

(d) **Time switches—**

(i) A time switch must be provided to a mechanical ventilation system with an air flow rate of more than 1000 L/s.

(ii) The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.

(iii) The requirements of (i) and (ii) do not apply to—

A. a mechanical ventilation system that serves—

(a) only one sole-occupancy unit in a Class 2, 3 or 9c building; or

(b) a Class 4 part of a building; or

B. a building where mechanical ventilation is needed for 24 hour occupancy.

J5.4 Fan systems

(a) Fans, ductwork and duct components that form part of an air-conditioning system or mechanical ventilation system must—

(i) separately comply with (b), (c), (d) and (e); or

(ii) achieve a fan motor input power per unit of flowrate lower than the fan motor input power per unit of flowrate achieved when applying (b), (c), (d) and (e) together.

(b) **Fans—**

(i) Fans in systems that have a static pressure of not more than 200 Pa must have an efficiency at the full load operating point not less than the efficiency calculated with the following formula:

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

where—

η_{min} = the minimum required system static efficiency for installation type A or C or the minimum required system total efficiency for installation type B or D; and

p = the static pressure of the system (Pa).

(ii) Fans in systems that have a static pressure above 200 Pa must have an efficiency at the full load operating point not less than the efficiency calculated with the following formula:

$\eta_{min} = 0.85 \times (a \times \ln(P) - b + N) / 100$
where—

η_{min} = the minimum required system static efficiency for installation type A or C or the minimum required system total efficiency for installation type B or D; and
P = the motor input power of the fan (kW); and
N = the minimum performance grade obtained from Table J5.4a; and
a = regression coefficient a, obtained from Table J5.4b; and
b = regression coefficient b, obtained from Table J5.4c; and
ln = natural logarithm.

(iii) The requirements of (i) and (ii) do not apply to fans that need to be explosion proof.

Table J5.4a Minimum fan performance grade

Fan type	Installation type A or C	Installation type B or D
Axial – as a component of an air handling unit or fan coil unit	46.0	51.5
Axial – other	42.0	61.0
Mixed flow – as a component of an air handling unit or fan coil unit	46.0	51.5
Mixed flow – other	52.5	65.0
Centrifugal forward curved	46.0	51.5
Centrifugal radial bladed	46.0	51.5
Centrifugal backward curved	64.0	64.0

Notes to Table J5.4a:
1.**Installation type A** means an arrangement where the fan is installed with free inlet and outlet conditions.
2.**Installation type B** means an arrangement where the fan is installed with a free inlet and a duct at its outlet.
3.**Installation type C** means an arrangement where the fan is installed with a duct fitted to its inlet and with free outlet conditions.
4.**Installation type D** means an arrangement where the fan is installed with a duct fitted to its inlet and outlet.

Table J5.4b Fan regression coefficient a

Fan type	Fan motor input power <10kW	Fam motor input power >=10kW
Axial	2.74	0.78
Mixed flow	4.56	1.1
Centrifugal forward curved	2.74	0.78
Centrifugal radial bladed	2.74	0.78
Centrifugal backward curved	4.56	1.1

Table J5.4c Fan regression coefficient b

Fan type	Fan motor input power <10kW	Fam motor input power >=10kW
Axial	6.33	1.88
Mixed flow	10.5	2.6
Centrifugal forward curved	6.33	1.88
Centrifugal radial bladed	6.33	1.88
Centrifugal backward curved	10.5	2.6

(c) **Ductwork—**

(i) 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.

(ii) Flexible ductwork must not account for more than 6 m in length in any duct run.

(iii) The upstream connection to ductwork bends, elbows and tees in the index run must have an equivalent diameter to the connected duct.

(iv) Turning vanes must be included in all rigid ductwork elbows of 90° or more acute than 90° in the index run except where—

A. the inclusion of turning vanes presents a fouling risk; or

B. a long radius bend in accordance with AS 4254.2 is used.

(d) **Ductwork components in the index run—**

(i) The pressure drop across a coil must not exceed the value specified in Table J5.4d

Table J5.4d Maximum coil pressure drop

Number of rows	Maximum pressure drop (Pa)
1	30
2	50
4	90
6	130
8	175
10	220

(ii) A high efficiency particulate arrestance (HEPA) air filter must not exceed the higher of—

A. a pressure drop of 200 Pa when clean; or

B. the filter design pressure drop when clean at an air velocity of 1.5 m/s.

(iii) Any other air filter must not exceed—

A. the pressure drop specified in Table J5.4e when clean; or

B. the filter design pressure drop when clean at an air velocity of 2.5 m/s.

Table J5.4e Maximum clean filter pressure drop

Filter minimum efficiency reporting value	Maximum pressure drop (Pa)
9	55
11	65
13	95
14	110

(iv) The pressure drop across intake louvres must not exceed the higher of—

A. for single stage louvres, 30 Pa; and

B. for two stage louvres, 60 Pa; and

C. for acoustic louvres, 50 Pa; and

D. for other non-weatherproof louvres, 30 Pa.

(v) The pressure drop across a variable air volume box, with the damper in the fully open position, must not exceed—

A. for units with electric reheat, 100 Pa; and

B. for other units, 25 Pa not including coil pressure losses.

(vi) Rooftop cowls must not exceed a pressure drop of 30 Pa.

(vii) Attenuators must not exceed a pressure drop of 40 Pa.

(viii) Fire dampers must not exceed a pressure drop of 15 Pa when open.

(ix) Balancing and control dampers in the index run must not exceed a pressure drop of 25 Pa when in the fully open position.

(x) Supply air diffusers and grilles must not exceed a pressure drop of 40 Pa.

(xi) Exhaust grilles must not exceed a pressure drop of 30 Pa.

(xii) Transfer ducts must not exceed a pressure drop of 12 Pa.

(xiii) Door grilles must not exceed a pressure drop of 12 Pa.

(xiv) Active chilled beams must not exceed a pressure drop of 150 Pa.

(e) The requirements of (a), (b), (c) and (d) do not apply to—

(i) fans in unducted air-conditioning systems with a supply air capacity of less than 1000 L/s; and

(ii) smoke spill fans, except where also used for air-conditioning or ventilation; and
(iii) the power for process-related components; and
(iv) kitchen exhaust systems.

J5.5 Ductwork insulation

(a) Ductwork and fittings in an air-conditioning system must be provided with insulation—
  (i) complying with AS/NZS 4859.1; and
  (ii) having an insulation R-Value greater than or equal to—
    A. for flexible ductwork, 1.0; or
    B. for cushion boxes, that of the connecting ductwork; or
    C. that specified in Table J5.5.

(b) Insulation must—
  (i) be protected against the effects of weather and sunlight; and
  (ii) be installed so that it—
    A. abuts adjoining insulation to form a continuous barrier; and
    B. maintains its position and thickness, other than at flanges and supports; and
  (iii) when conveying cooled air—
    A. be protected by a vapour barrier on the outside of the insulation; and
    B. where the vapour barrier is a membrane, be installed so that adjoining sheets of the membrane—
      (a) overlap by at least 50 mm; and
      (b) are bonded or taped together.

(c) The requirements of (a) do not apply to—
  (i) ductwork and fittings located within the only or last room served by the system; or
  (ii) fittings that form part of the interface with the conditioned space; or
  (iii) return air ductwork in, or passing through, a conditioned space; or
  (iv) ductwork for outdoor air and exhaust air associated with an air-conditioning system; or
  (v) the floor of an in-situ air-handling unit; or
  (vi) packaged air conditioners, split systems, and variable refrigerant flow air-conditioning equipment complying with MEPS; or
  (vii) flexible fan connections.

(d) For the purposes of (a), (b) and (c), fittings—
  (i) include non-active components of a ductwork system such as cushion boxes; and
  (ii) exclude active components such as air-handling unit components.

Table J5.5 Ductwork and fittings - Minimum insulation R-Value

Location of ductwork and fittings	Climate zone 1, 2, 3, 4, 5, 6 & 7	Climate zone 8
Within a conditioned space	1.2	2.0
Where exposed to direct sunlight	3.0	3.0
All other locations	2.0	3.0

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 Pump systems

(a) **General —** Pumps and pipework that form part of an air-conditioning system must either—
  (i) separately comply with (b), (c) and (d); or

(ii) achieve a pump motor power per unit of flowrate lower than the pump motor power per unit of flowrate achieved when applying (b), (c) and (d) together.

(b) **Circulator pumps —** A glandless impeller pump, with a rated hydraulic power output of less than 2.5 kW and that is used in closed loop systems must have an energy efficiency index (EEI) not more than 0.27 calculated in accordance with European Union Commission Regulation No. 622/2012.

(c) **Other pumps —** Pumps that are in accordance with Articles 1 and 2 of European Union Commission Regulation No. 547/2012 must have a minimum efficiency index (MEI) of 0.4 or more when calculated in accordance with European Union Commission Regulation No. 547/2012.

(d) **Pipework —** Straight segments of pipework along the index run, forming part of an air-conditioning system—

(i) in pipework systems that do not have branches and have the same flow rate throughout the entire pipe network, must achieve an average pressure drop of not more than—

A. for constant speed systems, the values nominated in Table J5.7a; or

B. for variable speed systems, the values nominated in Table J5.7b; or

(ii) (ii)in any other pipework system, must achieve an average pressure drop of not more than—

A. for constant speed systems, the values nominated in Table J5.7c; or

B. for variable speed systems, the values nominated in Table J5.7d.

(e) the requirements of (d) do not apply—

(i) to valves and fittings; or

(ii) where the smallest pipe size compliant with (d) results in a velocity of 0.7 m/s or less at design flow.

Table J5.7a Maximum pipework pressure drop - Non-distributive constant speed systems

Nominal pipe diameter (mm)	Maximum pressure drop in systems operating 5000 hours/annum or less (Pa/m)	Maximum pressure drop in systems operating more than 5000 hours/annum (Pa/m)
Not more than 20	400	400
25	400	400
32	400	400
40	400	400
50	400	350
65	400	350
80	400	350
100	400	200
125	400	200
150 or more	400	200

Table J5.7b Maximum pipework pressure drop - Non-distributive variable speed systems

Nominal pipe diameter (mm)	Maximum pressure drop in systems operating 5000 hours/annum or less (Pa/m)	Maximum pressure drop in systems operating more than 5000 hours/annum (Pa/m)
Not more than 20	400	400
25	400	400
32	400	400
40	400	400
50	400	400
65	400	400
80	400	400
100	400	300
125	400	300
150 or more	400	300

Table J5.7c Maximum pipework pressure drop - Distributive constant speed systems

Nominal pipe diameter (mm)	Maximum pressure drop in systems operating 2000 hours/annum or less (Pa/m)	Maximum pressure drop in systems operating between 2000 hours/annum and 5000 hours/annum (Pa/m)	Maximum pressure drop in systems operating more than 5000 hours/annum (Pa/m)
Not more than 20	400	300	150
25	400	220	100
32	400	220	100
40	400	220	100
50	400	220	100
65	400	400	170
80	400	400	170
100	400	400	170
125	400	400	170
150 or more	400	400	170

Table J5.7d Maximum pipework pressure drop - Distributive variable speed systems

Nominal pipe diameter (mm)	Maximum pressure drop in systems operating 5000 hours/annum or less (Pa/m)	Maximum pressure drop in systems operating more than 5000 hours/annum (Pa/m)
Not more than 20	400	250
25	400	180
32	400	180
40	400	180
50	400	180
65	400	300
80	400	300
100	400	300
125	400	300
150 or more	400	300

J5.8 Pipework insulation

(a) Piping, vessels, heat exchangers and tanks containing heating or cooling fluid, where the fluid is held at a heated or cooled temperature, that are part of an air-conditioning system, other than in appliances covered by MEPS, must be provided with insulation—
   (i) complying with AS/NZS 4859.1; and
   (ii) for piping of heating and cooling fluids, having an insulation R-Value in accordance with Table J5.8a; and
   (iii) for vessels, heat exchangers or tanks, having an insulation R-Value in accordance with Table J5.8b; and
   (iv) for refill or pressure relief piping, having an insulation R-Value equal to the required insulation R-Value of the connected pipe, vessel or tank within 500 mm of the connection.

(b) (b)Insulation must—
   (i) be protected against the effects of weather and sunlight; and
   (ii) be able to withstand the temperatures within the piping, vessel, heat exchanger or tank.

(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.

(d) The requirements of (a) and (b) do not apply to piping, vessels or heat exchangers—
   (i) located within the only or last room served by the system and downstream of the control device for the regulation of heating or cooling service to that room; or
   (ii) encased within a concrete slab or panel which is part of a heating or cooling system; or

(iii) supplied as an integral part of a chiller, boiler or unitary air-conditioner complying with the requirements of J5.9, J5.10 and J5.11; or

(iv) inside an air-handling unit, fan-coil unit, or the like.

(e) For the purposes of (a), (b), (c) and (d)—

(i) heating fluids include refrigerant, heated water, steam and condensate; and

(ii) cooling fluids include refrigerant, chilled water, brines and glycol mixtures, but do not include condenser cooling water.

Table J5.8a Piping — Minimum insulation R-Value

Fluid temperature range	Minimum insulation R-Value – nominal pipe dia. <=40mm	Minimum insulation R-Value – nominal pipe dia. >40mm & <=80mm	Minimum insulation R-Value – nominal pipe dia. >80mm & <=150mm	Minimum insulation R-Value – nominal pipe dia. >150mm
Low temperature chilled - <=2°C	1.3	1.7	2.0	2.7
Chilled - >2°C but <=20°C	1.0	1.5	2.0	2.0
Heated - >30°C but <=85°C	1.7	1.7	1.7	1.7
High temperature heated - >85°C	2.7	2.7	2.7	2.7

Note to Table J5.8a: The minimum required R-Value may be halved for piping penetrating a structural member.

Table J5.8b Vessels, heat exchangers and tanks — Minimum insulation R-Value

Fluid temperature range	Minimum insulation R-Value
Low temperature chilled - <=2°C	2.7
Chilled - >2°C but <=20°C	1.8
Heated - >30°C but <=85°C	3.0
High temperature heated - >85°C	3.0

J5.9 Space heating

(a) A heater used for air-conditioning or as part of an air-conditioning system must be—

(i) a solar heater; or

(ii) a gas heater; or

(iii) a heat pump heater; or

(iv) a heater using reclaimed heat from another process such as reject heat from a refrigeration plant; or

(v) an electric heater if—

A. the heating capacity is not more than—

(a) 10 W/m2 of the floor area of the conditioned space in climate zone 1; or

(b) 40 W/m2 of the floor area of the conditioned space in climate zone 2; or

(c) the value specified in Table J5.9 where reticulated gas is not available at the allotment boundary; or

B. the annual energy consumption for heating is not more than 15 kWh/m2 of the floor area of the conditioned space in climate zones 1, 2, 3, 4 and 5; or

C. the in-duct heater complies with J5.2(a)(ii)(C); or

(vi) any combination of (i) to (v).

(b) An electric heater may be used for heating a bathroom in a Class 2, 3, 9a or 9c building if the heating capacity is not more than 1.2 kW and the heater has a timer.

(c) A fixed heating or cooling appliance that moderates the temperature of an outdoor space must be configured to automatically shut down when—

(i) there are no occupants in the space served; or

(ii) a period of one hour has elapsed since the last activation of the heater; or

(iii) the space served has reached the design temperature.

(d) A gas water heater, that is used as part of an air-conditioning system, must—

(i) if rated to consume 500 MJ/hour of gas or less, achieve a minimum gross thermal efficiency of 86%; or

(ii) if rated to consume more than 500 MJ/hour of gas, achieve a minimum gross thermal efficiency of 90%.

Table J5.9 Maximum electric heating capacity

Floor area of the conditioned space	W/m² of floor area in climate zone 3	W/m² of floor area in climate zone 4	W/m² of floor area in climate zone 5	W/m² of floor area in climate zone 6	W/m² of floor area in climate zone 7
<=500 m²	50	60	55	65	70
>500 m²	40	50	45	55	60

J5.10 Refrigerant chillers

An air-conditioning system refrigerant chiller must comply with MEPS and the full load operation energy efficiency ratio and integrated part load energy efficiency ratio in Table J5.10a or Table J5.10b when determined in accordance with AHRI 551/591.

Table J5.10a Minimum energy efficiency ratio for refrigerant chillers — Option 1

Chiller type	Full load operation ($W_r/W_{Inputpower}$)	integrated part load ($W_r/W_{Inputpower}$)
Air cooled chiller with a capacity <=528 kWr	2.985	4.048
Air cooled chiller with a capacity >528 kWr	2.985	4.137
Water cooled positive displacement chiller with a capacity <=264kWr	4.694	5.867
Water cooled positive displacement chiller with a capacity >264kWr but <=528 kWr	4.889	6.286
Water cooled positive displacement chiller with a capacity >528kWr but <=1055 kWr	5.334	6.519
Water cooled positive displacement chiller with a capacity >1055kWr but <=2110 kWr	5.800	6.770
Water cooled positive displacement chiller with a capacity >2110kWr	6.286	7.041
Water cooled centrifugal chiller with a capacity <=528kWr	5.771	6.401
Water cooled centrifugal chiller with a capacity >528kWr but <=1055kWr	5.771	6.519
Water cooled centrifugal chiller with a capacity >1055kWr but <=1407kWr	6.286	6.770
Water cooled centrifugal chiller with a capacity >1407kWr	6.286	7.041

Table J5.10b Minimum energy efficiency ratio for refrigerant chillers — Option 2

Chiller type	Full load operation ($W_r/W_{Inputpower}$)	integrated part load ($W_r/W_{Inputpower}$)
Air cooled chiller with a capacity <=528 kWr	2.866	4.669
Air cooled chiller with a capacity >528 kWr	2.866	4.758
Water cooled positive displacement chiller with a capacity <=264kWr	4.513	7.041
Water cooled positive displacement chiller with a capacity >264kWr but <=528 kWr	4.694	7.184
Water cooled positive displacement chiller with a capacity >528kWr but <=1055 kWr	5.177	8.001
Water cooled positive displacement chiller with a capacity >1055kWr but <=2110 kWr	5.633	8.586
Water cooled positive displacement chiller with a capacity >2110kWr	6.018	9.264
Water cooled centrifugal chiller with a capacity <=528kWr	5.065	8.001
Water cooled centrifugal chiller with a capacity >528kWr but <=1055kWr	5.544	8.001
Water cooled centrifugal chiller with a capacity >1055kWr but <=1407kWr	5.917	9.027
Water cooled centrifugal chiller with a capacity >1407kWr	6.018	9.264

J5.11 Unitary air-conditioning equipment

Unitary air-conditioning equipment including packaged air-conditioners, split systems, and variable refrigerant flow systems must comply with MEPS and for a capacity greater than or equal to 65 kWr—

(a) where water cooled, have a minimum energy efficiency ratio of 4.0 Wr / Winput power for cooling when tested in accordance with AS/NZS 3823.1.2 at test condition T1, where input power includes both compressor and fan input power; or

(b) where air cooled, have a minimum energy efficiency ratio of 2.9 Wr / Winput power for cooling when tested in accordance with AS/NZS 3823.1.2 at test condition T1, where input power includes both compressor and fan input power.

J5.12 Heat rejection equipment

(a) The motor rated power of a fan in a cooling tower, closed circuit cooler or evaporative condenser must not exceed the allowances in Table J5.12.

(b) The fan in an air-cooled condenser must have a motor rated power of not more than 42 W for each kW of heat rejected from the refrigerant, when determined in accordance with AHRI 460 except for—

(i) a refrigerant chiller in an air-conditioning system that complies with the energy efficiency ratios in J5.10; or

(ii) packaged air-conditioners, split systems, and variable refrigerant flow air-conditioning equipment that complies with the energy efficiency ratios in J5.11.

Table J5.12 Maximum fan motor power — Cooling towers, closed circuit coolers and evaporative condensers

Type	Cooling tower maximum fan motor input power (W/kW_{rej})	Closed circuit cooler maximum fan motor input power (W/kW_{rej})	Evaporative condenser maximum fan motor input power (W/kW_{rej})
Induced draft	10.4	16.9	11.0
Forced draft	19.5	Note	11.0

Note to Table J5.12: A closed circuit, forced draft cooling tower must not be used.

Part J6 Artificial lighting and power

Refer to Appendix, Compliance will be demonstrated with the ABCB Lighting Calculator.

J6.1 Application of Part

J6.2, J6.3 and J6.5(a)(ii) do not apply to a Class 8 electricity network substation.

J6.2 Artificial lighting

(a) In a sole-occupancy unit of a Class 2 building or a Class 4 part of a building—

- (i) the lamp power density or illumination power density of artificial lighting must not exceed the allowance of—
  - A. 5 W/m2 within a sole-occupancy unit; and
  - B. 4 W/m2 on a verandah, balcony or the like attached to a sole-occupancy unit; and
- (ii) the illumination power density allowance in (i) may be increased by dividing it by the illumination power density adjustment factor for a control device in Table J6.2b as applicable; and
- (iii) when designing the lamp power density or illumination power density, the power of the proposed installation must be used rather than nominal allowances for exposed batten holders or luminaires; and
- (iv) halogen lamps must be separately switched from fluorescent lamps.

(b) In a building other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building—

- (i) for artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances obtained by multiplying the area of each space by the maximum illumination power density in Table J6.2a of BCA 2019; and
- (ii) the aggregate design illumination power load in (i) is the sum of the design illumination power loads in each of the spaces served; and
- (iii) where there are multiple lighting systems serving the same space, the design illumination power load for (ii) is—
  - A. the total illumination power load of all systems; or
  - B. where a control system permits only one system to operate at a time—
    - (a) based on the highest illumination power load; or
    - (b) determined by the formula—

    $$[H \times T/2 + P \times (100 - T/2)] / 100$$

    where—
    H = the highest illumination power load; and
    T = the time for which the maximum illumination power load will occur, expressed as a percentage; and
    P = the predominant illumination power load.

(c) The requirements of (a) and (b) do not apply to the following:

- (i) Emergency lighting provided in accordance with Part E4.
- (ii) Signage, display lighting within cabinets and display cases that are fixed in place.
- (iii) Lighting for accommodation within the residential part of a detention centre.
- (iv) A heater where the heater also emits light, such as in bathrooms.
- (v) Lighting of a specialist process nature such as in a surgical operating theatre, fume cupboard or clean workstation.
- (vi) Lighting of performances such as theatrical or sporting.

(vii) Lighting for the permanent display and preservation of works of art or objects in a museum or gallery other than for retail sale, purchase or auction.

(viii) Lighting installed solely to provide photosynthetically active radiation for indoor plant growth on green walls and the like.

(d) For the purposes of Table J6.2b of BCA 2019, the following control devices must comply with Specification J6:

(i) Lighting timers.

(ii) Motion detectors.

(iii) Daylight sensors and dynamic lighting control devices.

J6.3 Interior artificial lighting and power control

(a) All artificial lighting of a room or space must be individually operated by–

(i) a switch; or

(ii) other control device; or

(iii) a combination of (i) and (ii).

(b) An occupant activated device, such as a room security device, a motion detector in accordance with Specification J6, or the like, must be provided in the sole-occupancy unit of a Class 3 building, other than where providing accommodation for people with a disability or the aged, to cut power to the artificial lighting, air-conditioner, local exhaust fans and bathroom heater when the sole-occupancy unit is unoccupied.

(c) An artificial lighting switch or other control device in (a) must—

(i) if an artificial lighting switch, be located in a visible and easily accessed position—

A. in the room or space being switched; or

B. in an adjacent room or space from where 90% of the lighting being switched is visible; and

(ii) for other than a single functional space such as an auditorium, theatre, swimming pool, sporting stadium or warehouse—

A. not operate lighting for an area of more than 250 m2 if in a Class 5 building or a Class 8 laboratory; or

B. not operate lighting for an area of more than—

(a) 250 m2 for a space of not more than 2000 m2; or

(b) 1000 m2 for a space of more than 2000 m2, if in a Class 3, 6, 7, 8 (other than a laboratory) or 9 building.

(d) 95% of the light fittings in a building or storey of a building, other than a Class 2 or 3 building or a Class 4 part of a building, of more than 250 m2 must be controlled by—

(i) a time switch in accordance with Specification J6; or

(ii) an occupant sensing device such as—

A. a security key card reader that registers a person entering and leaving the building; or

B. a motion detector in accordance with Specification J6.

(e) In a Class 5, 6 or 8 building of more than 250 m2, artificial lighting in a natural lighting zone adjacent to windows must be separately controlled from artificial lighting not in a natural lighting zone in the same storey except where—

(i) the room containing the natural lighting zone is less than 20 m2; or

(ii) the room's natural lighting zone contains less than 4 luminaires; or

(iii) 70% or more of the luminaires in the room are in the natural lighting zone.

(f) Artificial lighting in a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp, must be controlled by a motion detector in accordance with Specification J6.

(g) Artificial lighting in a foyer, corridor and other circulation spaces—
  (i) of more than 250 W within a single zone; and
  (ii) adjacent to windows, must be controlled by a daylight sensor and dynamic lighting control device in accordance with Specification J6.

(h) Artificial lighting for daytime travel in the first 19 m of travel in a carpark entry zone must be controlled by a daylight sensor in accordance with Specification J6.

(i) The requirements of (a), (b), (c), (d), (e), (f), (g) and (h) do not apply to the following:
  (i) Emergency lighting in accordance with Part E4.
  (ii) Where artificial lighting is needed for 24 hour occupancy such as for a manufacturing process, parts of a hospital, an airport control tower or within a detention centre.

(j) The requirements of (d) do not apply to the following:
  (i) Artificial lighting in a space where the sudden loss of artificial lighting would cause an unsafe situation such as—
    A. in a patient care area in a Class 9a building or in a Class 9c building; or
    B. (B)a plant room or lift motor room; or
    C. (C)a workshop where power tools are used.
  (ii) A heater where the heater also emits light, such as in bathrooms.

J6.4 Interior decorative and display lighting

(a) Interior decorative and display lighting, such as for a foyer mural or art display, must be controlled—
  (i) separately from other artificial lighting; and
  (ii) by a manual switch for each area other than when the operating times of the displays are the same in a number of areas such as in a museum, art gallery or the like, in which case they may be combined; and
  (iii) by a time switch in accordance with Specification J6 where the display lighting exceeds 1 kW.

(b) Window display lighting must be controlled separately from other display lighting.

J6.5 Exterior artificial lighting

(a) Exterior artificial lighting attached to or directed at the facade of a building, must—
  (i) be controlled by—
    A. a daylight sensor; or
    B. a time switch that is capable of switching on and off electric power to the system at variable pre-programmed times and on variable pre-programmed days; and
  (ii) when the total lighting load exceeds 100 W—
    A. use LED luminaires for 90% of the total lighting load; or
    B. be controlled by a motion detector in accordance with Specification J6; or
    C. when used for decorative purposes, such as façade lighting or signage lighting, have a separate time switch in accordance with Specification J6.

(b) The requirements of (a)(ii) do not apply to the following:
  (i) Emergency lighting in accordance with Part E4.
  (ii) Lighting around a detention centre.

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 in accordance with Specification J6.

J6.7 Lifts

Lifts must—

(a) be configured to ensure artificial lighting and ventilation in the car are turned off when it is unused for 15 minutes; and

(b) achieve the idle and standby energy performance level in Table 6.7a; and

(c) achieve—

(i) the energy efficiency class in Table 6.7b; or

(ii) if a dedicated goods lift, energy efficiency class D in accordance with ISO 25745-2.

Table 6.7a Lift idle and standby energy performance level

Rated Load	Idle & standby (note) energy performance level in accordance with ISO 25745-2
Less than or equal to 800kg	2
801kg to less than or equal to 2000kg	3
2001kg to less than or equal to 4000kg	4
Greater than 4000kg	5

Note to Table 6.7a: Applies to the standby power used after 30 minutes.

Table 6.7b Lift energy efficiency class

Usage category in accordance with ISO 25745-2	Energy efficiency class in accordance with ISO 25745-2
1-4	C
>5	D

J6.8 Escalators and moving walkways

Escalators and moving walkways must have the ability to slow to between 0.2 m/s and 0.05 m/s when unused for more than 15 minutes.

Part J7 Heated water supply and swimming pool and spa pool plant

J7.2 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.

(a) Flow rate of heated water supply must not exceed 9 litres/minute

J7.3 Swimming pool heating and pumping

(a) Heating for a swimming pool must be by—
- (i) a solar heater; or
- (ii) a heater using reclaimed heat from another process such as reject heat from a refrigeration plant; or
- (iii) a geothermal heater; or
- (iv) a gas heater that—
  - A. (A)if rated to consume 500 MJ/hour or less, achieves a minimum gross thermal efficiency of 86%; or
  - B. (B)if rated to consume more than 500 MJ/hour, achieves a minimum gross thermal efficiency of 90%; or
- (v) a heat pump; or
- (vi) a combination of (i) to (v).

(b) Where some or all of the heating required by (a) is by a gas heater or a heat pump, the swimming pool must have—
- (i) a cover with a minimum R-Value of 0.05; and
- (ii) a time switch to control the operation of the heater.

(c) A time switch must be provided to control the operation of a circulation pump for a swimming pool.

(d) Where required, a time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.

(e) Pipework carrying heated or chilled water for a swimming pool must comply with the insulation requirements of J5.8.

(f) For the purpose of J7.3, a swimming pool does not include a spa pool.

J7.4 Spa pool heating and pumping

(a) Heating for a spa pool that shares a water recirculation system with a swimming pool must be by—
- (i) a solar heater; or
- (ii) a heater using reclaimed heat from another process such as reject heat from a refrigeration plant; or
- (iii) a geothermal heater; or
- (iv) a gas heater that—
  - A. if rated to consume 500 MJ/hour or less, achieves a minimum gross thermal efficiency of 86%; or
  - B. if rated to consume more than 500 MJ/hour, achieves a minimum gross thermal efficiency of 90%; or
- (v) a heat pump; or
- (vi) a combination of (i) to (v).

(b) Where some or all of the heating required by (a) is by a gas heater or a heat pump, the spa pool must have—
  (i) a cover with a minimum R-Value of 0.05; and
  (ii) a push button and a time switch to control the operation of the heater.
(c) A time switch must be provided to control the operation of a circulation pump for a spa pool having a capacity of 680 L or more.
(d) Where required, a time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.
(e) Pipework carrying heated or chilled water for a spa pool must comply with the insulation requirements of J5.8.

Part J8 Facilities for energy monitoring

J8.1 Application of Part

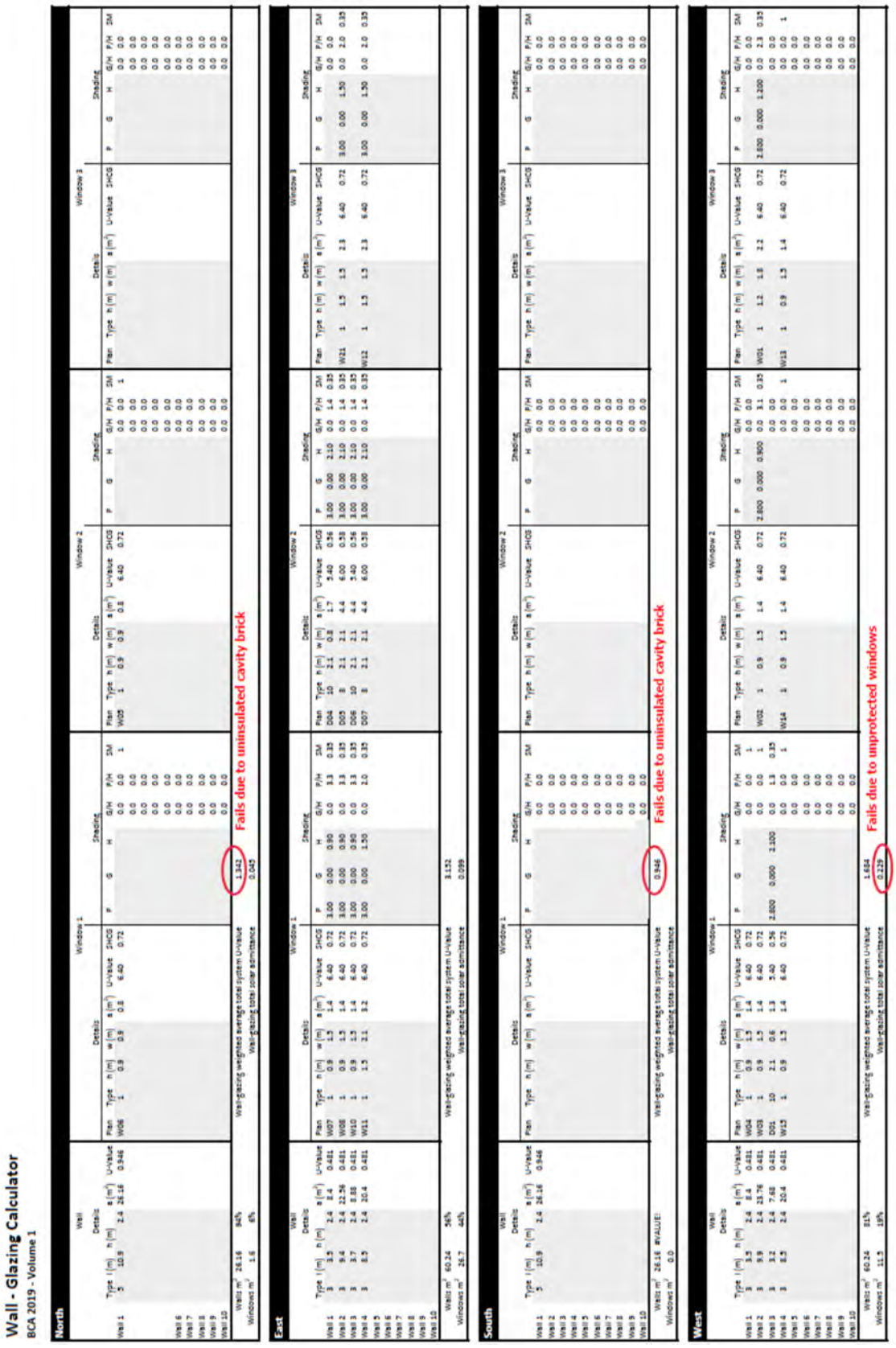
The Deemed-to-Satisfy Provisions of this Part do not apply—
(a) within a sole-occupancy unit of a Class 2 building or a Class 4 part of a building; or
(b) to a Class 8 electricity network substation.

J8.3 Facilities for energy monitoring

(a) A building or sole-occupancy unit with a floor area of more than 500 m2 must have an energy meter configured to record the time-of-use consumption of gas and electricity.
(b) A building with a floor area of more than 2 500 m2 must have energy meters configured to enable individual time-of-use energy consumption data recording, in accordance with (c), of the energy consumption of—
  (i) air-conditioning plant including, where appropriate, heating plant, cooling plant and air handling fans; and
  (ii) artificial lighting; and
  (iii) appliance power; and
  (iv) central hot water supply; and
  (v) internal transport devices including lifts, escalators and moving walkways where there is more than one serving the building; and
  (vi) other ancillary plant.
(c) Energy meters required by (b) must be interlinked by a communication system that collates the time-of-use energy consumption data to a single interface monitoring system where it can be stored, analysed and reviewed.
(d) The provisions of (b) do not apply to a Class 2 building with a floor area of more than 2 500 m2 where the total area of the common areas is less than 500 m2.

Appendices

Wall – Glazing Calculator



Wall - Glazing Calculator
BCA 2019 - Volume 1

North

	Wall Details Type	l (m)	h (m)	a (m²)	U-Value	Window 1 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
Wall 1	5	10.9	2.4	26.16	0.946	W06	1	0.9	0.9	0.8	6.40	0.72				0.0	0.0	
Wall 2																0.0	0.0	
Wall 3																0.0	0.0	
Wall 4																0.0	0.0	
Wall 5																0.0	0.0	
Wall 6																0.0	0.0	
Wall 7																0.0	0.0	
Wall 8																0.0	0.0	
Wall 9																0.0	0.0	
Wall 10																0.0	0.0	

	Window 2 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
	W05	1	0.9	0.9	0.8	6.40	0.72				0.0	0.0	1
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

	Window 3 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

Walls m²	26.16	84%	Wall-glazing weighted average total system U-value							1.345	Fails due to uninsulated cavity brick							
Windows m²	1.6	6%	Wall-glazing total solar admittance							0.045								

East

	Wall Details Type	l (m)	h (m)	a (m²)	U-Value	Window 1 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
Wall 1	3	3.5	2.4	8.4	0.481	W07	1	0.9	1.5	1.4	6.40	0.72	3.00	0.00	0.90	0.0	3.3	0.35
Wall 2	3	9.4	2.4	22.56	0.481	W08	1	0.9	1.5	1.4	6.40	0.72	3.00	0.00	0.90	0.0	3.3	0.35
Wall 3	3	3.7	2.4	8.88	0.481	W10	1	0.9	1.5	1.4	6.40	0.72	3.00	0.00	0.90	0.0	3.3	0.35
Wall 4	3	8.5	2.4	20.4	0.481	W11	1	1.5	2.1	3.2	6.40	0.72	3.00	0.00	1.50	0.0	2.0	0.35
Wall 5																		
Wall 6																		
Wall 7																		
Wall 8																		
Wall 9																		
Wall 10																		

	Window 2 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
	D04	10	2.1	0.8	1.7	5.40	0.56	3.00	0.00	2.10	0.0	1.4	0.35
	D05	8	2.1	2.1	4.4	6.00	0.58	3.00	0.00	2.10	0.0	1.4	0.35
	D06	10	2.1	2.1	4.4	5.40	0.56	3.00	0.00	2.10	0.0	1.4	0.35
	D07	8	2.1	2.1	4.4	6.00	0.58	3.00	0.00	2.10	0.0	1.4	0.35

	Window 3 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
	W21	1	1.5	1.5	2.3	6.40	0.72	3.00	0.00	1.50	0.0	2.0	0.35
	W12	1	1.5	1.5	2.3	6.40	0.72	3.00	0.00	1.50	0.0	2.0	0.35

Walls m²	60.24	56%	Wall-glazing weighted average total system U-value							3.152								
Windows m²	26.7	44%	Wall-glazing total solar admittance							0.099								

South

	Wall Details Type	l (m)	h (m)	a (m²)	U-Value	Window 1 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
Wall 1	5	10.9	2.4	26.16	0.946											0.0	0.0	
Wall 2																0.0	0.0	
Wall 3																0.0	0.0	
Wall 4																0.0	0.0	
Wall 5																0.0	0.0	
Wall 6																0.0	0.0	
Wall 7																0.0	0.0	
Wall 8																0.0	0.0	
Wall 9																0.0	0.0	
Wall 10																0.0	0.0	

	Window 2 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

	Window 3 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

Walls m²	26.16	#VALUE!	Wall-glazing weighted average total system U-value							0.946	Fails due to uninsulated cavity brick							
Windows m²	0.0		Wall-glazing total solar admittance															

West

	Wall Details Type	l (m)	h (m)	a (m²)	U-Value	Window 1 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
Wall 1	3	3.5	2.4	8.4	0.481	W04	1	0.9	1.5	1.4	6.40	0.72				0.0	0.0	
Wall 2	3	9.9	2.4	23.76	0.481	W03	1	0.9	1.5	1.4	6.40	0.72				0.0	0.0	1
Wall 3	3	3.2	2.4	7.68	0.481	D01	10	2.1	0.6	1.3	5.40	0.56	2.800	0.000	2.100	0.0	1.3	0.35
Wall 4	3	8.5	2.4	20.4	0.481	W13	1	0.9	1.5	1.4	6.40	0.72				0.0	0.0	1
Wall 5																0.0	0.0	
Wall 6																0.0	0.0	
Wall 7																0.0	0.0	
Wall 8																0.0	0.0	
Wall 9																0.0	0.0	
Wall 10																0.0	0.0	

	Window 2 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
	W02	1	0.9	1.5	1.4	6.40	0.72	2.800	0.000	0.900	0.0	3.1	0.35
											0.0	0.0	
	W14	1	0.9	1.5	1.4	6.40	0.72				0.0	0.0	1
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

	Window 3 Plan	Type	h (m)	w (m)	a (m²)	U-Value	SHGS	F	G	H	Shading G/H	F/H	SM
	W01	1	1.2	1.8	2.2	6.40	0.72	2.800	0.000	1.200	0.0	2.3	0.35
											0.0	0.0	
	W13	1	0.9	1.5	1.4	6.40	0.72				0.0	0.0	1
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	
											0.0	0.0	

Walls m²	60.24	81%	Wall-glazing weighted average total system U-value							1.884	Fails due to unprotected windows							
Windows m²	11.5	19%	Wall-glazing total solar admittance							0.229								

Window types (AWS unless noted otherwise)

No	Style	Glazing	Type	Uw	SHGC
1	Sliding	Single	Clear	6.4	0.72
2	Fixed	Single	Clear	5.9	0.75
3	Awning	Single	Clear	6.6	0.64
4	Double hung	Single	Clear	6.2	0.71
5	Sliding door	Single	Clear	6.2	0.66
6	Louver	Single	Clear	6.2	0.55
7	Sashless - Aneeta	Single	Clear	6	0.63
8	Hung door	Single	Clear	6	0.58
9	Glass block		Clear	3.1	0.68
10	Timber/Glass door	Single	Clear	5.4	0.56
11	Sliding	Single	Comfort plus neutral	4.6	0.44
12	Fixed	Single	Comfort plus neutral	3.9	0.47
13	Awning	Single	Comfort plus neutral	5	0.41
14	Double hung	Single	Comfort plus neutral	4.3	0.44
15	Sliding door	Single	Comfort plus neutral	4.3	0.44
16	Louver	Single	Energy Tech	4.8	0.47
17	Sashless - Aneeta	Single	Comfort plus neutral	4.4	0.4
18	Hung door	Single	Comfort plus neutral	4.5	0.36
21	Sliding	Double	Clear	4.2	0.58
22	Fixed	Double	Clear	3.3	0.65
23	Awning	Double	Clear	4.3	0.55
24	Double hung	Double	Clear	4.5	0.52
25	Sliding door	Double	Clear	4	0.61
26	Louver - Safetyline Jalouise	Double	Clear	4.9	0.53
27	Sashless - Aneeta	Double	Clear	4.2	0.6
28	Hung door	Double	Clear	4.2	0.52
30	Timber/Glass door	Double	Clear	3	0.48
31	Sliding	Double	Low e/argon	3.4	0.55
32	Fixed	Double	Low e/argon	2.4	0.64
33	Awning	Double	Low e/argon	3.6	0.52
34	Double hung	Double	Low e/argon	3.8	0.49
35	Sliding door	Double	Low e/argon	3.2	0.57
37	Sashless - Aneeta	Double	Low e/argon	2.1	0.59
38	Hung door	Double	Low e/argon	3.7	0.49
41	Sliding - Thermally broken	Double	Low e/argon		
42	Fixed - Thermally broken	Double	Low e/argon	2.3	0.6
43	Awning - Thermally broken	Double	Low e/argon	2.9	0.44
45	Sliding door - Thermally broken	Double	Low e/argon	2.7	0.51
48	Hung door - Thermally broken	Double	Low e/argon	2.9	0.43

ABCB Lighting Calculator