SECTION J

CREDWELL

Section J –DTS Report

ISSUED FOR DEVELOPMENT APPLICATION

EXP CAPITAL – CHILDCARE CENTRE

77-76, 79-81 RYANS ROAD, GILLIESTON HEIGHTS, NSW 2321

DATE: 13TH February 2025

Document Control

Reference/Revision	Date	Description	Section J Energy Efficiency Assessment
241115E-SJ-r1 Draft Issue for review	10/02/2025	**Prepared by**	**Reshma Punjabi** ESD/ Sustainability Engineer
		Approved by	**Termeh Hezareh** Associate
241115E-SJ-r2 Final Issue for DA	13/02/2025	**Prepared by**	 Reshma Punjabi ESD/ Sustainability Engineer 2025.02.13 14:43:04+11'00'
		Approved by	 Termeh Hezareh Associate 2025.02.13 17:45:35+11'00'

Contents

1 Executive Summary

Credwell Energy has been engaged to review 77-76, 79-81 Ryans Rd, Gillieston Heights, NSW, 2321, against the Deemed-to-Satisfy requirements for the National Construction Code 2022 provisions for energy efficiency under Section J (NCC 2022, Part J).

This report nominates the relevant NCC Section J requirements or 'deemed to satisfy' compliance provisions and areas in which alternative performance-based design solutions can be adopted where compliance with the nominated prescriptive provisions may not be achievable.

Section	Building fabric on envelope	Compliance
J2	**Energy Efficiency**	Refer to section 4.1. Thermal Breaks
J4	**Roof solar absorptance**	The upper surface of a roof must be ≤ 0.45. Roof SA
	Roof	Total R-value of R3.70 for a downward direction of heat flow. **Metal Roof:** Install R1.3 Roof blanket insulation and R2.0 batt insulation Roof Total R-value Thermal Calculation
	External Wall	Total R-value of 1.40 including thermal bridging. **Brick Veneer:** Install R2.5 insulation Method 2 - Total Facade Calculations Wall Thermal Bridging Calculation
	Internal Wall	Total R-value of 1.40 including thermal bridging. **Plasterboard Stud:** Install R1.5 insulation
	Solar Admittance of Externally Facing Wall-Glazing Construction	Must not be greater than 0.13. Solar Admittance
	Slab on Ground	Total R-value of 2.0. **Slab on ground:** No additional insulation Floor Total R-value
	Glazing	**Total (Including frame) U-value/SHGC:** All glazing U-value 4.8 & SHGC 0.60 or less. Method 2 - Total U-value Calculations Method 2 - SHGC Calculations
	Roof Light	Maximum U-value of 3.9 & SHGC of 0.29 and less than 5% of floor area.
J5	**Building Sealing**	Refer to section 4.4. Building Sealing
J6	**Air-Conditioning & Ventilation Systems**	Refer to section 4.5. AC & Ventilation
J7	**Artificial Lighting & Power**	Refer to section 4.6. Artificial Lighting
J8	**Heated Water Supply and Swimming Pool & Spa Pool Plant**	Refer to section 4.7. Heated Water
J9	**Energy Monitoring and on-site distributed energy resources**	Refer to section 4.8. Energy Monitoring

Subject to the satisfaction of the provisions outlined in this report, this development will comply with the requirements of Section J of NCC 2022.

N-B - Click on the hyperlinks to go to each detailed section

2 Introduction

Section J of the NCC sets regulations for energy efficiencies for all types of buildings with respect to the building's construction, design, and activity.

The objective of the NCC Section J is to reduce greenhouse gas emissions. Section J requires that a building, including its services, must have features to the degree necessary to facilitate efficient energy use.

The NCC offers two compliance methods that differ in complexity and flexibility. The two compliance methods are:

- Deemed-to-Satisfy (DTS) Compliance.
- JV3 - Verification using a referenced building.

This report provides an assessment of the building according to DTS provisions. The following works were carried out to assess DTS compliance:

- Determine the applicable NCC Section J requirement for the climate zone and building class.
- Provide recommendations to achieve compliance with DTS provisions.

2.1 Limitations

This report does not include, nor imply, any audit, assessment or upgrading of:

(1) Sections B, C, D, E, F, G, H, and I of the NCC;
(2) The structural design of the building;
(3) The capacity or design of any electrical, fire, hydraulic or mechanical services;
(4) The Disability (Access to Premises – Building) Standards 2010 and the Disability Discrimination Act 1992 (Cth);
(5) Volume 3 of the NCC – The Plumbing Code.
(6) This report does not include, nor imply, any assessment of or compliance with:
(7) Any Development Consent conditions;
(8) The Liquor Licencing Act 1997;
(9) The Work Health and Safety Act 2011;
(10) The Swimming Pools Act 1992; and

2.2 Reviewed Documentation

This assessment is based on drawings:

Architectural Details prepared by: Shaddock Architects Project Reference: 1302		
Drawing Number	**Revision**	**Title**
A02	9	Existing Site Plan
A03	9	Proposed Site Plan
A04	9	Proposed Roof Plan
A05	9	Proposed Floor Plan
A07	9	Elevations 1
A08	9	Elevations 2
A09	9	Sections
A10	9	External Glazing Schedule
A19	9	Materials Schedule

3 Building Description

For the purposes of the NCC, the building is described as follows:

3.1 Classification

Class	Use	Area
9b	Early Childcare Centre	Ground Floor

3.2 Thermal Envelope

The thermal envelope of the building is described as follows and as per the marked-up floor plan in Appendix C Building Envelope.

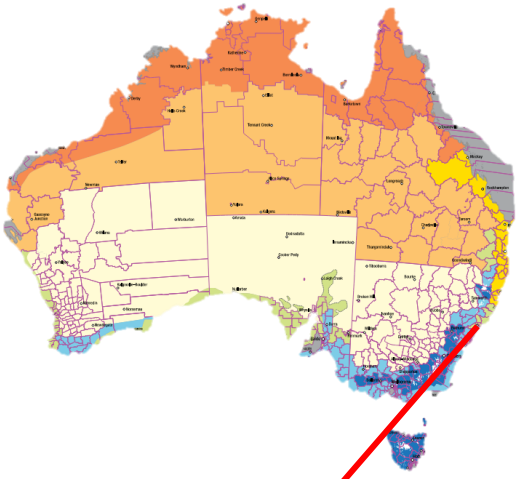
3.3 Climate Zone

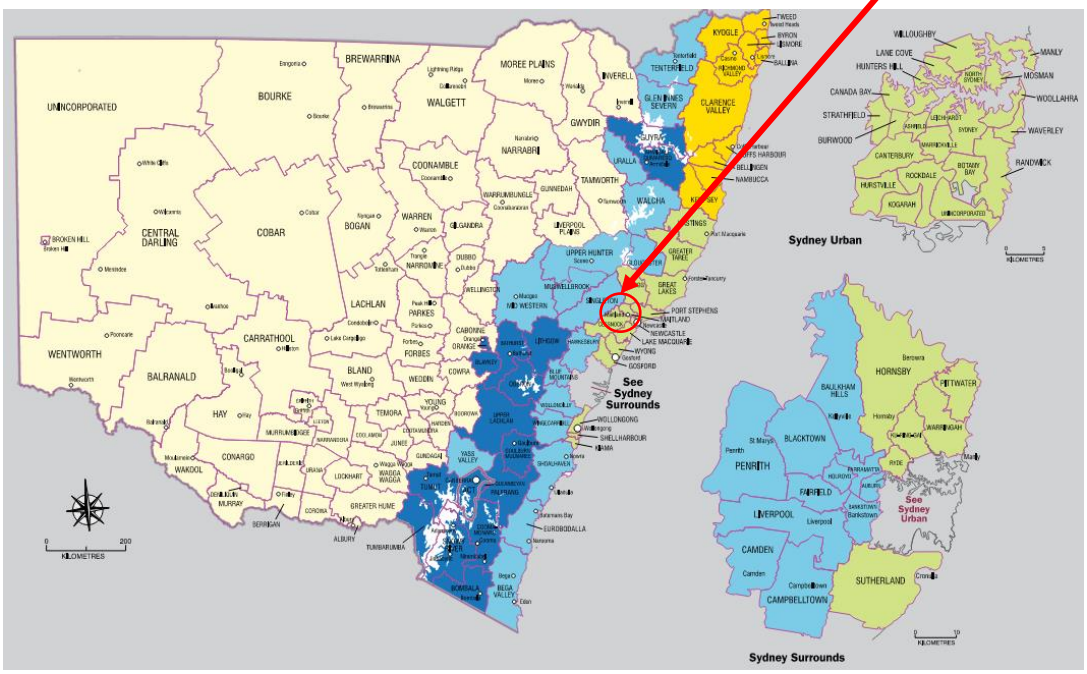
The climate zone is defined by the NCC as an area for specific locations, having energy efficiency provisions based upon a range of similar climatic characteristics.

The development will be located at Gillieston Heights within the Maitland City Council NSW government area which is within Climate Zone 5 (Warm temperate) of National Construction Code.

The following provides a brief description of each National Construction Code (NCC) climate zone:

	Zone	Description
	1	High humidity summer, warm winter
	2	Warm humid summer, mild winter
	3	Hot dry summer, warm winter
	4	Hot dry summer, cool winter
	5	Warm temperate
	6	Mild temperate
	7	Cool temperate
	8	Alpine





4 Detailed Assessment

4.1 Part J2 - Energy Efficiency

NSW J2D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, performance requirements NSW J1P1 to NSW J1P4 are satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

NSW J2D2 - Application of Section J

(1) For a Class 3 and 5 to 9 building, Performance requirement NSW J1P1 is satisfied by complying with:
- (a) J4, for the building fabric; and
- (b) J5, for building sealing; and
- (c) J6 for air-conditioning and ventilation; and
- (d) J7, for artificial lighting and power; and
- (e) J8, for heated water supply and swimming pool, and spa pool plant; and
- (f) J9D3, for facilities for energy monitoring

(2) For a Class 2 to 9 building, Performance Requirement NSW J1P4 is satisfied by complying with J9D4 and J9D5.

4.2 Part J3 - Elemental provisions for a sole-occupancy unit of a Class 2 building or a Class 4 part of a building - NA

4.3 Part J4 - Building Fabric

NSWJ4D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, performance requirements NSW J1P1 to NSW J1P4 are satisfied by complying with:
  (a) NSW J2D2; and
  (b) NSW J3D2 to J3D10; and
  (c) NSW J4D2 to J4D7; and
  (d) NSW J5D2 to J5D8; and
  (e) NSW J6D2 to J6D13; and
  (f) NSW J7D2 to J7D9; and
  (g) J8D2 to NSW J8D4; and
  (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

NSW J4D2 - Application of part

(1) The Deemed-to-Satisfy Provisions of this Part apply to building elements forming the envelope of a Class 3 and Class 5 to 9 building.

NSW J4D3 - Thermal construction - general

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

(2) Where required, reflective insulation must be installed with:
  (a) the necessary airspace to achieve the required R-value between a reflective side of the reflective insulation and a building lining or cladding; and
  (b) the reflective insulation must fit tight against any penetration, door or window opening; and
  (c) Framing members must adequately support the reflective insulation; and
  (d) each adjoining sheet of roll membrane overlapped 50mm or taped together.

(3) Where required, bulk insulation must be installed so that:
  (a) it maintains position and thickness, other than where it is compressed between the cladding and supporting members, water pipes, electrical cabling or the like; and
  (b) within a ceiling where there is no reflective or bulk insulation in the wall beneath, it overlaps the wall by 50mm or more.

(4) Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in Specification 36.

(5) The required Total R-Value and Total System U-value, including allowance for thermal bridging must be calculated in accordance with AS/NZS 4859.2 for a roof or floor; determined in accordance with Specification 37 for wall-glazing construction or in accordance with Specification 39 or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

The building envelope applicable to this report consists of any glazing-wall, floor or roof that separates a conditioned space or habitable room from the exterior of the building or a non-conditioned space. This may consist of an internal wall separating an unconditioned room from a conditioned room.

See Appendix C for the Building Envelope applicable to this building.

A conditioned space 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.

J4D4 - Roof and ceiling construction

(1) In climate zone 5, a minimum Total R-value of R3.70 for a downward direction of heat flow.

(2) In climate zone 5, the solar absorptance (SA) of the upper surface of a roof must be not more than 0.45.

Light colours like Surfmist® or Shale Grey® by Colorbond® are examples of SA less than 0.45.

All nominal non-reflective and reflective airspaces are determined by Tables S36C2f-m of Specification 36.

Note it is assumed that any downlights are LED's and must be fire or IC rated which will allow insulation to be placed over the top without a need for any clearance or space around the light.

For roof & ceiling systems in this climate zone, a total R-value of R3.70 can comply with insulation installed as per following tables.

Non-ventilated metal roof with cathedral ceiling with pitch of 15° to 25°

Building Element	R-value downwards
Outside air-film	0.03
Metal Roof (thermal strips of R0.20 will be required)	0.00
Additional Roof blanket insulation	**1.30**
Non-ventilated 50-300mm non-reflective air space	0.28
Additional batt insulation	**1.88**
Plasterboard (10mm)	0.06
Internal air-film	0.15
Total R-value	**3.70**

Compliance can be met by:

Metal Roof	Installing additional R1.30 roof insulation blanket and R2.0 batt insulation will comply.

J4D5 - Roof Lights

(1) Roof lights, including any associated shaft and diffuser, that form part of the envelope, apart from a Class 2 SOU or a Class 4 part of a building, 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 diffusers, with a combined performance of Total system U-value not more than 3.9 and Total system SHGC in accordance with Table J4D5.

Table J4D5 Roof lights – Total system SHGC		
Roof Light Shaft Index	**Total area of roof lights up to 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

As the roof light shaft index of the roof lights to the corridors and each playroom have less than 5%, then the total system value will be U-value 3.9 and SHGC 0.29.

Compliance can be met by:

Building Element	Compliance
Roof -lights complying with Table J4D5	Maximum U-value of 3.9 & SHGC of 0.29 and less than 5% of floor area.

NSW J4D6 - Walls and glazing

(1) The Total System U-Value of wall-glazing construction, including wall-glazing construction which wholly or partly forms the envelope internally, must not be greater than:
   (i) for a Class 9b, a value of U2.0; and

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

(3) The Total System U-value of wall-glazing construction must be calculated in accordance with Specification 37.

(4) 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 the table below.

Compliance can be met by:

Climate zone	Class 9b building
5	1.4

Note: For the wall construction make-up and insulation requirements for this project please refer to Appendix B. Wall Build-up

(5) The solar admittance of externally facing wall-glazing construction, excluding wall-glazing construction, which is wholly internal, must not be greater than:
   (a) For a Class 9b building the values specified in the table below:

Class 9b building				
Climate zone	**Eastern SA**	**Northern SA**	**Southern SA**	**Western SA**
5	0.13	0.13	0.13	0.13

(6) The solar admittance of a wall-glazing construction must be calculated in accordance with Specification 37.

(7) 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 37.

Note: For the SHGC (glass type) requirements for this project please refer to Appendix A. Façade Calculations

Specification 37 C3 & C4- Calculation of U-value

There are two methods to calculate the U-value required. In this report method 2 has been used to calculate the Total System U-value.

(1) Method 2 - (Multiple Aspects) - For the purposes of this method, a wall-glazing construction includes the walls and glazing facing multiple aspects.

(2) The total System U-value of the wall component of a wall-glazing construction must be calculated as the inverse of the Total R-value, including allowance for thermal bridging, in accordance with:
   (a) AS/NZS 4849.2; or
   (b) Specification 38 for spandrel panels.

(3) The Total System U-value of a wall-glazing construction must be calculated as the area-weighted average of the Total System U-Value of each of the components of the wall-glazing construction.
(4) The total System U-value must not exceed the applicable value in J4D6(e).

Specification 37 C5 & C6 - Calculation of Solar Admittance

There are two methods to calculate the SHGC-value required. In this report method 2 has been used to calculate the total system SHGC.

(1) Method 1 - (Single Aspect) - The solar admittance of a wall-glazing construction must be calculated in accordance with the following formula:

$$SA = \frac{A_{W1} \times S_{W1} \times SHGC_{W1}}{A_{WALL}} + \frac{A_{W2} \times S_{W2} \times SHGC_{W2}}{A_{WALL}} + \cdots$$

Where:

SA = the wall-glazing construction solar admittance; and
$A_{W1}, A_{W2}, \ldots$ = the area of each glazing element; and
$S_{W1}, S_{W2}, \ldots$ = the shading multiplier for each glazing element in accordance with S37C7; and
$SHGC_{W1,W2,\ldots}$ = the total system SHGC of each glazing element; and
A_{WALL} = the total wall-glazing construction area.

The solar admittance of the wall-glazing construction must not exceed the applicable value in J4D6(e).

OR

(2) Method 2 - (Multiple Aspects) - The solar admittance of a wall-glazing construction must achieve a representative air-conditioning value less than that achieved by the reference solar admittance, when using the following formula:

$$E_R = A_N \alpha_N SA_N + A_E \alpha_E SA_E + A_S \alpha_S SA_S + A_W \alpha_W SA_W$$

Where:

E_R = the representative air-conditioning energy value; and

$A_{N,E,S,W}$ = the area of the wall-glazing construction facing each aspect; and

$\alpha_{N,E,S,W}$ = the solar admittance weighting coefficient of each aspect equal to:

(i) where the glazing area on an aspect is less than 20% of the wall-glazing construction area, 0; and
(ii) the values in Table S37C6a and Table S37C6b; and

$SA_{N,E,S,W}$ = the wall-glazing construction solar admittance of each aspect:

(i) equal to the applicable value in J4D6(5) in the reference case; and
(ii) calculated in accordance with S37C5(1) in the proposed case.

N.B - Tables 6a or 6b can be located on page 393 of the NCC.

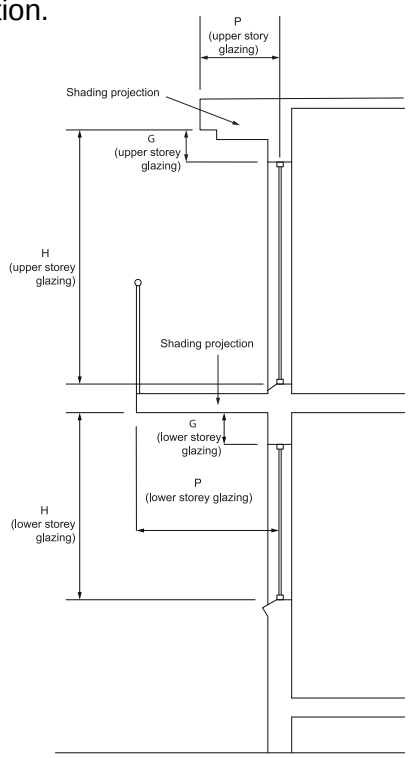
Specification 37C7 - Shading

For the purpose of calculating solar admittance, the shading multiplier is:

(a) For shading provided by an external permanent projection that extends horizontally on both sides of the glazing for the same projection distance P, as shown in Figure S37C7 below:
  (i) the value in Table S37C7a for shading on the northern, eastern or western aspects; or
  (ii) the value in Table S37C7b for shading on the southern aspect; or

  N.B - tables 7a or 7b can be located on page 393/394 of the NCC.

(b) 0.35 for shading that is provided by an external shading device such as a shutter, blind, vertical or horizontal building screen with blades, battens or slats, which:
  (i) is capable of restricting at least 80% of the summer solar radiation; and
  (ii) if adjustable, will operate automatically in response to the level of solar radiation.



J4D7 Floors

(1) A floor must achieve the Total R-value specified in the table below.

(2) For the purposes of (1), a slab-on-ground that does not have an in-slab heating or cooling system is considered to achieve a Total R-value of R2.0

Compliance can be met by:

Location	Climate zone 5 - downwards heat flow
A floor without an in-slab heating or cooling system	2.0
A floor with an in-slab heating or cooling system	3.25

4.4 Part J5 - Building Sealing

NSW J5D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, the Performance Requirements NSW J1P1 to NSW J1P4 is satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

NSW J5D2 - 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 zone 5 whereby 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) in a Class 9 Building, a building or space where the mechanical ventilation required by Part F6 provides sufficient pressurisation to prevent infiltration; or
- (d) parts of buildings that cannot be fully enclosed

J5D3 - Chimneys and flues - NA

J5D4 - Roof Lights

(1) A roof-light must be sealed, or capable of being sealed, when serving a conditioned space or a habitable room in Climate zone 5

(2) This roof light must be constructed with an imperforate ceiling diffuser at the ceiling or internal lining level; or a weatherproof seal; or a shutter system readily operated manually, mechanically or electronically by the occupant.

J5D5 - Windows and doors

(1) A door, openable window or the like must be sealed:
- (a) When forming part of the envelope; or
- (b) In Climate zone 5

(2) The requirements of (1) do not apply to:
- (a) A window complying with AS2047; or
- (b) A fire door or smoke door; or
- (c) A roller shutter door, roller shutter grille, or other security door or device installed only for out-of-hours security.

(3) 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 the other such opening, may be foam or rubbish compression strip, fibrous seal or the like.

(4) 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 50m^2; or
  (ii) where a café, restaurant, open front shop or the like has:
    (a) a 3m 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 door.

(5) A loading dock entrance, if leading to a conditioned space, must be fitted with a rapid roller door or the like. A rapid roller door means a door that opens and closes at a speed of not less than 0.5 m/s.

J5D6 - Exhaust fans

(a) A miscellaneous exhaust fan, such as a bathroom or domestic kitchen exhaust fan, must be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space or a habitable room in Climate zone 5.

J5D7 - Construction of ceilings, walls, and floors

(1) 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):
  (a) When forming part of the envelope; or
  (b) In Climate zone 5

(2) Construction required by (1) must be:
  (a) Enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
  (b) Sealed at junctions and penetrations with:
    (a) Close fitting architrave, skirting or cornice; or
    (b) Expanding foam, rubber compressible strip, caulking or the like.

(3) The requirements of (1) do not apply to openings, grilles or the like required for smoke hazard management.

J5D8 - Evaporative coolers

An evaporative cooler must be fitted with a self-closing damper or the like when serving a heated space or a building in climate zone Climate zone 5.

4.5 Part J6 - Air-conditioning and ventilation systems

NSW J6D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, the Performance Requirements NSW J1P1 to NSW J1P4 is satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

NSW J6D2 - Application of part

(1) The DTS provisions of this Part do not apply to a Class 8 electricity network substation.

(2) J6D10 does not apply to a Class 2 building or a Class 4 part of a building.

J6D3 - Air-conditioning system control

(1) An air-conditioning system:
- (a) must be capable of being deactivated when the building or part of a building served by that system is not occupied; and
- (b) when serving more than one air-conditioning zone or area with different heating or cooling needs, must:
  - (i) thermostatically control the temperature of each zone or area; and
  - (ii) not control the temperature by mixing actively heated air and actively cooled air; and
  - (iii) limit reheating to not more than:
    - (A) for a fixed supply air rate, a 7.5K rise in temperature; and
    - (B) for a variable supply air rate, a 7.5K rise in temperature at the nominal supply air rate but increased or decreased at the same rate that the supply air is respectively decreased or increased; and
- (c) which provides the required mechanical ventilation, or where dehumidification is needed, must have an outdoor *air* economy cycle if the total air flow rate of any airside component of the air-conditioning system is greater than or equal to the figures in the table below.

Requirement for an outdoor air economy cycle	
Climate zone	**Total air flow rate requiring an economy cycle (L/s)**
5	3000

- (d) which contains more than one water heater, chiller or coil, must be capable of stopping the flow of water to those not operating: and

(e) 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
(f) must have the ability to use direct signals form the control components responsible for the delivery of comfort conditions in the building to regulate the operation of the central plant; and
(g) must have a control dead band of not less than 2 degrees Celsius, except where a smaller range is required for specialised application; and
(h) must be provided with balancing dampers and balancing valves that ensure the max design air or fluid flow is achieved but not exceeded by more than 15% above design at each:
  (i) component; or
  (ii) group of components operating under a common control in a system containing multiple components,
(i) must ensure that each independently operating space of more than 1000m^2 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
(j) must have automatic variable temperature operation of heated water and chilled water circuits; and
(k) when deactivated, must close any motorised outdoor air or return air damper that is not otherwise being actively controlled.

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

(3) Time switches:
(a) A time switch must be provided to control an air conditioning system of more than 2kWr and a heater of more than 1$kW_{heating}$ used for air-conditioning.
(b) The time switch must be capable of switching electric power on or off at variable pre-programmed times and on variable pre-programmed days.

J6D4 - Mechanical ventilation system control

(1) General - A mechanical ventilation system, including one that is part of an air-conditioning system, must:
(a) be capable of being deactivated when the building or part of the building served by that system is not occupied; and
(b) when serving a conditioned space, except in periods when evaporative cooling is being used:
  (i) where specified in the table J6D4 below, 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
  (ii) not exceed the minimum outdoor air quality required by Part F6 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
(C) an exhaust or process exhaust; or an energy reclaiming system preconditions all the outdoor air; and

(c) For an airflow of more than 1000 L/s, have a variable speed fan unless the downstream airflow is required by Part F6 to be constant.

Table J6D4 - Required outdoor air treatment		
Climate zone	**Outdoor air flow (L/s)**	**Required measure**
5	>1000	Modulation control or energy reclaiming system

(2) Carpark exhaust systems - Carpark exhaust systems must have a control system in accordance with:
(a) Clause 4.11.2 of AS 1668.2; or
(b) Clause 4.11.3 of AS 1668.2.

(3) Time switches:
(a) A time switch must be provided to a mechanical ventilation system with an airflow rate of more than 1000 L/s
(b) The time switch must be capable of switching electric power on and off at variable pre-programmed times and on variable pre-programmed days.
(c) The requirements of (a) and (b) do not apply to:
(i) a mechanical ventilation system that serves:
(A) only one SOU in a Class 2,3,9c building; or
(B) a Class 4 part of a building; or
(ii) a building where mechanical ventilation is needed for 24-hour occupancy.

J6D5 - Fans and duct systems

(1) Fans, ductwork and duct components that form part of an air-conditioning system or mechanical ventilation system must:
(a) Separately comply with (2), (3), (4), and (5); or
(b) Achieve a fan motor input power per unit flowrate lower than the fan motor input power per unit flowrate achieved when applying (2), (3), (4) and (5) together.

This report does not include the fan calculator as provided by ABCB or as described by J5.4 (a)(ii).

Below provides an overview of the efficiency, ductwork and pressure drop requirements.

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

$$\eta_{min} = 13 \times \ln(p) - 0.3$$

(b) in the formula at (a):

(i) 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
(ii) **p** = the static pressure of the system (Pa); and
(iii) **ln** = natural logarithm.

(c) 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:

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

(d) In the formula at (c):
(i) 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
(ii) **P** = the motor input power of the fan (kW); and
(iii) **N** = the minimum performance grade obtained from table J6D5a; and
(iv) **a** = regression coefficient a, obtained from table J6D5b; and
(v) **b** = regression coefficient b, obtained from table J6D5c; and
(vi) **ln** = natural logarithm

(e) The requirements of (a) (b) (c) and (d) do not apply to fans that need to be explosion proof.

(3) Ductwork:
(a) 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.
(b) Flexible ductwork must not account for more than 6m in length in any duct run.
(c) The upstream connection to ductwork bends, elbows and tees in the index run must have an equivalent diameter to the connected duct.
(d) Turning vanes must be included in all rigid ductwork elbows of 90° or more acute than 90° in the index run except where:
(i) the inclusion of turning vanes presents a fouling risk; or
(ii) a long radius bend in accordance with AS 4254.2 is used.

(4) Ductwork components in the index run:
(a) The pressure drop across a coil must not exceed the value specified in table J6D5d.
(b) A high efficiency particulate arrestance (HEPA) air filter must not exceed the higher of:
(i) a pressure drop of 200 Pa when clean; or
(ii) the filter design pressure drop when clean at an air velocity of 1.5 m/s.
(c) Any other air filter must not exceed:
(i) the pressure drop specified in table J6D5e when clean; or
(ii) the filter design pressure drop when clean at an air velocity of 2.5 m/s.
(d) The pressure drop across intake louvres must not exceed the higher of:
(i) for single stage louvres, 30 Pa; and

(ii) for two stage louvres, 60 Pa; and
(iii) for acoustic louvres, 50 Pa; and
(iv) for other non-weatherproof louvres, 30 Pa.

(e) The pressure drop across a variable air volume box, with the damper in the fully open position, must not exceed –
(i) for units with electric reheat, 100 Pa; and
(ii) for other units, 25 Pa not including coil pressure losses

(f) Rooftop cowls must not exceed a pressure drop of 30 Pa.
(g) Attenuators must not exceed a pressure drop of 40 Pa.
(h) Fire dampers must not exceed a pressure drop of 15 Pa when open.
(i) Balancing and control dampers in the index run must not exceed a pressure drop of 25 Pa when in the fully open position.
(j) Supply air diffusers and grilles must not exceed a pressure drop of 40 Pa.
(k) Exhaust grilles must not exceed a pressure drop of 30 Pa.
(l) Transfer ducts must not exceed a pressure drop of 12 Pa.
(m) Door grilles must not exceed a pressure drop of 12 Pa.
(n) Active chilled beams must not exceed a pressure drop of 150 Pa.

(5) The requirements of (1), (2), (3), and (4) do not apply to:
(a) fans in unducted air-conditioning systems with a supply air capacity of less than 1000 L/S; and
(b) smoke spill fans, except where also used for air-conditioning or ventilation; and
(c) the power for process-related components; and
(d) kitchen exhaust systems.

J6D6 - Ductwork insulation

(1) Ductwork and fittings in an air conditioning system must be provided with insulation:
(a) complying with AS/NZS 4859.1; and
(b) having an insulation R-value greater than or equal to:
(i) for flexible ductwork, 1.0; or
(ii) for cushion boxes, that of the connecting ductwork; or
(iii) that specified in the table J6D6.

Table J6D6 Ductwork and fittings - Minimum R-Value	
Location of ductwork and fittings	**Climate zone 5**
Within a conditioned space	1.2
Where exposed to direct sunlight	3.0
All other locations	2.0

(2) Insulation must:
(a) be protected against the effects of weather and sunlight; and
(b) be installed so that it:
(i) abuts adjoining to form a continuous barrier; and
(ii) maintains its position and thickness, other than at flanges and supports; and
(c) when conveying cooled air:
(i) be protected by a vapour barrier on the outside of the insulation; and

(ii) where the vapour barrier is a membrane, be installed so that adjoining sheets of the membrane:
(A) overlap by at least 50mm; and
(B) are bonded or taped together

(3) The requirements of (1) do not apply to:
(a) ductwork and fittings located within the only or last room served by the system.
(b) fittings that form part of the interface with the conditioned space; or
(c) return air ductwork in, or passing through, a conditioned space; or
(d) ductwork for outdoor air and exhaust air associated with the air-conditioning system; or
(e) the floor of an in-situ AHU; or
(f) PAC, split systems, and VRF A/C equipment complying with MEPS; or
(g) flexible fan connections.

(4) For the purposes of (1), (2) and (3), fittings:
(a) include non-active components of a ductwork system such as cushion boxes; and
(b) exclude active components such as air-handling unit components.

J6D7- Ductwork sealing

Ductwork in an air-conditioning system with a capacity of 3,000 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.

AS 4254 Part 1 details that all connections to flexible ductwork must be both air sealed with adhesive tape and fixed with drawbands or the like.

J6D8 - Pump Systems

(1) General - Pumps and pipework that form part of an air-conditioning system must either:
(a) separately comply with (2), (3) and (4); or
(b) achieve a pump motor power per unit flowrate lower than the pump motor power per unit flowrate achieved when applying (2), (3) and (4) together.

(2) Circulator pumps - A glandless impeller pump, with a rated hydraulic power output of less than 2.5kW 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.

(3) 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.

(4) Pipework - Straight segments of pipework along the index run, forming part of an air conditioning system:
(a) 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:
(i) for constant speed systems, the values nominated in table J6D8a; or

(ii) for variable speed systems, the values nominated in table J6D8b; or

(b) in any other pipework system must achieve an average pressure drop of not more than:

(i) for constant speed systems, the values nominated in table J6D8c; or

(ii) for variable speed systems, the value nominated in table J6D8d.

Table J6D8a 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)	**operating more than 5000 hours/annum (Pa/m)**
40mm or less	400	400
50mm to 80mm	400	350
100mm or more	400	200

Table J6D8b 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)	**operating more than 5000 hours/annum (Pa/m)**
80mm or less	400	400
100mm or more	400	300

Table J6D8c 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)	**operating between 2000 hours/annum and 5000 hours/annum or less (Pa/m)**	**operating more than 5000 hours/annum (Pa/m)**
20 or less	400	300	150
25 to 50mm	400	220	100
65mm or more	400	400	170

Table J6D8d 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)	**operating more than 5000 hours/annum (Pa/m)**
20 or less	400	250
32mm to 50mm	400	180
65mm or more	400	300

(5) The requirements of (4) do not apply to valves and fittings or where the smallest pipe size compliant with (4) results in a velocity of 0.7 m/s or less at design flow.

J6D9 - Pipework insulation

(1) 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:
- (a) complying with AS/NZS 4859.1; and
- (b) for piping of heating and cooling fluids, having an insulation R-value in accordance with Table J6D9a below; and
- (c) for vessels, heat exchangers or tanks, having an insulation R-value in accordance with table J6D9b below; and
- (d) 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 500mm of the connection.

Table J6D9a Piping - Minimum insulation R-Value				
Fluid temperature range	**Minimum insulation R-value nominal pipe diameter:**			
	≤ 40mm	**>40mm and ≤ 80mm**	**>80mm and ≤ 150mm**	**> 150mm**
Low temp 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 temp heated > 85°C	2.7	2.7	2.7	2.7

NB - The minimum required R-value may be halved for pipe penetrating a structural member.

Table J6D9b Vessels, heat exchangers and tanks - Minimum R-Value	
Fluid temperature range	**Minimum insulation R-value**
Low temp chilled ≤ 2°C	2.7
Chilled > 2°C but ≤ 20°C	1.8
Heated - >30°C but ≤ 85°C	3.0
High temp heated > 85°C	3.0

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

(3) Insulation provided to piping, vessels heat exchangers or tanks containing fluid cooling fluid must be protected by a vapour barrier on the outside of the insulation.

(4) The requirements of (1) and (2) do not apply to piping, vessels, or heat exchangers:
- (a) 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
- (b) encased within a concrete slab or panel which is part of a heating or cooling system; or
- (c) supplied as an integral part of a chiller, boiler or unitary A/C complying with the requirements of J6D10, J6D11 and J6D12; or
- (d) inside an air handling unit, fan coil unit, or the like.

(5) For the purposes of (1), (2), (3), and (4):
- (a) heating fluids include refrigerant, heated water, steam and condensate; and
- (b) cooling fluids include refrigerant, chilled water, brines and glycol mixtures, but do not include condenser cooling water.

NSW J6D10 - Space heating

(1) A heater used for air conditioning or as part of an air conditioning system must be a:
- (a) solar heater; or
- (b) gas heater; or
- (c) heat pump heater; or
- (d) heater using reclaimed energy from another process such as reject heat from a refrigeration plant; or
- (e) an electric heater if:
  - (i) the heating capacity is not more than:

(A) The value specified in table J6D10 below where reticulated gas is not available at the allotment boundary; or

(ii) the annual consumption of heating is not more than 15 kWh/m^2 of the floor area of the conditioned space in climate zone 5; or

(iii) the in-duct heater complies with J6D3(1)(b)(iii) or

(f) any combination of (a) to (e).

Table J6D10 - Maximum electric heating capacity					
Floor area of the conditioned space	**W/m^2 of floor area in climate zone 3**	**W/m^2 of floor area in climate zone 4**	**W/m^2 of floor area in climate zone 5**	**W/m^2 of floor area in climate zone 6**	**W/m^2 of floor area in climate zone 7**
<= 500m^2	50	60	55	65	70
> 500 m^2	40	50	45	55	60

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

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

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

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

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

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

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

J6D11 - 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 J6D11a or table J6D11b when determined in accordance with AHRI 551/591.

Table J6D11a – Minimum EER for refrigerant chillers – option 1		
Chiller type	**Full load operation ($W_r/W_{input\ power}$)**	**Integrated part load ($W_r/W_{input\ power}$)**
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 ≤ 264 kWr	4.694	5.867
Water-cooled positive displacement chiller with a capacity > 264 kWr but ≤ 528 kWr	4.889	6.286
Water-cooled positive displacement chiller with a capacity > 528 kWr but ≤ 1055 kWr	5.334	6.519
Water-cooled positive displacement chiller with a capacity > 1055 kWr but ≤ 2110 kWr	5.800	6.770
Water-cooled positive displacement chiller with a capacity > 2110 kWr	6.286	7.041

Water-cooled centrifugal chiller with a capacity ≤ 528 kWr	5.771	6.401
Water-cooled centrifugal chiller with a capacity > 528 kWr but ≤ 1055 kWr	5.771	6.519
Water-cooled centrifugal chiller with a capacity > 1055 kWr but ≤ 1407 kWr	6.286	6.770
Water-cooled centrifugal chiller with a capacity > 1407 kWr	6.286	7.041

Table J6D11b – Minimum EER for refrigerant chillers – option 2		
Chiller type	**Full load operation ($W_r/W_{input\ power}$)**	**Integrated part load ($W_r/W_{input\ power}$)**
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 ≤ 264 kWr	4.513	7.041
Water-cooled positive displacement chiller with a capacity > 264 kWr but ≤ 528 kWr	4.694	7.184
Water-cooled positive displacement chiller with a capacity > 528 kWr but ≤ 1055 kWr	5.177	8.001
Water-cooled positive displacement chiller with a capacity > 1055 kWr but ≤ 2110 kWr	5.633	8.586
Water-cooled positive displacement chiller with a capacity > 2110 kWr	6.018	9.264
Water-cooled centrifugal chiller with a capacity ≤ 528 kWr	5.065	8.001
Water-cooled centrifugal chiller with a capacity > 528 kWr but ≤ 1055 kWr	5.544	8.001
Water-cooled centrifugal chiller with a capacity > 1055 kWr but ≤ 1407 kWr	5.917	9.027
Water-cooled centrifugal chiller with a capacity > 1407 kWr	6.018	9.264

J6D12 - Unitary air-conditioning equipment

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

(a) Where water cooled, have a minimum EER of 4.0 ($W_r/W_{input\ power}$) 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 EER of 2.9 ($W_r/W_{input\ power}$) 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.

J6D13 - Heat rejection equipment

(1) The motor rated power of a fan in a cooling tower, closed circuit cooler or evaporative condenser must not exceed the allowances in table J6D13 below.

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

(a) A refrigerant chiller in an A/C system that complies with the EER's in J6D11; or

(b) Packaged air-conditioners, split systems, and variable refrigerant flow air-conditioning equipment that complies with the EER's in J6D12.

Table J6D13 Maximum fan motor power

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: A closed circuit, forced draft cooling tower must not be used.

4.6 Part J7 - Artificial Lighting and Power

NSW J7D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, the Performance Requirements NSW J1P1 to NSW J1P4 is satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

NSW J7D2 - Application of part

(1) The DtS provisions of this part do not apply to a Class 2 building or a class 4 part of a building.

(2) J7D3, J7D4 and J7D6(1)(b) do not apply to a Class 8 electricity network substation.

NSW J7D3 - Artificial lighting

(1) This subclause does not apply in NSW.

(2) In a Class 9b building
- (a) 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 the table J7D3a below; and
- (b) the aggregate design illumination power load in (a) is the sum of the design illumination power loads in each of the spaces served; and
- (c) where there are multiple lighting systems serving the same space, the design illumination power load for (b) is:

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

- (d) in the formula at (c)(ii)
  - (i) **H** = the total illumination power load of all systems; or
  - (ii) **T** = where a control system permits only one system to operate at a time based on the highest illumination power load; or determined by the formula:
  - (iii) **P** = the predominant illumination power load.

(3) The requirements of (1) and (2) do not apply to the following:
- (a) Emergency lighting provided in accordance with Part E4.
- (b) Signage, display lighting within cabinets and display cases that are fixed in place.
- (c) Lighting for accommodation within the residential part of a detention centre.
- (d) A heater where the heater also emits light, such as in bathrooms.

(e) Lighting of a specialist process nature such as in a surgical operating theatre, fume cupboard or clean workstation.
(f) Lighting of performances such as theatrical or sporting.
(g) 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.
(h) Lighting installed solely to provide photosynthetically active radiation for indoor plant growth on green walls and the like.

(4) For the purposes of table J7D3b below, lighting timers, motion detectors, daylight sensors and dynamic lighting control devices must comply with Specification 40.

Table J7D3a Maximum illumination power density	
Space	**Maximum illumination power density (W/m^2)**
Board room and conference room	5
Carpark – entry zone (first 15m of travel) during the daytime	11.5
Carpark – General	2
Control room, switch room and the like – constant monitoring	4.5
Corridors	5
Entry lobby from outside the building	9
Kitchen and food preparation area	4
Office – artificially lit to an ambient level of 200 lx or more	4.5
Office – artificially lit to an ambient level of less than 200 lx	2.5
Storage	1.5
Service area, cleaners' room and the like	1.5
Toilet, locker room, staff room, rest room and the like	3
Wholesale storage area with a vertical illuminance of 160 lx	4

NB – Note above is an example of the Max illumination power density table. Please check the BCA for the full table.

Note: The maximum illumination power density may be increased by dividing it by the illumination power density factor in table J7D3b and table J7D3c and where the control device is not installed to comply with J7D4.

Table J7D3b Illumination power density adjustment factor for a control device		
Item	**Description**	**Maximum power density adjustment factor**
Motion Detector	In a toilet or change room, other than a public toilet, in a class 6 building	0.4
	Where a group of light fittings serving less than 100m^2 is controlled by one or more detectors	0.6
	Where a group of lighting fittings serving 100m^2 or more is controlled by one or more detectors	0.7
Programmable dimming system	Where not less than 75% of the area of a space is controlled by programmable dimmers	0.85
Fixed dimming	All fittings with fixed dimming	Whichever is greater of (a) 0.5; or (b) 0.2+0.8L where L = the illuminance turndown for the fixed dimming.
Lumen depreciating dimming	All fittings with lumen depreciation dimming	0.85
Two stage sensor - equipped lights with minimum power of 30% of peak power or less	Fire stairs and other spaces not used for regular transit	0.4
	Transitory spaces in regular use or in a carpark	0.7
Daylight sensor and dynamic lighting control device - dimmed or stepped switching of lights adjacent windows	In a Class 5, 6, 7, 8, or 9b building or a Class 9a building other than a ward area, where the lights are adjacent windows, other than roof lights, for a distance from the window equal to the depth of the floor to window head height	0.5
	Serving a Class 3 or 9c building, or a Class 9a ward area, where the lights are adjacent windows, other than roof lights, for a distance from the window equal to the depth of the floor to window head height	0.75

	In a Class 5, 6, 7, 8 or 9b building or a Class 9a building, other than a ward area, where the lights are adjacent roof lights	0.6
	In a Class 3 or 9c building, or a Class 9a ward area, where the lights are adjacent roof lights	0.8

Table J7D3c Illumination power density adjustment factor for light colour		
Light Source	**Description**	**Maximum power density adjustment factor**
CRI ≥ 90	Where lighting with good colour rendering is used	0.9
CCT ≤ 3500 K	Where lighting with a warm appearance is used	0.8
CCT ≥ 4500 K	Where lighting with a cool appearance is used	1.1

NSW J7D4 - Interior artificial lighting and power control

(1) All artificial lighting of a room or space must be individually operated by a switch, other control device, or a combination of both.

(2) An artificial lighting switch or other control device in (1) must:
  (a) If an artificial lighting switch, be located in a visible and easily accessed position in the room or space being switched or in an adjacent room or space form where 90% of the lighting being switched is visible; and

(3) 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 building of more than 250m^2 must be controlled by:
  (a) a time switch in accordance with Specification 40; or
  (b) an occupant sensing device such as a security key card reader that registers a person entering and leaving the building or a motion detector in accordance with Specification 40.

(4) 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 40.

(5) Artificial lighting in a foyer, corridor and other circulation spaces of more than 250W within a single zone and adjacent to windows must be controlled by a daylight sensor and dynamic lighting control device in accordance with Specification 40.

(6) Artificial lighting for daytime travel in the first 19m of travel in a carpark entry zone must be controlled by a daylight sensor in accordance with Specification 40.

(7) The requirements of (1), (2), (3), (4), (5), (6), (7) and (8) do not apply to the following:
  (a) Emergency lighting in accordance with Part E4.
  (b) 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.

(8) The requirements of (4) do not apply to the following:

(a) Artificial lighting in a space where the sudden loss of artificial lighting would cause an unsafe situation such as:
  (i) In a patient care area in a Class 9a building or in a Class 9c building; or
  (ii) a plant room or lift motor room; or
  (iii) a workshop where power tools are used.
(b) A heater where the heater also emits light, such as in bathrooms.

J7D5 - Interior decorative and display lighting – NA

J7D6 - Exterior artificial lighting

(1) Exterior artificial lighting attached to or directed at the façade of a building, must –
  (a) Be controlled by:
    (i) a daylight sensor; or
    (ii) 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
  (b) When the total lighting load exceeds 100W:
    (i) Use LED luminaires for 90% of the total lighting load; or
    (ii) controlled by a motion detector in accordance with Specification 40; or
    (iii) when used for decorative purposes, such as façade lighting or signage lighting, have a separate switch in accordance with Specification 40.
(2) The requirements of (1)(b) do not apply to emergency lighting in accordance with Part E4 and lighting around a detention centre.

J7D7 - 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 40.

J7D8 – Lifts - NA

J7D9 - Escalators and moving walkways - NA

4.7 Part J8 - Heated water supply and swimming pool and spa pool plant

NSW J8D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, the Performance Requirements NSW J1P1 to NSW J1P4 is satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

J8D2 - 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

J8D3 - Swimming pool heating and pumping – NA

J8D4 - Spa pool heating and pumping - NA

4.8 Part J9 - Energy monitoring and on-site distributed energy resources

NSW J9D1 - Deemed-to-Satisfy Provisions

(1) Where a DtS solution is proposed, the Performance Requirements NSW J1P1 to NSW J1P4 is satisfied by complying with:
- (a) NSW J2D2; and
- (b) NSW J3D2 to J3D10; and
- (c) NSW J4D2 to J4D7; and
- (d) NSW J5D2 to J5D8; and
- (e) NSW J6D2 to J6D13; and
- (f) NSW J7D2 to J7D9; and
- (g) J8D2 to NSW J8D4; and
- (h) J9D2 to J9D5.

(2) Where a performance solution is proposed, the relevant performance requirements must be determined in accordance with A2.G2(3) and A2.G4(3) as applicable.

J9D2 - Application of part

The DTS provisions of this Part do not apply:

- (a) within a SOU of a Class 2 building or a Class 4 part of a building; or
- (b) to a Class 8 electricity network substation

J9D3 - Facilities for energy monitoring

(1) A building or SOU with a floor area of more than 500m^2 must have energy meters configured to record the time-of-use consumption of gas and electricity.

(2) A building with a floor area of more than 2,500m^2 must have energy meters configured to enable individual time-of-use energy data recording, in accordance with (3), of:
- (a) air-conditioning plant including, where appropriate, heating plant, cooling plant and air handling fans; and
- (b) artificial lighting; and
- (c) appliance power; and
- (d) central hot water supply; and
- (e) internal transport devices including lifts, escalators and moving walkways where there is more than one serving the building; and
- (f) on-site renewable energy equipment; and
- (g) on-site electric vehicle charging equipment; and
- (h) on-site battery systems; and
- (i) other ancillary plant.

(3) Energy meters required by (2) must be interlinked by a communication system that collates the time-of-use energy data to a single interface monitoring system where it can be stored, analysed and reviewed.

(4) The provisions of (2) do not apply to energy meters serving:
- (a) A Class 2 building where the total floor area of the common area is less than 500m^2; or
- (b) Individual SOUs with a floor area of less than 2500m^2.

J9D4 - Facilities for electric vehicle charging equipment

(1) Subject to (2), a carpark associated with a Class 9 building must be provided with electrical distribution boards dedicated to electric vehicle charging:
   (a) In accordance with Table J9D4 below in each storey of the carpark; and
   (b) Labelled to indicate use for electric vehicle charging equipment.

Table J9D4 Electric vehicle distribution board requirement for each storey of a carpark	
Carpark spaces per storey for electric vehicles	**Electrical distribution boards for electric vehicle charging per storey**
0 - 9	0
10 - 24	1
25 - 48	2
49 - 72	3
73 - 96	4
97 - 120	5
121 - 144	6
145 - 168	7

NB Where there are more than 168 carpark spaces per storey, one additional distribution board must be provided for each additional 24 spaces or part thereof

(2) Electrical distribution boards dedicated to serving electric vehicle charging in a carpark must:
   (a) Be fitted with a charging control system with the ability to manage and schedule charging of electric vehicles in response to total building demand; and
   (b) When associated with a Class 9 building, have the capacity for each circuit to support an electric vehicle charger able to deliver a minimum of 12kWh from 9:00am to 5:00pm daily; and
   (c) Be sized to support the future installation of a 7kW (32A) type 2 electric vehicle charger in 20% of the car parking spaces associated with a Class 9 building; and
   (d) Contain space of at least 36mm width of DIN rail per outgoing circuit for individual sub-circuit electricity metering to record electricity use of electric vehicle charging equipment; and
   (e) Be labelled to indicate the use of the space required by (d) is for the future installation of metering equipment.

Limitations:
J9D4 does not apply to a stand-alone Class 7a building.

J9D5 - Facilities for solar photovoltaic and battery systems

(1) The main electrical switchboard of a building must:
  (a) Contain at least two empty three-phase circuit breaker slots and four DIN rail spaces labelled to indicate the use of each space for:
    (i) a solar photovoltaic system; and
    (ii) a battery system; and
  (b) Be sized to accommodate the installation of solar photovoltaic panels producing their maximum electrical output on at least 20% of the building roof area.

(2) At least 20% of the roof area of a building must be left clear for the installation of solar photovoltaic panels, except for buildings:
  (a) With installed solar photovoltaic panels on:
    (i) At least 20% of the roof area; or
    (ii) Equivalent generation capacity elsewhere on-site; or
  (b) Where 100% of the roof area is shaded for more than 70% of daylight hours; or
  (c) With a roof area of not more than $55m^2$; or
  (d) Where more than 50% of the roof area is used as a terrace, carpark, roof garden, roof light or the like.

Limitations:
The requirements of J9D5(1)(a)(i) and (b) do not apply to a building with solar photovoltaic panels installed on at least 20% of the roof area.

The requirements of J9D5(1)(a)(ii) and (b) do not apply to a building with battery systems installed.

Definitions for the purpose of NCC 2022:
Battery system: one or more chemical cells connected in series, parallel or a combination of the two for the purpose of electrical energy storage.

Renewable energy: energy that is derived from sources that are regenerated, replenished, or for all practical purposes cannot be depleted and the energy sources include, but are not limited to, solar, wind, hydroelectric, wave action and geothermal.

Appendix A - Façade Calculations

U-value Calculations – Method 1 – Non compliant: refer to Method 2 for compliance

North	Ground
Façade Area	110.84975
Glass to Façade Ratio	0.36283348
Wall to Façade Ratio	0.63716652
Total External façade area	98.331
Glass to External Aspect Ratio	40.90%
Target U-value	2
Façade U-value	2.19671963
Result	Non Compliant

Total Aspect Façade Area	110.85
Total External Façade	98.331
Total Glass to aspect	40.90%

East	Ground
Façade Area	100.25745
Glass to Façade Ratio	0.21544534
Wall to Façade Ratio	0.78455466
Total External façade area	87.7387
Glass to External Aspect Ratio	24.62%
Target U-value	2
Façade U-value	1.5945338
Result	Compliant

Total Aspect Façade Area	100.257
Total External Façade	87.7387
Total Glass to aspect	24.62%

South	Ground
Façade Area	110.36135
Glass to Façade Ratio	0.47217617
Wall to Façade Ratio	0.52782383
Total External façade area	97.8426
Glass to External Aspect Ratio	53.26%
Target U-value	2
Façade U-value	2.64346265
Result	Non Compliant

Total Aspect Façade Area	110.361
Total External Façade	97.8426
Total Glass to aspect	53.26%

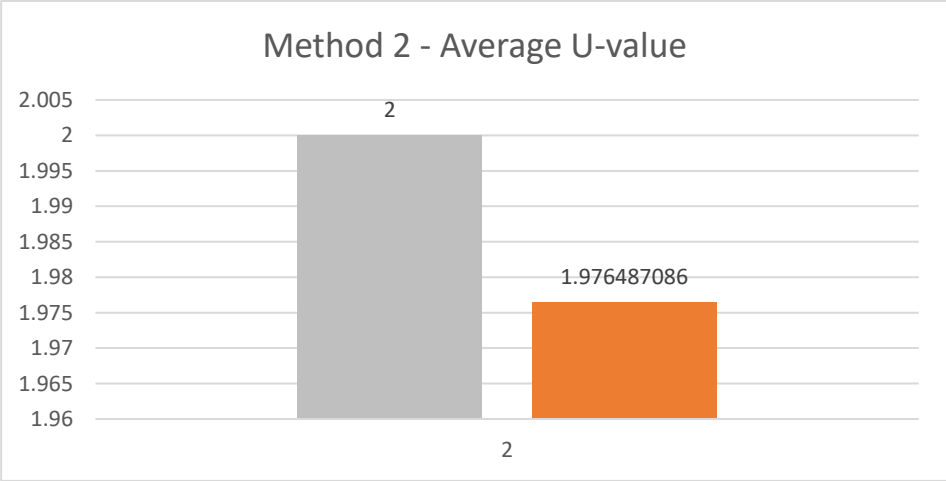
West	Ground
Façade Area	92.86425
Glass to Façade Ratio	0.15151148
Wall to Façade Ratio	0.84848852
Total External façade area	80.3455
Glass to External Aspect Ratio	17.51%
Target U-value	2
Façade U-value	1.33331833
Result	Compliant

Total Aspect Façade Area	92.8643
Total External Façade	80.3455
Total Glass to aspect	17.51%

U-value Calculations – Method 2 – U-value 4.8 to pass

Locations = 8	Façade Area	% of facade	Façade U-value	
Total Area	471.5845	100.00%		
Ground North	110.84975	0.26753795	2.19671963	Non Compliant
Ground East	100.25745	0.24197324	1.5945338	Compliant
Ground South	110.36135	0.26635919	2.64346265	Non Compliant
Ground West	92.86425	0.22412961	1.33331833	Compliant

Max U-value	2	
Average Total U-value	1.98	Compliant



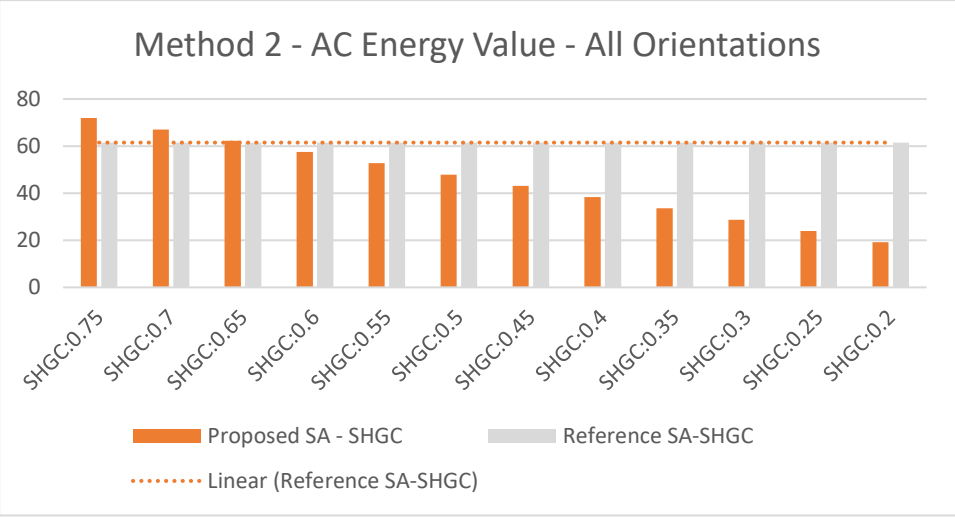
Method 1 & Method 2 assumes the Total R-value of 1.4 on any new wall is required to comply.

Any wall installed will be required to reach this value.

Wall thermal bridging calculations

Solar Admittance Calculation - Method 2 – SHGC 0.60 to pass

SA - All Orientations	Method 2 - Multiple Aspects		Reference
SHGC:0.75	71.877249	Non-Compliant	61.4832197
SHGC:0.7	67.0854324	Non-Compliant	61.4832197
SHGC:0.65	62.2936158	Non-Compliant	61.4832197
SHGC:0.6	57.5017992	Compliant	61.4832197
SHGC:0.55	52.7099826	Compliant	61.4832197
SHGC:0.5	47.918166	Compliant	61.4832197
SHGC:0.45	43.1263494	Compliant	61.4832197
SHGC:0.4	38.3345328	Compliant	61.4832197
SHGC:0.35	33.5427162	Compliant	61.4832197
SHGC:0.3	28.7508996	Compliant	61.4832197
SHGC:0.25	23.959083	Compliant	61.4832197
SHGC:0.2	19.1672664	Compliant	61.4832197



Appendix B - Thermal Bridging

Example of external wall thermal bridging calculation – Brick Veneer on thermal envelope. Total R-value of 1.4. Additional R2.5 insulation

Wall Systems

Ventilation		Slightly Ventilated	A slightly ventilated air space is derated by 45% for each layer between the cavity and layer 1 to account for lower thermal resistance				
Material	Clay brick - 3.25kg	Airspace - non-reflective	R2.5	Gypsum plasterboard			
Thickness (mm)	110	20	92	10			
Conductivity (W/mK)	0.650		0.036	0.170			
Framing Material			steel				
Metal Frame, Web Thickness (mm)			0.55				
Metal Frame, Flange Width (mm)			36				
Framing Area %			11.0%				
Thermal Break Material							
Thermal Break Thickness (mm)							
Thermal Break Overlap Area %							
Resistance (m².K/W)	0.08	0.00	1.20	0.06	0	0	0
Wall Construction			**External Surface Resistance (moving air, more than 3m/s and not more than 7/ms wind speed)**				0.03
						Internal Surface Resistance (still air, on a wall)	0.12
						System R-Value (m².K/W)	1.48
						System U-Value (W/m².K)	0.67

Example of internal wall thermal bridging calculation – plasterboard stud on thermal envelope. Total R-value of 1.4. Additional R1.5 insulation.

Wall Systems

Ventilation	Unventilated						
Material	Gypsum plasterboard	Airspace - non-reflective	R1.50	Gypsum plasterboard			
Thickness (mm)	10	20	90	10			
Conductivity (W/mK)	0.170		0.060	0.170			
Framing Material			steel				
Metal Frame, Web Thickness (mm)			0.55				
Metal Frame, Flange Width (mm)			36				
Framing Area %			11.0%				
Thermal Break Material							
Thermal Break Thickness (mm)							
Thermal Break Overlap Area %							
Resistance (m².K/W)	0.06	0.00	1.10	0.06	0	0	0
Wall Construction			Internal Surface Resistance (Still air)				0.14
			Internal Surface Resistance (still air, on a wall)				0.12
			System R-Value (m².K/W)				1.48
			System U-Value (W/m².K)				0.68

Appendix C - Building Envelope

Legend:
External Wall: Total R-Value of 1.4
Brick Veneer: Additional R2.5 insulation

Internal Wall: Total R-Value of 1.4
Plasterboard stud: Additional R1.5 insulation

Metal Roof: Total R-Value of 3.7
Additional R1.3 roof insulation blanket and R2.0 batt insulation.