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Project: **Proposed Mixed Use Development**
21-25 Woodriff Street
Penrith

Report: **Energy Efficiency Evaluation**
Section J of BCA 2016

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Contact: Michael May
0488129546
michael@partnersenergy.com.au

PO Box 185
Alstonville
NSW 2477

ABN 15418789019
Phone - 0266286528
Fax - 0266287055

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SECTION 1 - BASIS OF ASSESSMENT

1.1 THE PROJECT

The proposed mixed use development at 21-25 Woodriff Street, Penrith includes 2 levels of basement car park, ground floor retail areas, 6 levels of class 3 apartments above and a roof top conference, gym and pool area.

- The Climate Zone is Climate Zone 6.
- This assessment is based on drawings DA01-A, DA07-A, DA08-A, DA09-A, DA10-A, DA11-A, DA12-A, DA13-A, DA14-A, DA21-A,
- This Report addresses ONLY matters relevant to Section 'J' of Volume 1 of BCA 2016 pertaining to building Class 7a for the car park areas, Class 6 for the ground floor retail areas, Class 3 for the apartments levels and Class 9b for the roof top communal facilities.
- The project is assessed using the Deemed To Satisfy provisions of BCA 2016.

1.2 AUTHOR QUALIFICATION

Michael May is a qualified Electrical Engineer (SAIT – 1980), Certified Energy Manager (CEM)(2014), Sydney University Training in BCA - Section 'J' (2007), Accredited ABSA Sustainability Assessor (#40221), Member Australian Institute of Energy, 16 years experience in Energy Efficiency and Design.

1.3 COMPLIANCE

This assessment demonstrates that the project, as specified in the plans and in the recommendations in Section 2 of this report, complies with Section J of the BCA 2016.

Michael May
BEng, Dipl Bus Mgt

SECTION 2 - SUMMARY OF PROVISIONS TO COMPLY

In addition to the information provided in the drawings, the following measures are required to comply with Section J of the BCA 2016. The detailed report includes all supporting information.

PARTS J1-J3 compliance requirements apply to the Class 3, 6 and 9b areas as the conditioned spaces, while the Class 7a car park areas are unconditioned spaces and are exempt from compliance requirements of these sections.

PART J4 is not included in the current BCA.

PARTS J5-J8 compliance requirements apply to the whole development.

2.1 PART J1 – BUILDING FABRIC - class 3, 6 & 9b areas only

Compliance can be met by:
New ceiling

- *Ensuring the loss of insulation area because of exhaust fans, flues or down-lights is less than **0.5%** of the ceiling area.*

New metal roof (if used)

- *Installing 75mm R1.80 reflective insulating blanket or equivalent in the ceiling cavity, giving a **total 'R-value' of R3.34(downwards)**, which exceeds the required minimum of R3.20.*

OR

- *Installing R2.0 Ceiling batts & reflective sarking under the roof, giving a **total 'R-value' of R3.54 (downwards),** which exceeds the minimum required of R3.20*

New concrete roof

- *Installing 75mm R1.80 reflective insulating blanket or equivalent in the ceiling cavity, giving a **total 'R-value' of R3.44(downwards)**, which exceeds the required minimum of R3.20.*

OR

- *Installing R2.0 Ceiling batts & reflective sarking under the roof, giving a **total 'R-value' of R3.64 (downwards),** which exceeds the minimum required of R3.20*

OR

- *Adding a 40mm 'Kooltherm' product with a reflective air-gap to the concrete slab, providing an added R-value of R1.9, giving a **total 'R-value' of R3.54**, which exceeds the required minimum of R3.2.*

New external cladding walls

- *adding R2.70 'Sono' wall batts to the cladding wall system, providing an added R-value of R2.70, giving a **total 'R-value' of R2.95,** which exceeds the required minimum of R2.80.*
- *Installing wall sarking with a minimum R-value of R0.20 where metal frames are used.*

New external concrete walls

- *adding 30mm 'Kooltherm' and reflective air gap to the concrete panel wall system, providing a **total R-value of R2.38,** which exceeds the required minimum of R2.30.*

New internal concrete walls (ground level adjoining non-conditioned spaces)

- *adding 25mm 'Kooltherm' and reflective air gap to the concrete panel wall system, providing a total R-value of R2.26 which exceeds the required minimum of R1.80.*

New suspended concrete floors above basement

- *Adding a R1.0 insulation batt to the concrete slab, giving a **total 'R-value' of R1.3,** which exceeds the required minimum of R1.0.*

  OR

- *Adding a 25mm 'Kooltherm' product or equivalent to the concrete slab, providing an added R-value of R1.2, giving a **total 'R-value' of R1.50,** which exceeds the required minimum of R1.0.*

2.2 PART J2 - EXTERNAL GLAZING - class 3, 6 & 9b areas only

Compliance can be met by:

On the ground floor

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.52,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south and south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 3.0 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 5.3 and a SHGC-value of 0.75** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*

On Level 1 Podium

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.50,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.5 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.4 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.2 and a SHGC-value of 0.80** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.2 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.8 and a SHGC-value of 0.37** which can be achieved with tinted double glazing.*
- *Installing the new north east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.36,** which can be achieved with tinted glass in standard aluminium frames.*

On Levels 2 to 6

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.51,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.5 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.3 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.1 and a SHGC-value of 0.80** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.1 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.8 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.43,** which can be achieved with tinted glass in standard aluminium frames.*

On Level 7

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.39,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 5.4 and a SHGC-value of 0.75,** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 4.9 and a SHGC-value of 0.75,** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.9 and a SHGC-value of 0.75** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.0 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new east, north east and north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*

2.3 PART J3 - BUILDING SEALING - class 3, 6 & 9b areas only

Compliance can be met by the following:

- *The new entry doors on the ground floor must be self-closing as specified.*
- *Any new exhaust fans to have self-closing dampers, including "miscellaneous exhaust fans".*

2.4 PART J5 - A/C & VENTILATION SYSTEMS - class 3, 6 & 9b areas only

Compliance can be met by:

- *Certification by a mechanical engineer if any new air-conditioner is greater than **35kWr.***
- *Ensure any new A/C System has the ability to be inactive when the area is not occupied.*
- *Ensure any new ductwork, should it be installed, is insulated to a minimum R-value of R1.0 for flexible ductwork less than 3m, R1.20 within a conditioned space, R3.0 in direct sunlight, and R2.0 in other locations.*
- *Ensure any new A/C system does not operate when an external door of a sole-occupancy unit is open for more than one minute.*
- *Ensure any new A/C System greater than 10kWr has a 7 day time switch installed.*
- *Ensure any new Mechanical Ventilation system has the ability to be inactive when the area is not occupied.*
- *Ensure any new Mechanical Ventilation system greater than 1000L/s is controlled by a time switch.*
- *Ensure any new miscellaneous exhaust system with a flow rate of more than 1000L/s must be capable of stopping the motor when the system is not needed and have a variable speed fan or the like.*

2.5 PART J6 - ARTIFICIAL LIGHTING & POWER

Compliance can be met by:

- *Not exceeding the "Max. Lighting Wattage" for any new lighting in each of the areas in the lighting calculations table in **Appendix 2**.*
- *The maximum internal lighting wattage for the basement car park levels combined must not exceed **20,852 watts.***
- *The maximum internal lighting wattage for the ground floor must not exceed **20,047 watts.***
- *The maximum internal lighting wattage for the Podium Level 1 must not exceed **7,813 watts.***
- *The maximum internal lighting wattage for each level from Level 2 to Level 6 must not exceed **8,583 watts.***
- *The maximum internal lighting wattage for Level 7 must not exceed **5,606 watts.***
- *Time switch(s) or motion detector(s) or security card reader(s) must be installed to control at least 95% of the lighting in the ground level and basement levels of the building.*
- *Decorative or display lighting must be controlled separately from general lighting manually and by a time switch in accordance with specification J6 if the lighting exceeds 1kW*
- *External perimeter lighting must be controlled by either a daylight sensor or a time switch in accordance with specification J6, and have a light source efficiency of not less than 60 lumens/watt if the lighting exceeds 100watts.*

2.6 PART J7 – HEATED WATER SUPPLY, SWIMMING AND SPA POOLS

Compliance can be met by:

- *Direct electric resistance heating must not be used*
- *A pool cover must be used when heating with either gas or heat pump*
- *A time switch must be used to control the pool heater and any circulation pumps.*
- *A spa cover must be used when heating with either gas or heat pump*
- *A time switch and push button must be used to control the spa heater*
- *A time switch must be used to operate any circulation pumps if the spa capacity is more than 680L.*

2.7 PART J8 - ACCESS FOR MAINTENANCE & FACILITIES FOR MONITORING

Compliance can be met by:

- *The building must have separate facilities for recording the electricity used for common air-conditioning, lighting, power, central hot water, and lifts (private sub-metering in addition to any supply authority metering is required).*

SECTION 3 - DETAILED REPORT OF PROVISIONS TO COMPLY

3.1 PART J1 - BUILDING FABRIC - class 3, 6 & 9b areas only

J1.1 Application - All new parts of the new building envelope need to comply.

Building Envelope

The building envelope for the purpose of Section J is bound by the new external walls, floor and roof of the proposed building, but excludes the car park levels. Refer appendix 5.

J1.2 Thermal Construction General - Builder is to ensure compliance, during construction.

- Insulation must comply with AS/NZS 4859.1.
- Insulation must abut or overlap adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels where the insulation must be against the member.
- Insulation must form a continuous barrier with ceilings, walls, bulkheads, floors or the like that contribute to the thermal barrier.
- Insulation must not affect the safe or effective operation of a service or fitting.
- Reflective insulation must be installed with the necessary airspace between the reflective side of the insulation and the lining or cladding.
- Reflective insulation must be installed closely against any penetration, door or window opening.
- Each adjoining sheet of roll membrane being overlapped not less than 50mm or taped together.
- Bulk insulation must be installed so that it maintains its position and thickness, other than when it is compressed between cladding and supporting members, water pipes, electrical cabling or the like.
- When selecting insulation caution should be taken to clearly identify the total R-value of the installed roofing and ceiling system or wall system.

J1.3 Roof & Ceiling Construction

(a) In this Climate Zone, Table J1.3a requires a minimum total R-value of R3.20 (downwards).

(c) Where the area of ceiling insulation is reduced by more than 0.5% because of exhaust fans, flues or down-lights, the loss of insulation must be compensated for by increasing the R-value of the insulation.

Compliance can be met by:

- *Ensuring the loss of insulation area because of exhaust fans, flues or down-lights is less than 0.5% of the ceiling area.*

(d) A metal roof with metal purlins or metal battens, to which the ceiling lining is fixed directly underneath must have a thermal break consisting of a material with an R-value of not less than R0.2 installed between the metal sheet roofing and its supporting metal purlins, rafters or battens.

The reflective insulation blanket provides the required thermal break, in this instance.

Where the roof & ceiling system of level 7 is a metal roof with plasterboard ceiling additional insulation is required to achieve a minimum total R-value of R3.2(downwards).

Roof & Ceiling Element	R- Value Unventilated- Down
Outside air film	0.04
Metal roof	0.00
Reflective Blanket	*1.66 minimum*
Reflective Airspace	1.28
Plasterboard	0.06
Internal air film	0.16
Total R-value	**3.20 minimum**

Compliance can be met by:

- *Installing 75mm R1.80 reflective insulating blanket or equivalent in the ceiling cavity, giving a **total 'R-value' of R3.34(downwards)**, which exceeds the required minimum of R3.20.*

  OR

- *Installing R2.0 Ceiling batts & reflective sarking under the roof, giving a **total 'R-value' of R3.54 (downwards),** which exceeds the minimum required of R3.20*

Where the roof & ceiling system is a concrete roof with plasterboard ceiling additional insulation is required to achieve a minimum total R-value of R3.2(downwards).

Roof & Ceiling Element	R- Value Unventilated- Down
Outside air film	0.04
Concrete	0.10
Reflective Blanket	*1.56 minimum*
Reflective Airspace	1.28
Plasterboard	0.06
Internal air film	0.16
Total R-value	**3.20 minimum**

Compliance can be met by:

- *Installing 75mm R1.80 reflective insulating blanket or equivalent in the ceiling cavity, giving a **total 'R-value' of R3.44(downwards)**, which exceeds the required minimum of R3.20.*

  OR

- *Installing R2.0 Ceiling batts & reflective sarking under the roof, giving a **total 'R-value' of R3.64 (downwards),** which exceeds the minimum required of R3.20*

  OR

- *Adding a 40mm 'Kooltherm' product with a reflective air-gap to the concrete slab, providing an added R-value of R1.9, giving a **total 'R-value' of R3.54**, which exceeds the required minimum of R3.2.*

J1.4 Roof lights - Not Applicable

J1.5 Walls - External

(a) Each part of an external wall that is part of an envelope, must meet the following NCC thermal performance requirements except for -

- a sole-occupancy of a Class 2 building or Class 4 part of a building,
- Opaque non-glazed openings in external walls such as garage doors, vents, penetrations, shutters and the like;
- Glazing
- An earth retaining wall or earth-berm, except in Climate Zone 8.

For external walls in this Climate Zone, Table J1.5a requires a minimum total R-value of R2.80, which can be reduced by R0.5 if the wall surface density is greater than 220kg/m^2, and by another R0.5 if the wall is south facing or is shaded between 30 and 60 degrees.

Where the wall system is external cladding with internal plasterboard, additional insulation is required to achieve a total R-value of R2.80.

Wall Element	**R- Value**
Outside air film	0.04
Cladding	0.03
Additional insulation	*2.55 minimum*
Plasterboard	0.06
Internal air film	0.12
Total R-value	**2.80 minimum**

Compliance can be met by:

- *adding R2.70 'Sono' wall batts to the cladding wall system, providing an added R-value of R2.70, giving a **total 'R-value' of R2.95,** which exceeds the required minimum of R2.80.*

Where the wall system is concrete with internal plasterboard lining, additional insulation is required to achieve a total R-value of R2.30.

Wall Element	**R- Value**
Outside air film	0.04
Concrete	0.10
Additional insulation	*1.32 minimum*
16mm reflective airspace	*0.66*
Plasterboard	0.06
Internal air film	0.12
Total R-value	**2.30 minimum**

Compliance can be met by:

- *adding 30mm 'Kooltherm' and reflective air gap to the concrete panel wall system, providing a **total R-value of R2.38,** which exceeds the required minimum of R2.30.*

Walls - Internal

(b) For internal walls that form part of the envelope in this Climate Zone (4,5,6), Table J1.5b requires a minimum total R-value of R1.80.

Where the wall system is concrete with internal plasterboard lining, additional insulation is required to achieve a total R-value of R1.80.

Wall Element	R- Value
Inside air film	0.12
Concrete panel	0.10
Additional insulation	*0.74 minimum*
16mm reflective airspace	*0.66*
Plasterboard	0.06
Internal air film	0.12
Total R-value	**1.80 minimum**

Compliance can be met by:

- *adding 25mm 'Kooltherm' and reflective air gap to the concrete panel wall system, providing a **total R-value of R2.26** which exceeds the required minimum of R1.80.*

(c) A light weight wall that is part of the envelope on a metal frame must have thermal break using a material with an R-value of not less than R0.20 installed between the metal frame and the external cladding.

Compliance can be met by:

- *Installing wall sarking with a minimum R-value of R0.20 where metal frames are used.*

J1.6 Floors

(a) For a suspended floor with an enclosed subfloor in this Climate Zone, Table J1.6 requires a Total R-value of R1.0 to be achieved.

The concrete suspended slab has an uninsulated R-value of R0.30, therefore additional insulation is required where it is above under-croft area to achieve a minimum total R-value of R1.0 is required.

Floor Element	R- Value
Indoor air film	0.16
150mm Concrete Slab	0.10
Additional insulation	*0.70 minimum*
Outdoor air film	0.04
Total R-value	**1.0 minimum**

Compliance can therefore be met by the following:

- *Adding a R1.0 insulation batt to the concrete slab, giving a **total 'R-value' of R1.3,** which exceeds the required minimum of R1.0.*

  OR

- *Adding a 25mm 'Kooltherm' product or equivalent to the concrete slab, providing an added R-value of R1.2, giving a **total 'R-value' of R1.50,** which exceeds the required minimum of R1.0.*

3.2 PART J2 - GLAZING - class 3, 6 & 9b areas only

J2.1 Application

The provisions of this part apply to elements forming the envelope of a building other than a sole occupancy unit of a Class 2 building or a Class 4 part of a building.

J2.4 Glazing Requirements

The building must comply with glazing requirements, which satisfy the calculations of the BCA Vol. 1, 2016. In this instance the Glazing Calculator Spreadsheet developed by the ABCB has been employed and all results are attached in APPENDIX 1.

NOTE:

- The glazing characteristics referred to the whole window/door (glass and frame)
- The glazing system must have either a 'U value' or 'SHGC value' EQUAL TO OR LESS THAN that specified, to be acceptable.
- APPENDIX 1 contains these calculations.

Compliance can be met by:
On the ground floor

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.52,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south and south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 3.0 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 5.3 and a SHGC-value of 0.75** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*

On Level 1 Podium

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.50,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.5 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.4 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.2 and a SHGC-value of 0.80** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.2 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.8 and a SHGC-value of 0.37** which can be achieved with tinted double glazing.*
- *Installing the new north east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.36,** which can be achieved with tinted glass in standard aluminium frames.*

On Levels 2 to 6

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.51,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.5 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.3 and a SHGC-value of 0.75,** which can be achieved with clear double glazing.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.1 and a SHGC-value of 0.80** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 1.1 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.8 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new north east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.43,** which can be achieved with tinted glass in standard aluminium frames.*

On Level 7

- *Installing the new north facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.39,** which can be achieved with tinted glass in standard aluminium frames.*
- *Installing the new south facing windows and glazed doors with a characteristic equal to or less than a **U-value of 5.4 and a SHGC-value of 0.75,** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new south east facing windows and glazed doors with a characteristic equal to or less than a **U-value of 4.9 and a SHGC-value of 0.75,** which can be achieved with clear low-e type glass in standard aluminium frames.*
- *Installing the new south west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.9 and a SHGC-value of 0.75** which can be achieved with clear double glazing.*
- *Installing the new west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 2.0 and a SHGC-value of 0.33** which can be achieved with tinted double glazing.*
- *Installing the new east, north east and north west facing windows and glazed doors with a characteristic equal to or less than a **U-value of 7.50 and a SHGC-value of 0.75,** which can be achieved with clear glass in standard aluminium frames.*

It is important to note that it is the system U and SHGC characteristics which are the determining factors for compliance NOT the glazing description.

J2.5 Shading Requirements

Where shading is required is must be provided by

- an external permanent projection which extends horizontally on both side of the glazing for the same projection distance, or
- an external shading "Device" (shutter, blind, screen, battens, slats or the like) which is capable of restricting at least 80% of the summer solar radiation and if adjustable is operated automatically in response to the level of solar radiation.

3.3 PART J3 - BUILDING SEALING - class 3, 6 & 9b areas only

J3.1 Application

Applies 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.

(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.

(c) A building or space where the mechanical ventilation required provides sufficient pressurisation to prevent infiltration.

J3.2 Chimneys and Flues – not applicable

J3.3 Roof Lights – not applicable

J3.4 Windows and doors

All external doors and windows must either have seals to restrict air infiltration or the windows must comply with AS 2047. (fire and smoke doors, roller shutter door or grills are exempt)

A seal for the bottom edge of a swing door must be a draft protection device and for other edges of an external door and openable windows may be a foam or rubber compression strip fibrous seal or the like.

An entrance to a building must have an airlock, self-closing door, revolving door or the like, where the conditioned space has a floor area greater than 50m^2.

Compliance can be met by the following:

- *The new entry doors on the ground floor must be self-closing as specified.*

J3.5 Exhaust fans

All exhaust fans fitted in a conditioned space must have a sealing device such as a self-closing damper or the like.

Compliance can be met by:

- *Any new exhaust fans to have self-closing dampers, including "miscellaneous exhaust fans".*

J3.6 Construction of roofs, walls and floors

Roofs, walls and floors and any opening such as a window or door must be constructed to minimise air leakage by:

- Enclosed or internal lining systems that are close fitting at ceiling, wall and floor *junctions* or
- Sealed by caulking, skirting, architraves, cornices or the like.

3.4 PART J4 - AIR MOVEMENT- Is not included in the current BCA

3.5 PART J5 - A/C & VENTILATION SYSTEMS - class 3, 6 & 9b areas only

Any new air-conditioning system requires certification by a Mechanical Engineer, where the size of the air-conditioner is greater than 35kWr. For smaller package or split systems the motor efficiency performance is controlled under the Australian Governments Minimum Energy performance Scheme (MEPS).

Compliance can be met by:

- *Certification by a mechanical engineer if any new air-conditioner is greater than 35kWr.*

A mechanical ventilation system will require certification by a Mechanical Engineer.

General provisions include:

J5.2 Air-conditioning and ventilation systems

(a) Control –
  (i) 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—
      (aa) thermostatically control the temperature of each zone of area; and
      (bb) not control the temperature by mixing actively heated air and actively cooled air; and
      (cc) limit reheating to not more than—
        (AA) for a fixed supply air rate, a 7.5 K rise in temperature; and
        (BB) 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
    (C) which provides the required mechanical ventilation, other than in process-related applications where humidity control is needed, must have an outdoor air economy cycle, when the air-conditioning system capacity is more than 35 kWr; and
    (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) except for a packaged air-conditioning system, must have a variable speed fan when its supply air quantity is capable of being varied; and
    (F) 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.
  (ii) When an air-conditioning system is deactivated, any motorised outside air and return dampers must close.
  (iii) Compliance with (i) must not adversely affect—
    (A) smoke hazard management measures required by Part E2; and
    (B) ventilation required by Part E3 and Part F4.

(b) Fans —
- this section does not apply to unducted air-conditioning system with supply air capacity less than 1000L/s, or
- fans in energy reclaiming systems that precondition outside air, or
- process related components.
- Parts E2, E3 and E4 take precedence over these requirements,
- otherwise fans of an air-conditioning system must comply with Specification J5.2a in the NCC

(c) Pumps —
(i) An air-conditioning system, where water is circulated by pumping at more than 2L/s, must be designed so that the maximum pump power to the pump complies with Table J5.2.
- For conditioned floor area above 400m^2 – 5.6W/m^2 for chilled water, 5.6W/m^2 for Condenser water, and 3.6W/m^2 for Heating water.

(ii) An air-conditioning system pump that is rated at more than 3 kW of pump power and circulates water at more than 2 L/s must be capable of varying its speed in response to varying load.

(iii) A spray water pump of an air-conditioning system's closed circuit cooler or evaporative condenser must not use more than 150 W of pump power for each L/s of spray water circulated.

(d) Insulation –
(i) The ductwork of an air-conditioning system must be insulated and sealed in accordance with Specification J5.2b in the NCC, namely.

Have ductwork insulated to
- R1.0 flexible ductwork of less than 3 metres
- R1.20 within a conditioned space
- R3.0 where exposed to direct sunlight
- R2.0 all other locations

Have ductwork insulated to
- R1.0 flexible ductwork of less than 3 metres
- R1.20 within a conditioned space

These requirements do not apply to:
- Ductwork or fittings located in the last room served, or
- Return air ductwork passing in a conditioned space, or
- Ductwork for outside or exhaust air, or
- The floor of an in-situ air-handling unit, or
- Packaged air-conditioning equipment complying with MEPS

(ii) Piping, vessels, heat exchangers and tanks containing heating or cooling fluid that are part of an air-conditioning system, other than those with insulation levels covered by MEPS, must be insulated in accordance with Specification J5.2c in the NCC.

(e) Space Heating - A heater used for air-conditioning or as part of an air-conditioning system must comply with Specification J5.2d in the NCC, namely.

A heater for heating a space other than via water must be:
- A solar heater, or
- A gas heater, or
- An oil heater if reticulated gas is not available, or
- A heat pump heater, or
- A heater using reclaimed heat from another process, or

- An electric only heater if
  - Reticulated gas is not available and the heater capacity is not more than 55W/m^2 , or
  - The induct heater complies with J5.2(a)(v)(C), namely limiting reheating to not more than a 7.5K rise in temperature at the nominal supply air rate for the space served, but increased or decreased in direct proportion to any variable supply air rate.
- A combination of any of the above, or

A heater for bathroom in a class 3 or Class 9c ages care building, may be electric if the heating capacity i not more than 1.2kW

A heating appliance installed outdoors must be capable of automatic shutdown.

(f) Energy Efficiency Ratios –
- Water cooled chillers must have a minimum energy efficiency ratio of 4.2 at full load and 5.2 for integrated part load,
- Air cooled or evaporative chillers must have a minimum energy efficiency ratio of 2.5 at full load and 3.4 for integrated part load,
- Packaged air conditioners - cooling must have a minimum energy efficiency ratio of 2.7 for capacity greater than 65kWr and 2.8 for capacity greater than 95kWr,
- Packaged heat pump –cooling must have a minimum energy efficiency ratio of 2.6 for capacity greater than 65kWr and 2.7 for capacity greater than 95kWr

As per Specification J5.2e in the NCC

(g) Time switches –
(i) A time switch complying with Specification J6 must be provided to control –
(A) an air-conditioning system of more than 10 kWr; and
(B) a heater of more than 10 $kW_{heating}$ used for air-conditioning.
(ii) The requirements of (i) do not apply to –
(A) an air-conditioning system that serves—
(aa) only one sole-occupancy unit in a Class 2 or 3 building; or
(bb) a Class 4 part of a building; or
(cc) only one sole-occupancy unit in a Class 9c building; or
(B) a building where air-conditioning is needed for 24 hour occupancy.

Compliance can be met by:
- *Ensure any new A/C System has the ability to be inactive when the area is not occupied.*
- *Ensure any new ductwork, should it be installed, is insulated to a minimum R-value of R1.0 for flexible ductwork less than 3m, R1.20 within a conditioned space, R3.0 in direct sunlight, and R2.0 in other locations.*
- *Ensure any new A/C System greater than 10kWr has a 7 day time switch installed.*

J5.3 Mechanical ventilation systems

(a) Control –
(i) 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—
(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—
(aa) not exceed the minimum outdoor air quantity required by Part F4, where relevant, by more than 20%; and
(bb) in other than climate zone 2, where the number of square metres per person is not more than 1 as specified in D1.13 and the air flow rate is more than 1000 L/s, have—
(AA) an energy reclaiming system that preconditions outside air; or
(BB) the ability to automatically modulate the mechanical ventilation required by Part F4 in proportion to the number of occupants.

(ii) The requirements of (a)(i)(B)(aa) do not apply where—
(A) additional unconditioned outside air is supplied for free cooling or to balance process exhaust; or
(B) additional exhaust ventilation is needed to balance the required mechanical ventilation; or
(C) an energy reclaiming system preconditions all the outside air.

(iii) Compliance with (a)(i) must not adversely affect—
(A) smoke hazard management measures required by Part E2; and
(B) ventilation required by Part E3 and Part F4

(b) Fans —
- this section does not apply to unducted air-conditioning system with supply air capacity less than 1000L/s, or
- fans in energy reclaiming systems that precondition outside air, or
- process related components.
- Parts E2, E3 and E4 take precedence over these requirements,
- otherwise fans of an air-conditioning system must comply with Specification J5.2a

(c) Time switches –
(i) A time switch complying with Specification J6 must be provided to control a mechanical ventilation system with an air flow rate of more than 1000 L/s
(ii) The requirements of (i) do not apply to –
(A) an air-conditioning system that serves—
(aa) only one sole-occupancy unit in a Class 2 or 3 building; or
(bb) a Class 4 part of a building; or
(cc) only one sole-occupancy unit in a Class 9c building; or
(B) a building where air-conditioning is needed for 24 hour occupancy.

Compliance can be met by:
- *Ensure any new Mechanical Ventilation system has the ability to be inactive when the area is not occupied.*
- *Ensure any new Mechanical Ventilation system greater than 1000L/s is controlled by a time switch.*

J5.4 Miscellaneous exhaust systems

(a) A miscellaneous exhaust system with an air flow rate of more than 1000 L/s, that is associated with equipment having a variable demand, must—
(i) be capable of stopping the motor when the system is not needed; and
(ii) have a variable speed fan or the like.

(b) The requirements of (a) do not apply—
  (i) to a miscellaneous exhaust system in—
    (A) a sole-occupancy unit in a Class 2, 3 or 9c building; or
    (B) a Class 4 part of a building; or
  (ii) where additional exhaust ventilation is needed to balance the required outside air for ventilation.

Compliance can be met by:

- *Ensure any new miscellaneous exhaust system with a flow rate of more than 1000L/s must be capable of stopping the motor when the system is not needed and have a variable speed fan or the like.*

3.6 PART J6 - ARTIFICIAL LIGHTING & POWER

J6.1 Application

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

J6.2 Interior artificial lighting

(b) All artificial lighting for the whole building must not exceed the aggregated maximum Illumination Power Density (IPD) specified in Table J6.2b.(refer Appendix 3).

NOTE: Illumination Power Density is not just the wattage of the lamps but of the entire installation. eg: Typically a 2 x 36W fluorescent fitting is not 72 watts BUT 80 watts, to allow for energy losses in the control equipment and particularly the ballast. For LV lights, the transformer and control gear must be considered. For example a 50W LV dichroic light is rated at 65W. When purchasing or specifying lighting equipment, the full energy use data for the equipment should be obtained from the supplier.

Compliance can be met by:

- *Not exceeding the "Max. Lighting Wattage" for any new lighting in each of the areas in the lighting calculations table in Appendix 2.*
- *The maximum internal lighting wattage for the basement car park levels combined must not exceed **20,852 watts.***
- *The maximum internal lighting wattage for the ground floor must not exceed **20,047 watts.***
- *The maximum internal lighting wattage for the Podium Level 1 must not exceed **7,813 watts.***
- *The maximum internal lighting wattage for each level from Level 2 to Level 6 must not exceed **8,583 watts.***
- *The maximum internal lighting wattage for Level 7 must not exceed **5,606 watts.***

In calculating the number of such lamps required:

A 2 x 36W triphosphor fluorescent fitting will generate 80 Lm/W, resulting in a lighting output of 5,760 Lm per fitting.
This fitting will use 80W of electricity, therefore to comply with 10 W/ m^2 IPD, for an area of 100 m^2, the maximum number of these fittings permissible is: 10 x 100 W = 1,000W / 80 = 12 fittings, and this will produce 69,000 Lm or 690 Lux. (ie: more than twice that required for an Office).

(c) The lighting limits do not apply to the following:
- Emergency Lighting
- Signage and display lighting
- A heater where it emits light
- Lighting for a specialised process nature
- Lighting for performances such as theatrical or sporting
- Lighting of permanent displays in museums or galleries

J6.3 Interior artificial lighting and power control

(a) Artificial lighting of a room or space must be individually operated by a switch or other control device.

(b) An occupant activated device must be provided in the sole-occupancy unit of a class 3 building, other than where providing accommodation for people with disability or the aged, to cut power to the artificial lighting, air-conditioning, local exhaust fans and bathroom heater when the sole-occupancy unit is unoccupied.

Compliance can be met by:
- *Installing an occupant activated device to cut power to the lighting, air-conditioning, local exhaust fans and bathroom heater when the unit is unoccupied.*

(c) An artificial lighting switch must:
(i) Be located in a visible position in the room being switched or in an adjacent room or space from where the lighting being switched is visible,
(ii) In a Class 5 or Class 8 Laboratory, not operate lighting for an area greater than 250m^2 except for single function spaces.
(ii) In a Class 3,6,7,8 (other than a laboratory) or 9 building, not operate lighting for an area greater than 250m_2 for a space up to 2000m_2 or up to 1000m^2 for a space greater than 2000m^2

(d) 95% of artificial lighting in a building or storey of a building, other than a Class 2 or 3 building or a Class 4 part, of more than 250m^2 must be controlled by:
(i) A time switch in accordance with Specification J6; or
(ii) An occupant sensing device such as a security key card reader or a motion detector in accordance with Specification J6.

Compliance can be met by:
- *Time switch(s) or motion detector(s) or security card reader(s) must be installed to control at least 95% of the lighting in the ground level and basement levels of the building.*

(e) In a Class 5, 6 or 8 building of more than 250m^2, artificial lighting in a natural lighting a zone adjacent to windows must be separately controlled from artificial lighting not in natural lighting zone in the same storey except where:
(i) The room containing the natural lighting zone is less than 20m^2; or
(ii) The room's natural lighting zone contains less than 4 luminaires; or
(iii) 70% or more of the luminaries in the room are in the natural lighting zone.

(f) These lighting requirements do not apply to Emergency lighting requirements or where lighting is required for 24 hours occupancy situations.

(g) 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 in a patient care area in a Class 9a building or in a Class 9c aged care building.
  (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 display lighting exceeds 1 kW.

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

Compliance can be met by:
- *Decorative or display lighting must be controlled separately from general lighting manually and by a time switch in accordance with specification J6 if the lighting exceeds 1kW*

J6.5 Artificial lighting around the perimeter of a building

(a) Artificial lighting around the perimeter of a building, must:
  (i) Be controlled by either a daylight sensor or 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 perimeter lighting load exceeds 100W, have an average light source efficacy of not less than 60 Lumens/W, or be controlled by a motion detector in accordance with Specification J6
  (iii) 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.

Compliance can be met by:
- *External perimeter lighting must be controlled by either a daylight sensor or a time switch in accordance with specification J6, and have a light source efficiency of not less than 60 lumens/watt if the lighting exceeds 100 watts.*

NOTE:
- That for smaller rooms a greater Illumination Power Density can be achieved by using a Motion Detector.
- All areas have had the Room Aspect Ration applied.

- Low Voltage Halogen lights only have efficacy of approx. 20 Lm/W and Compact Fluorescent lamps have an efficacy of approx. 70 Lm/W.
- For stairwells and corridors the provisions of Part E4 override this Section.

J6.6 Boiling water & 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.

Specification J6

This section contains the requirements for lighting control devices should they be used in the building.

Spec J6.3 Time switch

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

(b) A time switch for internal lighting must be capable of being overridden by
- a means of turning the lights on
  - by a manual switch or occupant sensing device for a period of 2 hours after which the time switch must resume control or
  - an occupant sensing device that overrides the time switch upon a person's entry and returns control to the time switch on the person's exit (eg security card reader), and
- a manual "off" switch

(c) A time switch for external lighting must be capable of
- Limiting the period the system is switched on to between 30 minutes before sunset and 30 minutes after sunrise is determined or detected including any pre-programming period between these times, and
- Being overridden by a manual switch or a security access system for a period of up to 30 minutes, after which the time switch must resume control.

(d) A time switch for boiling water and chilled water storage units must be capable of being overridden by a manual switch or a security access system that senses a person's presence, overrides for a period of up to 2 hours, after which if there is no further presence detected, the time switch must resume control.

Spec J6.4 Motion Detectors

(b) In the Class 3 areas of the building other than within a sole-occupancy unit, a motion detector must:
- (i) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and
- (ii) Be capable of detecting a person before they have entered 1 m into the space, and
- (iii) Other than within a sole-occupancy unit of a Class 3 building, not control more than, an area of 100m^2 and 95% of the lights in spaces of area more than 25m^2; and
- (iv) Be capable of maintaining the artificial lighting when activated for not less than 5 minutes and not more than 15 minutes unless it is reset; and
- (v) Without interruption if the motion detector is reset by movement.

(b) In a Class 6, 7 and 9b building, a motion detector must:

(i) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and

(ii) Be capable of detecting a person before they have entered 1 m into the space, and movement of 500mm within the useable part of the space; and

(iii) Not control more than, in other than a car park, an area of 500m^2 with a single sensor or group of parallel sensors and 75% of the lights in spaces using high intensity discharge; and

(iv) Be capable of maintaining the artificial lighting when activated for a maximum of 30 minutes unless it is reset, and without interruption if the motion detector is reset by movement; and

(v) Not be overridden by a manual switch to permanently leave the lights on.

(c) When outside a building, a motion detector must:

(i) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and

(ii) Be capable of detecting a person within a distance of twice the mounting height or 80% of the ground area covered by the lights beam, and

(iii) Not control more than 5 lights and

(iv) Be operated in series with a photoelectric cell or astronomical time switch so that the lights will not operate in daylight hours, and

(v) Be capable of maintaining the artificial lighting when the switch is turned on for a maximum of 10 minutes unless it is reset, and

(vi) Have a manual override switch which is reset after a maximum period of 4 hours.

Spec J6.5 Daylight sensor and dynamic lighting control device

(a) A daylight sensor and dynamic lighting control device for artificial lighting must:

For switching on and off, be capable of having the switching level set point adjusted between 50 and 10000 lux; and have a delay of more than 2 minutes or a differential of more than 50 lux, and

For dimming or stepped switching, be capable of reducing the power consumed by the controlled lighting in proportion to the incident daylight on the working plane either continuously down or in no less than 4 steps down to a power consumption that is less than 50% of full power.

(b) Where a daylight sensor and dynamic control device has a manual override switch, the manual override switch must not be able to switch the lights permanently on or bypass the lighting controls.

3.7 PART J7 – HEATED WATER SUPPLY, SWIMMING POOL, SPA POOL

J7.2 Heated Water Supply

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

J7.3 Swimming Pool Heating and Pumping

(a) Heating for a swimming pool must be by a solar heater not boosted by electric resistance heating, a heater using reclaimed energy, a gas heater, a heat pump or a combination of any of these.
(b) Where some or all of the heating is provided by a gas heater or heat pump the swimming pool must have a cover (other than when located in a conditioned space) and a time switch in accordance with Specification J6 to control the heater.
(c) A time switch in accordance with Specification J6 must be provided to operate any circulation pump for a swimming pool.

Compliance can be met by:

- *Direct electric resistance heating must not be used*
- *A pool cover must be used when heating with either gas or heat pump*
- *A time switch must be used to control the pool heater and any circulation pumps.*

J7.4 Spa Pool Heating and Pumping

(a) Heating for a spa pool having a capacity of more than 680L must be by a solar heater, a heater using reclaimed energy, a gas heater, a heat pump or a combination of any of these.
(b) Where some or all of the heating is provided by a gas heater or heat pump the spa must have a cover and a push button and time switch in accordance with Specification J6 to control the heater.
(c) A time switch in accordance with Specification J6 must be provided to operate any circulation pump for a spa pool of more than 680L.

Compliance can be met by:

- *Direct electric resistance heating must not be used*
- *A spa cover must be used when heating with either gas or heat pump*
- *A time switch and push button must be used to control the pool heater*
- *A time switch must be used to operate any circulation pumps if the capacity is more than 680L.*

3.8 PART J8 - ACCESS FOR MAINTENANCE & FACILITIES FOR MONITIRING

J8.1 Application

The provisions of this part do not apply to the sole-occupancy of a Class 2 building, a Class 4 part of a building or to a Class 8 electricity network substation.

J8.2 Not included in current NCC

J8.3 Facilities for Energy Monitoring

(a) A building with a floor area greater than 500m^2 must have the facility to record the consumption of gas and electricity.

(b) A building with a floor area greater than 2500m^2 must have the facility to record individually the energy consumption of air-conditioning plant, artificial lighting, appliance power, central hot water supply, internal transport devices, and other ancillary plant.

Compliance can be met by:

- *The building must have separate facilities for recording the electricity used for common air-conditioning, lighting, power, central hot water, and lifts (private sub-metering in addition to any supply authority metering is required).*

SECTION 4 - APPENDICES

APPENDIX 1 - GLAZING

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

HELP

Building name/description: Woodriff street, Penrith

Application: shop display

Climate zone: 6

Storey: ground

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	106m²			176m²	35.2m²	55m²	94.2m²		
Option B									n/a
Glazing area (A)	*66.5m²*	.....	.....	*134m²*	*31.2m²*	*19.3m²*	*23.8m²*		

Number of rows preferred in table below: 13 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	cafe window	N		4.10	3.40		7.5	0.52	1.300	3.700	0.35	-0.40	0.85	0.68	13.94	18% of 98%
2	cafe entry	N		4.10	1.70		7.5	0.52	1.300	3.700	0.35	-0.40	0.85	0.68	6.97	9% of 98%
3	cafe verandah	N		4.10	4.30		7.5	0.52	2.900	3.700	0.78	-0.40	0.33	0.41	17.63	14% of 98%
4	entry	N		2.40	4.80		7.5	0.52	2.600	3.700	0.70	1.30	0.98	0.85	11.52	21% of 98%
5	cafebar alfresco	N		4.10	4.00		7.5	0.52				0.00	1.00	1.00	16.40	38% of 98%
6	cafebar alfresco	se		4.10	9.20		3.0	0.75				0.00	1.00	1.00	37.72	31% of 99%
7	CAFEBAR ENTRY	se		4.10	1.80		3.0	0.75	2.600	3.700	0.70	-0.40	0.66	0.60	7.38	5% of 99%
8	KITCHEN	se		4.10	7.30		3.0	0.75	2.600	3.700	0.70	-0.40	0.66	0.60	29.93	22% of 99%
9	ENTRY	se		4.10	4.00		3.0	0.75	2.600	3.700	0.70	-0.40	0.66	0.60	16.40	12% of 99%
10	Retail	se		4.10	10.40		3.0	0.75	2.600	3.700	0.70	-0.40	0.66	0.60	42.64	31% of 99%
11	Retail	s		4.10	7.60		3.0	0.75	device		2.00	0.00	0.55	0.55	31.16	100% of 100%
12	Retail	sw		4.10	4.70		5.3	0.75	device		2.00	0.00	0.38	0.38	19.27	100% of 99%
13	entry	w		4.10	5.80		7.5	0.75	device		2.00	0.00	0.05	0.31	23.78	100% of 94%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

if inputs are valid

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

HELP

Building name/description: WOODRIFF PENRITH

Application: Class 3

Climate zone: 6

Storey: Podium

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	101m²	38.8m²		170m²	46.8m²	62m²	82.5m²	81.8m²	
Option B									n/a
Glazing area (A)	*48.7m²*	*8.96m²*	.....	*69.2m²*	*1.44m²*	*38.6m²*	*52.6m²*	*36.2m²*	

Number of rows preferred in table below: 36 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	1011	W		2.80	4.00		1.2	0.33	1.700	2.800	0.61	0.00	0.64	0.61	11.20	19% of 100%
2	1012	W		2.80	1.80		1.2	0.33	1.700	2.800	0.61	0.00	0.64	0.61	5.04	9% of 100%
3	1013	S		0.60	2.40		7.5	0.75				0.00	1.00	1.00	1.44	100% of 26%
4	1021	N		2.80	1.80		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	5.04	10% of 100%
5	1022	N		2.80	3.60		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	10.08	21% of 100%
6	1023	W		2.80	5.00		1.2	0.33	1.700	2.800	0.61	0.00	0.64	0.61	14.00	24% of 100%
7	1024	W		1.60	1.00		1.2	0.33	1.700	1.600	1.06	0.00	0.37	0.44	1.60	3% of 100%
8	1025	W		1.80	3.00		1.2	0.33	1.700	1.800	0.94	0.00	0.43	0.47	5.40	10% of 100%
9	1031	N		2.80	3.60		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	10.08	21% of 100%
10	1032	N		2.80	1.80		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	5.04	10% of 100%
11	1041	SE		0.70	3.00		2.4	0.75				0.00	1.00	1.00	2.10	3% of 100%
12	1042	N		2.80	3.00		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	8.40	17% of 100%
13	1043	N		2.80	3.60		7.5	0.50	1.700	2.800	0.61	0.00	0.60	0.49	10.08	21% of 100%
14	1061	SE		2.80	3.00		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	8.40	12% of 100%
15	1062	SE		2.80	3.60		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	10.08	14% of 100%
16	1063	SE		2.80	3.00		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	8.40	12% of 100%
17	1071	SE		2.80	3.00		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	8.40	12% of 100%
18	1072	SE		2.80	3.60		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	10.08	14% of 100%
19	1073	SE		2.80	3.00		2.4	0.75	1.700	2.800	0.61	0.00	0.70	0.64	8.40	12% of 100%
20	1081	SW		2.80	1.80		2.2	0.80	3.000	2.800	1.07	0.00	0.54	0.50	5.04	14% of 98%
21	1082	SW		2.80	4.00		2.2	0.80	3.000	2.800	1.07	0.00	0.54	0.50	11.20	31% of 98%
22	1083	SE		0.70	2.00		2.4	0.80	1.700	0.700	2.43	0.00	0.37	0.39	1.40	3% of 100%
23	1084	SE		1.40	1.00		2.4	0.80	1.700	1.400	1.21	0.00	0.53	0.48	1.40	2% of 100%
24	1085	SE		2.80	3.00		2.4	0.80	1.700	2.800	0.61	0.00	0.70	0.64	8.40	12% of 100%
25	1091	NW		1.40	1.40		1.8	0.37				0.00	1.00	1.00	1.96	9% of 100%
26	1092	NW		0.60	2.40		1.8	0.37				0.00	1.00	1.00	1.44	6% of 100%
27	1093	NW		2.80	4.00		1.8	0.37	1.700	2.800	0.61	0.00	0.61	0.54	11.20	28% of 100%
28	1094	SW		2.80	4.00		2.2	0.80	3.000	2.800	1.07	0.00	0.54	0.50	11.20	31% of 98%
29	1095	SW		2.80	1.80		2.2	0.80	3.000	2.800	1.07	0.00	0.54	0.50	5.04	14% of 98%
30	1096	SE		0.70	3.00		2.2	0.80				0.00	1.00	1.00	2.10	3% of 100%
31	1101	NW		1.40	1.40		1.8	0.37				0.00	1.00	1.00	1.96	9% of 100%
32	1102	NW		2.80	3.00		1.8	0.37	1.700	2.800	0.61	0.00	0.61	0.54	8.40	21% of 100%
33	1103	NW		2.80	4.00		1.8	0.37	1.700	2.800	0.61	0.00	0.61	0.54	11.20	28% of 100%
34	Corridor	NE		2.80	3.20		7.5	0.36				0.00	1.00	1.00	8.96	100% of 100%
35	entry	W		2.80	5.50		1.2	0.33				0.00	1.00	1.00	15.40	34% of 100%
36	Corridor	SW		2.80	2.20		2.2	0.80				0.00	1.00	1.00	6.16	10% of 98%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

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

HELP

Building name/description: WOODRIFF PENRITH

Application: Class 3

Climate zone: 6

Storey: Level 2-6

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	101m²	45m²		197m²	46.8m²	62m²	82.5m²	81.8m²	
Option B									n/a
Glazing area (A)	*49m²*	*8.4m²*	.....	*84m²*	*1.4m²*	*41m²*	*53m²*	*31m²*	

Number of rows preferred in table below: 37 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	2011	W		2.80	4.00		1.2	0.33	2.000	2.800	0.71	0.00	0.57	0.56	11.20	20% of 99%
2	2012	W		2.80	1.80		1.2	0.33	2.000	2.800	0.71	0.00	0.57	0.56	5.04	9% of 99%
3	2013	S		0.60	2.40		7.5	0.75				0.00	1.00	1.00	1.44	100% of 26%
4	2021	N		2.80	1.80		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	5.04	10% of 99%
5	2022	N		2.80	3.60		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	10.08	21% of 99%
6	2023	W		2.80	5.00		1.1	0.33	2.000	2.800	0.71	0.00	0.57	0.56	14.00	23% of 99%
7	2024	W		1.60	1.00		1.1	0.33	2.000	1.600	1.25	0.00	0.28	0.40	1.60	3% of 99%
8	2025	W		1.80	3.00		1.1	0.33				0.00	1.00	1.00	5.40	12% of 99%
9	2031	N		2.80	3.60		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	10.08	21% of 99%
10	2032	N		2.80	1.80		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	5.04	10% of 99%
11	2041	SE		0.70	3.00		2.3	0.75				0.00	1.00	1.00	2.10	3% of 99%
12	2042	N		2.80	3.00		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	8.40	17% of 99%
13	2043	N		2.80	3.60		7.5	0.51	2.000	2.800	0.71	0.00	0.44	0.44	10.08	21% of 99%
14	2051	NW		0.70	3.00		2.8	0.33				0.00	1.00	1.00	2.10	9% of 99%
15	2052	SE		2.80	8.10		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	22.68	26% of 99%
16	2053	SE		2.80	2.90		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	8.12	9% of 99%
17	2061	SE		2.80	3.00		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	8.40	10% of 99%
18	2062	SE		2.80	3.60		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	10.08	12% of 99%
19	2071	SE		1.80	3.00		2.3	0.75	2.000	2.800	0.71	1.00	0.89	0.85	5.40	7% of 99%
##	2072	SE		2.80	3.60		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	10.08	12% of 99%
21	2073	SE		2.80	3.00		2.3	0.75	2.000	2.800	0.71	0.00	0.66	0.59	8.40	10% of 99%
##	2081	SW		2.80	1.80		2.1	0.80	2.000	0.700	2.86	-2.10	0.38	0.38	5.04	18% of 97%
##	2082	SW		2.80	5.00		2.1	0.80	2.000	1.400	1.43	-1.40	0.47	0.44	14.00	42% of 97%
##	2083	SE		1.40	1.00		2.3	0.75				0.00	1.00	1.00	1.40	2% of 99%
##	2084	SE		1.80	3.00		2.3	0.75				0.00	1.00	1.00	5.40	7% of 99%
##	2091	NW		1.40	1.40		2.8	0.33				0.00	1.00	1.00	1.96	9% of 99%
##	2092	NW		0.60	2.40		2.8	0.33				0.00	1.00	1.00	1.44	6% of 99%
##	2093	NW		2.80	4.00		2.8	0.33	2.000	2.800	0.71	0.00	0.50	0.48	11.20	30% of 99%
##	2094	SW		2.80	4.00		2.1	0.80	2.000	2.800	0.71	0.00	0.66	0.60	11.20	22% of 97%
##	2095	SW		2.80	1.80		2.1	0.80	2.000	2.800	0.71	0.00	0.66	0.60	5.04	10% of 97%
31	2096	SE		0.70	3.00		2.3	0.75				0.00	1.00	1.00	2.10	3% of 99%
##	2101	NW		1.40	1.40		2.8	0.33				0.00	1.00	1.00	1.96	9% of 99%
##	2102	NW		1.40	1.00		2.8	0.33				0.00	1.00	1.00	1.40	6% of 99%
##	2103	NW		2.80	4.00		2.8	0.33	2.000	2.800	0.71	0.00	0.50	0.48	11.20	30% of 99%
##	corridor	W		2.80	5.50		1.1	0.33				0.00	1.00	1.00	15.40	33% of 99%
##	Corridor	SW		2.80	2.20		2.1	0.80				0.00	1.00	1.00	6.16	8% of 97%
##	corridor	NE		2.80	3.00		7.5	0.43				0.00	1.00	1.00	8.40	100% of 99%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

if inputs are valid

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While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any

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

HELP

Building name/description: WOODRIFF PENRITH

Application: other

Climate zone: 6

Storey: Level 7

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	71.3m²	32.9m²	37.2m²	51.8m²	49.9m²	38.8m²	65.1m²	81.8m²	
Option B									n/a
Glazing area (A)	*51.2m²*	*4.2m²*	*4.08m²*	*12m²*	*12.5m²*	*23.3m²*	*37.5m²*	*3.6m²*	

Number of rows preferred in table below: 12 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	CONFERENCE	W		2.80	11.00		2.0	0.33	1.400	2.800	0.50	0.00	0.71	0.67	30.80	82% of 98%
2	CONFERENCE	N		2.80	15.40		7.5	0.39	1.400	2.800	0.50	0.00	0.72	0.56	43.12	84% of 97%
3	ROOM	N		2.80	2.90		7.5	0.39	1.400	2.800	0.50	0.00	0.72	0.56	8.12	16% of 97%
4	ROOM	E		1.70	2.40		7.5	0.75	1.400	1.700	0.82	0.00	0.47	0.50	4.08	100% of 51%
5	CORRIDOR	NE		2.80	1.50		7.5	0.75	1.400	2.800	0.50	0.00	0.74	0.63	4.20	100% of 55%
6	GYMNASIUM	SW		2.40	4.30		2.9	0.75	1.400	2.800	0.50	0.40	0.88	0.81	10.32	44% of 98%
7	GYMNASIUM	NW		2.40	1.50		7.5	0.75	1.400	2.800	0.50	0.40	0.90	0.75	3.60	100% of 22%
8	CORRIDOR	SW		2.40	5.40		2.9	0.75	1.400	2.800	0.50	0.40	0.88	0.81	12.96	56% of 98%
9	CORRIDOR	S		2.40	5.20		5.4	0.75	1.400	2.800	0.50	0.40	0.90	0.85	12.48	100% of 100%
10	CORRIDOR	W		2.40	2.80		2.0	0.33	1.400	2.800	0.50	0.40	0.87	0.80	6.72	18% of 98%
11	GYMNASIUM	SE		2.40	5.00		4.9	0.75	1.400	2.800	0.50	0.40	0.86	0.81	12.00	100% of 100%
12																

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if inputs are valid

APPENDIX 2 - LIGHTING CALCULATIONS TABLE(S)

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B		(W/m^2)	(W)
Basement 1					
Car Park	44	43.1	1898.0	5	**9490**
Storage	9	9.7	87.0	8	**917**
Basement 2					
Car Park	44	43.4	1910.0	5	**9550**
Storage	9	9.7	87.0	8	**895**
Total Sum					**20852**

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B		(W/m^2)	(W)
Ground floor					
Loading Bay	7	21.4	150.0	8	**1667**
Waste Chute Room	5.3	4.1	21.7	8	**292**
Linen Room	3.6	4.7	17.0	8	**232**
Bin Store	2.8	3.2	9.0	8	**127**
MSB	2.8	3.4	9.5	8	**135**
Cafe	11.4	8.3	95.0	18	**2441**
Circulation	2.7	7.5	20.2	8	**277**
Storage	2.3	1.9	4.3	8	**63**
Amenities	5	2.1	10.5	6	**112**
NE Entry	8.1	4.4	35.9	15	**869**
Astina Lobby	18.6	8.6	159.2	15	**3209**
Astina BOH	6.9	2.8	19.0	8	**261**
Cafe	7.1	10.6	75.0	18	**1994**
Kitchen	7.1	7.0	49.4	8	**611**
Retail	16.3	18.7	304.0	22	**7755**
Total Sum					**20047**

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B		(W/m^2)	(W)
Level 1 Podium					
101	7.5	12.5	94.0	5	**618**
102	10.8	8.3	90.0	5	**591**
103	8.6	10.0	86.0	5	**568**
104	8.6	10.2	88.0	5	**579**
106	8.6	10.1	87.0	5	**574**
107	8.6	10.1	87.0	5	**574**
108	8.6	10.2	88.0	5	**579**
109	8	11.5	92.0	5	**604**
110	8	9.9	79.0	5	**530**
Astina BOH	4.6	9.4	43.2	8	**515**
Corridor	3	57.1	171.3	8	**2082**
Total Sum					**7813**

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B		(W/m^2)	(W)
Level 2 - 6					
201	7.5	12.5	94.0	5	**587**
202	10.8	8.3	90.0	5	**561**
203	8.6	10.0	86.0	5	**540**
204	8.6	10.2	88.0	5	**550**
205	9.1	3.4	108.0	5	**820**
206	8.6	10.8	93.0	5	**576**
207	8.6	10.8	93.0	5	**576**
208	8.6	11.5	99.0	5	**607**
209	8	2.1	92.0	5	**758**
210	8	9.9	79.0	5	**504**
Astina BOH	4.6	9.4	43.2	8	**496**
Corridor	3	57.1	171.3	8	**2007**
Total Sum					**8583**

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B		(W/m^2)	(W)
Level 7					
Conference	12	16.1	193.0	10	**2052**
Room	12	4.9	59.0	10	**815**
Storage	3.2	4.5	14.4	8	**186**
Room	3.2	6.9	22.1	10	**345**
Corridor	6.7	7.5	50.0	8	**551**
Corridor	11.6	3.4	40.0	8	**477**
Toilets	5.4	3.8	20.5	6	**191**
Storage	5.4	2.6	14.0	8	**183**
Toilets	6.5	5.2	34.0	6	**297**
Gym	6.5	5.4	35.0	10	**508**
Total Sum					**5606**

APPENDIX 3 - TABLE OF MAXIMUM ILLUMINATION POWER DENSITY

Space	Maximum illumination power density ($W/m^{2)}$
Auditorium, church and public hall	10
Board room and conference room	10
Car park - general	6
Car park - entry zone (first 20 m of travel)	25
Common rooms spaces and corridors	8
Control room, switch room, and the like	9
Corridors	8
Courtroom	12
Entry lobby	15
Health-care - Children's ward	10
Health-care - examination room	10
Health-care - patient ward	7
Health-care - all patient care	13
Kitchen and food preparation area	8
Laboratory	12
Library - stack and shelving	12
Library - reading room	10
Museum and gallery - circulation, cleaning and service lighting	8
Office - artificially lit to an ambient level of 200 lux or more	9
Office - artificially lit to an ambient level of less than 200 lux	7
Plant room	5
Restaurant, café, bar, hotel lounge and a space for the serving and consumption of food or drinks	18
Retail space including a museum and gallery whose purpose is the sale of objects	22
School - general purpose learning area	8
Storage with shelving no higher than 75% of the height of the aisle lighting	8
Storage with shelving higher than 75% of the height of the aisle lighting	10
Service area, locker room, staff room, cleaner's room, rest room and the like	5
Toilet, locker room, staff room, rest room and the like	6
Wholesale storage and display area	10

Notes:

1. In areas not listed above, the maximum *illumination power density* is:
   a) For an illuminance of less than 80 Lux, 7.5 W/m^2
   b) For an illuminance of less than 80 to 160 Lux, 9 W/m^2
   c) For an illuminance of less than 160 to 240 Lux,10 W/m^2
   d) For an illuminance of less than 240 to 320 Lux, 11 W/m^2
   e) For an illuminance of less than 320 to 400 Lux, 12 W/m^2
   f) For an illuminance of less than 400 to 480 Lux, 13 W/m^2
   g) For an illuminance of less than 480 to 540 Lux, 14 W/m^2
   h) For an illuminance of less than 540 to 620 Lux, 15 W/m^2
   i) For an illuminance of more than 620 Lux, the light source efficacy must not be less than 80 Lumens/W

APPENDIX 4 - EVIDENCE OF COMPLIANCE CHECKLIST

The purpose of this checklist is to itemise the evidence that should be collected during the construction phase of the project that will demonstrate how the final building complies with the Energy Efficiency requirements of Section J of the BCA that were identified during the design phase. Generally evidence should take the form of delivery receipts, photographs, or signed and dated statements from installers. This following check list is a generic list and some elements may not be applicable to a particular project.

PART J1 - BUILDING FABRIC

Element	Applicable (Y or N)	Evidence
Roof & ceiling insulation		Delivery receipts for roof/ceiling insulation type and rating and/or pictures of insulation installation and the R rating of the insulation.
Wall insulation		Delivery receipts for wall insulation type and rating and/or pictures of insulation installation and the R rating of the insulation.
Floor		Delivery receipts for floor insulation type and rating and/or pictures of insulation installation and the R rating of the insulation.

Or a signed and dated statement from the builder/contractor that the Building Fabric insulation was installed as per the authorised plans and the Energy Efficiency Report.

PART J2 - GLAZING

Element	Applicable (Y or N)	Evidence
Glazing		Delivery receipts for the glazing installed on site including the thermal characteristics of the glazing (U-value and SHGC- value).

Or a signed and dated statement from the builder/contractor that the Glazing was installed with the thermal characteristics as per the authorised plans and the Energy Efficiency Report.

PART J3 - BUILDING SEALING

Element	Applicable (Y or N)	Evidence
Infiltration prevention		Delivery receipts for the number of self closing doors installed.
Exhaust fans		Delivery receipts for the self closing dampers on exhaust fans or pictures showing their installation.

Or a signed and dated statement from the builder/contractor that the self closing doors and/or A/C outlet next to the open shop front was installed as per the authorised plans, specifications and the Energy Efficiency Report.

PART J5 - A/C & VENTILATION SYSTEMS

A signed and dated statement from the A/C installer that the A/C system complies with MEPS and complies with all the requirements of Section J of the BCA 2016.

PART J6 - ARTIFICIAL LIGHTING AND POWER

Element	Applicable (Y or N)	Evidence
Internal Lighting		Delivery receipts for the number and wattage of all the internal lights installed.
External lighting		Delivery receipts for the number and wattage of all the external lights installed.

Or a signed and dated statement from the lighting installer that the lighting was installed as per the authorised plans, specifications and the Energy Efficiency Report.

PART J7 - HOT WATER SUPPLY, SWIMMING POOL, SPA POOL

Element	Applicable (Y or N)	Evidence
Time clocks		Delivery receipts for the number and type of time clocks installed to control the hot water systems.

Or a signed and dated statement from the hot water installer that the hot water system fitting and time clocks were installed as per the authorised plans, specifications and the Energy Efficiency Report.

APPENDIX 5 – BUILDING ENVELOPE