



www.partnersenergy.com.au

Project: **Mixed Use Development
100 Edinburg Road
Castlecrag**

Report: **Energy Efficiency Evaluation
Section J of NCC 2022 Amendment 2**

Reference: 24636

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

Date: 23/10/2025

TABLE OF CONTENTS

	PAGE
SECTION 1 - BASIS OF ASSESSMENT	3
1.1 THE PROJECT	3
1.2 AUTHOR QUALIFICATION.....	3
1.3 COMPLIANCE	3
SECTION 2 - SUMMARY OF COMPLIANCE REQUIRMENTS	4
2.1 PART J4 - BUILDING FABRIC.....	4
2.2 PART J5 - BUILDING SEALING	5
2.3 PART J6 - A/C & VENTILATION SYSTEMS.....	5
2.4 PART J7 - ARTIFICIAL LIGHTING & POWER.....	5
2.5 PART J9 - ENERGY MONITORING & ON-SITE DISTRIBUTED ENERGY RESOURCES	5
SECTION 3 - DETAILED REPORT OF PROVISIONS TO COMPLY	7
3.1 PART J4 - BUILDING FABRIC.....	7
3.2 PART J5 - BUILDING SEALING	10
3.3 PART J6 - A/C & VENTILATION SYSTEMS.....	11
3.4 PART J7 - ARTIFICIAL LIGHTING & POWER.....	15
3.5 PART J8 - HEATED WATER SUPPLY, SWIMMING POOL, SPA POOL	17
3.6 PART J9 - ENERGY MONITORING & ON-SITE DISTRIBUTED ENERGY RESOURCES	17
SECTION 4 - APPENDICES.....	20

SECTION 1 - BASIS OF ASSESSMENT

1.1 THE PROJECT

The proposed development at 100 Edinburg Road, Castlecrag is a new multi-storey mixed-use building comprising four levels of basement car parking, commercial tenancies on the lower ground and ground levels and residential apartments on the mezzanine and levels 1 to 10.

- The Climate Zone is Climate Zone 5.
- This assessment is based on drawings listed in Appendix 8
- This Report addresses ONLY matters relevant to Section 'J' of Volume 1 of NCC 2022, Amendment 2
- The project is assessed using the Deemed To Satisfy method.

1.2 AUTHOR QUALIFICATION

Michael May is a qualified Electrical Engineer (SAIT – 1980), Certified Energy Manager (CEM)(certification #92319), Sydney University Training in NCC/BCA - Section 'J' (2007), Member Australian Institute of Energy, Member Association of Energy Engineers.

1.3 COMPLIANCE

This assessment demonstrates that the project design, as specified in the plans and in the compliance requirements in Section 2 of this report, complies with the design requirements of Section J of the NCC 2022, Amendment 2.



Michael May
BEng, Dipl Bus Mgt

SECTION 2 - SUMMARY OF COMPLIANCE REQUIREMENTS

In addition to the information provided in the drawings, the following measures are required to comply with Section J of the NCC 2022, Amendment 2. The detailed report includes all supporting information.

PARTS J4 & J5 compliance requirements apply to the Commercial and retail areas on the lower ground and ground floors. The basement car parks are unconditioned spaces and are exempt from compliance requirements of these sections.

PARTS J6-J9 compliance requirements apply where appropriate.

The residential apartments are subject to a BASIX assessment.

2.1 PART J4 - BUILDING FABRIC

Compliance can be met by:

Concrete roof/ceiling for Supermarket, Retail and F&B (where there is non-conditioned space above)

- *Installing 40mm R1.9 PIR type product or equivalent with a reflective airspace providing an additional R3.18, giving a **total 'R-value' of R3.76(downwards)**, which exceeds the required minimum of R3.70.*

OR

- *Installing R3.5 Ceiling batts, giving a **total 'R-value' of R4.08 (downwards)**, which exceeds the minimum required of R3.70*

For block veneer walls around building envelope

- *Adding R1.5 wall batts in a metal frame and a reflective air-gap to the block veneer wall system, giving a total 'R-value' of R1.61*

For cladding walls around building envelope

- *adding R1.5 wall batts in a metal frame and a reflective wall wrap, giving a **total 'R-value' of R1.47.***

For concrete walls around building envelope

- *adding R1.5 wall batts in a metal frame with a reflective wrap facing the airgap to the concrete wall, providing a **total R-value of R1.54***

New external glazing

- *For the lower ground supermarket - installing the new windows and glazed doors with a characteristic equal to or less than a **U-value of 7.0 and a SHGC-value of 0.75**, which can be achieved with clear single glazing.*
- *For the ground floor retail and F&B - installing the new windows and glazed doors with a characteristic equal to or less than a **U-value of 5.5 and a SHGC-value of 0.75**, which can be achieved with clear single low-e type glazing.*

Suspended concrete floors for Supermarket, Retail and F&B (where they are above non-conditioned spaces)

- *Adding a R2.0 insulation batt to the concrete slab, giving a **total 'R-value' of R2.3**, which exceeds the required minimum of R2.0.*

OR

- *Adding a 40mm R1.9 PIR board product or equivalent to the concrete slab, providing an added R-value of R1.9, giving a **total 'R-value' of R2.20**, which exceeds the required minimum of R2.0.*

2.2 PART J5 - BUILDING SEALING

Compliance can be met by:

- *The new entry doors to all the Retail and F&B areas and the Supermarket must be self-closing.*
- *Any new exhaust fans to have self-closing dampers, including “miscellaneous exhaust fans”.*

2.3 PART J6 - A/C & VENTILATION SYSTEMS

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 A/C System greater than 2kW_r 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.*
- *Certification by a mechanical engineer if any new air-conditioner is greater than 65kW_r.*

2.4 PART J7 - 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 of the building must not exceed **35,485 watts**.*
- *The maximum internal lighting wattage for the lower ground areas of the building must not exceed **27,161 watts**.*
- *The maximum internal lighting wattage for the ground areas of the building must not exceed **24,411 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 building.*
- *Decorative or display lighting must be controlled separately from general lighting manually and by a time switch in accordance with specification 40 in appendix 7 if the lighting exceeds 1kW*
- *External perimeter lighting must be controlled by either a daylight sensor or a time switch in accordance with specification 40 in appendix 7, and LED lights must be used for 90% of the total lighting load if the lighting exceeds 100 watts.*
- *Ensure the lift lighting and ventilation is turned off when the lift is unused for more than 15 minutes*

2.5 PART J9 - ENERGY MONITORING & ON-SITE DISTRIBUTED ENERGY RESOURCES

Compliance can be met by:

Metering provisions

- *The building must have energy meters for recording time-of-use electricity and gas (if applicable) consumption for air-conditioning, lighting, power, central hot water, lifts and escalators*

EV Charging Provisions

- *Installing a dedicated electrical distribution board for every 24 electric vehicle carpark spaces.*
- *Installing the switchboards fitted with charging control system to manage and schedule charging*
- *The capacity for each circuit must deliver a minimum 12kWh from 11pm to 7am daily for class 2, 12kWh from 9:00am to 5:00pm daily for class 5 to 9, and 48kWh from 11pm to 7am daily for class 3*
- *Installing the switchboard with capacity*
 - *For a future 7kW (32A) type 2 electric vehicle charge 100% of the spaces in class 2, 10% of the spaces in Class 5 & 6, 20% of the spaces for class 3, 7b, 8 or 9.*
 - *For at least 36mm width DIN rail per outgoing circuit for individual sub-circuit electricity metering to record electricity use of electric vehicle charging equipment*
 - *Be labelled to indicate the space is for future use*

SECTION 3 - DETAILED REPORT OF PROVISIONS TO COMPLY

3.1 PART J4 - BUILDING FABRIC

J4D2 Application - All new parts of the new building envelope need to comply.

Building Envelope, for the purpose of Section J, is bound by the new external walls, floor and roof of the proposed commercial and retail areas of the building, as shown in Appendix 5

External envelope means any walls separating internal conditioned space and external ambient conditions. Internal envelope means any walls separating internal conditioned space and internal non-conditioned space.

J4D3 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.

J4D4 Roof & Ceiling Construction

- (1) In this Climate Zone, the minimum total R-value is R3.70 (downward direction of heat flow).

The roof/ceiling for both the supermarket and the ground floor retail and commercial areas will need insulation where there is unconditioned or open space above to achieve compliance.

The roof/ceiling system is a concrete roof with a suspended plasterboard ceiling which requires additional insulation to achieve a minimum total R-value of R3.7(downwards).

Roof & Ceiling Element	R- Value Unventilated- Down
Outside air film	0.03
Concrete roof	0.10
Airspace	0.22
Additional insulation	3.12 minimum
Plasterboard	0.06
Internal air film	0.16
Total R-value	3.70 minimum

Compliance can be met by:

- Installing 40mm R1.9 PIR type product or equivalent with a reflective airspace providing an additional R3.18, giving a **total 'R-value' of R3.76(downwards)**, which exceeds the required minimum of R3.70.

OR

- Installing R3.5 Ceiling batts, giving a **total 'R-value' of R4.08 (downwards)**, which exceeds the minimum required of R3.70

- (2) In this Climate zone the solar absorptance of the upper surface of a roof must be no more than 0.45 (light coloured roof)

Compliance can be met by:

- Installing a light coloured roof with a solar absorptance of 0.45 or less.

The following table is provided by "Colorbond" to describe their range of roof colours according to the Section J requires. It is reproduced here as a guide.

Colour	Solar Absorptance
Classic Cream™	0.32
Surfmist®	0.32
Paperbark®	0.42
Evening Haze®	0.43
Shale Grey™	0.43
Sandbank®	0.46
Dune®	0.47
Windspray®	0.58
Pale Eucalypt®	0.60

J4D5 Roof lights – not applicable

J4D6 Walls-glazing construction

- (1) The total system U-value for the Wall-glazing construction must not be greater than U-value 2.0
- (2) The total system U-value for display glazing must not be greater than U-value 5.8.
- (3) The total system U-value for wall-glazing construction must be calculated in accordance with Specification 37.
- (4) Wall components must achieve a minimum total R-value of R1.0 where the wall area is less than 80% of the total wall-glazing area, and R1.4 where the wall area is 80% or more of the total wall-glazing area.
- (5) The solar admittance of externally facing wall-glazing construction must not be greater than that specified in Table J4d6b, namely 0.13 for this climate zone.
- (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 shading multiplier specified in Specification 37C7.

In this project the new walls have to achieve a minimum R-value of R1.4

For Block veneer walls with metal frames

Wall Element	R- Value
Outside air film	0.03
Block	0.17
Reflective Air gap	0.66
R1.5 wall batts in metal frame	0.57
Plasterboard	0.06
Internal air film	0.12
Total R-value	1.61

Compliance can be met by:

- Adding R1.5 wall batts in a metal frame and a reflective air-gap to the block veneer wall system, giving a total 'R-value' of R1.61

For cladding walls (internal or external) with FC type cladding and metal frame and plasterboard.

Wall Element	R- Value
Outside air film	0.03
Cladding on 15mm top hats	0.03
Reflective air-gap	0.66
R1.5 Wall batts with metal frame	0.57
Plasterboard	0.06
Internal air film	0.12
Total R-value	1.47

Compliance can be met by:

- adding R1.5 wall batts in a metal frame and a reflective wall wrap, giving a **total 'R-value' of R1.47.**

For concrete walls with metal frames and plasterboard.

Wall Element	R- Value
Outside air film	0.03
Concrete	0.10
Reflective air-gap	0.66
R1.5 Wall batts with metal frame	0.57
Plasterboard	0.06
Internal air film	0.12
Total R-value	1.54

Compliance can be met by:

- adding R1.5 wall batts in a metal frame with a reflective wrap facing the airgap to the concrete wall, providing a **total R-value of R1.54**

Glazing – Method 2 – Refer appendix 1.

Compliance can be met by:

- For the lower ground supermarket - installing the new windows and glazed doors with a characteristic equal to or less than a **U-value of 7.0 and a SHGC-value of 0.75**, which can be achieved with clear single glazing.
- For the ground floor retail and F&B - installing the new windows and glazed doors with a characteristic equal to or less than a **U-value of 5.5 and a SHGC-value of 0.75**, which can be achieved with clear single low-e type glazing.

J4D7 Floors

- (1) A floor must achieve a minimum Total R-Value of R2.0

The floor of both the supermarket and the ground floor retail and commercial areas, insulation is required, where there is unconditioned or open space below, to achieve compliance.

The concrete suspended slab requires additional insulation where it is above open or enclosed space to achieve a minimum total R-value of R2.0.

Floor Element	R- Value
Indoor air film	0.16
150mm Concrete Slab	0.10
Additional insulation	1.70 minimum
Outdoor air film	0.03
Total R-value	2.0 minimum

Compliance can be met by:

- *Adding a R2.0 insulation batt to the concrete slab, giving a **total 'R-value' of R2.3**, which exceeds the required minimum of R2.0.*
- OR
- *Adding a 40mm R1.9 PIR board product or equivalent to the concrete slab, providing an added R-value of R1.9, giving a **total 'R-value' of R2.20**, which exceeds the required minimum of R2.0.*

3.2 PART J5 - BUILDING SEALING**J5D3 Chimneys and Flues – not applicable****J5D4 Roof Lights – not applicable****J5D5 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 50m².

Compliance can be met by:

- *The new entry doors to all the Retail and F&B areas and the Supermarket must be self-closing.*

J5D6 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”.*

J5D7 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.

3.3 PART J6 - A/C & VENTILATION SYSTEMS

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 of area; and
 - (ii) not control the temperature by mixing actively heated air and actively cooled air; and
 - (iii) 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 climate zone 1 or where dehumidification control is needed, must have an outdoor air economy cycle, if the total air flow rate of any airside component of an air-conditioning system capacity is greater than or equal to 3000) l/s; 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) with an airflow of more than 1000L/s, 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; and
 - (g) must have the ability to use direct signals from the control components responsible for the delivery of comfort conditions in the building to regulate the operation of central plant; and
 - (h) must have a control dead band of no less than 2°C, except where a smaller range is required for specialised applications; and

- (i) must be provided with balancing dampers and balancing valves that ensure the maximum design air or fluid flow is achieved but not exceeded by more than 15% above design at each component or group of components
 - (j) must ensure that each independently operating space of more than 1000m² 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
 - (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 from operating in opposing heating and cooling modes.
- (3) Time switches –
 - (a) A time switch must be provided to control –
 - (i) an air-conditioning system of more than 2 kW_r; and
 - (ii) a heater of more than 1 kW_{heating} used for air-conditioning.
 - (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) an air-conditioning system that serves—
 - (A) only one sole-occupancy unit in a Class 2, 3 or 9c building; or
 - (B) a Class 4 part of a building; or
 - (ii) 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 A/C System greater than 2kW_r has a 7 day time switch installed.*

J6D4 Mechanical ventilation systems control

- (1) General - A mechanical ventilation system, including one that is part of an air-conditioning system, except where the mechanical system serves only one sole-occupancy unit in a Class 2 building or serves only a Class 4 part of a building, must—
 - (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
 - (i) where the outdoor air flow is greater than 1000 L/s, 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 quantity required by Part F4 by more than 20%, except where –
 - (A) additional unconditioned outdoor air is supplied for free cooling; or
 - (B) additional mechanical ventilation is needed to balance the required exhaust; or
 - (C) an energy reclaiming system preconditions all the outside air.
 - (c) For an airflow of more than 1000L/s, have a variable speed fan unless the downstream airflow is required by Part F4 to be constant.
- (2) Exhaust Systems – An exhaust system with an air flow rate of more than 1000L/s must be capable of stopping the motor when the system is not needed, except for an exhaust system in a sole-occupancy unit in a Class2,3 or 9c building.

- (3) Carpark exhaust systems – Carpark exhaust systems must have a control system in accordance with 4.11.2 or 4.11.3 of AS 1668.2
- (4) Time switches –
 - (a) A time switch must be provided to a mechanical ventilation system with an air flow 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 (i) and (ii) do not apply to –
 - (i) A mechanical ventilation system that serves—
 - (A) only one sole-occupancy unit in a Class 2, 3 or 9c building; or
 - (B) a Class 4 part of a building; or
 - (ii) 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.*

J6D5 Fan systems

- (1) Fans, ductwork and duct components that form part of an air-conditioning system or mechanical ventilation system must separately comply with (2), (3), (4) and (5) or achieve a lower fan motor input power per flowrate than when combining (2), (3), (4) and (5) together.

Clauses J6D5 (2), (3), (4) and (5) are included in appendix 6

J6D6 Ductwork insulation

- (2) Ductwork and fitting in an air-conditioning system must be provided with insulation.
 - (a) Complying with AS/NZS 4859.a, and
 - (b) Have an insulation R-value greater than or equal to
 - R1.0 flexible ductwork
 - The same as connecting duct work for cushion boxes
 - R1.20 within a conditioned space
 - R3.0 where exposed to direct sunlight
 - R2.0 all other locations
- (3) Insulation must
 - (a) Be protected against the effects of weather and sunlight, and
 - (b) Be installed so that it abuts joining insulation to form a continuous barrier and maintains its position and thickness
 - (c) When conveying cooled air be protected by a vapour barrier on the outside of the insulation.
- (4) 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, or
 - Flexible fan connectors

J6D7 Ductwork sealing

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

J6D8 Pump systems

Refer appendix 6.

J6D9 Pipework insulation

Refer appendix 6.

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) A gas heater; or
 - (c) A heat pump heater; or
 - (d) A heater using reclaimed heats from another process such as reject heat from a refrigeration plant; or
 - (e) An electric heater if_
 - (i) The heater capacity is not more than-
 - A. 10 W/m² of the floor area of the conditioned space in climate zone 1; or
 - B. 40 W/m² of the floor area of the conditioned space in climate zone 2; or
 - C. In this climate zone <500m² – 65W/m² or >500m² – 55W/m²; or
 - (ii) The annual energy consumption of the heating is not more than 15 kWh/m² of the floor area of the conditioned space in climate zones 1,2,3,4 and 5; or
 - (iii) The in-duct heater complies with J5.2(a)(ii)(C); or
 - (f) Any combination of (i) to (v).
- (2) An electric heater may be used for heating a bathroom in a class 2,3,9a or 9c building if the heating capacity is not more than 1.2 kW and the heater has a timer.
- (3) 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 a design temperature.
- (4) A gas water heater, that is used as part of an air-conditioning system, must-
 - (a) If rated to consume 500MJ/hour of gas or less, achieve a minimum gross thermal efficiency of 86%; or
 - (b) If rated to consume more than 500MJ/hour of gas or less, achieve a minimum gross thermal efficiency of 90.

J6D11 Refrigerant chillers

Refer appendix 6.

J6D12 Unitary air-conditioning equipment

Any new air-conditioning system 65kW_r or less must comply with MEPS, and any new air-conditioning system greater than 65kW_r must have a minimum energy efficiency ratio of 4.0 W_r/W_{input power} for water cooled and 2.9 W_r/W_{input power} for air cooled

Compliance can be met by:

- *Certification by a mechanical engineer if any new air-conditioner is greater than 65kW_r.*

J6D13 Heat rejection equipment

Refer appendix 6.

3.4 PART J7 - ARTIFICIAL LIGHTING & POWER

J7D3 Artificial lighting

- (2) All artificial lighting for the whole building must not exceed the aggregated maximum Illumination Power Density (IPD) specified in Table J7D3a.(refer Appendix 3).

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 of the building must not exceed **35,485 watts**.*
- *The maximum internal lighting wattage for the lower ground areas of the building must not exceed **27,161 watts**.*
- *The maximum internal lighting wattage for the ground areas of the building must not exceed **24,411 watts**.*

- (3) 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
 - Lighting installed solely to provide Photosynthetically active radiation for plant growth

J7D4 Interior artificial lighting and power control

- (1) Artificial lighting of a room or space must be individually operated by a switch or other control device.
- (3) 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 90% of the lighting being switched is visible,
 - (ii) for other than a single function space such as an auditorium, theatre or sporting stadium, not operate lighting for an area greater than 250m² if in a Class 5 or Class 8 building, or,
 - (ii) not operate lighting for an area greater than 250m² for a space up to 2000m² or up to 1000m² for a space greater than 2000m²
- (4) 95% of artificial lighting in the lower ground and ground floor areas of the building, other than a Class 2 or 3 building or a Class 4 part, of more than 250m² must be controlled by:
- (i) A time switch in accordance with Specification 40 in appendix 7; or
 - (ii) An occupant sensing device such as a security key card reader or a motion detector in accordance with Specification 40 in appendix 7.

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 lower ground and ground floors of the building.*
- (9) These lighting requirements do not apply to Emergency lighting requirements or where lighting is required for 24 hours occupancy situations.
- (10) The requirements of (4) 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.

J7D5 Interior decorative and display lighting

- (1) Interior decorative and display lighting, such as for a foyer mural or art display, must be controlled:
- (a) Separately from other artificial lighting; and
 - (b) 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
 - (c) By a time switch in accordance with Specification 40 in appendix 7 where display lighting exceeds 1 kW.
- (2) 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 40 in appendix 7 if the lighting exceeds 1kW*

J7D6 External artificial lighting

- (1) External artificial lighting attached to or directed at the façade of a building, must:
- (a) 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
 - (b) When the total perimeter lighting load exceeds 100W, use LED luminaires for 90% of the total lighting load, or be controlled by a motion detector in accordance with Specification 40 in appendix 7, or when used for decorative purposes, such as façade lighting or signage lighting, have a separate time switch in accordance with Specification 40 in appendix 7.
- (2) The requirements of (1)(b) 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 40 in appendix 7, and LED lights must be used for 90% of the total lighting load 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 Ratio applied.
- For stairwells and corridors the provisions of Part E4 override this Section.

J7D7 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 40 in appendix 7.

J7D8 Lifts

Lifts must be configured to ensure the lighting and ventilation in the car are turned off when unused for 15 minutes, and achieve the idle and standby energy performance level of 2 for rated load less than 800kg, 3 for 801kg to 2000kg, 4 for 2001kg to 4000kg, 5 for greater than 4000kg, and achieve the energy efficiency class C for usage categories 1 to 4 and energy efficiency class D for usage categories greater than 5, or energy efficiency class D for dedicated goods lifts.

Compliance can be met by:

- *Ensure the lift lighting and ventilation is turned off when the lift is unused for more than 15 minutes*

J7D9 Escalators and moving walkways

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

Compliance can be met by:

- *Ensure the escalators are slowed to less than 0.2m/s when the escalators are unused for more than 15 minutes*

3.5 PART J8 - HEATED WATER SUPPLY, SWIMMING POOL, SPA POOL

J8D2 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.

3.6 PART J9 - ENERGY MONITORING & ON-SITE DISTRIBUTED ENERGY RESOURCES

J9D3 Facilities for Energy Monitoring

- (1) A building with a floor area greater than 500m² must have an energy meter to record time-of-use consumption of gas and electricity.

- (2) A building with a floor area greater than 2500m² must have energy meters to record time-of-use energy consumption of air-conditioning plant, artificial lighting, appliance power, central hot water supply, internal transport devices, renewable energy equipment, on-site electric vehicle charging equipment, on-site battery systems, and other ancillary plant.
- (3) Energy meters required by (2) must be interlinked by a communication system that collates the time-of-use energy consumption data to a single interface monitoring system where it can be stored, analysed and reviewed.
- (4) the provision of (2) do not apply to a Class 2 Building with a floor of more than 2500m² where the total area of common areas is less the 500m²

Compliance can be met by:

- *The building must have energy meters for recording time-of-use electricity and gas (if applicable) consumption for air-conditioning, lighting, power, central hot water, lifts and escalators, renewable energy, EV charging equipment and battery systems.*

J9D4 Facilities for Electric vehicle charging equipment

- (1) A carpark associated with a Class 2, 3, 5, 6, 7b, or 9 building must be provided with electrical distribution boards dedicated to electric vehicle charging –
 - (a) In accordance with Table J9D4 in each storey of the carpark, and
 - (b) Labelled to indicate use for electric vehicle charging equipment.
- (2) Electrical distribution boards dedicated to serving electric vehicle charging 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) For class 2 buildings, have capacity for each circuit to support an electric vehicle charger able to deliver a minimum of 12kWh from 11:00pm to 7:00am daily; and
 - (c) For Class 5 to 9 buildings, have 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
 - (d) For Class 3 buildings, have capacity for each circuit to support an electric vehicle charger able to deliver a minimum of 48kWh from 11:00pm to 7:00am daily; and
 - (e) Be sized to support the future installation of a 7kW (32A) type 2 electric vehicle charge in
 - (i) 100% of the car parking spaces associated with a Class 2 building; or
 - (ii) 10% of the car parking spaces associated with a Class 5 or 6 building; or
 - (iii) 20% of the car parking spaces associated with a Class 3, 7b, 8 or 9 building; and
 - (f) 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
 - (g) Be labelled to indicate the use of the space required by (f) is for the future installation of metering equipment.

Compliance can be met by:

- *Installing a dedicated electrical distribution board for every 24 electric vehicle carpark spaces.*
- *Installing the switchboards fitted with charging control system to manage and schedule charging*

- The capacity for each circuit must deliver a minimum 12kWh from 11pm to 7am daily for class 2, 12kWh from 9:00am to 5:00pm daily for class 5 to 9, and 48kWh from 11pm to 7am daily for class 3
- Installing the switchboard with capacity
 - For a future 7kW (32A) type 2 electric vehicle charge 100% of the spaces in class 2, 10% of the spaces in Class 5 & 6, 20% of the spaces for class 3, 7b, 8 or 9.
 - For at least 36mm width DIN rail per outgoing circuit for individual sub-circuit electricity metering to record electricity use of electric vehicle charging equipment
 - Be labelled to indicate the space is for future use

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

Table Notes

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.

J9D5 Facilities for Solar Photovoltaic and Battery Systems – not applicable

More than 50% of the roof space is fully utilised by communal open space and plant & equipment areas, with little space for solar panels.

- (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) An equivalent generation capacity elsewhere on the 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 55m²; or
 - (d) Where more than 50% of the roof area is used as a terrace, carpark, roof garden, roof light or the like.

SECTION 4 - APPENDICES

APPENDIX 1 – WALL-GLAZING CONSTRUCTION

NCC Facade calculator									
Project Name	100 Edinburg Road								
Building Class	6	Class 2,3,5,6,7,8,9a, 9c, ward							
Climate Zone	5	Storey Lower Ground							
Wall+glazing U-value max limit	2.0								
	N	E	S	W					
Solar Admittance max limit	0.13	0.13	0.13	0.13					
Proposed wall R-value	1.40	1.40	1.40	1.40					
	Method 1				Method 2				
	N	E	S	W	Combined				
Wall+glazing area	211.0	211.0	211.0	211.0	844.0				
Glazing area	0.0	54.8	46.4	0.0	101.2				
wall area percentage	100%	74%	78%	100%	88%				
Proposed Wall U-value	0.71	0.71	0.71	0.71	0.71				
Proposed Wall+Glazing U-value	0.71	2.35	2.10	0.71		1.47			
Proposed Wall+Glazing Solar Adm	0.000	0.000	0.058	0.000					
	Reference combined SHGC Energy Value					74.61			
	Proposed combined SHGC Energy Value					12.18			
Element	Facing	Height	Width	Area	U-value	SHGC	P (device)	H	
Supermarket	s	2.00	23.20	46.4	7.00	0.75	device		
Supermarket	e	4.00	13.70	54.8	7.00	0.75	int		

NCC Facade calculator								
Project Name	100 Edinburg Road							
Building Class	6	Class 2,3,5,6,7,8,9a, 9c, ward						
Climate Zone	5	Storey Ground						
Wall+glazing U-value max limit	2.0							
	N	E	S	W				
Solar Admittance max limit	0.13	0.13	0.13	0.13				
Proposed wall R-value	1.40	1.40	1.40	1.40				
	Method 1				Method 2			
	N	E	S	W	Combined			
Wall+glazing area	559.0	475.5	559.0	475.5	2069.0			
Glazing area	329.0	77.4	49.0	94.2	549.5			
Glazing wall area percentage	41%	84%	91%	80%	73%			
Proposed Wall U-value	0.71	0.71	0.71	0.71	0.71			
Proposed Wall+Glazing U-value	3.53	1.49	1.13	1.66		1.99		
Proposed Wall+Glazing Solar Admittance	0.123	0.018	0.023	0.101				
	Reference combined SHGC Energy Value					165.69		
	Proposed combined SHGC Energy Value					156.41		
Element	Facing	Height	Width	Area	U-value	SHGC	P (device type)	H
G1	n	4.30	7.80	33.5	5.50	0.75	device	
G1	w	4.30	11.10	47.7	5.50	0.75	device	
G1	s	4.30	7.80	33.5	5.50	0.75	device	
G2	n	4.30	7.80	33.5	5.50	0.75	device	
G3	n	4.30	7.80	33.5	5.50	0.75	device	
G7	n	4.30	3.60	15.5	5.50	0.75	device	
G7	w	4.30	10.80	46.4	5.50	0.75	device	
G7	s	4.30	3.60	15.5	5.50	0.75	device	
G11	n	4.30	14.10	60.6	5.50	0.75	device	
G12	n	4.30	12.10	52.0	5.50	0.75	device	
G18	n	4.30	3.90	16.8	5.50	0.75	3	5
G18	e	4.30	7.90	34.0	5.50	0.75	int	
G17	e	4.30	2.50	10.8	5.50	0.75	int	
G16	n	4.30	2.50	10.8	5.50	0.75	int	
G15	n	4.30	8.30	35.7	5.50	0.75	int	
G14	n	4.30	8.60	37.0	5.50	0.75	int	
G14	e	4.30	7.60	32.7	5.50	0.75	device	

APPENDIX 2 - LIGHTING CALCULATIONS TABLES

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B			
				(W/m ²)	(W)
Basement 4					
Car Park	43.8	93.1	4078.5	2	8157
Pump room	7.9	5.9	47.0	4	265
Basement 3					
Car Park	43.8	93.1	4078.5	2	8157
Plant room	7.9	5.9	47.0	4	265
Basement 2					
Car Park	43.8	84.7	3709.0	2	7418
Sprinkler room	5.2	5.4	28.0	4	169
Plant room	6.7	19.1	128.0	4	635
Grease arrestors	6.7	8.2	55.0	4	302
Plant room	6.7	9.7	65.0	4	349
Circulation	18	7.2	130.0	5	794
Basement 1					
Car Park	43.8	85.8	3757.7	2	7515
Switch room	5.2	4.6	24.0	4	147
Plant room	6.7	19.1	128.0	4	635
Supermarket switch	4.9	5.5	27.0	4	164
Comms	4.9	6.7	33.0	4.5	220
Store	4.9	14.0	68.5	1.5	142
Store	4.9	14.9	72.8	1.5	150
Total Sum					35485

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW	MAX. LIGHTING WATTAGE
	L	B			
				(W/m ²)	(W)
Lower Ground					
Supermarket	43	36.1	1552.0	14	21728
Air Plant	12.9	5.6	72.0	4	451
Circulation	26.1	7.1	185.9	5	1331
Super BOH	45.6	10.0	456.0	5	2883
Super Waste	13.8	2.8	39.0	1.5	100
Retail Waste	8.2	3.9	32.0	1.5	81
Resi Waste	8.2	5.2	43.0	1.5	105
Super Plant	10.1	7.8	79.0	4	481
Total Sum					27161

AREA DESCRIPTION	FLOOR DIMENSIONS		AREA (m2)	LIGHT ALLOW (W/m ²)	MAX. LIGHTING WATTAGE (W)
	L	B			
Ground					
G1 F&B	11.9	8.7	103.0	14	2248
G2 Retail	11.9	7.9	94.0	14	2075
G3 F&B	11.9	7.8	93.0	14	2056
BOH corridor	1.7	43.5	74.0	5	677
G7 Retail	10.5	8.5	89.0	14	1970
G11 F&B	8.1	14.4	117.0	14	2533
G12 F&B	8.1	13.1	106.0	14	2314
G14 Retail	11.9	6.7	80.0	14	1803
G15 Retail	11.9	7.8	93.0	14	2056
G16 Retail	9.1	5.3	48.0	14	1131
G17 Retail	9.9	12.7	126.0	14	2684
G18 Retail	9.9	7.3	72.0	14	1630
Local Services	1.8	50.6	91.0	5	829
Circulation	5.8	8.3	48.4	5	406
Total Sum					24411

APPENDIX 3 - TABLE OF MAXIMUM ILLUMINATION POWER DENSITY

Space	Maximum illumination power density (W/m ²)
Auditorium, church and public hall	8
Board room and conference room	5
Car park - general	2
Car park - entry zone (first 20 m of travel)	11.5
Common rooms spaces and corridors	4.5
Control room, switch room, and the like	3
Corridors	5
Courtroom	4.5
Entry lobby	9
Health-care - Children's ward	4
Health-care - examination room	4.5
Health-care - patient ward	2.5
Health-care - all patient care	2.5
Kitchen and food preparation area	4
Laboratory	6
Library - stack and shelving	2.5
Library - reading room	4.5
Museum and gallery - circulation, cleaning and service lighting	2.5
Office - artificially lit to an ambient level of 200 lux or more	4.5
Office - artificially lit to an ambient level of less than 200 lux	2.5
Plant room	4
Restaurant, café, bar, hotel lounge and a space for the serving and consumption of food or drinks	14
Retail space including a museum and gallery whose purpose is the sale of objects	14
School - general purpose learning area	4.5
Storage with shelving no higher than 75% of the height of the aisle lighting	1.5
Service area, locker room, staff room, cleaner's room, rest room and the like	1.5
Toilet, locker room, staff room, rest room and the like	3
Wholesale storage and display area	4

Notes:

- In areas not listed above, the maximum *illumination power density* is:
 - For an illuminance of less than 80 Lux, 2 W/m²
 - For an illuminance of less than 80 to 160 Lux, 2.5 W/m²
 - For an illuminance of less than 160 to 240 Lux, 3 W/m²
 - For an illuminance of less than 240 to 320 Lux, 4.5 W/m²
 - For an illuminance of less than 320 to 400 Lux, 6 W/m²
 - For an illuminance of less than 400 to 600 Lux, 10 W/m²
 - For an illuminance of less than 600 to 800 Lux, 11.5 W/m²

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 that were identified during the design phase. This following check list is a generic list and some elements may not be applicable to a particular project. Evidence of construction compliance should be provided by the installer.

PART J4 - 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.
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 Building Fabric insulation was installed as per the authorised plans and the Energy Efficiency Report.

PART J5 - 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 J6 - 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.

PART J7 - ARTIFICIAL LIGHTING AND POWER

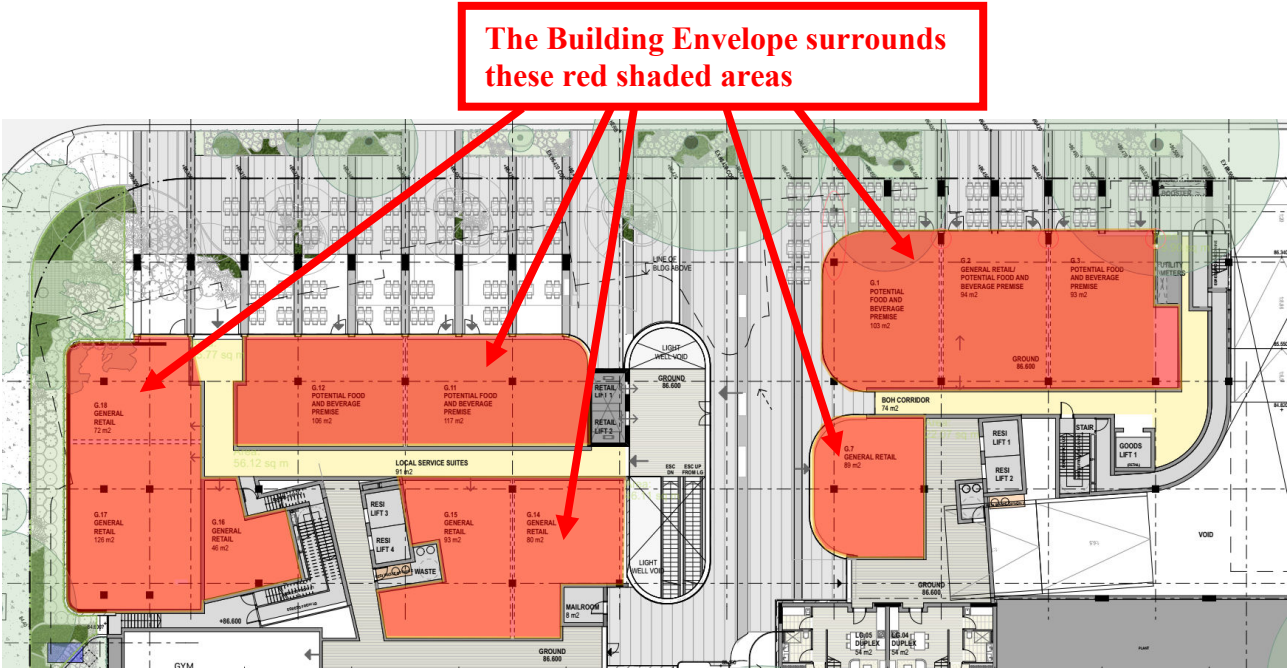
Element	Applicable (Y or N)	Evidence
Internal Lighting		Delivery receipts for the number and wattage of all the internal lights installed.
External lighting		Delivery receipts for the number and wattage of all the external lights installed.

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.

APPENDIX 5 – BUILDING ENVELOPE

The Building Envelope surrounds this red shaded area





APPENDIX 6 – NCC 2022, Amendment 2 - ADDITIONAL CLAUSES

J6D5 Fans and duct systems

[2019: J5.4]

- (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 of flowrate lower than the fan motor input power per unit of flowrate achieved when applying (2), (3), (4) and (5) together.

(2) Fans:

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

$$\eta_{\min} = 0.13 \times \ln(p) - 0.3$$

- (a) In the formula at (a)—

- (i) $\eta_{\min}$ = the minimum *required* system static efficiency for installation type A or C or the minimum *required* system total efficiency installation type B or D; and
- (ii) p = the static pressure of the system (Pa); and
- (iii) $\ln$ = natural logarithm.

- (b) 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:

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

- (c) In the formula at (c)—

- (i) $\eta_{\min}$ = the minimum *required* system static efficiency for installation type A or C or the minimum *required* system total efficiency installation type B or D; and
- (ii) P = the motor input power of the fan; 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.

- (d) 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 6 m 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.

Table J6D5a: Minimum fan performance grade

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

Table Notes

- (1) Installation type A means an arrangement where the fan is installed with free inlet and outlet conditions.
- (2) Installation type B means an arrangement where the fan is installed with a free inlet and a duct at its outlet.
- (3) Installation type C means an arrangement where the fan is installed with a duct fitted to its inlet and with free outlet conditions.
- (4) Installation type D means an arrangement where the fan is installed with a duct fitted to its inlet and outlet.

Table J6D5b: Fan regression coefficient a

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

Table J6D5c: Fan regression coefficient b

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

Table J6D5d: Maximum coil pressure drop

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

Table J6D5e: Maximum clean filter pressure drop

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

J6D8 Pump systems

[2019: J5.7]

- (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 of flowrate lower than the pump motor power per unit of 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 2.5 kW and that is used in closed loop systems must have an energy efficiency index (EEI) not more than 0.27 calculated in accordance with European Union Commission Regulation No. 622/2012.
- (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—
- 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—
 - for constant speed systems, the values nominated in Table J6D8a; or
 - for variable speed systems, the values nominated in Table J6D8b; or
 - in any other pipework system, must achieve an average pressure drop of not more than—
 - for constant speed systems, the values nominated in Table J6D8c; or
 - for variable speed systems, the values nominated in Table J6D8d.
- (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.

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

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

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

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

J6D9 Pipework insulation

[2019: J5.8]

- (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; and
 - (c) for vessels, heat exchangers or tanks, having an insulation *R-Value* in accordance with Table J6D9b; 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 500 mm of the connection.
- (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 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 *pipings*, 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 air-conditioner 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.

Table J6D9a: Piping — Minimum insulation R-Value

Fluid temperature	Minimum insulation <i>R-Value</i> nominal pipe diameter ≤ 40 mm	Minimum insulation <i>R-Value</i> — nominal pipe diameter > 40 mm and ≤ 80 mm	Minimum insulation <i>R-Value</i> — nominal pipe diameter between > 80 mm and ≤ 150 mm	Minimum insulation <i>R-Value</i> — nominal pipe diameter > 150 mm
Low temperature chilled — ≤ 2°C	1.3	1.7	2.0	2.7
Chilled — > 2°C but ≤ 20°C	1.0	1.5	2.0	2.0
Heated — > 30°C but ≤ 85°C	1.7	1.7	1.7	1.7
High Temperature heated — > 85°C	2.7	2.7	2.7	2.7

Table Notes

The minimum *required R-Value* may be halved for *pipings* penetrating a structural member.

Table J6D9b: Vessels, heat exchangers and tanks — Minimum insulation R-Value

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

J6D11 Refrigerant chillers

[2019: J5.10]

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 energy efficiency ratio for refrigerant chillers – Option 1

Chiller type	Full load operation ($W_r/W_{\text{input power}}$)	Integrated part load ($W_r/W_{\text{input power}}$)
Air-cooled chiller with a capacity $\leq$ 528 kW _r	2.985	4.048
Air-cooled chiller with a capacity $>$ 528 kW _r	2.985	4.137
Water-cooled positive displacement chiller with a capacity $\leq$ 264 kW _r	4.694	5.867
Water-cooled positive displacement chiller with a capacity $>$ 264 kW _r but $\leq$ 528 kW _r	4.889	6.286
Water-cooled positive displacement chiller with a capacity $>$ 528 kW _r but $\leq$ 1055 kW _r	5.334	6.519
Water-cooled positive displacement chiller with a capacity $>$ 1055 kW _r but $\leq$ 2110 kW _r	5.800	6.770
Water-cooled positive displacement chiller with a capacity $>$ 2110 kW _r	6.286	7.041
Water-cooled centrifugal chiller with a capacity $\leq$ 528 kW _r	5.771	6.401
Water-cooled centrifugal chiller with a capacity $>$ 528 kW _r but $\leq$ 1055 kW _r	5.771	6.519
Water-cooled centrifugal chiller with a capacity $>$ 1055 kW _r but $\leq$ 1407 kW _r	6.286	6.770
Water-cooled centrifugal chiller with a capacity $>$ 1407 kW _r	6.286	7.041

Table J6D11b: Minimum energy efficiency ratio for refrigerant chillers – Option 2

Chiller type	Full load operation ($W_r/W_{\text{input power}}$)	Integrated part load ($W_r/W_{\text{input power}}$)
Air-cooled chiller with a capacity $\leq$ 528 kW _r	2.866	4.669
Air-cooled chiller with a capacity $>$ 528 kW _r	2.866	4.758
Water-cooled positive displacement chiller with a capacity $\leq$ 264 kW _r	4.513	7.041
Water-cooled positive displacement chiller with a capacity $>$ 264 kW _r but $\leq$ 528 kW _r	4.694	7.184
Water-cooled positive displacement chiller with a capacity $>$ 528 kW _r but $\leq$ 1055 kW _r	5.177	8.001
Water-cooled positive displacement chiller with a capacity $>$ 1055 kW _r but $\leq$ 2110 kW _r	5.633	8.586
Water-cooled positive displacement chiller with a capacity $>$ 2110 kW _r	6.018	9.264
Water-cooled centrifugal chiller with a capacity $\leq$ 528 kW _r	5.065	8.001
Water-cooled centrifugal chiller with a capacity $>$ 528 kW _r but $\leq$ 1055 kW _r	5.544	8.001
Water-cooled centrifugal chiller with a capacity $>$ 1055 kW _r but $\leq$ 1407 kW _r	5.917	9.027
Water-cooled centrifugal chiller with a capacity $>$ 1407 kW _r	6.018	9.264

J6D13 Heat rejection equipment

[2019: J5.12]

- (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](#).
- (2) The fan in an air-cooled condenser must have a motor rated power of not more than 42 W for each kW of heat rejected from the refrigerant, when determined in accordance with AHRI 460 except for—
 - (a) a refrigerant chiller in an *air-conditioning* system that complies with the energy efficiency ratios in [J6D11](#); or
 - (b) packaged air-conditioners, split systems, and variable refrigerant flow *air-conditioning* equipment that complies with the energy efficiency ratios in [J6D12](#).

Table J6D13: Maximum fan motor power – Cooling towers, closed circuit coolers and evaporative condensers

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

Table Notes

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

Appendix 7

This appendix contains the requirements for lighting and power control devices including timers, time switches, motion detectors and daylight control devices, consistent with Specification 40 in the NCC.

S40C2 Lighting timers

A lighting timer must-

- (a) Be located within 2m of every entry door to the space; and
- (b) Have an indicator light that is illuminated when the artificial lighting is off; and
- (c) not control more than 100m² with a single push button and 97% of the lights in spaces more than 25m²; and
- (d) be capable of maintaining the artificial lighting for no less than 5 minutes and no more than 12 hours.

S40C3 Time switch

- (1) A time switch must be capable of switching on and off electric power at variable pre-programmed times and on variable pre-programmed days, and configured to turn off the lights any time the space is designated to be unoccupied.
- (2) 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
- (3) 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, remote control or a security access system for a period of up to 8 hours, after which the time switch must resume control.
- (4) 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.

S40C4 Motion Detectors

- (2) In a Class 5, 6, 7, 8, 9a or 9b building, a motion detector must:
 - (a) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and
 - (b) Be capable of detecting a person before they have entered 1 m into the space; and
 - (c) Not control more than an area of 100m² and 95% of the lights in spaces more than 25m²; and
 - (d) Be configured so that the lights are turned off when the space is unoccupied for more than 15 minutes; and
 - (e) Be capable of being overridden by a manual switch only enabling the lights to be turned off.

- (3) When outside a building, a motion detector must:
 - (a) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and
 - (b) 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
 - (c) Not control more than 5 lights and
 - (d) Be operated in series with a photoelectric cell or astronomical time switch so that the lights will not operate in daylight hours, and
 - (e) Be configured so that the lights are turned off when the space is unoccupied for more than 15 minutes, and
 - (f) Have a manual override switch which is reset after a maximum period of 4 hours.
- (4) When in a fire-isolated stairway, fire-isolated passageway or fire-isolated ramp, a motion detector must:
 - (a) Be capable of sensing movement such as by infra-red, ultrasonic or microwave detection or by a combination of these means; and
 - (b) Be capable of detecting movement of 500mm within the useable part of the space and a person before they have entered 1m into the space; and
 - (c) Be configured so that the lights dim to a 30% peak power or less when the space is unoccupied for more than 15 minutes.

S40C5 Daylight sensor and dynamic lighting control device

- (1) A daylight sensor and dynamic lighting control device for artificial lighting must:
 - (a) 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 100 lux for high pressure discharge lighting and 50 lux for everything else; and
 - (b) 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.
- (2) 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.

Appendix 8 – Drawing list

Dwg No.	Title
1000 Cover Sheet	
1000	Cover Sheet
1100 General	
1100	Site Context Plan
1101	Site Survey
1102	Site Analysis Plan
1103	Site Plan
2000 Plans	
2000	GA Plans - Basement 4
2001	GA Plans - Basement 3
2002	GA Plans - Basement 2
2003	GA Plans - Basement 1
2004	GA Plans - Lower Ground Floor
2005	GA Plans - Ground Floor
2006	GA Plans - Mezzanine
2007	GA Plans - Level 1
2008	GA Plans - Level 2
2009	GA Plans - Level 3
2010	GA Plans - Level 4
2011	GA Plans - Level 5
2012	GA Plans - Level 6
2013	GA Plans - Level 7
2014	GA Plans - Level 8
2015	GA Plans - Level 9
2016	GA Plans - Level 10
2017	GA Plans - Level 11 Roof
3000 Elevations	
3000	Elevations - North
3001	Elevations - South
3002	Elevations - East
3003	Elevations - West
3004	Elevations - East Inner
3005	Elevations - West Inner
3006	Elevations - Materials Board
4000 Sections	
4000	Section A, D
4001	Section 3