ecospecifier
products:knowledge:solutions

ESD and Section J Report

Proposed Mixed Use Development
157 Redfern St, Redfern

Prepared on behalf of
DeiCorpPty Ltd

Prepared by
Ecospecifier Consulting
June 2009

Table of Contents

Introduction

This report summarises the ESD (Ecologically Sustainable Development) and Section J initiatives for the proposed mixed-use development at 157 Redfern St, Redfern. The report has been prepared by Ecospecifier Consulting on behalf of DeiCorp Pty Ltd.

Ecospecifier Consulting and DeiCorp Pty Ltd have worked closely with the architects, Nordon Jago, and other members of the consultant team to ensure a high level of sustainability outcomes. In particular, a strong emphasis has been placed on the passive efficiency of the building.

Indeed, the team has worked collaboratively to develop a design with significant natural lighting, heating, cooling and ventilation, and the success of these initiatives is discussed in the report below and also within the BASIX Summary Report (as prepared by Windtech).

ESD Analysis

A summary of the ESD initiatives proposed for the development at 157 Redfern Street is provided below.

Category	Issue	Initiative
Management	Building Users' Guides	Building Users' Guides will be supplied to educate and inspire the behavior of building users (in relation to ESD strategies and technologies). Users' Guides will cover issues related to Energy, Water, Management, Materials, Waste, Pollution, Transport, Indoor Environment Quality, etc.
	EMP (Environmental Management Plan)	An EMP will be developed to help minimise the potential environmental impacts from the construction activities. The EMP will cover issues related to Energy, Water, Management, Materials, Waste, Pollution, Soil Management, etc.
	Recycling or Reusing of Construction and Demolition (C&D Waste)	In the EMP, consideration will be given to the potential recycling and reuse of C&D Waste (especially in relation to steel, concrete, bricks and other demolition waste).
	Commissioning and Building Tuning	Office HVAC systems will be tuned after installation, to ensure a correct and efficient operational performance. Consideration will also be given to using an Independent Commissioning Agent.
Energy	Hot Water Systems	Electric hot water will be provided for the retail and commercial components. This will be designed to comply with Section J, Part J7. For the residential development, the central hot water system will be a gas-fired boiler (with all internal piping to include a minimum of R0.45 insulation).
Energy	Heating and Cooling	For heating and cooling, a common chilled water system

(continued)		will serve the Retail, RSL and Commercial areas, to allow for the efficiencies available in larger plant. Base provisions will be made for the offices and facilities will be made for connection in the retail areas. The heating will be from gas fired hot water reticulation, on a similar basis. The systems will be designed to comply with Section J, Part J5. For the apartments, energy-efficient 1-phase reverse cycle systems will be provided with minimum ratings of 3.5*.
	Energy Sub-Meters	Energy sub-meters will be provided for all major tenants (commercial, retail and RSL).
	Car Park Ventilation	Energy-efficient ventilation will be provided by carbon monoxide monitors and control mechanisms (linked to variable speed fans). The ventilation system will be designed to comply with Section J Part J5.
	Efficient Lighting	Energy-efficient LED, fluorescent and/or compact fluorescent lighting will be incorporated into the final lighting designs (to comply with Section J, Part J6). Likewise, the tenants for the RSL and retail components will be encouraged to adopt these technologies. For example fluorescent lights have been proposed for the offices, car park, plant rooms and lobbies.
	Lighting zoning and switching	Efficient zoning and switching strategies will be used to reduce the energy consumption related to excessive internal lighting (and to comply with Section J, Part J6). Likewise the tenants for the RSL and retail will be encouraged o adopt these strategies.
	External Lighting	Efficient lighting, motion sensors and daylight sensors will be considered for the final lighting designs (to comply with Section J, Part J6). Furthermore, all external lighting will be directed onto building surfaces to avoid light pollution and excessive “sky glow”.
	Energy Efficiency Sensors	Motion sensors, time clocks and/or daylight sensors will also be incorporated into the final ventilation and lighting designs. Likewise the tenants for the RSL and retail levels will be encouraged to adopt these technologies. For example, lighting in the car park and lobbies will be controlled by a combination of time clocks and motion sensors.
	Passive Ventilation	Operable windows on most levels and facades will provide some portion of passive ventilation, under the right climatic conditions, for most internal spaces.
	Passive Heating and Cooling	Passive heating and cooling has been embraced through the sensible use of: building orientation, thermal mass, insulation, horizontal shading, external shading devices, building sealing and performance glazing/framing.
Energy (continued)	Natural Lighting	Natural lighting has been considered for all levels. The shape of the building, the placement of internal zones and the positioning of windows have all been designed to allow for the provision of natural light to almost all

		internal spaces.
	Energy Efficient Appliances	Energy efficient appliances will also be installed where applicable. For example, the apartments will be provided with 4* fridges, 3* dishwashers and 2.5* clothes washers and dryers. Apartments will also be provided with internal clothes drying lines, to reduce the reliance on clothes dryers. All oven/cooktops will be electric and gas respectively. The "Energy Rating" database of appliances will also be used to source energy efficient options, at their website: http://www.energyrating.gov.au
Transport	Bike facilities	Bike facilities will be provided for all buildings users (RSL, Retail, Commercial and Residential). Furthermore, the use of these facilities will be encouraged within the Building Users' Guides.
	Public Transport	The proximity to and frequency of ample public transport will also be highlighted in the Building Users' Guides. Building users will be encouraged to take advantage of these facilities in preference to private motor vehicles.
	Minimal Car Parking	The use of public transport will also be encouraged by providing a reduced number of car parking spaces. For example, 15 apartments will not be provided with any car parking at all.
Water	Water Meters	Water meters will be provided for all major tenants (commercial, retail and RSL).
	Water Efficient Fittings	Water efficient options will be considered for all water-related fittings (including taps, showers and toilets). As a guide, 3* showers, 3* toilets, 3* urinals and 3* taps will be provided, as a minimum. The "Water Efficiency Labelling and Standards (WELS) Scheme" will be used to source products, courtesy of their website: http://www.waterrating.gov.au/index.html
	Water Efficient Appliances	Water efficient appliances will be installed where applicable. For example, where dishwashers or clothes washers are provided they will have a minimum 2* water rating. Again, the WELS Scheme will be used to source products, courtesy of their website: http://www.waterrating.gov.au/index.html
	Water Collection and Recycling	Rainwater collection and reuse will be facilitated by a 10,000 L tank in the basement (to provide recycled water for irrigation and car washing).
Waste	Waste Recycling	Waste recycling will entail the usual waste streams of paper, glass, plastic, tin/aluminium, etc. The provision of waste shutes will make the disposal of waste convenient and easy for building users. There is also a separate garbage room for retail, RSL and commercial.
	Waste reduction and recycling	All tenants will be educated and encouraged to recycle

	schemes	as part of the Building Users' Guides.
Materials	Shell and Core Fit-outs	Shell and Core Fit-outs for the RSL, commercial and retail components will reduce material wastage by ensuring that the tenants design their own ideal fitout.
	Concrete	The use of recycled aggregates and/or cement replacements will be considered for all concrete (which is suited to these strategies).
	Steel	The use of steel with a high recycled content will be considered for all applicable uses of structural and non-structural steel.
Indoor Environment	Daylight Glare Control	Daylight glare will be reduced through the widespread use of external shading. Internal blinds, if required to further reduce glare, will be provided by the tenants, as part of the shell and core fitout approach.
	High Frequency Ballasts	High frequency ballasts will be used for all internal fluorescent light fittings. This will improve energy efficiency and reduce any potential audible and visible light flickering.
	Car Park Carbon Monoxide Monitoring and Control	The air quality of the car park levels will be ensured by the use of carbon monoxide monitors and control mechanisms (linked to variable speed fans for ventilation).
	Low Volatile Organic Compounds (VOC) Paints and Finishes	Low-VOC Paints and Finishes will be considered for all internal spaces (retail, RSL, commercial and residential). This will significantly help to reduce the potential release of toxic VOC gases (and hence reduce the chance of "sick building syndrome" and other health complications).
	Mould Prevention	Humidity levels will be addressed as part of the HVAC design (both within the ductwork and within the internal spaces). This will help to reduce the potential for mould and bacteria development.

Section J Analysis

An analysis of the Section J issues has been provided below. This is based on the following classifications under BCA Part A3.2 - Classifications.

- Office – Class 5
- Retail – Class 6
- Car Park – Class 7a
- RSL – Class 9b

The section below ("Summary of Main Section J Commitments") is designed to provide a brief summary of some of the pertinent Section J issues, with which the project will comply. It is also meant to accompany the more detailed subsequent sections, including the table titled "Summary of Relevant Section J Requirements" and also Appendices A to E.

Summary of Main Section J Commitments

1. Part J1 Building Fabric

- External Floor Insulation – not required (unless in-slab heating or cooling systems are used, in which case R1 insulation is required under the slab and around the slab edges).
- External wall insulation - Total R-Value of 1.8 (i.e. added insulation of approx. R1.4 for a typical concrete, concrete block or brick veneer wall, assuming a small unvented and unreflective airspace of at least 20-40mm). Otherwise walls must satisfy one of the options as discussed in "J1.5 Walls" as listed in "Summary of Relevant Section J Requirements".
- Typical Roof insulation – total R-value of R3.2 (i.e. minimum bulk insulation of R2.64 for a typical 100mm concrete roof with plasterboard ceiling and internal airspace >30mm)
- Roof insulation below non-conditioned spaces (plant rooms, store room, etc) – total R-value of R1.6 (i.e. minimum bulk insulation of R1.04 for a typical 100mm concrete roof with plasterboard ceiling and internal airspace of at least 30mm)
- Roof Insulation Adjustments - The "Total R-values" above can be reduced with a roof upper surface solar absorptance value of not more than 0.55, by R0.25; OR with a roof upper surface solar absorptance value of not more than 0.35, by R0.5.
- Thermal construction and installation – must comply with "J1.2 Thermal construction general", as detailed in "Summary of Relevant Section J Requirements".

2. Part J2 Glazing

- Section J2.4 Glazing - Method 2 applies to Levels 1-4
- Please see Appendix A for the Glazing Calculator Results for Levels 1-4.
- A range of possible glazing specs (combined glass + frame) are shown below:
-

	U-value	SHGC	U-value	SHGC	U-value	SHGC
Retail	4.8	0.76	**5.1**	**0.74**	5.4	0.68
RSL	7.7	0.39	**7.1**	**0.38**	6.5	0.37
Level 3	6.0	0.42	**6.0**	**0.40**	6.2	0.40
Level 4	4.9	0.54	**5.1**	**0.54**	5.1	0.53

- Shading devices which are compliant with BCA requirements include all those protecting the west facades and north facades on Levels 2, 3 and 4 (with the exception of the four tall vertical blades on the north façade of the offices, near to the north east corner of the building). These compliant devices will have final designs which exclude 80% of summer sun (and if adjustable, operate automatically in response to the level of solar radiation).

3. Part J3 Building Sealing

- Note: "Conditioned space"= space within a building where the environment is likely, by the intended use of the space, to be controlled by air-conditioning, but does not include a space in a Class 6, 7, 8 or 9b building where the input power to an air-conditioning system is not more than 15 W/m2.

- A seal to restrict air infiltration must be fitted to each edge of a door, openable window or the like forming part of the envelope of a conditioned space, except for:
  (i) a window complying with AS 2047; or
  (ii) a louvre door, louvre window, or other such opening; or
  (iii) a fire door or smoke door; or
  (iv) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.

- A main entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, revolving door or the like, other than—

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

- A miscellaneous exhaust fan, such as a bathroom or domestic kitchen exhaust fan, must be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space.
- Roofs, ceilings, walls, floors and any opening such as a window, door or the like must be constructed to minimise air leakage when forming part of the envelope. Construction must be enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or sealed by caulking, skirting, architraves, cornices or the like. These requirements do not apply to openings, grilles and the like required for smoke hazard management.
- An evaporative cooler must be fitted with a self-closing damper or the like when serving a heated space.

4. Part J4 Air Movement

- N/A – only for a Class 2 building or a Class 4 part of a building.

5. Part J5 Air-conditioning and Ventilation Systems

- Part J5 (as described in Appendix B) lists the efficiency measures required for: Air-conditioning and ventilation systems; Time switches (for HVAC systems); Heating and chilling systems; and miscellaneous exhaust systems.
- The mechanical engineers for the project must ensure that all future HVAC designs comply with these requirements (for Levels 1-4 and for the Car Park levels).

6. Part J6 Artificial Lighting and Power

- The required lighting levels are detailed under Appendix D (for a Class 5, 6, 7, 8, 9a or 9b building).
- The lighting engineers for the project must ensure that all future lighting designs comply with these requirements (for Levels 1-4 and for the Car Park levels) in relation to all parts of Section J, Part J6 including:
    - "J6.2 Interior artificial lighting",
    - "J6.3 Interior artificial lighting and power control",
    - "J6.4 Interior decorative and display lighting",
    - "J6.5 Artificial lighting around the perimeter of a building").

- Power supply to a boiling water or chilled water storage unit must be controlled by a time switch in accordance with Specification J6 (SEE APPENDIX C).

7. Part J7 Hot water Supply

- A hot water supply system for food preparation and sanitary purposes must be designed and installed in accordance with Section 8 of AS/NZS 3500.4.

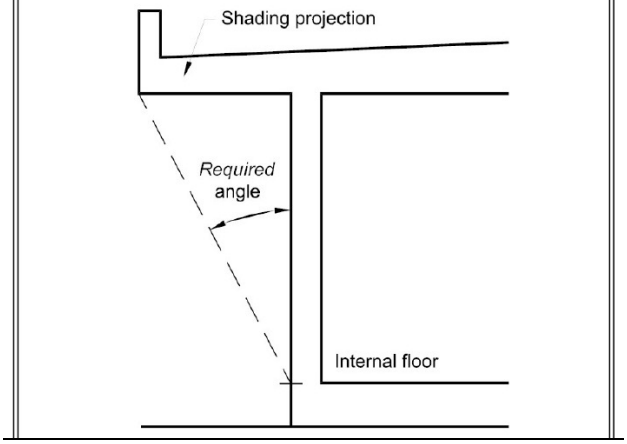
8. Part J8 Access for Maintenance

- Access for maintenance is required to all services (and components) and all adjustable or motorised shading devices, as listed in the Summary Table under "J8.2 Access for maintenance".

Summary of Relevant Section J Requirements

BCA Reference	Relevant BCA Conditions for Compliance
JP1	A building, including its *services*, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to— (a) the function and use of the building and *services*; and (b) the internal environment; and (c) the geographic location of the building; and (d) the effects of nearby permanent features such as topography, structures and buildings; and (e) solar radiation being— (i) utilised for heating; and (ii) controlled to minimise energy for cooling; and (f) the sealing of the building *envelope* against air leakage; and (g) the utilisation of air movement to assist heating and cooling; and (h) the energy source of the *services*.
JP2	A building, including its *services*, must have, to the degree necessary, features that facilitate the maintenance of systems and components appropriate to the function and use of the building.
J1.2 Thermal construction general	(a) Where *required*, insulation must comply with AS/NZS 4859.1 and be installed so that it— (i) abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must butt against the member; and (ii) forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and (iii) does not affect the safe or effective operation of a *service* or fitting. (b) Where *required*, *reflective insulation* must be installed with— (i) the necessary airspace to achieve the *required* *R-Value* between a reflective side of the *reflective insulation* and a building lining or cladding; and (ii) the *reflective insulation* closely fitted against any penetration, door or *window* opening; and (iii) the *reflective insulation* adequately supported by framing members; and (iv) each adjoining sheet of roll membrane being— (A) overlapped not less than 50 mm; or (B) taped together. (c) Where *required*, bulk insulation must be installed so that—

	(i) it maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like; and (ii) in a ceiling, where there is no bulk insulation or *reflective insulation* in the wall beneath, it overlaps the wall by not less than 50 mm. (d) Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in Specification J1.2.
J1.3 Roof and ceiling construction	Minimum *Total R-Value* for a roof or ceiling generally — R3.2 downwards Minimum *Total R-Value* for a ceiling below a non- *conditioned space* (such as a plant room, lift machinery room, store room or the like) — R1.6 downwards Note: In accordance with (b) (iii) The Total R-value can be reduced with— (A) a roof upper surface solar absorptance value of not more than 0.55, by R0.25; OR (B) a roof upper surface solar absorptance value of not more than 0.35, by R0.5.
J1.4 Roof lights	N/A – no roof lights
J1.5 Walls	Each part of an external wall that is part of the envelope must satisfy one of the following (except glazing AND opaque non-glazed openings in external walls such as doors (including garage doors), vents, penetrations, shutters and the like): (a) Achieve a minimum *Total R-Value* of 1.8. (b) (i) Achieve a surface density of not less than 220 kg/m^2 with masonry that has a thermal conductivity of less than 0.8 (SEE APPENDIX E); and (ii) shade the *external wall* of the *storey* with a verandah, balcony, eaves, overhang, covered *carpark*, carport or the like which projects at a minimum angle of 30 degrees in accordance with Figure J1.5 (SEE BELOW). (c) (i) Achieve a surface density of not less than 220 kg/m^2 (SEE APPENDIX E); and (ii) incorporate a cavity of 20 mm to 35 mm; and (iii) shade the *external wall* of the *storey* with a verandah, balcony, eaves, overhang, covered *carpark*, carport or the like which projects at a minimum angle of 15 degrees in accordance with Figure J1.5 (SEE BELOW); and (iv) incorporate insulation with an *R-Value* of not less than 0.5. (d) (i) Achieve a surface density of not less than 220 kg/m^2 with masonry that has a thermal conductivity of less than 0.8 (SEE APPENDIX E); and (ii) incorporate a cavity of 20 mm to 35 mm; and (iii) incorporate insulation with an *R-Value* of not less than 0.5.

	Figure J1.5 MEASUREMENT OF PROJECTION FOR WALL SHADING  **Note**: If applicable, please see "Appendix E – Table 2a Thermal Conductivity of Typical Wall, Roof/Ceiling and Floor Materials" **Note:** A wall that is required to achieve a minimum Total R-Value; and (ii) has lightweight external cladding such as weatherboards, fibre cement or metal sheeting fixed to a metal frame; and (iii) does not have a wall lining or has a wall lining that is fixed directly to the metal frame, must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed between the external cladding and the metal frame.
J1.6 Floors	(a) A suspended floor that is part of a building's envelope— (i) with an unenclosed perimeter, must achieve a Total R-Value of NIL; and (ii) with an in-slab heating or cooling system, must be insulated around the vertical edge of its perimeter and underneath the slab with insulation having an R-Value of not less than 1.0.
J2.2 Applicable glazing provisions	J2.4 Glazing - Method 2 is required for— (i) a Class 6 building with a total floor area of more than 500 m2; and (ii) a Class 5, 7, 8, 9a and 9b building. Applies to Levels 1-4 due to building classifications. Please see Appendix A for Glazing Calculators.
J2.3 Glazing - Method 1	N/A due to building classifications.
J2.4 Glazing - Method 2	Applies to Levels 1-4 due to building classifications. Please see Appendix A for Glazing Calculators.

J2.5 Shading	Where shading is to be provided by a "compliant" external shading device, such as a shutter, blind, vertical or horizontal building screen with blades, battens or slats, it— (i) is capable of restricting at least 80% of summer solar radiation; and (ii) if adjustable- (B) in a Class 3, 5, 6, 7, 8 or 9 building, is operated automatically in response to the level of solar radiation.
J3.2 Chimneys and flues	N/A – no open solid-fuel burning appliances
J3.3 Roof lights	N/A – no roof lights
J3.4 Windows and doors	A seal to restrict air infiltration must be fitted to each edge of a door, openable *window* (a) or the like forming part of— (i) the *envelope* of a *conditioned space*; (b) The requirements of (a) do not apply to— (i) a *window* complying with AS 2047; or (ii) a louvre door, louvre *window*, or other such opening; or (iii) a fire door or smoke door; or (iv) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security. (c) A seal *required* by (a) may be a foam or rubber compressible strip, fibrous seal or the like. (d) A main entrance to a building, if leading to a *conditioned space* must have an airlock, *self-closing* door, revolving door or the like, other than— (i) where the *conditioned space* has a *floor area* of not more than 50 m^2; or (ii) where a cafe, restaurant, open front shop or the like has— (A) a 3 m deep un-conditioned zone between the main entrance, including an open front, and the *conditioned space*; and (B) at all other entrances to the cafe, restaurant, open front shop or the like, *self-closing* doors
J3.5 Exhaust fans	A miscellaneous exhaust fan, such as a bathroom or domestic kitchen exhaust fan, must be fitted with a sealing device such as a self-closing damper or the like when serving a *conditioned space*; Note: "Conditioned space"= space within a building where the environment is likely, by the intended use of the space, to be controlled by air-conditioning, but does not include a space in a Class 6, 7, 8 or

	9b building where the input power to an air-conditioning system is not more than 15 W/m2.
J3.6 Construction of roofs, walls and floors	(a) Roofs, ceilings, walls, floors and any opening such as a *window*, door or the like must be constructed to minimise air leakage in accordance with (b) when forming part of— (i) the *envelope*; (b) Construction *required* by (a) must be— (i) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or (ii) sealed by caulking, skirting, architraves, cornices or the like. (c) The requirements of (a) do not apply to openings, grilles and the like *required* for smoke hazard management.
J3.7 Evaporative coolers	An evaporative cooler must be fitted with a self-closing damper or the like when serving a heated space.
J4 Air Movement	N/A – only for a Class 2 building or a Class 4 part of a building.
J5 Air-conditioning and Ventilation Systems	Part J5 (as described in Appendix B) lists the efficiency measures required for: • Air-conditioning and ventilation systems • Time switches (for HVAC systems) • Heating and chilling systems • Miscellaneous exhaust systems The Mechanical engineers for the project must ensure that all future HVAC designs comply with these requirements.
J6.2 Interior artificial lighting	The required lighting levels are detailed under Appendix D (for a Class 5, 6, 7, 8, 9a or 9b building). The lighting engineers for the project must ensure that all future lighting designs comply with these requirements (and the other sections of Part J6 as discussed below).
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) N/A (c) An artificial lighting switch or other control device in (a) must— (i) if an artificial lighting switch, be located in a visible position— (A) in the room or space being switched; or (B) in an adjacent room or space from where the lighting being switched is visible; and (ii) if in a building other than a Class 2 or 3 building or a Class 4 part, not operate lighting within an area of more than— (A) 250 m^2 for a space of not more than 2000 m^2 *floor area*; or (B 1000 m^2 for a space of more than 2000 m^2 *floor area*.

	) (d) 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 250 m^2 in *floor area* must be controlled by— (i) a time switch in accordance with Specification J6 (SEE APPENDIX C); or (ii) an occupant sensing device such as— (A) a security key card reader; or (B) a motion detector in accordance with Specification J6 (SEE APPENDIX C). (e) Artificial lighting adjacent to windows in a *storey* of a Class 5, 6 or 8 building, of more than 250 m^2 in *floor area* must be switched separately from artificial lighting not adjacent to windows. (f) The requirements of (a), (b), (c), (d) and (e) do not apply to the following: (i) Emergency lighting in accordance with Part E4 (ii) Where artificial lighting is needed for 24-hour occupancy such as for a manufacturing process, an airport control tower or within a *detention centre*. (g) N/A
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 (SEE APPENDIX C) where the display lighting exceeds 7 kW. (b) Window display lighting must be controlled separately from other display lighting.
J6.5 Artificial lighting around the perimeter of a building	(a) Artificial lighting around the perimeter of a building, must— (i) be controlled by— (A) a daylight sensor; or (B) a time switch that is capable of switching on and off electric power to the system at variable pre-programmed times and on variable pre-programmed days; and (ii) when the total perimeter lighting load exceeds 100 W— (A) have an average *light source efficacy* of not less than 60 Lumens/W; or (B) be controlled by a motion detector in accordance with Specification J6 (SEE APPENDIX C); and

	(iii) when used for decorative purposes, such as facade lighting or signage lighting, have a separate time switch in accordance with Specification J6 (SEE APPENDIX C). (b) The requirements of (a)(ii) do not apply to the following: (i) Emergency lighting in accordance with Part E4.
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 (SEE APPENDIX C).
J7.2 Hot water supply	A hot water supply system for food preparation and sanitary purposes must be designed and installed in accordance with Section 8 of AS/NZS 3500.4.
J8.2 Access for maintenance	Access for maintenance must be provided to— (a) all services and their components, including— (i) time switches and motion detectors; and (ii) room temperature thermostats; and (iii) plant thermostats such as on boilers or refrigeration units; and (iv) outside air dampers; and (v) reflectors, lenses and diffusers of light fittings; and (vi) heat transfer equipment; and (b) adjustable or motorised shading devices.

Appendix A – Glazing Calculators as Required by Part J2 Glazing

Report from 090529 Redfern Glazing Calculator - RETAIL *printed 6/29/2009*

GLAZING CALCULATOR FOR USE WITH CLAUSE J2.4, BCA VOLUME ONE (METHOD 2)

Building name/description: Mixed Use Development - 157 Redfern St Redfern

Climate zone: 5

Storey: 1 (ground)

Facade areas	N	NE	E	SE	S	SW	W	NW
Option A	97.5m²	63m²			37.3m²	40.3m²	174m²	
Option B								
Glazing area (A)	*84m²*	*42.6m²*			*6.9m²*	*33m²*	*113m²*	

Number of rows preferred in table below: 10 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES - OK (if inputs are valid)				
Glazing element		Sector faced		Size			Performance			P&H or device		Shading	Multipliers			Size
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	*Total U-Value* (NFRC)	*SHGC* (NFRC)		P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North	N		3.00	24.00		4.8	0.76		device		2.00	0.00		0.19	72.00	42% of 80%
2	North (ends)	N		3.00	4.00		4.8	0.76					0.00	1.00	1.00	12.00	58% of 80%
3	South	S		3.00	2.30		4.8	0.76		3.000	3.500	0.86	0.50	0.83	0.75	6.90	100% of 20%
4	West	W		3.00	25.00		4.8	0.76		3.000	3.000	1.00	0.00	0.35	0.44	75.00	67% of 100%
5	West (ends)	W		3.00	2.20		4.8	0.76					0.00	1.00	1.00	6.60	11% of 100%
6	West Entry Passage	W		3.00	10.30		4.8	0.76		device		2.00	0.00		0.26	30.90	22% of 100%
7	South West 1	SW		3.00	11.00		4.8	0.76		device		2.00	0.00	0.39	0.34	33.00	100% of 92%
8	North East	NE		3.00	11.30		4.8	0.76		device		2.00	0.00		0.20	33.90	41% of 97%
9	North East	NE		3.00	2.90		4.8	0.76					0.00	1.00	1.00	8.70	59% of 97%

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

Report from 090529 Redfern Glazing Calculator - RSL *printed 6/29/2009*

GLAZING CALCULATOR FOR USE WITH CLAUSE J2.4, BCA VOLUME ONE (METHOD 2)

Building name/description: Mixed Use Development - 157 Redfern St Redfern

Climate zone: 5

Storey: 2 (RSL)

Facade areas	N	NE	E	SE	S	SW	W	NW
Option A	165m²	30.2m²			193m²		168m²	
Option B								
Glazing area (A)	*148m²*	*14.8m²*			*7.56m²*		*119m²*	

Number of rows preferred in table below: 10 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES - OK (if inputs are valid)				
Glazing element		Sector faced		Size			Performance			P&H or device		Shading	Multipliers			Size
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	*Total U-Value* (NFRC)	*SHGC* (NFRC)		P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North	N		3.60	28.90		7.7	0.39		0.700	3.600	0.19	0.00	0.96	0.82	104.04	71% of 100%
2	North (no shade)	N		3.60	1.40		7.7	0.39					0.00	1.00	1.00	5.04	5% of 100%
3	North Balcony	N		3.60	7.80		7.7	0.39		0.200	3.600	0.06	0.00	0.99	0.95	28.08	24% of 100%
4	North lobby	N		3.60	3.10		7.7	0.39		device		2.00	0.00		0.19	11.16	
5	West lobby	W		3.60	6.20		7.7	0.39		device		2.00	0.00		0.26	22.32	19% of 75%
6	West Gibbons St	W		3.60	26.90		7.7	0.39		device		2.00	0.00		0.26	96.84	81% of 75%
7	North East Balcony	NE		3.60	4.10		7.7	0.39					0.00	1.00	1.00	14.76	100% of 94%
8	South lobby	S		3.60	2.10		7.7	0.39		device		2.00	0.00	0.64	0.54	7.56	100% of 8%
10																	

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

Report from 090529 Redfern Glazing Calculator - OFFICE 1 *printed 6/29/2009*

GLAZING CALCULATOR FOR USE WITH CLAUSE J2.4, BCA VOLUME ONE (METHOD 2)

Building name/description: Mixed Use Development - 157 Redfern St Redfern

Climate zone: 5

Storey: 3 (Office 1)

Facade areas	N	NE	E	SE	S	SW	W	NW
Option A	105m²		104m²		121m²		107m²	
Option B								
Glazing area (A)	*83.5m²*		*63.8m²*		*74.9m²*		*82.7m²*	

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

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES - OK (if inputs are valid)					
Glazing element		Sector faced		Size			Performance			P&H or device		Shading		Multipliers		Size	
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	*Total U-Value* (NFRC)	*SHGC* (NFRC)		P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North Shaded	N		2.90	16.30		6.0	0.42		device		2.00	0.00		0.19	47.27	
2	North Not shaded	N		2.90	10.20		6.0	0.42					0.00	1.00	1.00	29.58	82% of 63%
3	North Small	N		2.90	2.30		6.0	0.42					0.00	1.00	1.00	6.67	18% of 63%
4	West at NW corner)	W		2.90	7.90		6.0	0.42		device		2.00	0.00		0.26	22.91	28% of 74%
5	West Gibbons St	W		2.90	18.00		6.0	0.42		device		2.00	0.00		0.26	52.20	63% of 74%
6	West Lobby	W		2.90	2.60		6.0	0.42		device		2.00	0.00		0.26	7.54	9% of 74%
7	East Lobby	E		2.90	2.60		6.0	0.42		device		2.00	0.00		0.25	7.54	4% of 98%
8	East	E		2.90	19.40		6.0	0.42		0.800	3.200	0.25	0.30	0.97	0.94	56.26	96% of 98%
9	South Lobby	S		2.90	9.50		6.0	0.42					0.00	1.00	1.00	27.55	37% of 96%
10	South (at SW corner)	S		2.30	7.40		6.0	0.42					0.00	1.00	1.00	17.02	23% of 96%
11	South (at SE corner)	S		2.30	13.20		6.0	0.42					0.00	1.00	1.00	30.36	41% of 96%
12																	

if inputs are valid

Report from 090529 Redfern Glazing Calculator - OFFICE 2 *printed 6/29/2009*

GLAZING CALCULATOR FOR USE WITH CLAUSE J2.4, BCA VOLUME ONE (METHOD 2)

Building name/description: Mixed Use Development - 157 Redfern St Redfern

Climate zone: 5

Storey: 4 (Office 2)

Facade areas	N	NE	E	SE	S	SW	W	NW
Option A	109m²		105m²		125m²		109m²	
Option B								
Glazing area (A)	*76.9m²*		*61.8m²*		*98.5m²*		*88.2m²*	

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

GLAZING ELEMENTS, ORIENTATION, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES - OK (if inputs are valid)					
Glazing element		Sector faced		Size			Performance			P&H or device		Shading		Multipliers		Size	
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	*Total U-Value* (NFRC)	*SHGC* (NFRC)		P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North Shaded	N		2.90	18.50		4.9	0.54		device		2.00	0.00		0.19	53.65	15% of 65%
2	North Not shaded	N		2.90	8.00		4.9	0.54					0.00	1.00	1.00	23.20	85% of 65%
3	West at NW corner)	W		2.90	7.90		4.9	0.54		device		2.00	0.00		0.26	22.91	26% of 81%
4	West Gibbons St	W		2.90	19.90		4.9	0.54		device		2.00	0.00		0.26	57.71	65% of 81%
5	West Lobby	W		2.90	2.60		4.9	0.54		22.000	2.900	7.59	0.00		0.26	7.54	9% of 81%
6	East Lobby	E		2.90	1.90		4.9	0.54		22.000	2.900	7.59	0.00		0.25	5.51	4% of 99%
7	East	E		2.90	19.40		4.9	0.54		1.000	2.800	0.36	-0.10	0.82	0.75	56.26	96% of 99%
8	South Lobby	S		2.90	9.50		4.9	0.54		3.300	3.500	0.94	0.60	0.90	0.83	27.55	27% of 95%
9	South (at SW corner)	S		2.90	6.30		4.9	0.54		1.000	3.500	0.29	0.60	0.98	0.97	18.27	19% of 95%
10	South (near lobby)	S		2.40	6.00		4.9	0.54					0.00	1.00	1.00	14.40	15% of 95%
11	South (at SE corner)	S		2.90	13.20		4.9	0.54					0.00	1.00	1.00	38.28	39% of 95%

if inputs are valid

Appendix B – Summary of Part J5 - Air-conditioning and Ventilation Systems

J5.1 BLANK

J5.2 Air-conditioning and ventilation systems

(a) An *air-conditioning* unit or system must—

(i) be capable of—

(A) being inactivated when the *sole-occupancy unit*, building or part of the building served is not occupied; and

(B) where the *air-conditioning* unit or system has motorised outside air and return dampers, close the dampers when the *air-conditioning* unit or system is inactivated.

(ii) have any supply and return ductwork insulated and sealed in accordance with Specification J5.2; and

(iii) when serving more than one *sole-occupancy unit*, *air-conditioning* zone or area with different heating and cooling needs—

(A) thermostatically control the temperature of each *sole-occupancy unit*, zone or area; and

(B) not control the temperature by mixing actively heated air and actively cooled air; and

(C) limit reheating to not more than a 7.5 K rise in temperature at the supply air rate for the space served and may be increased or decreased at the same rate that the supply air rate is respectively decreased or increased; and

(iv) in other than a Class 6 restaurant, bar or cafe or Class 9b building, have an *outdoor air economy cycle*—

(A) in *climate zone* 3, when the *air-conditioning* unit capacity is over 65 kWr; and

(B) in *climate zones* 4, 5, 6, 7 and 8 when the *air-conditioning* unit capacity is over 50 kWr; and

(v) in a Class 3 building, be capable of controlling the temperature of a *sole-occupancy unit* at a different temperature during sleeping periods than during other periods; and

(vi) when the air flow rate is greater than 1000 L/s, be designed so that the total *motor shaft power* of the fans in the system is in accordance with Table J5.2a; and

Table J5.2a FAN MAXIMUM TOTAL MOTOR SHAFT POWER

Internal load for equipment and people (W/m² of the *floor area* of the *conditioned space*)	**Fan maximum total *motor shaft power***	
	For a building of not more than 500 m² *floor area* (W/m² of the *conditioned space*)	**For a building of more than 500 m² *floor area* (W/m² of the *conditioned space*)**
Up to 100	9	12
101 to 150	12	15
151 to 200	14	18
201 to 300	19	25
301 to 400	23	31
Notes	For more than 400 W/m² internal load—	
	(a)	in a building of not more than 500 m² *floor area*, use 0.07 W of *motor shaft power* for each Watt of internal load; and
	(b)	in a building of more than 500 m² *floor area*, use 0.09 W of *motor shaft power* for each Watt of internal load.

(vii) the requirements of (vi) do not apply to—

(A) the input power for an energy reclaiming system that preconditions outdoor air; and

(B) the input power for process related components such as high efficiency particulate air filters.

(b) A mechanical ventilation system must—

(i) in other than a *sole-occupancy unit* in a Class 2 building or a Class 4 part of a building, be capable of being inactivated when the building or part of the building served by that system is not occupied; and

(ii) when serving a *conditioned space*, not provide mechanical ventilation in excess of the minimum quantity *required* by Part F4 by more than 50% other than where there is—

(A) additional unconditioned outside air supplied—

(aa) to provide free cooling; or

(bb) to balance *required* exhaust ventilation such as toilet exhaust; or

(cc) to balance process exhaust such as from a *health-care building* or laboratory; or

(B) additional exhaust ventilation needed to balance the *required* mechanical ventilation; or

(C) an energy reclaiming system that preconditions outside air; and

(iii) when the air flow rate is more than 1000 L/s,

(A) have a fan *motor shaft power* to air flow rate ratio, or fan *motor input power* to air flow rate ratio, in accordance with Table J5.2b; and

(B) in other than *climate zone* 2, when serving a *conditioned space* in a Class 9b building where the number of square metres per person is 1 or less as specified in D1.13, 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.

Table J5.2b MAXIMUM FAN MOTOR POWER TO AIR FLOW RATE RATIO

System static pressure (Pa)	**Maximum fan *motor shaft power* to air flow rate ratio W/(L/s)**	**Maximum fan *motor input power* to air flow rate ratio W/(L/s)**
Up to 200	0.55	0.73

300	0.75	1.0
400	0.95	1.27
500	1.15	1.5
600	1.4	1.9
700	1.6	2.1
800	1.8	2.4
900	2.0	2.7
1000	2.2	2.9
>1000	2.5	3.3
Notes:		
1.	The maximum fan motor power to air flow rate ratio may be increased to that for the next higher system resistance where a fixed pitch and fixed speed fan is used.	
2.	The system static pressure includes all the resistance against which the fan must operate including integrated fan cowls, flaps and grilles.	

(iv) when serving over 40 vehicles in a *carpark*—

(A) be controlled by an atmospheric contaminant monitoring system in accordance with AS 1668.2; and

(B) maintain an average minimum air-change rate of 0.5 air changes per hour other than when the *carpark* is not occupied for a period of more than 2 hours.

(c) The requirements of (a) and (b) must not inhibit—

(i) the smoke hazard management operation of *air-conditioning* and mechanical ventilation systems; and

(ii) essential ventilation such as for a garbage room, lift motor room, gas meter enclosure or gas regulator enclosure or the like.

J5.3 Time switch

(a) A time switch in accordance with Specification J6 must be provided to control each of the following:

(i) An *air-conditioning* system of more than 10 kWr.

(ii) A ventilation system with an air flow rate of more than 1000 L/s.

(iii) A heating system of more than 10 $kW_{heating}$.

(b) The requirements of (a) do not apply to—

(i) an *air-conditioning* system or ventilation system that serves only one *sole-occupancy unit* of—

(A) a Class 2 or 3 building; or

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

(C) a Class 9c *aged care building*; or

(ii) a building where *air-conditioning* or ventilation is needed for 24 hour occupancy such as a manufacturing process or emergency services.

J5.4 Heating and chilling systems

(a) Systems that provide heating or chilling for *air-conditioning* systems must—

(i) have any *piping*, vessels, heat exchangers or tanks containing heated or chilled fluid, other than those with insulation levels covered by Minimum Energy Performance Standards (MEPS),

insulated in accordance with Specification J5.4; and

(ii) where water is circulated by pumping at greater than 2 L/s—

(A) be designed so that the total of the *motor shaft power* to the *air-conditioning* pump is in accordance with Table J5.4a; and

Table J5.4a PUMP MAXIMUM MOTOR SHAFT POWER

Internal load for equipment and people (W/m^2 of the *floor area* of the *conditioned space*)	Pump maximum *motor shaft power*	
	For a building of not more than 500 m^2 *floor area* (W/m^2) of the *floor area* of the *conditioned space*)	For a building of more than 500 m^2 *floor area* (W/m^2) of the *floor area* of the *conditioned space*)
Up to 100	**2**	**3**
101 to 150	**3**	**4**
151 to 200	**3**	**6**
201 to 300	**5**	**8**
301 to 400	**7**	**11**
More than 400	**8**	**14**

(B) have the pump capable of varying its speed when it is—

(aa) operating for more than 3,500 hours per year; or

(bb) more than 11 kW of *motor shaft power*,

except where the pump is needed to run at full speed for safe or efficient operation; and

(iii) if the system contains more than one water heater used for heating a building, chiller or coil, be capable of stopping the flow of water to those not operating.

(b) A water heater, such as a boiler, that is part of an *air-conditioning* system, must achieve a thermal efficiency complying with Table J5.4b when tested in accordance with BS 7190.

Table J5.4b MINIMUM THERMAL EFFICIENCY OF A WATER HEATER

Fuel type	Rated capacity ($kW_{heating}$)	Minimum gross thermal efficiency (%)
Gas	Less than 90	75
	90 to 750	80
	More than 750	83
Oil	Less than 90	76
	90 to 750	78
	More than 750	80

(c) Package *air-conditioning* equipment with a capacity of not less than 65 kWr, including a split unit and a heat pump, must have an energy efficiency ratio complying with Table J5.4c when tested in accordance with AS/NZS 3823.1.2 at test condition T1.

Table J5.4c MINIMUM ENERGY EFFICIENCY RATIO FOR PACKAGED AIR-CONDITIONING EQUIPMENT

Equipment	Minimum energy efficiency ratio ($W_r/W_{input\ power}$)	
	65 kWr to 95 kWr capacity	More than 95 kWr capacity
Air-conditioner — cooling	2.7	2.8
Heat pump — cooling	2.6	2.7

(d) A refrigerant chiller over 125 kWr capacity that is part of an *air-conditioning* system, must have an energy efficiency ratio complying with Table J5.4d when determined in accordance with ARI 550/590.

Table J5.4d MINIMUM ENERGY EFFICIENCY RATIO FOR REFRIGERANT CHILLERS

Equipment	Minimum energy efficiency ratio ($W_r/W_{input\ power}$)	
	For full load operation	For integrated part load
Water cooled chiller		
More than 125 kWr but not more than 525 kWr	4.2	5.2
More than 525 kWr but not more than 1000 kWr	4.5	5.6
More than 1000 kWr	5.5	6.1
Air cooled or evaporatively cooled chiller		
More than 125 kWr but not more than 525 kWr	2.2	3.0
More than 525 kWr	2.5	3.1

(e) The fan motor of an air cooled condenser that is part of an *air-conditioning* system, other than one that is part of package *air-conditioning* equipment in (c), must not use more than—

(i) 42 W of *motor shaft power*; or

(ii) 53 W of *motor input power*,

for each kW of heat rejected from the refrigerant when determined in accordance with ARI 460.

(f) The fan of a cooling tower that is part of an *air-conditioning* system must not use more than—

(i) if a propeller or axial fan—

(A) 310 W of *motor shaft power* for each L/s of cooling water circulated; or

(B) 390 W of *motor input power* for each L/s of cooling water circulated; and

(ii) if a centrifugal fan, 590 W of *motor shaft power* for each L/s of cooling water circulated.

(g) The fan of a closed circuit cooler that is part of an *air-conditioning* system must not use more than—

(i) if a propeller or axial fan—

(A) 500 W of *motor shaft power* for each L/s of cooled fluid circulated; or

(B) 625 W of *motor input power* for each L/s of cooled fluid circulated; and

(ii) if a centrifugal fan—

(A) 670 W of *motor shaft power* for each L/s of cooled fluid circulated; or

(B) 840 W *motor input power* for each L/s of cooled fluid circulated.

(h) The fan of a evaporative condenser that is part of an *air-conditioning* system must not use more than—

(i) if a propeller or axial fan—

(A) 18 W of *motor shaft power* for each kW of heat rejected; or

(B) 22 W of *motor input power* for each kW of heat rejected; and

(ii) if a centrifugal fan—

(A) 22 W of *motor shaft power* for each kW of heat rejected; or

(B) 27 W of *motor input power* for each kW of heat rejected.

(i) The spray water pump of a closed circuit cooler or evaporative condenser that is part of an *air-conditioning* system must not use more than 150 W of pump *motor shaft power* for each L/s of spray water circulated.

J5.5 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 such as a stove in a commercial kitchen or a chemical bath in a factory, must—

(i) have the means for the operator to—

(A) reduce the energy used, such as by a variable speed fan, and

(B) stop the motor when the system is not needed; and

(ii) be designed to minimise the exhausting of conditioned air.

(b) The requirements of (a) do not apply—

(i) within a *sole-occupancy unit* of a Class 2 or 3 building, Class 4 part of a building or Class 9c *aged care building*; or

(ii) where additional exhaust ventilation is needed to balance the *required* outside air for ventilation; or

(iii) where air flow must be maintained for safe operation.

Appendix C – Specification J6 – Lighting and Power Control Devices

1. Scope

This Specification contains the requirements for lighting and power control devices including timers, time switches, motion detectors and daylight control devices.

2. Lighting timers

A lighting timer must—

(a) be located within 2 m 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—

(i) an area of 100 m^2 with a single push button timer; and

(ii) 95% of the lights in spaces of area more than 25 m^2; and

(d) be capable of maintaining the artificial lighting—

(i) for not less than 5Â minutes and not more than 15 minutes unless it is reset; and

(ii) without interruption if the timer is reset.

3. Time switch

A time switch must be capable of—

(a) switching on and off electric power to systems—

(i) at variable pre-programmed times and on variable pre-programmed days; and

(ii) limiting the period the system is switched on to 2Â hours beyond the time for which the building is occupied; and

(b) being overridden by—

(i) a manual switch or an occupant sensing device that senses a person's presence for a period of up to 2 hours, after which the time switch must resume control; or

(ii) an occupant sensing device such as a security card reader that overrides the time switch upon a person's entry and returns control to the time switch upon the person's exit.

4. Motion detectors

(a) In a Class 2, 3 or 9c *aged care 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 are 1Â m into the space; and

(iii) other than within a *sole-occupancy unit* of a Class 3 building, not control more than—

(A) an area of 100 m^2; and

(B) 95% of the lights in spaces of area more than 25 m^2; and

(iv) be capable of maintaining the artificial lighting when activated—

(A) for not less than 5 minutes and not more than 15 minutes unless it is reset; and

(B) without interruption if the motion detector is reset by movement.

(b) In a Class 5, 6, 7, 8, 9a or 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) a person before they have entered 1 m into the space; and

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

(iii) not control more than—

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

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

(iv) be capable of maintaining the artificial lighting when activated—

(A) for a minimum of 5 minutes and a maximum of 30 minutes unless it is reset; and

(B) without interruption if the motion detector is reset by movement; and

(v) have a manual override switch which—

(A) enables the lighting to that area, or a greater area, to be turned off; and

(B) is not capable of switching the lights permanently 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 from the light equal to—

(A) twice the mounting height; or

(B) 80% of the ground area covered by the light's beam; and

(iii) not control more than five lights; and

(iv) be operated in series with a photoelectric cell or astronomical time switch so that the light will not operate in daylight hours; and

(v) be capable of maintaining the artificial lighting when the switch is on for a minimum of 1 minute and 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.

5. Daylight sensor and dynamic lighting control device

A daylight sensor and dynamic control device for artificial lighting must—

(a) for switching on and off—

(i) be capable of having the switching level set point adjusted between 50 and 1000 Lux; and

(ii) have—

(A) a delay of more than 2 minutes; or

(B) a differential of more than 50 Lux, and

(b) for dimmed 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—

(i) continuously down to a power consumption that is less than 50% of full power; or

(ii) in no less than 4 steps down to a power consumption that is less than 50% of full power; and

(c) have a manual override switch which enables the lighting in an area to be turned off but is not able to switch the lights permanently on or bypass the lighting controls.

Appendix D – Summary of J6.2 - Interior Artificial Lighting

(b) In a Class 5, 6, 7, 8, 9a or 9b building—

(i) for artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances obtained by multiplying the area of each space by the maximum *illumination power density* in Table J6.2b, except where the space is a shop of not more than 100 m^2 *floor area*, an average artificial *light source efficacy* of not less than 40 Lumens/W may be used; and—

(ii) the aggregate design illumination power load in (i) is the sum of the design illumination power loads in each of the spaces served; and

(iii) in determining the design illumination power load for (ii) the following must be used:

(A) Where there are multiple lighting systems serving the same space—

(aa) the total illumination power load of all systems; or

(bb) for a control system that permits only one system to operate at a time, the design illumination power load is—

(AA) based on the highest illumination power load; or

(BB) determined by the formula—

[H x T/2 + P x (100 - T/2)] / 100

Where:

H = the highest illumination power load; and

T = the time for which the maximum illumination power load will occur, expressed as a percentage; and

P = the predominant illumination power load.

(B) Where there is track lighting—

(aa) of extra low voltage, 80% of the power rating of the transformer; and

(bb) of mains voltage, 100 W per metre of track.

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

(i) Emergency lighting in accordance with Part E4.

(ii) Signage and display lighting within cabinets and display cases.

(iii) Lighting for accommodation within the residential part of a *detention centre*.

(iv) A heater where the heater also emits light.

(v) Lighting of a specialist process nature such as in an operating theatre, fume cupboard or clean workstation.

(vi) Lighting of performances such as theatrical or sporting.

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

Table J6.2b MAXIMUM ILLUMINATION POWER DENSITY

Space	Maximum *illumination power density* (W/m^2)
Auditorium, church and public hall	10
Board room and conference room	8
Carpark - general	6
Carpark - entry zone (first 20 m of travel)	25
Circulation space and corridor	8
Control room, switch room, and the like	10
Courtroom	12
Entry lobby	15
Factory, industrial tasks and processes	17
Farm and rural building - general	7
Farm and rural building - dairy and shearing	15
Health-care - examination room	20
Health-care - patient ward	10
Health-care - children's ward	15
Kitchen and food preparation area	8
Laboratory	15
Library - general	12
Library - reading room	10
Museum and gallery - circulation, cleaning and service lighting	8
Office - artificially lit to an ambient level of 200 lx or more	10
Office - artificially lit to an ambient level of less than 200 lx	7
Plant room	5
Public toilet	5
Restaurant, cafe, bar, hotel lounge and a space for the serving and consumption of food or drinks	20
Retail space including a museum and gallery whose purpose is the sale of objects	25
School - general purpose learning area	10
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	3
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 160 lx, 13 W/m^2
	(b)	For an illuminance of 160 to 600 lx, 16 W/m^2
	(c)	For an illuminance of more than 600 lx, 20 W/m^2
2.	For illuminance levels greater than 600 lx, the maximum *illumination power density* can only apply to the location where that level is needed.	
3.	The maximum *illumination power density* may be increased by dividing it by the *illumination power density* adjustment factor in Table J6.2c where applicable.	

Table J6.2c ILLUMINATION POWER DENSITY ADJUSTMENT FACTOR

Item	Description			*Illumination power density* adjustment factor
Motion detector in accordance with Specification J6	(a)	Where—		0.9
		(i)	at least 75% of the *floor area* of a space is controlled by one or more motion detectors; or	
		(ii)	an area of less than 200 m^2 is switched as a block by one or more detectors.	
	(b)	Where up to 6 lights are switched as a block by one or more detectors.		0.7
	(c)	Where an area of a *carpark* of less than 500 m^2 is switched as a block by one or more detectors.		0.7
	(d)	Where up to 2 lights are switched as a block by one or more detectors.		0.55
Manual dimming system (Note 1)	Where at least 75% of the *floor area* of a space is controlled by manually operated dimmers.			0.95
Programmable dimming system (Note 2)	Where at least 75% of the *floor area* of a space is controlled by programmable dimmers.			0.85
Dynamic dimming system (Note 3)	Automatic compensation for lumen depreciation.			The design lumen depreciation factor; and
			(i)	with fluorescent lights, no less than 0.9; or
			(ii)	with high pressure discharge lights, no less than 0.8.
Fixed dimming (Note 4)	Where at least 75% of the *floor area* is controlled by fixed dimmers that reduce the overall lighting level and the power consumption of the lighting.			% of full power to which the dimmer is set multiplied by 0.95.
Daylight sensor and dynamic lighting control	(a)	Lights within the space adjacent to *windows* other than *roof lights* for a distance from the *window* equal to the depth of the floor to window head height.		0.5 (Note 5)

switching of lights adjacent *windows*		the *floor area*.	
Room size (Note 6)	Room index not more than 0.7.		0.5
	Room index more than 0.7 but not more than 1.5.		0.7
	Room index more than 1.5 but not more than 3.0.		0.9
	Room index more than 3.0.		1.0
Notes:			
1.	Manual dimming is where lights are controlled by a knob, slider or other mechanism or where there are pre-selected scenes that are manually selected.		
2.	Programmed dimming is where pre-selected scenes or levels are automatically selected by the time of day, photoelectric cell or occupancy sensor.		
3.	Dynamic dimming is where the lighting level is varied automatically by a photoelectric cell to either proportionally compensate for the availability of daylight or the lumen depreciation of the lamps.		
4.	Fixed dimming is where lights are controlled to a level and that level cannot be adjusted by the user.		
5.	The *illumination power density* adjustment factor is only applied to lights controlled by that item. This adjustment factor does not apply to tungsten halogen or other incandescent sources.		
6.	The room index is an expression of the room proportion with respect to the lights and is determined by the formula:		
	$L \times W / H_m(L + W)$		
	Where:		
	L is the length of the room; and		
	W is the width of the room; and		
	H_m is the height that the fitting is mounted above the work surface.		
7.	Room size and a maximum of two other *illumination power density* adjustment factors can be applied to an area. Where more than one *illumination power density* adjustment factor (other than for room size) apply to an area, they are to be combined using the following formula:		
	$A \times (B + [(1 - B) / 2])$		
	Where:		
	A is the lowest applicable *illumination power density* adjustment factor; and		
	B is the second lowest applicable *illumination power density* adjustment factor.		

Appendix E – Table 2a Thermal Conductivity of Typical Wall, Roof/Ceiling and Floor Materials

Material description			Material density kg/m^3	Thermal conductivity W/m.K
1.	**Framing**			
(a)	Steel		7850	47.5
(b)	Timber – kiln dried hardwood (across the grain)		677	0.16
(c)	Timber – Radiata pine (across the grain)		506	0.10
2.	**Roof Cladding**			
(a)	Aluminium sheeting		2680	210
(b)	Concrete or terra cotta tiles		1922	0.81
(c)	Steel sheeting		7850	47.5
3.	**Wall Cladding**			
(a)	Aluminium sheeting		2680	210
(b)	Autoclaved aerated concrete		350	0.10
			900	0.27
(c)	Cement render (1 cement : 4 sand)		1570	0.53
(d)	Clay bricks			
	(i)	Clay brick – 2.75 kg	1430	0.55
	(ii)	Clay brick – 3.25 kg	1690	0.65
	(iii)	Clay brick – 3.75 kg	1950	0.78
(e)	Concrete blocks			
	(i)	190 mm dense or 90 mm dense solid	1100/2200	1.1
	(ii)	140 mm dense or 190 mm lightweight	1250/910	0.85
	(iii)	90 mm dense hollow or 90 mm lightweight solid	1650/1800	0.75
	(iv)	140 mm lightweight	1050	0.67
	(v)	90 mm lightweight	1360	0.55
(f)	Fibre-cement		1360	0.25
(g)	Gypsum plasterboard		880	0.17
(h)	Pine weatherboards		506	0.10
(i)	Plywood		530	0.14
(j)	Solid concrete		2400	1.44
(k)	Steel sheeting		7850	47.5
(l)	Prestressed hollow core concrete panel		1680	0.80
4.	**Flooring Materials**			
(a)	Carpet underlay		-	0.04

Material description		Material density kg/m^3	Thermal conductivity W/m.K
(b)	Carpet	-	0.05
(c)	Prestressed hollow core concrete planks	1680	0.80
(d)	Particleboard	640	0.12
(e)	Plywood	530	0.14
(f)	Timber – kiln dried hardwood (across the grain)	677	0.16
(g)	Timber – Radiata pine (across the grain)	506	0.10
(h)	Solid concrete	2400	1.44
(i)	Vinyl floor tiles	2050	0.79
5.	**Other Materials**		
(a)	Air (still)	1.2	0.03
(b)	Clay soil (10% moisture content)	1300	0.6
(c)	PMMA (polymethylmethacrylate)	1180	1.00
(d)	Polycarbonates	1200	0.2
(e)	Sand (6% moisture content)	1800	1.64
(f)	Soda lime glass	2500	1.0

Notes:

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