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Section J Report

Rhodes Development - Stages 2A and 3A
40 Walker Street, Rhodes

Prepared on behalf of
Billbergia Pty Ltd

Prepared by
Ecospecifier Consulting
November 2010

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Introduction

This report summarises the Section J initiatives for the proposed mixed-use development (Stages 2A and 3A) at 40 Walker Street, Rhodes. The report has been prepared by Ecospecifier Consulting on behalf of Billbergia Pty Ltd.

Ecospecifier Consulting and Billbergia have worked closely with the architects, and other members of the consultant team to ensure a high level of energy-efficiency and sustainability outcomes. In particular, a strong emphasis has been placed on the passive efficiency of the building. This includes passive heating, passive cooling, natural lighting and natural ventilation.

In particular, the team has worked collaboratively to develop a design with high levels of passive thermal comfort, and the success of these initiatives is discussed in the report below.

Section J Analysis

The site is located in Rhodes, Sydney, and falls under the BCA climate zone 5.

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

- Residential Buildings – Class 2
- Retail and Cafe – Class 6
- Pool and Gymnasium Building – Class 9b
- Car Park and Basement Levels – Class 7a

Importantly, the only conditioned areas (other than the dwellings themselves) are the retail areas and the gymnasium.

The following two sections in this report ("Section J Requirements and Initiatives" for Class 2 and Overall) are designed to provide a reference to the pertinent Section J requirements, as well as a brief description as to how the project will comply. The Section J requirements are detailed in one column and the relevant sections to this development are summarised in the next column.

Importantly, most of Section J will not apply to the Class 2 areas, since the BASIX assessments (compulsory in NSW) already assess most of the energy efficient issues of the apartment buildings. Hence, the next section ("Section J Requirements and Initiatives – Class 2, NSW") lists which Section J requirements are designed to complement the BASIX assessments. Each building (A to E) has had a separate BASIX assessment.

Section J Requirements and Initiatives – Class 2 Buildings (NSW)

BCA Reference	Section J - Energy Efficiency	Project Initiative
NSW J(A)P1	(a) Thermal insulation in a building must be installed in a manner and have characteristics, which facilitate the efficient use of energy for artificial heating and cooling. (b) A building must have, to the degree necessary, thermal breaks installed between the framing and external cladding, to facilitate efficient thermal performance of the building envelope. Application: (a) NSW J(A)P1(a) only applies to thermal insulation in a Class 2 building or Class 4 part of a building where a development consent specifies that the insulation is to be provided as part of the development. (b) In (a), the term development consent has the meaning given by the Environmental Planning and Assessment Act 1979. (c) NSW J(A)P1(b) only applies to a metal framed roof and a metal framed wall.	Contractors will be instructed to adhere to this, in the final specifications. Applies to all Class 2 where insulation is required.
NSW J(A)P2	A building must have, to the degree necessary, a level of building sealing against air leakage to facilitate the efficient use of energy for artificial heating and cooling appropriate to— (a) the function and use of the building; and (b) the internal environment; and (c) the geographic location of the building. Application: NSW J(A)P2 only applies to a Class 2 building or Class 4 part of a building, except— (a) a building in climate zones 2 and 5 where the only means of air-conditioning is by using an evaporative cooler; and (b) a building ventilation opening that is necessary for the safe operation of a gas appliance; and (c) parts that cannot be fully enclosed	Building sealing will be designed to adhere to this. Applies to all Class 2.

NSW J(A)P3	A building's services must have features that, to the degree necessary, facilitate the efficient use of energy appropriate to— (a) the function and use of the service; and (b) the internal environment; and (c) the geographic location of the building; and (d) the energy source of the service. Application: NSW J(A)P3 only applies to a Class 2 building or Class 4 part of a building.	Building services will be designed to adhere to this. In particular, solar and/or gas hot water, solar power, BMS, smart controls, efficient lights, efficient HVAC and excellent thermal comfort results will ensure the efficient use of energy. Applies to all Class 2.
NSW J(A)P4	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. Application: NSW J(A)P4 only applies to a Class 2 building, except for a sole-occupancy unit in that building.	Buildings and services will be designed to adhere to this. Applies to all Class 2 (except for the dwellings themselves).
	NSW PART J(A)1 - BUILDING FABRIC	
NSW J(A)1.1 Application of Part	(a) The Deemed-to-Satisfy Provisions only apply to thermal insulation in a Class 2 building or Class 4 part of a building where a development consent or complying development certificate specifies that the insulation is to be provided as part of the development. (b) For alterations and additions, until 1 July 2006 when BASIX will apply, in addition to (a), the provision of insulation as part of the development may also be specified in an environmental planning instrument. (c) In (a) and (b), development consent, complying development certificate, environmental planning instrument, have the meaning given to these terms by the Environmental Planning and Assessment Act 1979. (d) The Deemed-to-Satisfy provisions of this Part for thermal breaks apply to all Class 2 buildings and Class 4 parts.	Applies to all class 2 (including dwellings). Importantly insulation levels have been assessed under BASIX (except for Class 2 common areas).
NSW J(A)1.2 Compliance with BCA provisions	(a) Thermal insulation in Class 2 buildings and Class 4 parts of buildings must comply with the national BCA provisions of J1.2 Thermal construction general, except that the reference in Clause J1.2 to "Where required", is deemed to refer to "Where a development consent specifies that insulation is to be provided as part of the development". (b) A thermal break must be provided between the external cladding and framing as follows - (i) for a metal framed roof, in accordance with national BCA provisions of J1.3(d); and (ii) for a metal framed wall, in accordance with national BCA provisions of J1.5(e)	Contractors will be instructed to adhere to the insulation installation requirements, in the final specifications. For J1.2, see next chapter “Section J Requirements and Initiatives – Overall”.

	NSW PART J(A)2 - BUILDING SEALING	
NSW J(A)2.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to a Class 2 building and a Class 4 part of a building, but exclude— (a) a building in climate zones 2 and 5 where the only means of air-conditioning is by using an evaporative cooler; and (b) a building ventilation opening that is necessary for the safe operation of a gas appliance; & (c) parts of buildings that cannot be fully enclosed.	Applies to all Class 2.
NSW J(A)2.2 Compliance with BCA provisions	Class 2 buildings and Class 4 parts of buildings must comply with the following national BCA provisions— (a) J3.2 Chimneys and flues; and (b) J3.3 Roof lights; and (c) J3.4 External doors and windows; and (d) J3.5 Exhaust fans; and (e) J3.6 Construction of roofs, walls and floors; and (f) J3.7 Evaporative coolers.	Building sealing will be designed to adhere to this. Applies to all Class 2. For J3.2 to J3.7, see next chapter "Section J Requirements and Initiatives – Overall".
	NSW PART J(A)3 - AIR-CONDITIONING AND VENTILATING SYSTEMS	
NSW J(A)3.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to a Class 2 building and a Class 4 part of a building.	Applies to all Class 2.
NSW J(A)3.2 Compliance with BCA provisions	Class 2 buildings and Class 4 parts of buildings must comply with the following national BCA provisions, as applicable— (a) J5.2 Air conditioning and ventilating systems; and (b) J5.3 Time switch; and (c) J5.4 Heating and cooling systems; and (d) J5.5 Ancillary exhaust systems.	Building HVAC will be designed to adhere to this. Applies to all Class 2. For J5.2 to J5.5, see next chapter "Section J Requirements and Initiatives – Overall".
	NSW PART J(A)4 - HOT WATER SUPPLY	
NSW J(A)4.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to a Class 2 building and a Class 4 part of a building.	Applies to all Class 2.
NSW J(A)4.2 Compliance with BCA provisions	Class 2 buildings and Class 4 parts of buildings must comply with the national BCA provisions of J7.2.	Building Hot Water will be designed to adhere to this. Applies to all Class 2. For J7.2, see next chapter "Section J Requirements and Initiatives – Overall".

	NSW PART J(A)5 - ACCESS FOR MAINTENANCE	
NSW J(A)5.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to a Class 2 building except within a sole-occupancy unit.	Applies to all Class 2 (except dwellings).
NSW J(A)5.2 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.	Buildings and services will be designed to adhere to this. Applies to all Class 2 (except dwellings).

Section J Requirements and Initiatives - Overall

BCA Reference	Section J - Energy Efficiency	Project Initiative
JF1 (Functional Statement)	To reduce greenhouse gas emissions, to the degree necessary— (a) a building, including its services, is to be capable of efficiently using energy; and (b) a building's services for heating are to obtain their energy from— (i) a source that has a low greenhouse gas intensity; or (ii) a source that is renewable on-site; or (iii) another process as reclaimed energy.	The development has been designed for this, as discussed in the summary table below. Water heating uses solar and/or gas. Likewise, for the small conditioned spaces outside the apartments themselves (retail and gym) the heating required will be far less than the energy generated by the on-site PV cells.
JP1 (Performance Requirement)	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; & (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.	Buildings will be designed for this, as discussed in this summary table.
JP2 (Performance Requirement)	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. **Limitation**: JP2 does not apply to services serving only one sole-occupancy unit in a Class 2 building or serving a Class 4 part of a building.	Buildings will be designed for this, as discussed in this summary table.
JP3 (Performance Requirement)	Heating such as for a conditioned space must, to the degree necessary, obtain energy from— (a) a source that has a greenhouse gas intensity that does not exceed 100 g CO2-e/MJ of thermal energy load; or (b) a source that is renewable on-site such as solar, geothermal or wind; or (c) another process as reclaimed energy.	Water heating uses gas and gas-boosted solar systems. Likewise, for the conditioned spaces outside the apartments (retail areas and gym) the heating required will be far less than the energy generated by the on-site PV cells.

	Part J0 - Deemed-to-Satisfy Provisions	
J0.0 Deemed-to-Satisfy Provisions	(a) Where a Building Solution is proposed to comply with the Deemed-to-Satisfy Provisions, Performance Requirements JP1 and JP3 are satisfied by complying with— (i) J0.1 to J0.3; and (ii) J1.1 to J1.6; and (iii) J2.1 to J2.5; and (iv) J3.1 to J3.7; and (v) J5.1 to J5.5; and (vi) J6.1 to J6.6; and (vii) J7.1 to J7.4. (b) Where a Building Solution is proposed as an Alternative Solution to the Deemed-to-Satisfy Provisions of— (i) J0.1 to J0.3; and (ii) J1.1 to J1.6; and (iii) J2.1 to J2.5; and (iv) J3.1 to J3.7; and (v) J5.1 to J5.5; and (vi) J6.1 to J6.6; and (vii) J7.1 to J7.4, the relevant Performance Requirements must be determined in accordance with A0.10.	Buildings will be designed for this, as discussed in this summary table.
J0.1 Application of Section J	Performance Requirements JP1, JP2 and JP3 are satisfied by complying with— .(a) for reducing the heating or cooling loads— (i) of sole-occupancy units of a Class 2 building or a Class 4 part of a building, J0.2 and J0.3; & (ii) of a Class 2 to 9 building, other than the sole-occupancy units of a Class 2 building or a Class 4 part, Parts J1, J2 and J3; and (b) for air-conditioning and ventilation, Part J5; and (c) for artificial lighting and power, Part J6; and (d) for hot water supply, Part J7; and (e) for facilities for maintenance and monitoring, Part J8.	Buildings will be designed for this, as discussed in this summary table.

J0.2 Heating and cooling loads of sole-occupancy units	N/A since BASIX applies for NSW.	N/A
J0.3 Ceiling fans	N/A since BASIX applies for NSW.	N/A
	Part J1 - Building Fabric	
J1.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to building elements forming the envelope of a Class 2 to 9 building other than— (a) a Class 7, 8 or 9b building that does not have a conditioned space; or (b) an atrium or solarium that is not a conditioned space and is separated from the remainder of the building by an envelope.	DTS for J1 will apply to all conditioned areas such as the retail and gym. For example, since corridors and lobbies are unconditioned then the "envelope" is regarded as the boundary between the retail or gym and the corridor/lobby. Class 2 dwellings will only be subject to J1.2.
J1.2 Thermal construction general	(a) Where required, insulation must comply with AS/NZS 4859.1 and be installed so that it— (i) abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must be against the member; and (ii) forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and (iii) does not affect the safe or effective operation of a service or fitting. (b) Where required, reflective insulation must be installed with— (i) the necessary airspace to achieve the required R-Value between a reflective side of the reflective insulation and a building lining or cladding; and (ii) the reflective insulation closely fitted against any penetration, door or window opening; and (iii) the reflective insulation adequately supported by framing members; and (iv) each adjoining sheet of roll membrane being— (A) overlapped not less than 50 mm; or (B) taped together.	Contractors will be obliged to adhere to these installation guidelines, in the final specifications. These will apply to all building types where thermal insulation is required. Note this applies to Class 2 as well.

<table>
<tr>
<td>J1.2
Thermal construction general (contd.)</td>
<td>(c) Where required, bulk insulation must be installed so that—
(i) it maintains its position and thickness, other than where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like; and
(ii) in a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall by not less than 50 mm.

(d) Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in Specification J1.2. (see Appendix B)</td>
<td></td>
</tr>
<tr>
<td>J1.3
Roof and ceiling construction</td>
<td>(a) A roof or ceiling that is part of the envelope, other than of a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, must achieve the Total R-Value specified in Table J1.3a for the direction of heat flow.

Table J1.3a ROOFS AND CEILINGS - MINIMUM TOTAL R-VALUE FOR EACH CLIMATE ZONE
<table>
<tr><th>Climate zone</th><th>1, 2 and 3</th><th>4, 5 and 6</th><th>7</th><th>8</th></tr>
<tr><th>Direction of heat flow</th><th colspan="2">Downwards</th><th colspan="2">Upwards</th></tr>
<tr><td>Minimum Total R-Value for a roof or ceiling with a roof upper surface solar absorptance value of not more than 0.5</td><td>3.2</td><td>3.2</td><td>3.7</td><td>4.8</td></tr>
<tr><td>Minimum Total R-Value for a roof or ceiling with a roof upper surface solar absorptance value of more than 0.5 but not more than 0.6</td><td>3.7</td><td>3.2</td><td>3.7</td><td>4.8</td></tr>
<tr><td>Minimum Total R-Value for a roof or ceiling with a roof upper surface solar absorptance value of more than 0.6</td><td>4.2</td><td>3.2</td><td>3.7</td><td>4.8</td></tr>
</table>
(b) For compliance with Table J1.3a, roof and ceiling construction is deemed to have the thermal properties listed in Specification J1.3.

(c) Where, for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the R-Value of the insulation in the remainder of the ceiling in accordance with Table J1.3b.</td>
<td>Roof/Ceiling Total Insulation Levels are:

Class 6 – Retail and Class 9b – Gym
R3.2 total downwards (i.e. approx. R3.0 added) for all conditioned spaces

(Note: Class 2 dwellings are N/A since they are assessed by BASIX. There are no conditioned residential common areas).</td>
</tr>
</table>

J1.3 Roof and ceiling construction (contd.)

Table J1.3b ADJUSTMENT OF MINIMUM R-VALUE FOR LOSS OF CEILING INSULATION

Percentage of ceiling area uninsulated	Minimum *R-Value* of ceiling insulation *required* to satisfy J1.3 (a)							
	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
	Adjusted minimum *R-Value* of ceiling insulation *required* to compensate for loss of ceiling area insulation							
0.5% to less than 1.0%	2.8	3.4	4.0	4.7	5.4	6.2	6.9	
1.0% to less than 1.5%	2.9	3.6	4.4	5.2	6.1	7.0		
1.5% to less than 2.0%	3.1	3.9	4.8	5.8	6.8			
2.0% to less than 2.5%	3.3	4.2	5.3	6.5				
2.5% to less than 3.0%	3.6	4.6	5.9					
3.0% to less than 4.0%	4.2	5.7	Not Permitted					
4.0% to less than 5.0%	5.0							
5.0% or more								

Note:
Where the minimum *R-Value* of ceiling insulation *required* to satisfy J1.3(a) is between the values stated, interpolation may be used to determine the adjusted minimum *R-Value*.

(d) A roof that—

(i) is required to achieve a minimum Total R-Value; and

(ii) has metal sheet roofing fixed to metal purlins, metal rafters or metal battens; and

(iii) does not have a ceiling lining or has a ceiling lining fixed directly to those metal purlins, metal rafters or metal battens (see Specification J1.3 Figure 2(c) and (f)),

must have a thermal break, consisting of a material with an R-Value of not less than R0.2, installed between the metal sheet roofing and its supporting metal purlins, metal rafters or metal battens.

J1.4 Roof lights

Roof lights, including any associated shaft and diffuser, that form part of the envelope, other than of a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, must—

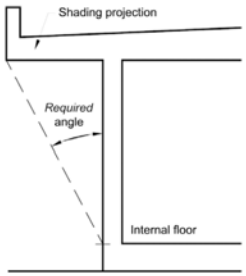
(a) if the roof lights are not required for compliance with Part F4, comply with Table J1.4; or

NA since no roof lights.

	(b) if the roof lights are required for compliance with Part F4— (i) have an area not more than 150% of the minimum area required by F4.6; and (ii) have transparent and translucent elements, including any imperforate ceiling diffuser, with a combined performance of not more than— (A) 0.29 SHGC; and (B) 2.9 Total U-Value. **Note**: Not shown (due to lack of roof lights) is Table J1.4 ROOF LIGHTS - THERMAL PERFORMANCE OF TRANSPARENT AND TRANSLUCENT ELEMENTS	
J1.5 Walls	(a) Each part of an external wall that is part of the envelope, other than of a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, must satisfy one of the options in Table J1.5a except for— (i) opaque non-glazed openings in external walls such as doors (including garage doors), vents, penetrations, shutters and the like; and (ii) glazing; and (iii) an earth retaining wall or earth-berm, in other than climate Table J1.5a	**Wall Total Insulation Levels are:** **Class 6 - Retail and Class 9b – Gym (conditioned areas)** R2.8 total (i.e. approx R2.5 added) OR R2.3 total (i.e. approx. R2.0 added) if south facing OR well-shaded (over 30 degrees for projection) OR the wall is >220kg/m2 (i.e. 150mm concrete with density >147 kg/m^3) **Class 6 - Retail and Class 9b – Gym (conditioned areas) wherever adjacent to plant rooms, car park or other unconditioned spaces** R1.8 total (i.e. approx R1.5 added) for conditioned areas (Note: Class 2 dwellings are N/A since they are assessed by BASIX. There are no conditioned residential common areas).

4, 5 and 6	(a)	(i)	Achieve a minimum *Total R-Value* of 2.8.				
		(ii)	The minimum *Total R-Value* in (i) is reduced—				
			(A)	for a wall with a surface density of not less than 220 kg/m^2, by 0.5; and			
			(B)	for a wall that is—			
				(aa)	facing the south orientation as described in Figure J2.3, by 0.5; or		
				(bb)	shaded with a projection shade angle in accordance with Figure J1.5 of—		
					(AA)	30 degrees to not more than 60 degrees, by 0.5; or	
					(BB)	more than 60 degrees, by 1.0.	
	(b)	Where the only space for insulation is provided by a furring channel, top hat section, batten or the like—					
		(i)	achieve a minimum *Total R-Value* of 1.4; and				
		(ii)	satisfy *glazing* energy index Option B of Table J2.4a.				

Figure J1.5
MEASUREMENT OF PROJECTION FOR WALL SHADING



J1.5 Walls (contd.)

(b) Any wall, other than an *external wall*, that is part of the *envelope* must achieve the *Total R-Value* in Table J1.5b.

Table J1.5b AN ENVELOPE WALL OTHER THAN AN EXTERNAL WALL – MINIMUM TOTAL R-VALUE

Location			*Climate zone*							
			1	2	3	4	5	6	7	8
(a)	With the non- *conditioned space*—									
	(i)	enclosed, with mechanical ventilation of not more than 1.5 air changes per hour of outside air; and	1.0	1.0	Nil	Nil	1.0	1.0	1.5	2.5
	(ii)	*glazing* not more than that *required* by Part J2.								
(b)	For other than (a)		2.3	2.3	2.3	1.8	1.8	1.8	2.8	3.8

(c) A wall that—

(i) 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 same 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.

(d) For compliance with Table J1.5a and Table J1.5b, wall construction is deemed to have the thermal properties listed in Specification J1.5.

J1.6 Floors

(a) A floor that is part of the envelope of a building, other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, including a floor above or below a carpark or a plant room—

(i) must achieve the Total R-Value specified in Table J1.6; and

(ii) with an in-slab heating or cooling system, must be insulated around the vertical edge of its perimeter with insulation having an R-Value of not less than 1.0.

Class 6 - Retail and Class 9b – Gym (conditioned areas)
Since these are all above the unenclosed basement then R2 total is required (i.e. approx. R1.7 added).

(Note: Class 2 dwellings are N/A since they are assessed by BASIX. There are no conditioned residential common areas).

J1.6 Floors (contd.)

(b) In climate zones 1 to 6, the minimum Total R-Value required in (a) may be reduced by R0.5 provided R0.75 is added to the Total R-Value required for the roof and ceiling construction.

(c) A concrete slab-on-ground—
(i) with an in-slab heating or cooling system; or
(ii) located in climate zone 8,
must have insulation installed around the vertical edge of its perimeter.

(d) Insulation required by (c) must—
(i) have an R-Value of not less than 1.0; and
(ii) be water resistant; and
(iii) be continuous from the adjacent finished ground level—
(A) to a depth of not less than 300 mm; or
(B) for the full depth of the vertical edge of the concrete slab-on-ground.

(e) Floor construction is deemed to have the thermal properties listed in Specification J1.6.

Table J1.6 FLOORS — MINIMUM TOTAL R-VALUE

Location			Climate zone							
			1	2	3	4	5	6	7	8
(a)	A slab on ground:									
	(i)	Without an in-slab heating or cooling system	Nil	Nil	Nil	Nil	Nil	Nil	1.0	2.0
	(ii)	With an in-slab heating or cooling system	1.25	1.25	1.25	1.25	1.25	1.25	1.25	2.25
(b)	A suspended floor without an in-slab heating or cooling system where the non-conditioned space is—		1.0	1.0	Nil	Nil	1.0	1.0	1.5	2.5
	(i)	enclosed; and								
	(ii)	where mechanically ventilated by not more than 1.5 air changes per hour.								
(c)	A suspended floor with an in-slab heating or cooling system where the non-conditioned space is—		1.25	1.25	1.25	1.25	1.25	1.25	1.75	2.75
	(i)	enclosed; and								
	(ii)	where mechanically ventilated by not more than 1.5 air changes per hour								
(d)	For other than (a), (b) or (c)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.5

Note:
A sub-floor space with not more than 150% of the required sub-floor ventilation is considered enclosed.

	Part J2 - Glazing	
J2.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to elements forming the envelope of a building other than— (a) a sole-occupancy unit of a Class 2 building or a Class 4 part of a building; or (b) a Class 7, 8 or 9b building that does not have a conditioned space; or (c) an atrium or solarium that is not a conditioned space and is separated from the remainder of the building by an envelope.	This will apply to the all conditioned areas (except the apartments) and this includes: Class 6 - Retail and Class 9b – Gym. DTS for J2 will not apply to Class 2 dwellings (which are assessed by BASIX).
J2.2	Left Blank in BCA	N/A
J2.3	Left Blank in BCA	N/A
J2.4 Glazing	(a) The glazing in each storey, including any mezzanine, of a building must be assessed separately in accordance with (b) and (c) for— (i) glazing in the external fabric facing each orientation; and (ii) glazing in the internal fabric using the south orientation sector energy constants in Table J2.4b and shading multipliers in Table J2.4c and Table J2.4d. (b) The aggregate air-conditioning energy value attributable to the glazing must not exceed the allowance obtained by multiplying the facade area that is exposed to the conditioned space for the orientation by the energy index in Table J2.4a.	These Tables are incorporated into the glazing calculator 2010. Glazing Calculators used for all conditioned areas (not dwellings) which include the following areas: Class 6 - Retail and Class 9b – Gym. See Appendix A.
J2.5 Shading	Where shading is required to comply with J2.4, it must— (a) be provided by an external permanent projection, such as a verandah, balcony, fixed canopy, eaves or shading hood, which— (i) extends horizontally on both sides of the glazing for the same projection distance P in Figure J2.4; or (ii) provides the equivalent shading to (i) with a reveal or the like; or (b) be provided by an external shading device, such as a shutter, blind, vertical or horizontal building screen with blades, battens or slats, which— (i) is capable of restricting at least 80% of summer solar radiation; and (ii) if adjustable, is operated automatically in response to the level of solar radiation.	Shading devices are referenced in the glazing calculators, when relevant. Non-compliant devices have been ignored within the calculators (i.e. given no shading credit at all).

	Part J3 - Building Sealing	
J3.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part apply to elements forming the envelope of a Class 2 to 9 building, other than— (a) a building in climate zones 1, 2, 3 and 5 where the only means of air-conditioning is by using an evaporative cooler; or (b) a permanent building opening, in a space where a gas appliance is located, that is necessary for the safe operation of a gas appliance; or (c) a Class 6, 7, 8 and 9b building that does not have a conditioned space; or (d) a building or space where the mechanical ventilation required by Part F4 provides sufficient pressurisation to prevent infiltration; or (e) an atrium or solarium that is not a conditioned space and is separated from the remainder of the building by an envelope. (f) parts of buildings that cannot be fully enclosed.	DTS for J3 will apply to all conditioned areas (including Class 2 dwellings). For example, since corridors and lobbies are unconditioned then the "envelope" is regarded as the boundary between the apartment and the corridor/lobby. This Part will not apply to areas that can't be fully enclosed NOR to spaces where the mechanical ventilation required by Part F4 provides sufficient pressurisation to prevent infiltration (e.g. fire stairs).
J3.2 Chimneys and flues	The chimney or flue of an open solid-fuel burning appliance must be provided with a damper or flap that can be closed to seal the chimney or flue.	NA - No solid-fuel burning appliances. Note this applies to Class 2 as well.
J3.3 Roof lights	(a) A roof light must be sealed, or capable of being sealed when serving— (i) a conditioned space; or (ii) a habitable room in climate zones 4, 6, 7 and 8. (b) A roof light required by (a) must be constructed with— (i) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or (ii) a weatherproof seal if it is a roof window; or (iii) a shutter system readily operated either manually, mechanically or electronically by the occupant.	NA - No roof lights. Note this applies to Class 2 as well.
J3.4 Windows and doors	(a) A seal to restrict air infiltration must be fitted to each edge of a door, openable window or the like forming part of— (i) the envelope of a conditioned space; or (ii) the external fabric of a habitable room or public area in climate zones 4, 5, 6, 7 and 8. (b) The requirements of (a) do not apply to— (i) a window complying with AS 2047; or (ii) a fire door or smoke door; or (iii) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.	A seal to restrict air infiltration will be fitted to each edge of a door, openable window or the like forming part of the envelope of a conditioned space or habitable room or public area. This does not apply however to— (i) a window complying with AS 2047; or (ii) a fire door or smoke door; or (iii) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.

J3.4 Windows and doors (contd.)	(c) A seal required by (a)— (i) for the bottom edge of an external swing door, must be a draft protection device; and (ii) for the other edges of an external door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like. (d) An entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, 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 cafÃ©, 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 cafÃ©, restaurant, open front shop or the like, self-closing doors.	Main entrances to the building, if leading to a conditioned space will have an airlock, self-closing door, revolving door or the like (unless the conditioned zone is <50m2). Note this applies to Class 2 as well.
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) a conditioned space; or (b) a habitable room in climate zones 4, 5, 6, 7 and 8.	All miscellaneous exhaust fans, such as a bathroom or domestic kitchen exhaust fans, will be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space or habitable space. Note this applies to Class 2 as well.
J3.6 Construction of roofs, walls and floors	(a) Roofs, ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like must be constructed to minimise air leakage in accordance with (b) when forming part of— (i) the envelope; or (ii) the external fabric of a habitable room or a public area in climate zones 4, 6, 7 and 8. (b) Construction required by (a) must be— (i) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or (ii) sealed 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.	Contractors will ensure that all roofs, walls, floors and any opening such as a window, door or the like will be constructed to minimise air leakage (as detailed to the left). These requirements will be included in the final specifications. Note this applies to Class 2 as well.
J3.7 Evaporative coolers	An evaporative cooler must be fitted with a self-closing damper or the like when serving— (a) a heated space; or (b) a habitable room or a public area of a building in climate zones 4, 5, 6, 7 and 8.	NA – no evaporative coolers. Note this applies to Class 2 as well.

	Part J4 - (Blank)	
	Part J5 - Air-conditioning and Ventilation Systems	
J5.1	Left Blank in BCA	
J5.2 Air-conditioning and ventilation systems	(a) An air-conditioning unit or system must— (i) be capable of being deactivated when the sole-occupancy unit, building or part of the building served is not occupied; and (ii) 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 deactivated; and (iii) when serving a sole-occupancy unit of a Class 3 building, not operate when any external door including a door opening to a balcony, patio, courtyard or the like is open for more than 1 minute; and (iv) have any supply and return ductwork sealed and insulated in accordance with Specification J5.2; and (v) 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; & (B) not control the temperature by mixing actively heated air and actively cooled air; and (C) 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 increased or decreased; and (vi) other than where a packaged air-conditioning unit is used, have a variable speed fan when its supply air quantity is varied; and (vii) where the air-conditioning system provides the required mechanical ventilation, have an outdoor air economy cycle— (A) in climate zone 2 and 3, when the air-conditioning unit capacity is over 50 kWr; and (B) in climate zones 4, 5, 6, 7, 8 when the air-conditioning unit capacity is over 35 kWr; & (viii) 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 (ix) when the air flow rate is greater than 1000 L/s, be designed so that the total fan power of the fans in the system is in accordance with Table J5.2, except the following need not comply with this requirement: (A) The power for an energy reclaiming system that preconditions outdoor air. (B) The power for process related components such as high efficiency particulate air filters. (C) The power for miscellaneous exhaust systems complying with J5.5.	Mechanical systems have been designed to meet all these conditions. Note this applies to Class 2 as well.

J5.2 Air-conditioning and ventilation systems (contd.)

Table J5.2 MAXIMUM FAN POWER

Air-conditioning sensible heat load (W/m^2 of the *floor area* of the *conditioned space*)	Maximum *fan power* (W/m^2 of the *floor area* of the *conditioned space*)	
	For an *air-conditioning* system serving not more than 500 m^2	For an *air-conditioning* system serving more than 500 m^2
Up to 100	4.1	6.4
101 to 150	7.3	10.4
151 to 200	10.5	14.1
201 to 300	17.1	21.5
301 to 400	23.6	28.4

Notes		
	For more than 400 W/m^2 internal load—	
	(a)	in a building of not more than 500 m^2 *floor area*, use 0.07 W of *fan power* for each Watt of internal load; and
	(b)	in a building of more than 500 m^2 *floor area*, use 0.09 W of *fan power* for each Watt of internal load.

(b) A system that provides mechanical ventilation to other than a sole-occupancy unit in a Class 2 building or a Class 4 part of a building, either as part of an air-conditioning system or as a separate ventilation system, must—

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

(ii) when serving a conditioned space—

(A) not provide mechanical ventilation in excess of the minimum quantity required by Part F4 for a mechanical ventilation system, where relevant, by >20% other than where there is—

(aa) additional unconditioned outside air supplied to provide free cooling or to balance process exhaust such as from a health-care building or laboratory; or

(bb) additional exhaust ventilation needed to balance required mechanical ventilation; or

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

(B) in other than climate zone 2, where the number of square metres per person is 1 or less as specified in D1.13 and the air flow rate is more than 1000 L/s, have—

(aa) an energy reclaiming system that preconditions outside air; or

(bb) the ability to automatically modulate the mechanical ventilation required by Part F4 in proportion to the number of occupants; and

J5.2 Air-conditioning and ventilation systems (contd.)	(iii) when the mechanical ventilation is provided by means other than an air-conditioning system and the air flow rate is more than 1000 L/s— (A) have a fan power to air flow rate ratio of 0.5 W/(L/s) without filters or 0.75 W/(L/s) with filters for a general mechanical ventilation system; and (B) for carpark exhaust, when serving over 40 vehicles— (aa) be controlled by an atmospheric contaminant monitoring system in accordance with AS 1668.2; and (bb) 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. (d) The provisions of (b)(iii) do not apply to the following: (i) The power for an energy reclaiming system that preconditions outside air. (ii) The power for process related components such as high efficiency particulate air filters. (iii) The power for a miscellaneous exhaust system complying with J5.5.	
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 1 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.	Mechanical systems have been designed to meet all these conditions. Note this applies to Class 2 as well.

J5.4 Heating and cooling systems

(a) Systems that provide heating or cooling 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 pump power to the pump is in accordance with Table J5.4a; and

Table J5.4a MAXIMUM PUMP POWER

Cooling or heating load (W/m^2 of the *floor area* of the *conditioned space*)	Maximum *pump power* (W/m^2 of the *floor area* of the *conditioned space*)		
	Chilled water	Condenser water	Heating water
Up to 100	1.3	0.9	1.0
101 to 150	1.9	1.2	1.3
151 to 200	2.2	2.2	1.7
201 to 300	4.3	3.0	2.5
301 to 400	5.0	3.6	3.2
More than 400	5.6	5.6	3.6

(B) have the pump capable of varying its speed in response to varying load when it is rated at more than 3 kW of pump 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 heater—

(i) for heating a space via water, such as a boiler, that is part of an air-cond. system, must—

(A) achieve a thermal efficiency complying with Table J5.4b when tested in accordance with BS 7190; and

(B) use reticulated gas where it is available at the allotment boundary; and

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

Fuel type	Rated capacity ($kW_{heating}$)	Minimum gross thermal efficiency (%)
Gas	Not more than 750	80
	More than 750	83
Oil	All capacities	80

Mechanical systems have been designed to meet all these conditions.

Note this applies to Class 2 as well.

J5.4 Heating and cooling systems (contd.)

(ii) for heating a space other than via water, must be—

(A) a solar heater; or

(B) a gas heater; or

(C) an oil heater if reticulated gas is not available at the allotment boundary; or

(D) a heat pump heater; or

(E) a solid-fuel burning heater; or

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

(G) a combination of 2 or more of (A) to (F); and

(iii) that is a fixed space heating appliance installed outdoors, must be controlled to automatically turn off when not needed by an outdoor air temperature sensor, timer, motion detector, or the like.

(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	2.70	2.80
Heat pump — cooling	2.60	2.70

(d) A refrigerant chiller up to 350 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	4.2	5.2
Air cooled or evaporatively cooled chiller	2.5	3.4

J5.4 Heating and cooling systems (contd.)	(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) or that is part of a Liquid Chilling Package, using the vapour compression cycle in (d), must not use more than 42 W of fan 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-cond. system must not use more than— (i) if a propeller or axial fan, 310 W of fan power for each L/s of cooling water circulated; or (ii) if a centrifugal fan, 590 W of fan power for each L/s of cooling water circulated. (g) The fan of a closed circuit cooler that is part of an air-cond. system must not use more than— (i) if a propeller or axial fan, 500 W of fan power for each L/s of cooled fluid circulated; and (ii) if a centrifugal fan, 670 W of fan power for each L/s of cooled fluid circulated. (h) The fan of an evaporative condenser that is part of an air-conditioning system must not use more than— (i) if a propeller or axial fan, 18 W of fan power for each kW of heat rejected; and (ii) if a centrifugal fan, 22 W of fan 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 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.	Mechanical systems have been designed to meet all these conditions. Note this applies to Class 2 as well.

	Part J6 - Artificial Lighting and Power	
J6.1	Blank	
J6.2 Artificial lighting	(a) In a sole-occupancy unit of a Class 2 building or a Class 4 part of a building— (i) the lamp power density or illumination power density of artificial lighting must not exceed— (A) within the building, 5 W/m2; and (B) on a verandah or balcony of the building 4 W/m2; and (ii) the illumination power density in (i) may be increased by dividing it by the illumination power density adjustment factor for a control device in Table J6.2b; and (iii) when designing the lamp power density or illumination power density, the power of the proposed installation must be used rather than nominal allowances for exposed batten holders or luminaires; and (iv) where lamps are used that have a transformer or ballast, the transformer or ballast must be of the electronic type; and (v) halogen lamps must be separately switched from fluorescent lamps. (b) In a building other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building— (i) for artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances obtained by multiplying the area of each space by the maximum illumination power density in Table J6.2a; 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.	Final lighting designs will be designed to satisfy these lighting levels. Note Class 2 does not adhere to these requirements since it is assessed in BASIX.

J6.2 Artificial lighting (contd.)

(B) Where there is adjustable position lighting such as trapeze lighting or track lighting other than trunking systems that accept fluorescent lamps—

(aa) the rating of the circuit breaker protecting the track; or

(bb) of extra low voltage, 80% of the power rating of the transformer; or

(cc) 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 that are fixed in place.

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

(iv) A heater where the heater also emits light, such as in bathrooms.

(v) Lighting of a specialist process nature such as in 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 J6.2a MAXIMUM ILLUMINATION POWER DENSITY

Table J6.2a MAXIMUM ILLUMINATION POWER DENSITY

Space	Maximum *illumination power density* (W/m^2)
Auditorium, church and public hall	10
Board room and conference room	10
Carpark - general	6
Carpark - entry zone (first 20 m of travel)	25
Common rooms, spaces and corridors in a Class 2 building	8
Control room, switch room, and the like	9
Corridors	8
Courtroom	12
Dormitory of a Class 3 building used for sleeping only	6
Dormitory of a Class 3 building used for sleeping and study	9
Entry lobby from outside the building	15
Health-care - children's ward	10
Health-care - examination room	10
Health-care - patient ward	7
Health-care - all patient care areas including corridors where cyanosis lamps are used	13

J6.2 Artificial lighting (contd.)

Kitchen and food preparation area	8
Laboratory - artificially lit to an ambient level of 400 lx or more	12
Library - stack and shelving area	12
Library - reading room and general areas	10
Lounge area for communal use in a Class 3 building or Class 9c *aged care building*	10
Museum and gallery - circulation, cleaning and service lighting	8
Office - artificially lit to an ambient level of 200 lx or more	9
Office - artificially lit to an ambient level of less than 200 lx	7
Plant room	5
Restaurant, cafÃ©, bar, hotel lounge and a space for the serving and consumption of food or drinks	18
Retail space including a museum and gallery whose purpose is the sale of objects	22
School - general purpose learning areas and tutorial rooms	8
Sole-occupancy unit of a Class 3 building	5
Sole-occupancy unit of a Class 9c *aged care building*	7
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, cleaner's room and the like	5
Toilet, locker room, staff room, rest room and the like	6
Wholesale storage and display area	10

Notes:

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

J6.2 Artificial lighting (contd.)

2.	For illuminance levels greater than 620 lx, the average *light source efficacy* must not be less than 80 Lumens/W.
3.	For enclosed spaces with a Room Aspect Ratio of less than 1.5, the maximum *illumination power density* may be increased by dividing it by an adjustment factor for room aspect which is:
	0.5 + (Room Aspect Ratio/3)
	The Room Aspect Ratio of the enclosed space is determined by the formula:
	A/(H x C)
	Where:
	A is the area of the enclosed space
	H is the height of the space measured from the floor to the highest part of the ceiling
	C is the perimeter of the enclosed space at floor level
4.	In addition to 3, the maximum *illumination power density* may be increased by dividing it by the *illumination power density* adjustment factor in Table J6.2b where applicable.
5.	Circulation spaces are included in the allowances listed in the Table.

Table J6.2b ILLUMINATION POWER DENSITY ADJUSTMENT FACTOR FOR A CONTROL DEVICE

Item	Description	*Illumination power density* adjustment factor
Lighting timer in accordance with Specification J6	For corridor lighting	0.7
Motion detector in accordance with Specification J6	(a) Where—	0.9
	(i) at least 75% of the area of a space is controlled by one or more motion detectors; or	
	(iii) 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 up to 2 lights are switched as a block by one or more detectors.	0.55
Manual dimming system (Note 1)	(a) Where at least 75% of the area of a space, in other than a *sole-occupancy unit* of a Class 2 building or a Class 4 part, is controlled by manually operated dimmers.	0.95
	(b) Where at least 75% of the area of a space, in a *sole-occupancy unit* of a Class 2 building or a Class 4 part, is controlled by manually operated dimmers.	0.85
Programmable dimming system (Note 2)	Where at least 75% of the area of a space is controlled by programmable dimmers.	0.85

J6.2 Artificial lighting (contd.)

Dynamic dimming system (Note 3)	Automatic compensation for lumen depreciation.	The design lumen depreciation factor of not less than—	
		(i)	for fluorescent lights, 0.9; or
		(ii)	for high pressure discharge lights, 0.8.
Fixed dimming (Note 4)	Where at least 75% of the 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 divided by 0.95.	
Daylight sensor and dynamic lighting control device in accordance with Specification J6 –	(a) Lights within the space adjacent to *windows* other than *roof lights* for a distance from the *window*		
dimmed or stepped switching of lights adjacent *windows*	equal to the depth of the floor to window head height.	0.5 (Note 5)	
	(b) Lights within the space adjacent to *roof lights*.	0.6 (Note 5)	

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.	A maximum of two other *illumination power density* adjustment factors for a control device can be applied to an area. Where more than one *illumination power density* adjustment factor (other than for room aspect) apply to an area, they are to be combined using the following formula:
	A x (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.

J6.3 Interior artificial lighting and power control

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

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

Final lighting designs will be designed to satisfy these lighting requirements.

Note Class 2 does not adhere to these requirements since it is assessed in BASIX.

J6.3 Interior artificial lighting and power control (contd.)	(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) for other than a single functional space such as an auditorium, theatre, swimming pool, sporting stadium or warehouse— (A) not operate lighting for an area of more than 250 m2 if in a Class 5 building or a Class 8 laboratory; or (B) not operate lighting for an area of more than— (aa) 250 m2 for a space of not more than 2000 m2; or (bb) 1000 m2 for a space of more than 2000 m2, if in a Class 3, 6, 7, 8 (other than a laboratory) or 9 building. (d) 95% of the 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 m2 must be controlled by— (i) a time switch in accordance with Specification J6; or (ii) an occupant sensing device such as— (A) a security key card reader; or (B) a motion detector in accordance with Specification J6. (e) Artificial lighting in a natural lighting zone adjacent to windows in a storey of a Class 5, 6 or 8 building, of more than 250 m2 must be separately controlled from artificial lighting not in a natural lighting zone except where— (i) the room containing the natural lighting zone is less than 20 m2; or (ii) the room's natural lighting zone contains less than 4 luminaires; or (iii) the luminaires in the natural lighting zone are ≤70% of the luminaires in the room. (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, parts of a hospital, an airport control tower or within a detention centre. (g) The requirements of (d) do not apply to the following: (i) Artificial lighting in a space where the sudden loss of artificial lighting would cause an unsafe situation such as in a patient care area in a Class 9a or Class 9c building. (ii) A heater where the heater also emits light, such as in bathrooms.	

J6.4 Interior decorative and display lighting	(a) Interior decorative and display lighting, such as for a foyer mural or art display, must be controlled— (i) separately from other artificial lighting; and (ii) by a manual switch for each area other than when the operating times of the displays are the same in a number of areas such as in a museum, art gallery or the like, in which case they may be combined; and (iii) by a time switch in accordance with Specification J6 where the display lighting exceeds 1 kW. (b) Window display lighting must be controlled separately from other display lighting.	Final lighting designs will be designed to satisfy these lighting requirements. Note Class 2 does not adhere to these requirements since it is assessed in BASIX.
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; and (iii) when used for decorative purposes, such as facade lighting or signage lighting, have a separate time switch in accordance with Specification J6. (b) The requirements of (a)(ii) do not apply to the following: (i) Emergency lighting in accordance with Part E4. (ii) Lighting around a detention centre.	Final lighting designs will be designed to satisfy these lighting requirements. Note Class 2 does not adhere to these requirements since it is assessed in BASIX.
J6.6 Boiling water and chilled water storage units	Power supply to a boiling water or chilled water storage unit must be controlled by a time switch in accordance with Specification J6.	Services will be designed to satisfy these requirements.

	Part J7 - Hot water supply and swimming pool and spa pool plant	
J7.1	Blank	
J7.2 **Hot water supply**	A hot water supply system for food preparation and sanitary purposes, other than a solar hot water supply system in climate zones 1, 2 and 3, must be designed and installed in accordance with Section 8 of AS/NZS 3500.4.	This will be met with final equipment selection. Note this applies to Class 2 as well.
J7.3 **Swimming pool heating and pumping**	(a) Heating for a swimming pool must be by— (i) a solar heater not boosted by electric resistance heating; or (ii) a heater using reclaimed energy; or (iii) a gas heater; or (iv) a heat pump; or (v) a combination of 2 or more of (i), (ii), (iii) and (iv). (b) Where some or all of the heating required by (a) is by a gas heater or a heat pump, the swimming pool must have— (i) a cover other than when located in a conditioned space; and (ii) a time switch in accordance with Specification J6 to control the operation of the heater. (c) A time switch must be provided in accordance with Specification J6 to control the operation of a circulation pump for a swimming pool. (d) For the purpose of J7.3, a swimming pool does not include a spa pool.	This is satisfied by the proposed systems. Pool heating will be gas-boosted solar. The pool must also have: (i) a cover (since not located in a conditioned space); and (ii) a time switch in accordance with Specification J6 to control the operation of the heater (see Appendix H). (c) A time switch must be provided in accordance with Specification J6 to control the operation of a circulation pump for a swimming pool (see Appendix H).
J7.4 **Spa pool heating and pumping**	(a) Heating for a spa pool having a capacity of 680 L or more must be by— (i) a solar heater; or (ii) a heater using reclaimed energy; or (iii) a gas heater; or (iv) a heat pump; or (v) a combination of 2 or more of (i), (ii), (iii) and (iv). (b) Where some or all of the heating required by (a) is by a gas heater or a heat pump, the spa pool must have— (i) a cover; and (ii) a push button and a time switch in accordance with Specification J6 to control the operation of the heater. (c) A time switch must be provided in accordance with Specification J6 to control the operation of a circulation pump for a spa pool having a capacity of 680 L or more.	N/A since no spa.

	Part J8 - Access for Maintenance and Facilities for Monitoring	
J8.1 Application of Part	The Deemed-to-Satisfy Provisions of this Part do not apply within a sole-occupancy unit of a Class 2 building or a Class 4 part of a building.	N/A for dwellings themselves.
NSW J8.2 Access for maintenance	Access for maintenance must be provided to— (a) adjustable or motorised shading devices; and (b) time switches and motion detectors; and (c) room temperature thermostats; and (d) plant thermostats such as on boilers or refrigeration units; and (e) motorised air dampers and control valves; and (f) reflectors, lenses and diffusers of light fittings; and (g) heat transfer equipment; and (h) plant that receives a concession under JV3(b) for the use of energy obtained from— (i) a source that is renewable on-site such as solar, geothermal or wind; or (ii) another process as reclaimed energy.	This will be met with final equipment selection and placement.
J8.3 Facilities for energy monitoring	(a) A building or sole-occupancy unit with a floor area of more than 500 m2 must have the facility to record the consumption of gas and electricity. (b) A building with a floor area of more than 2,500 m2 must have the facility to record individually the energy consumption of— (i) air-conditioning plant including, where appropriate, heating plant, cooling plant and air handling fans; and (ii) artificial lighting; and (iii) appliance power; and (iv) central hot water supply; and (v) internal transport devices including lifts, escalators and travelators where there is more than one serving the building; and (vi) other ancillary plant. (c) The provisions of (b) do not apply to a Class 2 building with a floor area of more than 2,500 m2 where the total area of the common areas is less than 500 m2.	This will be met with final equipment selection and placement. Note this does not apply to Class 2 so the only buildings over 500m2 are the Gym/Pool and the Retails Areas in Building D and Building E.

Appendix A – GLAZING CALCULATORS

Report from RETAIL NE3 glazing_calculator_bca2010_v1_v2-00 *printed 22/11/2010*

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010)

Building name/description: **Retail - Building A**

Application: **shop display**

Climate zone: **5**

Storey: **1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A			35.2m²		53.1m²		35.2m²		
Option B									n/a
Glazing area (A)			35.2m²		53.1m²		35.2m²		

Number of rows preferred in table below: **6** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1		E		3.20	9.40		3.2	0.42	4.400	3.20	1.38	0.00	0.05	0.34	30.08	82% of 74%
2		E		3.20	1.60		3.2	0.42	2.800	3.20	0.88	0.00	0.35	0.46	5.12	18% of 74%
3		S		3.20	16.60		3.2	0.42	2.800	3.20	0.88	0.00	0.76	0.67	53.12	100% of 74%
4		W		3.20	8.00		3.2	0.42	5.800	3.20	1.81	0.00	0.04	0.29	25.60	68% of 82%
5		W		3.20	3.00		3.2	0.42	2.800	3.20	0.88	0.00	0.44	0.48	9.60	32% of 82%
6																

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Report from RETAIL EAST glazing_calculator_bca2010_v1_v2-00 *printed 22/11/2010*

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010)

Building name/description: **Retail - Building D**

Application: **shop display**

Climate zone: **5**

Storey: **1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A		22.4m²	99.8m²			34.2m²		98.2m²	
Option B									n/a
Glazing area (A)		*16.6m²*	*99.8m²*			*33.9m²*		*98.2m²*	

Number of rows preferred in table below: **9** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1		E		3.20	26.20		3.2	0.42	6.000	3.20	1.88	0.00	0.01	0.26	83.84	73% of 65%
2		E		3.20	5.00		3.2	0.42	2.000	3.20	0.63	0.00	0.61	0.58	16.00	27% of 65%
3		NE		3.20	5.20		3.2	0.42	1.600	3.20	0.50	0.00	0.74	0.61	16.64	100% of 98%
4		NW		3.20	1.40		3.2	0.42	1.600	3.20	0.50	0.00	0.78	0.60	4.48	9% of 53%
5		NW		3.20	15.00		3.2	0.42	3.000	3.20	0.94	0.00	0.25	0.37	48.00	60% of 53%
6		NW		3.20	14.30		3.2	0.42	7.200	3.20	2.25	0.00	0.00	0.21	45.76	31% of 53%
7		SW		3.20	4.30		3.2	0.42	3.000	3.20	0.94	0.00	0.62	0.52	13.76	39% of 79%
8		SW		3.20	6.30		3.2	0.42	2.200	3.20	0.69	0.00	0.71	0.61	20.16	61% of 79%
9																

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Report from RETAIL SOUTH glazing_calculator_bca2010_v1_v2-00 *printed 22/11/2010*

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010)

Building name/description: **Retail - Building E**

Application: **shop display**

Climate zone: **5**

Storey: **1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	151m²		28.1m²				28.1m²		
Option B									n/a
Glazing area (A)	*151m²*	.....	*20.3m²*	.....			*20.3m²*		

Number of rows preferred in table below: **5** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance			P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)		P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1		N		3.90	36.20		3.2	0.42		5.000	3.40	1.47	-0.50	0.00	0.21	141.18	87% of 29%
2		N		3.90	2.40		3.2	0.42		2.600	3.40	0.76	-0.50	0.36	0.37	9.36	13% of 29%
3		E		3.90	5.20		3.2	0.42		5.900	3.40	1.74	-0.50	0.01	0.28	20.28	100% of 44%
4		W		3.90	5.20		3.2	0.42		2.600	3.40	0.76	-0.50	0.53	0.53	20.28	100% of 71%

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Report from POOL-GYM2 glazing_calculator_bca2010_v1_v2-00 *printed 22/11/2010*

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010)

Building name/description: **Gymnasium**

Application: **other**

Climate zone: **5**

Storey: **1**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A		89.4m²		20m²				20m²	
Option B									n/a
Glazing area (A)		*37.5m²*		*13.8m²*				*7.02m²*	

Number of rows preferred in table below: **4** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1		NE		2.70	13.90		3.2	0.42	2.300	2.70	0.85	0.00	0.32	0.40	37.53	100% of 52%
2		SE		2.70	5.10		3.2	0.42	1.700	2.70	0.63	0.00	0.68	0.60	13.77	100% of 92%
3		NW		2.70	2.60		3.2	0.42	2.700	2.70	1.00	0.00	0.15	0.34	7.02	100% of 32%

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if inputs are valid

Appendix B – SPECIFICATION J1.2 - MATERIAL PROPERTIES

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
(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.		

(b) Table 2b lists the *R-Values* considered to be achieved by air films and airspaces.

Position of airspace	Direction of heat flow	R-Value
1.	**Airspaces non-reflective unventilated**	
In a roof with a pitch of not more than 5^0	Up	0.15
	Down	0.22
In a roof with a ceiling that is parallel with a roof with a pitch more than 5° and not more than 15°	Up	0.15
	Down	0.21
In a roof with a ceiling that is parallel with a roof with a pitch more than 22° and not more than 45°	Up	0.15
	Down	0.18
In any roof space with a horizontal ceiling, with a pitch more than 5°	Up	0.18
	Down	0.28
In a wall	Horizontal	0.17
2.	**Airspaces non-reflective ventilated**	
In any roof with a pitch not more than 5° and 100 mm deep airspace	Up	Nil
	Down	0.19
In any roof space with a horizontal ceiling, with a pitch more than 5°	Up	Nil
	Down	0.46
In a wall	Horizontal	0.14
3.	**Air films – Still air**	
On a surface with a pitch of not more than 5°	Up	0.11
	Down	0.16
On a surface with a pitch of more than 5° and not more than 30°	Up	0.11
	Down	0.15
On a surface with a pitch of more than 30° and not more than 45°	Up	0.11
	Down	0.13
On a wall	Horizontal	0.12
4.	**Air films – Moving air**	
Not more than 3 m/s wind	Any direction	0.04
More than 3 m/s wind speed and not more than 7 m/s wind speed	Any direction	0.03
Note: *R-Values* are for a temperature of 10°C and temperature difference of 15K.		

The thermal properties considered to be achieved by reflective surfaces are—

(i) within a wall—

(A) with an inner reflective surface of 0.05 emittance and a 20 mm airspace to the wall lining, an added *R-Value* of 0.48; and

(B) with an inner reflective surface of 0.05 emittance and a 70 mm airspace to the wall lining, an added *R-Value* of 0.43; and

(C) with an inner reflective surface of 0.05 emittance and a 70 mm airspace to the wall lining and an outer anti-glare reflective surface of 0.20 emittance and a 25 mm airspace to the wall cladding, an added *R-Value* of 0.95; and

(D) with an outer anti-glare reflective surface of 0.20 emittance and a 35 mm airspace to the wall cladding, an added *R-Value* of 0.50; and

(ii) within a roof where the *reflective insulation* is laid directly under the roof, those in Table 2c.

Table 2c TYPICAL THERMAL PROPERTIES FOR REFLECTIVE SURFACES WITH AIRSPACES IN ROOFS

Emittance of added *reflective insulation*	**Direction of heat flow**	***R-Value* added by a reflective surface**					
		Pitched roof (>10°) with horizontal ceiling		**Flat, skillion or pitched roof (≤10°) with horizontal ceiling**	**Pitched r of w th cathedral ceiling**		
		Ventilated roof space	**Non-ventilated roof space**		**15° to not more than 25° pitch**	**more than 25° to not more than 35° pitch**	**mor than 35° to 45° pitch**
0. outer 0.05 inner	Downwards	1.21	1.12	1.28	0.96	0.86	0.66
0.2 outer 0.05 inner	Upwards	0.59	0.75	0.68	0.72	0.74	0.77
0.9 outer 0.05 inner	Downwards	1.01	0.92	1.06	0.74	0.64	0.44
0.9 outer 0.05 inner	Upward	0.40	0.55	0.49	0.51	0.52	0.53

(d) A ventilated roof space is a roof space with—

(i) gable vents, ridge vents, eave vents, roof vents or the like that—

(A) are evenly distributed to allow an unobstructed flow of air; and

(B) are located to ensure, where practicable, there are no dead airspaces; and

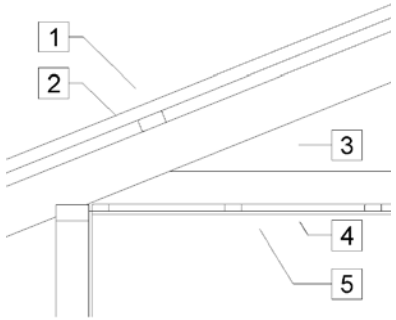
(C) have an aggregate fixed open area of not less than 1.0% of the ceiling area; or

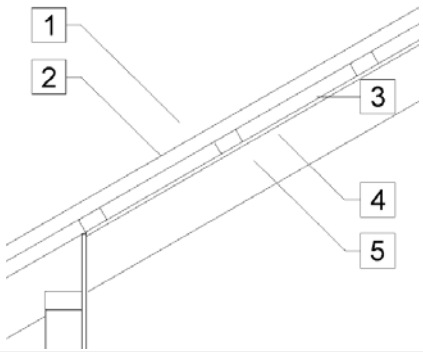
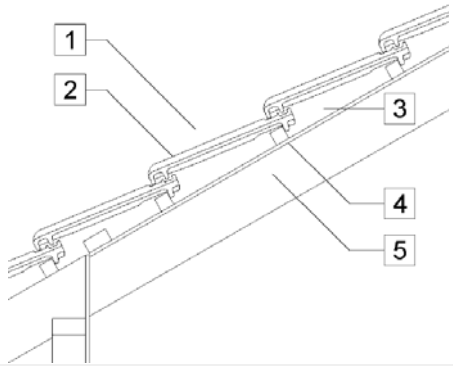
(ii) not less than 2 wind-driven roof ventilators having an aggregate opening area of not less than 0.14 m^2 in conjunction with gable vents, ridge vents, eave vents, roof vents or the like having an aggregate fixed open area of not less than 0.2% of the ceiling area; or

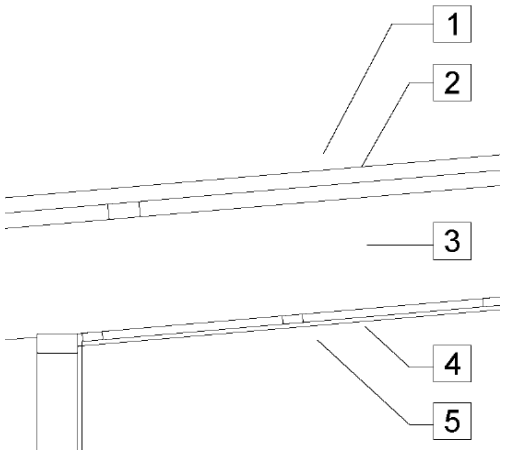
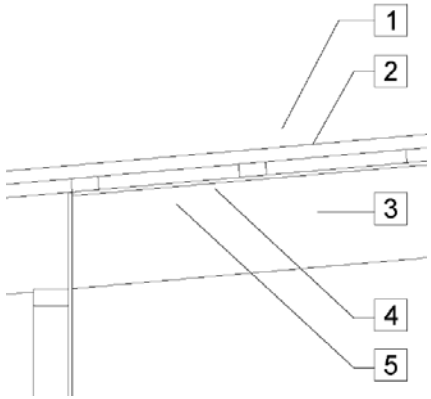
(iii) a tiled roof without *sarking-type material* at roof level.

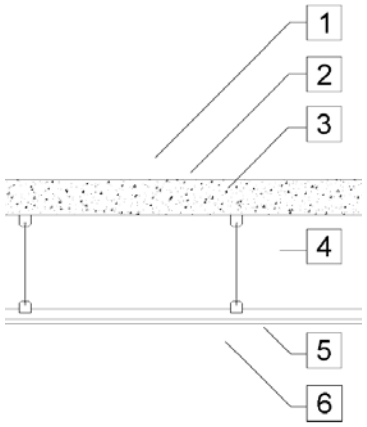
Appendix C – SPECIFICATION J1.3 - ROOF AND CEILING CONSTRUCTION

Figure 2 TYPICAL R-VALUES FOR ROOF AND CEILING CONSTRUCTION

Roof construction description	Item	Item description	R-Value Unventilated		R-Value Ventilated	
			Up	Down	Up	Down
(a) Roof 22° to 45° pitch – Horizontal ceiling – Metal cladding	1.	Outdoor air film (7m/s)	0.04	0.04	0.04	0.04
	2.	Metal cladding	0.00	0.00	0.00	0.00
	3.	Roof airspace (non-reflective)	0.18	0.28	0.00	0.46
	4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06	0.06	0.06
	5.	Indoor air film (still air)	0.11	0.16	0.11	0.16
		Total R-Value	0.39	0.54	0.21	0.72
(b) Roof 22° to 45° pitch – Horizontal ceiling – Clay tiles 19 mm	1.	Outdoor air film (7m/s)	0.04	0.04	0.04	0.04
	2.	Roof tile, clay or concrete (1922 kg/m^3)	0.02	0.02	0.02	0.02
	3.	Roof airspace (non-reflective)	0.18	0.28	0.00	0.46
	4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06	0.06	0.06
	5.	Indoor air film (still air)	0.11	0.16	0.11	0.16
		Total R-Value	0.41	0.56	0.23	0.74

Roof construction description		Item	Item description	R-Value Unventilated	
				Up	Down
(c)	Cathedral ceiling 22° to 45° pitch	1.	Outdoor air film (7m/s)	0.04	0.04
	– 10 mm plaster on top of rafters				
	– Metal external cladding	2.	Metal cladding	0.00	0.00
		3.	Roof airspace (30 mm to 100 mm, non-reflective)	0.15	0.18
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		5.	Indoor air film (still air)	0.11	0.14
			Total R-Value	0.36	0.42
(d)	Cathedral ceiling 22° to 45° pitch	1.	Outdoor air film (7m/s)	0.04	0.04
	– 10 mm plaster on top of rafters				
	– Tiles external cladding	2.	Roof tile, clay or concrete (1922 kg/m^3)	0.02	0.02
		3.	Roof airspace (30 mm to 100 mm, non-reflective)	0.15	0.18
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		5.	Indoor air film (still air)	0.11	0.14
			Total R-Value	0.38	0.44

(e)	Skillion roof less than 5° pitch – 10 mm plaster below rafters – Metal external cladding	**1.**	Outdoor air film (7m/s)	0.04	0.04
		**2.**	Metal cladding	0.00	0.00
		3.	Roof airspace (100 mm to 300 mm, non-reflective)	0.15	0.22
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		5.	Indoor air film (still air)	0.11	0.16
			Total R-Value	0.36	0.48
(f)	Skillion roof 5° to 15° pitch – 10 mm plaster on top of rafters – Metal external cladding	**1.**	Outdoor air film (7m/s)	0.04	0.04
		**2.**	Metal cladding	0.00	0.00
		3.	Roof airspace (30 mm to 100 mm non-reflective)	0.15	0.21
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		5.	Indoor air film (still air)	0.11	0.16
			Total R-Value	0.36	0.47

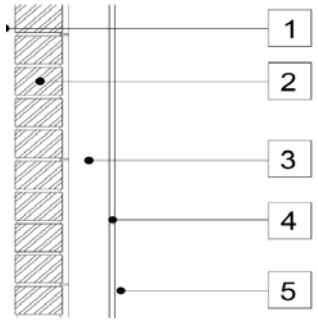
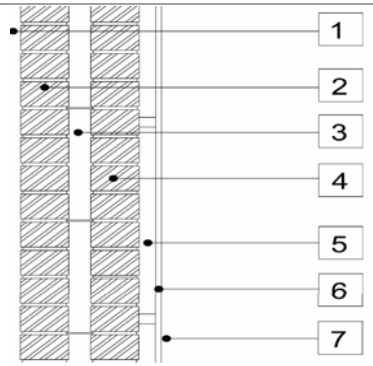
(g)	100 mm solid concrete roof to 5° – 10 mm plaster, suspended ceiling – Applied external waterproof membrane	**1.**	Outdoor air film (7m/s)	0.04	0.04
		2.	Waterproof membrane, rubber synthetic (4 mm, 961 kg/m^3)	0.03	0.03
		**3.**	Solid concrete, (100 mm, 2400 kg/m^3)	0.07	0.07
		4.	Ceiling airspace (100 mm to 300 mm, non-reflective)	0.15	0.22
		5.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		6.	Indoor air film (still air)	0.11	0.16
			Total R-Value	0.46	0.58

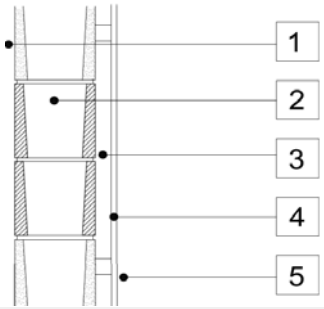
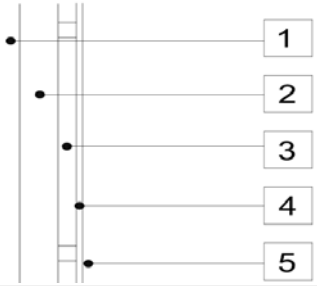
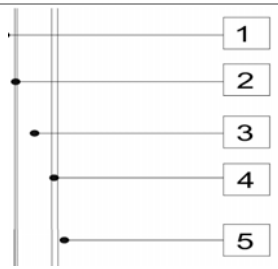
Notes:

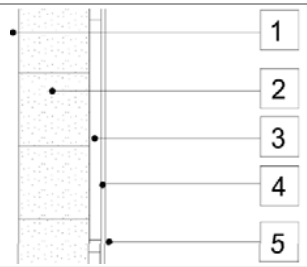
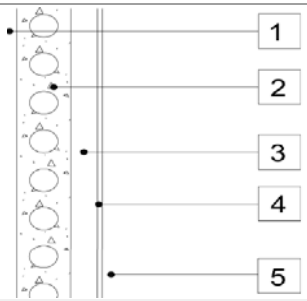
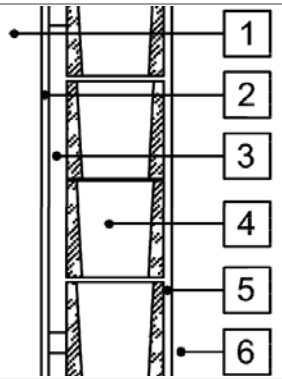
1.	The *R-Value* of an item, other than an airspace, air film or air cavity, may be increased in proportion to the increased thickness of the item.
2.	The *Total R-Value* of a form of construction may be increased by the amount that the *R-Value* of an individual item is increased.
3.	Where an airspace is filled, the *R-Value* listed for the airspace must be deducted from the *Total R-Value* of the roof construction.
4.	For information on a roof space that is considered to be ventilated, see Specification J1.2, Clause 2(d).

Appendix D – SPECIFICATION J1.5 – WALL CONSTRUCTION

Figure 2 TYPICAL R-VALUES FOR WALL CONSTRUCTION

External wall construction description		Item	Item description	R-Value
(a)	Masonry veneer – 25 mm to 50 mm cavity, 10 mm internal plaster on 90 mm stud frame	1.	Outdoor air film (7m/s)	0.04
		2.	Masonry (See notes 3 and 4)	0.09
		3.	Cavity and airspace (115 to 140 mm, made up of 90 mm stud + 25 mm to 50 mm airspace non-reflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	0.48
(b)	Cavity masonry – 20 mm to 50 mm cavity, 10 mm internal plaster on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	Masonry (See notes 3 and 4)	0.09
		3.	Masonry cavity (20 mm to 50 mm, non-reflective and unventilated)	0.17
		4.	Masonry (See note 4)	0.09
		5.	Airspace (20 mm to 35 mm, non-reflective and unventilated)	0.17
		6.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		7.	Indoor air film (still air)	0.12
			Total R-Value	0.74

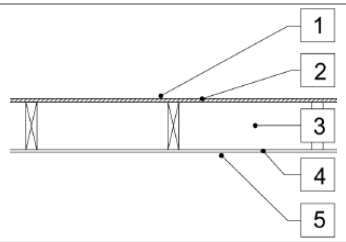
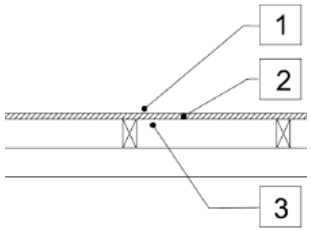
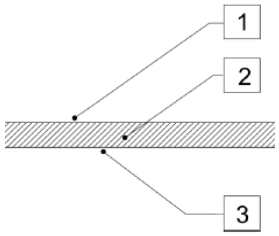
(c)	Denseweight hollow concrete block with internal plaster on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	Denseweight hollow concrete block (See notes 3 and 4)	0.15
		3.	Airspace (20 mm to 40 mm non-reflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	0.54
(d)	125 mm solid reinforced concrete (dense weight) – 10 mm internal plaster on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	125 mm minimum solid reinforced concrete (See note 3)	0.09
		3.	Airspace (20 mm to 40 mm non-reflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	0.48
(e)	Timber wall – external 6 mm cement sheet cladding, 90 mm stud frame, 10 mm plaster	1.	Outdoor air film (7m/s)	0.04
		2.	Fibre cement (6 mm, 1360 kg/m^3)	0.03
		3.	Airspace (90 mm nonreflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	0.42

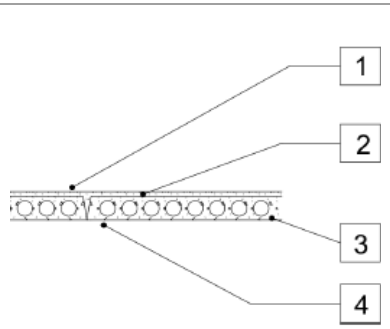
(f)	200 mm autoclaved aerated concrete block – 10 mm internal plaster on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	Autoclaved aerated concrete block (200 mm, 350 kg/m^3)	2.00
		3.	Airspace (20 mm to 40 mm non-reflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	2.39
(g)	150 mm hollow-core concrete panels – 10 mm internal plaster on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	Prestressed hollow-core concrete panels (150 mm, 1,680 kg/m^3, 30% cores)	0.14
		3.	Airspace (20 mm to 40 mm non-reflective and unventilated)	0.17
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06
		5.	Indoor air film (still air)	0.12
			Total R-Value	0.53
(h)	Denseweight hollow concrete block with external 6 mm cement sheet cladding on battens or furring channels	1.	Outdoor air film (7m/s)	0.04
		2.	Fibre cement (6 mm, 1360 kg/m^3)	0.03
		3.	Airspace (20 mm to 40 mm non-reflective and unventilated)	0.17
		4.	Denseweight hollow concrete block (See note 4)	0.15
		5.	10 mm render	0.02
		6.	Indoor air film (still air)	0.12
		Total R-Value		0.53

Notes:					
1.	The *R-Value* of an item, other than an airspace, air film or air cavity, may be increased in proportion to the increased thickness of the item.				
2.	The *Total R-Value* of a form of construction may be increased by the amount that an individual item is increased.				
3.	The addition of 10 mm of render to a concrete or masonry wall will increase the *Total R-Value* by 0.02.				
4.	(a)	The typical *R-Value* in Figure 2(a) and (b) is for 90 mm denseweight concrete block.			
	(b)	The typical *R-Value* in Figure 2(c) and (h) is for 140 mm denseweight hollow concrete block.			
	(c)	The typical *R-Value* in Figure 2(d) is for 125 mm solid reinforced concrete (2400 kg/m^3).			
	(d)	Other typical *R-Values* for masonry and concrete are as follows and may be substituted for those above:			
		90 mm clay brick:			
			(density 1430 kg/m^3)	0.16	
			(density 1690 kg/m^3)	0.14	
			(density 1950 kg/m^3)	0.12	
		110 mm clay brick:			
			(density 1430 kg/m^3, 2.75 kg/brick)	0.20	
			(density 1690 kg/m^3, 3.25 kg/brick)	0.17	
			(density 1950 kg/m^3, 3.75 kg/brick)	0.14	
		Denseweight hollow concrete block:			
			110 mm	0.12	
			190 mm	0.20	
5.	The *Total R-Values* in this Figure are for *external walls*. The *Total R-Value* for an internal wall of the same construction would be 0.09 greater because the *R-Value* for an outdoor air film would be replaced by that of an indoor air film.				
6.	Where a cavity or airspace is filled, the *R-Value* listed for the cavity must be deducted from the *Total R-Value* of the wall.				

Appendix E – SPECIFICATION J1.6 – FLOOR CONSTRUCTION

Figure 2 TYPICAL R-VALUES FOR FLOOR CONSTRUCTION (for a floor without a floor heating system)

Floor construction description		Item	Item description	R-Value	
				Up	Down
(a)	Timber internal floor, 10 mm internal plaster	1.	Indoor air film (still air)	0.11	0.16
		2.	Particleboard flooring (19 mm, 640 kg/m^3)	0.15	0.15
		3.	Floor airspace, 100 mm to 300 mm (non reflective)	0.15	0.22
		4.	Plasterboard, gypsum (10 mm, 880 kg/m^3)	0.06	0.06
		5.	Indoor air film (still air)	0.11	0.16
			Total R-Value	0.58	0.75
(b)	Timber, suspended ground floor, open sub-floor	1.	Indoor air film (still air)	0.11	0.16
		2.	Particleboard flooring (19 mm, 640 kg/m^3)	0.15	0.15
		3.	Outdoor air film (7m/s)	0.04	0.04
			Total R-Value	0.30	0.35
(c)	Solid concrete suspended slab, ground floor	1.	Indoor air film (still air)	0.11	0.16
		2.	Solid concrete (150 mm, 2400 kg/m^3)	0.10	0.10
		3.	Outdoor air film (7m/s)	0.04	0.04
			Total R-Value	0.25	0.30

(d)	150 mm hollow-core concrete planks, ground floor	1.	Indoor air film (still air)	0.11	0.16
		2.	Concrete topping (60 mm, 2,400 kg/m^3)	0.04	0.04
		3.	Hollow-core concrete planks (150 mm, 1,680 kg/m^3, 30% cores)	0.14	0.14
		4.	Outdoor air film (7m/s)	0.04	0.04
			Total R-Value	0.33	0.38

Notes:

1.	The *R-Value* of an item, other than an airspace, air film or air cavity, may be increased in proportion to the increased thickness of the item.
2.	The *Total R-Value* of a form of construction may be increased by the amount that an individual item is increased.
3.	For floor types (c) and (d) that are located over an internal space, the *Total R-Value* can be calculated by replacing the value for outdoor air film (R0.04) on the underside of the floor with the value for indoor air film (R0.11 for heat flow up or R0.16 for heat flow down).
4.	For floor types (b), (c) and (d) located over ground with an enclosed perimeter, the *Total R-Value* can be calculated by replacing the value for outdoor air film (R0.04) on the underside of the floor with the value for indoor air film plus ground thermal resistance (i.e. R0.11+R0.56=R0.67 for heat flow up, or R0.16+R0.58=R0.74 for heat flow down).
5.	Where reflective building membrane is attached beneath the floor with a 100 mm reflective airspace, add R0.38 for heat flow up and R1.14 for heat flow down.
6.	Where ground floor construction with an enclosed perimeter makes the airspace adjacent to the ground reflective, the face down sub-floor air films will be R0.23 instead of R0.11 for heat flow up, and R0.80 instead of R0.16 for heat flow down.
7.	The addition of 10 mm of render to the ceiling of a suspended internal concrete floor will increase the *Total R-Value* by 0.02.
8.	Solid concrete slab includes concrete beam and infill floors and concrete precast permanent formwork panels.
9.	Where an airspace is filled, the *R-Value* listed for the airspace must be deducted from the *Total R-Value* of the floor construction.

Appendix F – SPECIFICATION J5.2 - DUCTWORK INSULATION AND SEALING

1. Scope -
This Specification contains the requirements for the sealing and the insulating of supply and return ductwork used in a system that heats or cools a building.

2. Ductwork sealing

(a) Heating or cooling ductwork and fittings must be sealed against air loss—

(i) by closing all openings in the surface, joints and seams of ductwork with adhesives, mastics, sealants or gaskets in accordance with the duct sealing requirements of AS 4254 for the static pressure in the system; or

(ii) for flexible ductwork at an operating static pressure of less than 500 Pa, with a draw band in conjunction with a sealant or adhesive tape.

(b) The requirements of (a) do not apply to ductwork and fittings located within the only or last room that is served by the system.

3. Ductwork insulation

(a) Insulation must be provided on ductwork and fittings, used for heating or cooling, including evaporative cooling, with insulation complying with AS/NZS 4859.1 and—

(i) achieve the material *R-Value* specified in Table 3; or

(ii) for flexible ductwork of no more than 3 m in length to an outlet or from an inlet, achieve a minimum material *R-Value* of 1.0.

(b) Insulation on ductwork conveying cold air must be protected by—

(i) a vapour barrier on the outside of the insulation; and

(ii) where the vapour barrier is a membrane, overlapping adjoining sheets of the membrane by 50 mm and bonding or taping the sheets together.

(c) Ductwork insulation must—

(i) be protected against the effects of weather and sunlight; and

(ii) abut adjoining insulation to form a continuous barrier; and

(iii) be installed so that it maintains its position and thickness, other than at flanges and supports.

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

(i) heating and cooling ductwork and fittings located within the only or last room that is served by the system; and

(ii) air registers, diffusers, outlets, grilles and flexible fan connections; and

(iii) return air ductwork in, or passing through, a *conditioned space*; and

(iv) ductwork for outside air and exhaust air associated with a heating or cooling system; and

(v) the floor of an in-situ air-handling unit; and

(vi) packaged air-conditioning equipment complying with Minimum Energy Performance Standard (MEPS).

Table 3 DUCTWORK AND FITTINGS - MINIMUM MATERIAL R-VALUE

Location of ductwork and fittings	**Minimum material *R-Value* for ductwork and fittings in each *climate zone***		
	1, 2, 3 and 5	**4, 6 and 7**	**8**
Within a *conditioned space*	1.2	1.0	1.6
Where exposed to direct sunlight	3.0	3.0	3.4
All other locations	2.0	2.0	2.4

Appendix G – SPECIFICATION J5.4 - INSULATING OF PIPING, VESSELS, HEAT EXCHANGERS AND TANKS

1. Scope

(a) This Specification contains the requirements for the insulating of *piping*, vessels, heat exchangers and tanks containing heating fluids or cooling fluids.

(b) For the purposes of this Specification—

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

(ii) cooling fluids include refrigerant, chilled water and brines and glycol mixtures, but not condenser cooling water to or from a cooling tower.

2. Insulation

(a) Insulation provided on piping, vessels, heat exchangers and tanks must comply with AS/NZS 4859.1 and—

(i) be protected against the effects of weather and sunlight; and

(ii) be able to withstand the temperatures within the *piping*, vessel, heat exchanger or tank; and

(iii) for—

(A) heating water and cooling water *piping*, achieve the material *R-Value* in Table 2a; and

(B) refrigerant, steam and condensate *piping*, achieve the material *R-Value* in Table 2b; and

(iv) for vessels, heat exchangers and tanks, achieve a minimum material *R-Value* of—

(A) 2.7 if the content is refrigerant, low temperature brine or glycol that is not more than 2°C; or

(B) 1.8 if the content is refrigerant cooling water that is more than 2°C but not more than 20°C; or

(C) 1.4 if the content is heating water; or

(D) 2.5 if the content is steam.

(b) Insulation on *piping*, vessels, heat exchangers and tanks containing chilled fluid must be protected by a vapour barrier on the outside of the insulation.

(c) The requirements of (a) do not apply to *piping*—

(i) located within the *conditioned space* where the *piping*, and fittings which provide heating and cooling to that space are located within the last or only room that is served by the system; or

(ii) encased within a concrete slab or panel which is part of a heating or cooling system; or

(iii) supplied as an integral part of a piece of plant; or

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

Table 2a WATER PIPING - MINIMUM MATERIAL R-VALUE

Location			Minimum material *R-Value* for each *climate zone*		
			1, 2, 3 and 5	4, 6 and 7	8
1.	**Heating water *piping* for systems of not more than 65 $kW_{heating}$ capacity**				
	(a)	Located internally	1.0	1.0	1.3
	(b)	Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.1	1.1	1.4
	(c)	Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.2	1.2	1.5
2.	**Heating water *piping* for systems of more than 65 $kW_{heating}$ capacity**				
	(a)	Located internally	1.0	1.0	1.7
	(b)	Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.1	1.1	1.8
	(c)	Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.2	1.5	1.9
3.	**Cooling water *piping* for systems of not more than 65 kW_r capacity**				
	(a)	Located internally	1.0	0.6	0.6
	(b)	Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.1	0.7	0.7
	(c)	Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.2	0.8	0.8
4.	**Cooling water *piping* for systems of more than 65 kW_r capacity but not more than 250 kW_r capacity**				
	(a)	Located internally	1.7	1.3	1.0
	(b)	Located within a wall space, an enclosed sub-floor area or an enclosed roof space	1.8	1.4	1.1
	(c)	Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	1.9	1.5	1.2
5.	**Cooling water *piping* for systems of more than 250 kW_r capacity**				
	(a)	Located internally	2.0	1.7	1.3
	(b)	Located within a wall space, an enclosed sub-floor area or an enclosed roof space	2.1	1.8	1.4

	(c)	Located outside the building or in an unenclosed sub-floor area or an unenclosed roof space	2.2	1.9	1.5

Note:

1. *Piping* to be insulated includes all flow and return *piping*, cold water supply *piping* within 500 mm of the connection to the heating or cooling system and pressure relief *piping* within 500 mm of the connection to the heating or cooling system.
2. For *piping* diameters of not more than 32 mm, the insulation material *R-Value* may be halved for the last 750 mm adjoining items of plant.
3. For *piping* penetrating a structural member, the insulation material *R-Value* may be halved.

Table 2b REFRIGERANT, STEAM AND CONDENSATE PIPING— MINIMUM MATERIAL R-VALUE

Temperature range	**Nominal pipe size**				
	15 mm to 40 mm	**50 mm to 80 mm**	**100 mm to 125 mm**	**150 mm**	**200 mm**
Refrigerant not more than 2°C	1.3	1.7	2.0	2.0	2.7
Refrigerant more than 2°C but not more than 20°C	As for cooling water in Table 2a				
Steam and condensate not more than 120°C	1.0	1.0	1.3	1.3	1.3
Steam more than 120°C	1.5	1.5	1.5	1.8	2.1

Appendix H – 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) A time switch must be capable of switching on and off electric power at variable pre-programmed times and on variable pre-programmed days.

(b) A time switch for internal lighting must be capable of being overridden by—

(i) a means of turning the lights on, either by—

(A) a manual switch or an occupant sensing device that on sensing a person's presence, overrides the time switch for a period of up to 2 hours, after which there is no further presence detected, the time switch must resume control; or

(B) an occupant sensing device that overrides the time switch upon a person's entry and returns control to the time switch upon the person's exiting, such as a security card reader; and

(ii) a manual "off" switch.

(c) A time switch for external lighting must be capable of—

(i) 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-programmed period between these times; and

(ii) being overridden by a manual switch or a security access system for a period of up to 30 minutes, after which the time switch must resume

control.

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

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 maximum of 30 minutes unless it is reset; and

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

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

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

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

(ii) be capable of detecting a person within a distance 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 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) A daylight sensor and dynamic control device for artificial lighting must—

(i) for switching on and off—

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

(B) have—

(aa) a delay of more than 2 minutes; and

(bb) a differential of more than 100 Lux for a sensor controlling high pressure discharge lighting, and 50 Lux for a sensor controlling other than high pressure discharge lighting; and

(ii) 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—

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

(B) in no less than 4 steps down to a power consumption that is less than 50% of full power.

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