Australian Building Codes Board

Housing Provisions Standard

PREVIEW

ENERGY EFFICIENCY AND CONDENSATION PROVISIONS

2022

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Part 10.8 Condensation management

10.8.1 External wall construction

[2019: 3.8.7.2]

(1) Where a *pliable building membrane* is installed in an *external wall*, it must—

(a) comply with AS 4200.1; and

(b) be installed in accordance with AS 4200.2; and

(c) be located on the exterior side of the *primary insulation layer* of wall assemblies that form the external envelope of a building.

(2) Where a *pliable building membrane*, *sarking-type material* or insulation layer is installed on the exterior side of the *primary insulation layer* of an *external wall* it must have a *vapour permeance* of not less than—

(a) in *climate zones* 4 and 5, 0.143 µg/N.s; and

(b) in *climate zones* 6, 7 and 8, 1.14 µg/N.s.

(3) Except for single skin masonry or single skin concrete, where a *pliable building membrane* is not installed in an *external wall*, the primary *water control layer* must be separated from *water sensitive materials* by a drained cavity.

Explanatory Information

10.8.1(2) requires some wall materials on the external side of the *primary insulation layer* to have a minimum level of *vapour permeance*. *Vapour permeance* is measured in µg/N.s (micrograms per newton-second).

Class 3 and Class 4 vapour control membranes (as defined by clause 5.3.4 of AS 4200.1) meet the *vapour permeance* requirements of 10.8.1(2)(a), while Class 4 vapour control membranes meet the *vapour permeance* requirements of 10.8.1(2)(b).

Open-cell insulation, such as mineral wool or fibreglass, typically has a high *vapour permeance*, while closed-cell insulation such as polystyrene typically has a low *vapour permeance*. Many foil-faced insulation products have a low *vapour permeance*.

10.8.2 Exhaust systems

[2019: 3.8.7.3]

(1) An exhaust system installed in a kitchen, bathroom, *sanitary compartment* or laundry must have a minimum flow rate of—

(a) 25 L/s for a bathroom or *sanitary compartment*; and

(b) 40 L/s for a kitchen or laundry.

(2) Exhaust from a kitchen, kitchen range hood, bathroom, *sanitary compartment* or laundry must discharge directly or via a shaft or duct to *outdoor air*.

(3) Where a venting clothes dryer is installed, it must discharge directly or via a shaft or duct to *outdoor air*.

(4) An exhaust system that is not run continuously and is serving a bathroom or *sanitary compartment* that is not ventilated in accordance with 10.6.2(a) must—

(a) be interlocked with the room's light switch; and

(b) include a run-on timer so that the exhaust system continues to operate for 10 minutes after the light switch is turned off.

(5) Except for rooms that are ventilated in accordance with 10.6.2(a), a room with an exhaust system in accordance with (1) must be provided with make-up air—

(a) via openings to an adjacent room with a free area of 14,000 mm^2; or

(b) in accordance with AS 1668.2.

(6) Except for rooms that are ventilated in accordance with 10.6.2(a), a room with an exhaust system in accordance with (3) must be provided with make-up air in accordance with AS 1668.2.

Explanatory Information

A range hood installed in a kitchen must comply with 10.8.2(2).

10.8.2(3) requires venting clothes dryers to be provided with exhaust ducting directly from the clothes dryer to *outdoor air*. This requirement only applies to venting clothes dryers and not other types of clothes dryers, such as condensing clothes dryers.

10.8.2(5) and 10.8.2(6) requires some rooms that have exhaust systems and are not naturally ventilated (e.g. rooms without openable windows) to be provided with make-up air. The make-up air openings *required* by 10.8.2(5)(a) are based on the minimum flow rates of 10.8.2(1). An opening with a free area of 14,000 mm^2 can by achieved by a 20 mm undercut to a 700 mm wide door. If the exhaust flowrates exceed the minimum flowrates of 10.8.2(1), additional make-up air openings may be required for the correct operation of the exhaust system.

10.8.3 Ventilation of roof spaces

[2019: 3.8.7.4]

(1) In *climate zones* 6, 7 and 8, a roof must have a roof space that—

(a) is located—

(i) immediately above the *primary insulation layer*; or

(ii) immediately above sarking with a *vapour permeance* of not less than 1.14 µg/N.s, which is immediately above the *primary insulation layer*; or

(iii) immediately above ceiling insulation that meets the requirements of 13.2.3(3) and 13.2.3(4); and

(b) has a height of not less than 20 mm; and

(c) is either—

(i) ventilated to *outdoor air* through evenly distributed openings in accordance with Table 10.8.3; or

(ii) located immediately underneath the roof tiles of an unsarked tiled roof.

(2) The requirements of (1) do not apply to a—

(a) concrete roof; or

(b) roof that is made of structural insulated panels; or

(c) roof that is subject to Bushfire Attack Level FZ requirements in accordance with AS 3959.

Table 10.8.3: Roof space ventilation requirements

Roof pitch	Ventilation openings
< 10°	25,000 mm^2/m provided at each of two opposing ends
≥ 10° and < 15°	25,000 mm^2/m provided at the eaves and 5,000 mm^2/m at high level
≥ 15° and < 75°	7,000 mm^2/m provided at the eaves and 5,000 mm^2/m at high level, plus an additional 18,000 mm^2/m at the eaves if the roof has a cathedral ceiling

Table Notes

(1) Ventilation openings are specified as a minimum free open area per metre length of the longest horizontal dimension of the roof.

(2) For the purposes of this Table, high level openings are openings provided at the ridge or not more than 900 mm below the ridge or highest point of the roof space, measured vertically.

Explanatory Information

Explanatory Figure 10.8.3 is an example of a roof space with low level ventilation.

Figure 10.8.3 (explanatory): Example of roof space with low level ventilation

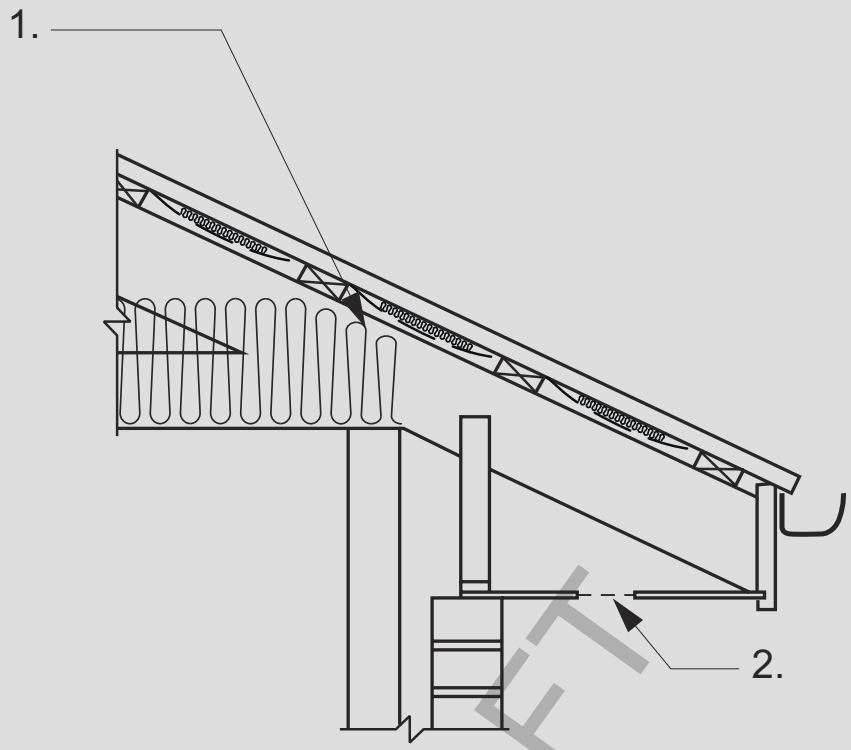


Figure Notes

(1) Minimum 20 mm gap maintained between insulation and sarking.

(2) Eave ventilation opening in accordance with Table 10.8.3.

13 Energy efficiency

Part 13.1 Scope and application of Section 13

13.1.1 Scope

[New for 2022]

This Section sets out the following *Deemed-to-Satisfy Provisions* for energy efficiency:

(a) Building fabric (see Part 13.2).

(b) External glazing (see Part 13.3).

(c) Building sealing (see Part 13.4).

(d) Ceiling fans (see Part 13.5).

(e) Whole-of-home energy usage (see Part 13.6).

(f) Services (see Part 13.7).

SA 13.1.2

13.1.2 Application

[New for 2022]

The application of this Section is subject to the following:

(a) The Governing Requirements of NCC Volume Two.

(b) The State and Territory variations, additions and deletions contained in the Schedules to the ABCB Housing Provisions and NCC Volume Two.

Explanatory Information

In NCC 2019, the content of Section 13 of the ABCB Housing Provisions (other than content added in NCC 2022 or later) was contained in the acceptable construction practices for Part 3.12 of NCC 2019 Volume Two.

Part 13.2 Building fabric

13.2.1 Application of Part 13.2

[2019: 3.12.1]

(1) The provisions of 13.2.2 to 13.2.6 apply to—

(a) a Class 1 building; and

(b) a Class 10a building with a *conditioned space*.

(2) The provisions of 13.2.7 apply to a Class 1 building with an attached Class 10a building.

(3) Part 13.2 must be applied as directed in H6D2(1)(a) or (b).

13.2.2 Building fabric thermal insulation

[2019: 3.12.1.1]

(1) Where *required*, insulation must comply with AS/NZS 4859.1 and be installed so that it—

(a) abuts or overlaps adjoining insulation other than at supporting members such as columns, studs, noggings, joists, furring channels and the like where the insulation must butt against the member; and

(b) forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and

(c) does not affect the safe or effective operation of a *domestic service* or fitting.

(2) Where *required*, *reflective insulation* must be installed with—

(a) the necessary airspace, to achieve the required *R-Value* between a reflective side of the *reflective insulation* and a building lining or cladding; and

(b) the *reflective insulation* closely fitted against any penetration, door or *window* opening; and

(c) the *reflective insulation* adequately supported by framing members; and

(d) each adjoining sheet of roll membrane being—

(i) overlapped greater than or equal to 150 mm; or

(ii) taped together.

(3) Where *required*, bulk insulation must be installed so that—

(a) it maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like; and

(b) in a ceiling, where there is no bulk insulation or *reflective insulation* in the *external wall* beneath, it overlaps the *external wall* by greater than or equal to 50 mm.

Explanatory Information: Example

- In a two storey house with the second storey set back, the insulation in the first storey wall, the second storey wall and the roof over the set-back must be continuous. Therefore if the roof over the set-back has insulation on a horizontal ceiling, then insulation is also needed on the vertical in any ceiling space in order to connect the ceiling insulation to the second storey wall.
- To form a continuous barrier, insulation should be placed in gaps between window and door jambs, heads and sills, and the adjoining wall framing unless a gap is otherwise *required*. This may need to be compressible to allow for movement between members.

Explanatory Information: Safety of domestic services

Care should be taken when installing insulation to ensure that it does not interfere with the safety or performance of *domestic services* and fittings such as heating flues, recessed light fittings, light transformers, gas appliances and general plumbing and electrical components. This includes providing appropriate clearance as detailed in relevant legislation and referenced standards such as for electrical, gas and fuel oil installations.

Explanatory Information: Compression of insulation

The *R-Value* of insulation, including insulation used to mitigate thermal bridging, is reduced if it is compressed. The allocated space for insulation must therefore allow the insulation to be installed so that it maintains its correct thickness to achieve the product's stated *R-Value*. Otherwise the *R-Value* needs to be reduced to account for any compression. This is particularly relevant to wall and cathedral ceiling framing whose members can only accommodate a limited thickness of insulation. In some instances, larger framing members or thinner insulation material, such as rigid boards, may be necessary to ensure that the insulation achieves its *required R-Value*.

Explanatory Information: Installation of reflective insulation

For *reflective insulation* and the adjoining airspace to achieve its tested *R-Value*, the airspace needs to be a certain width. This width varies depending on the particular type of *reflective insulation*. The *R-Value* also depends on the orientation of the insulation.

Where *reflective insulation* also acts as a vapour barrier of sarking, both a minimum overlap and taping may be necessary.

13.2.3 Roofs and ceilings

[2019: 3.12.1.2]

(1) Roof and ceiling insulation must achieve the minimum *R-Value*—

- (a) in *climate zone* 1, in accordance with Tables 13.2.3a, 13.2.3b, 13.2.3j and 13.2.3k as applicable; and
- (b) in *climate zone* 2, in accordance with Tables 13.2.3c and 13.2.3l as applicable; and
- (c) in *climate zone* 3, in accordance with Tables 13.2.3d and 13.2.3m as applicable; and
- (d) in *climate zone* 4, in accordance with Tables 13.2.3e and 13.2.3n as applicable; and
- (e) in *climate zone* 5, in accordance with Tables 13.2.3f and 13.2.3o as applicable; and
- (f) in *climate zone* 6, in accordance with Tables 13.2.3g and 13.2.3p as applicable; and
- (g) in *climate zone* 7, in accordance with Tables 13.2.3h and 13.2.3q as applicable; and
- (h) in *climate zone* 8, in accordance with Tables 13.2.3i and 13.2.3r as applicable.

(2) *Reflective insulation* installed to comply with (1) must—

- (a) have a surface emittance of not more than 0.05; and
- (b) be adjacent to a roof space of not less than 20 mm; and
- (c) in *climate zones* 3 to 8, be downward facing.

(3) The thermal bridging in a metal-framed roof must be addressed as follows—

- (a) for a pitched roof with a horizontal ceiling—
  - (i) achieving the *Total R-Value* in Table 13.2.3s, calculated using a method that accounts for the effects of thermal bridging; or
  - (ii) increasing the *R-Value* of the insulation between the ceiling frames by R0.5 more than the *R-Value* derived from (1); or
  - (iii) adding a continuous ceiling insulation layer with a minimum *R-Value* of R0.13 above or below the ceiling joists or the bottom chords of the trusses; or

(iv) achieving the *required* ceiling *R-Value* derived from (1) by stacking two layers of insulation immediately on top of each other, such that the top layer is orientated to cover the ceiling joists or bottom chords of the trusses and has an *R-Value* of at least R0.5; or

(b) for a flat, skillion or cathedral roof—

(i) achieving the *Total R-Value* in Table 13.2.3t, calculated using a method that accounts for the effects of thermal bridging; or

(ii) complying with Table 13.2.3u.

(4) Where 10.8.3(1) of the ABCB Housing Provisions applies, continuous insulation placed above the *primary insulation layer* to mitigate thermal bridging must have a *vapour permeance* of not less than that of the *primary insulation layer*.

(5) Where, for operational or safety reasons, the area of ceiling insulation *required* is reduced, the loss of insulation must be compensated for in accordance with Table 13.2.3w.

(6) Where the ceiling insulation *required* by (1) to (5) has an *R-Value*—

(a) greater than R3.0 and less than or equal to R4.5, it may be reduced to R3.0 within 450 mm of an *external wall*; or

(b) greater than R4.5, it may be reduced to R3.0 within 450 mm of an *external wall*, provided all other *required* ceiling insulation is increased by R0.5.

(7) A roof that—

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

(b) does not have a ceiling lining or has a ceiling lining fixed directly to those metal purlins, metal rafters or metal battens,

must have a thermal break, consisting of a material with an *R-Value* of greater than or equal to 0.2, installed between the metal sheet roofing and its supporting metal purlins, metal rafters or metal battens.

(8) The requirements of (1) to (7) do not apply to roofs constructed using insulated sandwich panels.

(9) Roofs constructed using insulated sandwich panels must achieve the minimum *Total R-Value* in Table 13.2.3x.

(10) In *climate zones* 1 to 5, the solar absorptance of the upper surface of a roof must not be more than 0.64.

Table 13.2.3a: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 1 – single storey dwelling

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤0 .64
Vented	Yes	< 1.0	1.5	2.0	2.5	3.0	3.5
		≥ 1.0 to < 1.5	1.5	1.5	2.0	2.5	3.0
		≥ 1.5	1.5	2.0	2.0	2.0	2.0
	No	< 1.0	2.5	4.5	X	X	X
		≥ 1.0 to < 1.5	2.0	3.0	4.0	5.0	X
		≥ 1.5	2.0	2.5	3.0	4.0	5.0
Standard	Yes	< 1.0	1.5	2.0	2.5	4.0	X
		≥ 1.0 to < 1.5	1.5	1.5	2.0	3.0	4.0
		≥ 1.5	1.5	1.5	2.0	2.5	3.0

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤0 .64
	No	< 1.0	3.5	X	X	X	X
		≥ 1.0 to < 1.5	2.0	3.5	5.5	X	X
		≥ 1.5	2.0	2.0	3.5	4.0	6.0

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) R-Values listed are for the labelled, declared *R-Value* of insulation.

(6) X = not permitted.

Table 13.2.3b: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 1 – two (or more) storey dwelling

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA≤ 0.23	0.23< SA≤0.32	0.32< SA≤0.42	0.42< SA≤0.53	0.53< SA≤0.64
Vented	Yes	< 1.0	1.5	1.5	1.5	1.5	2.0
		≥ 1.0 to < 1.5	1.5	1.5	1.5	1.5	1.5
		≥ 1.5 to < 2.0	1.5	1.5	1.5	1.5	1.5
		≥ 2.0	1.5	1.5	1.5	2.0	2.0
	No	< 1.0	2.0	2.5	4.0	5.0	X
		≥ 1.0 to < 1.5	1.5	1.5	1.5	1.5	2.5
		≥ 1.5 to < 2.0	1.5	1.5	1.5	2.0	2.0
		≥ 2.0	1.5	1.5	1.5	1.5	1.5
Standard	Yes	< 1.0	1.5	1.5	2.0	3.0	4.0
		≥ 1.0 to < 1.5	1.5	1.5	1.5	1.5	2.5
		≥ 1.5 to < 2.0	1.5	1.5	1.5	1.5	2.0
		≥ 2.0	1.5	1.5	1.5	1.5	1.5
	No	< 1.0	2.5	4.0	6.0	X	X
		≥ 1.0 to < 1.5	1.5	1.5	1.5	1.5	4.0
		≥ 1.5 to < 2.0	1.5	1.5	2.0	2.0	2.5
		≥ 2.0	1.5	1.5	1.5	2.0	2.5

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) R-Values listed are for the labelled, declared *R-Value* of insulation.

(6) X = not permitted.

Table 13.2.3c: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 2

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.64
Vented	Yes	Any	2.5			
	No	< 0.5	2.5	3.0	3.0	3.5
		≥ 0.5	2.5			
Standard	Yes	Any	2.5			
	No	< 0.5	3.0	3.0	3.5	4.0
		≥ 0.5 to < 1.0	2.5	2.5	2.5	3.0
		≥ 1.0	2.5			

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under roof or ceiling insulation.

(5) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3d: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 3

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Vented	Yes	< 0.5	2.5				
		≥ 0.5 to < 1.0	2.0				
		≥ 1.0 to < 1.5	2.0	2.5	2.5	2.5	2.5
		≥ 1.5 to < 2.0	2.0	2.0	2.5	2.5	2.5
		≥ 2.0	2.5	2.5	3.0	3.0	3.0
	No	< 0.5	3.5	4.0	4.5	5.0	X
		≥ 0.5 to < 1.0	3.0	3.5	3.5	4.0	4.5
		≥ 1.0 to < 1.5	2.5	3.0	3.0	3.0	3.5
		≥ 1.5 to < 2.0	2.5	3.0	3.0	3.0	3.0
		≥ 2.0	2.5	2.5	3.0	3.0	3.0

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Standard	Yes	< 0.5	2.0	2.0	2.5	2.5	2.5
		≥ 0.5 to < 1.0	2.0	2.0	2.5	2.5	2.5
		≥ 1.0 to < 1.5	2.0	2.0	2.0	2.0	2.5
		≥ 1.5 to < 2.0	2.0	2.5	2.5	2.5	3.0
		≥ 2.0	2.0	2.0	2.5	2.5	2.5
	No	< 0.5	3.5	4.0	5.0	X	X
		≥ 0.5 to < 1.0	3.0	3.0	3.5	4.0	5.0
		≥ 1.0 to < 1.5	2.5	2.5	3.0	3.0	3.5
		≥ 1.5 to < 2.0	2.0	2.0	2.5	2.5	2.5
		≥ 2.0	2.0	2.0	2.5	2.5	2.5

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(6) X = not permitted.

Table 13.2.3e: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 4

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.64
Vented	Yes	< 0.5	3.0	3.5
		≥ 0.5	3.0	
	No	Any	3.5	
Standard	Yes	Any	3.0	
	No	≤ 0.5	3.5	
		> 0.5	3.0	

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3f: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 5

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.42	0.42 < SA ≤ 0.64
Vented	Yes	< 0.5	3.0	2.5
		≥ 0.5	2.5	
	No	< 2.0	3.0	
		≥ 2.0	2.5	
Standard	Yes	Any	2.5	
	No	≤ 0.5	3.0	
		> 0.5 to < 2.0	2.5	
		≥ 2.0	3.0	

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3g: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 6

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	0.23 ≤ SA ≤ 0.64	0.64 < SA ≤ 0.96
Vented	Yes	< 1.0	4.0	3.5
		≥ 1.0	3.5	
	No	< 1.0	4.0	
		≥ 1.0	3.5	
Standard	Yes	< 1.0	3.5	
		≥ 1.0	3.0	
	No	< 1.0	4.0	
		≥ 1.0	3.5	

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

(c) is ventilated to *outdoor air* through evenly distributed openings with Table 10.8.3; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) In *climate zones* 6, 7 and 8, roof ventilation must comply with 10.8.3.

(5) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(6) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3h: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 7

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
Vented	Yes	< 1.0	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0
		≥ 1.0	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
	No	< 1.0	5.0	4.5	4.5	4.5	4.0	4.0	3.5	3.5
		≥ 1.0 to < 1.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
		≥ 1.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0
Standard	Yes	< 1.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0
		≥ 1.0	4.0							
	No	< 1.0	5.0	4.5	4.5	4.0	4.0	3.5	3.5	3.5
		≥ 1.0 to < 1.5	4.5	4.5	4.0	4.0	4.0	4.0	3.5	3.5
		≥ 1.5 to < 2.0	4.0							
		≥ 2.0	4.5	4.0	4.0	4.0	4.0	4.0	4.0	3.5

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

(c) is ventilated to *outdoor air* through evenly distributed openings in accordance with Table 10.8.3; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3i: Pitched roof with horizontal ceiling – minimum R-Value for ceiling insulation: climate zone 8

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
Vented	Yes	< 1.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0
		≥ 1.5 to < 2.0	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
		≥ 2.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0
	No	< 1.0	4.5	4.5	4.5	4.0	4.0	3.5	3.5	3.0
		≥ 1.0 to < 1.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0
		≥1.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0

Roof ventilation	*Reflective insulation* under-roof	Under-roof insulation *R-Value*	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
Standard	Yes	< 1.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
		≥ 1.0 to < 1.5	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5
		≥ 1.5 to < 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
		≥ 2.0	4.0							
	No	< 1.0	4.5	4.0	4.0	3.5	3.5	3.0	3.0	3.0
		≥ 1.0 to < 1.5	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
		≥ 1.5 to < 2.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
		≥ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5

Table Notes

(1) SA = solar absorptance.

(2) A roof is considered 'vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of ceiling area, with gable, eave or ridge vents; or

(b) has one powered roof ventilator per 200 m^2 of ceiling area, with gable, eave or ridge vents; or

(c) is ventilated to *outdoor air* through evenly distributed openings in accordance with Table 10.8.3; or

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

(3) If a roof is not 'vented', it is a 'standard' roof.

(4) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(5) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3j: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 1 – single storey dwelling

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Yes	1.0	2.0	2.0	4.0	4.0
No	1.0	3.5	X	X	X

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on the top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(5) X = not permitted.

Table 13.2.3k: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 1 – two (or more) storey dwelling

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Yes	1.5	1.5	2.0	3.0	4.0
No	1.5	3.5	5.0	X	X

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

(5) X = not permitted.

Table 13.2.3l: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 2

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Yes	2.5	2.5	2.5	2.5	2.5
No	3.0	3.0	3.5	4.0	4.0

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3m: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 3

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64
Yes	2.0	2.0	2.5	2.5	2.5
No	3.5	4.0	5.0	X	X

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

(5) X = not permitted.

Table 13.2.3n: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 4

Reflective insulation under-roof	SA ≤ 0.64
Yes	3.0

Reflective insulation under-roof	SA ≤ 0.64
No	3.5

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3o: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 5

Reflective insulation under-roof	SA ≤ 0.64
Yes	2.5
No	3.0

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3p: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 6

Reflective insulation under-roof	0.23 ≤ SA < 0.64	SA = 0.64	0.64 < SA ≤ 0.96
Yes	4.0	3.5	4.0
No	4.0	4.0	4.0

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3q: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 7

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
Yes	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0
No	5.0	4.5	4.5	4.0	4.0	3.5	3.5	3.5

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) R-Values listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3r: Flat, skillion or cathedral roof – minimum R-Value for ceiling insulation: climate zone 8

Reflective insulation under-roof	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
Yes	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
No	4.5	4.0	4.0	3.5	3.5	3.0	3.0	3.0

Table Notes

(1) SA = solar absorptance.

(2) The *R-Value* can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both.

(3) The *R-Value* of *reflective insulation* is not to be included in the *R-Value* of any under-roof or ceiling insulation.

(4) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.3s: Metal-framed pitched roof with horizontal ceiling – minimum Total R-Value of ceiling to account for thermal bridging

Minimum ceiling insulation *R-Value* from Tables 13.2.3a to 13.2.3i as applicable	Minimum ceiling *Total R-Value*
1.5	1.38
2.0	1.74
2.5	2.09
3.0	2.43
3.5	2.63
4.0	2.95
4.5	3.27
5.0	3.59
5.5	3.91
6.0	4.23

Table Notes

(1) The *Total R-Value* calculation only includes the ceiling frame, insulation and ceiling lining. It is not to include internal air films, roof space or roof lining.

(2) Minimum ceiling *Total R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.3t: Metal-framed flat, skillion or cathedral roof – minimum Total R-Value to account for thermal bridging

Minimum ceiling insulation *R-Value* from Tables 13.2.3j to 13.2.3r	Minimum *Total R-Value* to account for thermal bridging – heat flow down	Minimum *Total R-Value* to account for thermal bridging – heat flow up
1.0	1.40	1.32
1.5	1.86	1.78
2.0	2.29	2.21
2.5	2.71	2.63
3.0	3.11	3.02
3.5	3.31	3.22
4.0	3.66	3.57
4.5	3.98	3.90
5.0	4.32	4.22

Minimum ceiling insulation *R-Value* from Tables 13.2.3j to 13.2.3r	Minimum *Total R-Value* to account for thermal bridging – heat flow down	Minimum *Total R-Value* to account for thermal bridging – heat flow up
5.5	4.63	4.53
6.0	4.93	4.82

Table Notes

(1) Minimum *Total R-Values* are in-situ values. They account for compression of insulation.

(2) Direction of heat flow must be determined in accordance with Table 13.2.3v.

Table 13.2.3u: Metal-framed flat, skillion or cathedral roof – thermal bridging mitigation

Minimum ceiling insulation *R-Value* from Tables 13.2.3j to 13.2.3r	Option 1 – increase insulation between roof frame members to specified minimum *R-Value*	Option 2 – add a layer of continuous insulation with specified minimum *R-Value* above or below the roof frame members
1.0	1.5	0.13
1.5	2.5	0.30
2.0	3.5	0.30
2.5	5.0	0.40
3.0	6.0	0.60
3.5	X	0.60
4.0	X	0.60
4.5	X	0.60
5.0	X	0.60
5.5	X	0.60
6.0	X	0.60

Table Notes

(1) Minimum *R-Values* are in-situ values. They account for compression of insulation.

(2) X = not permitted.

Table 13.2.3v: Direction of heat flow

Climate zone	Direction of heat flow
1	Down
2 (altitude less than 300 m)	Down
2 (altitude 300 m or more)	Down and up
3	Down and up
4	Up
5	Up
6	Up
7	Up
8	Up

Table 13.2.3w: Adjusted minimum R-Value of ceiling insulation required to compensate for loss of ceiling insulation area

Percentage of ceiling area uninsulated	Minimum *R-Value* of ceiling insulation required to satisfy 13.2.3(1) and (3)									
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
0.5 to less than 1.0%	1.0	1.6	2.2	2.8	3.4	4.0	4.7	5.4	6.2	6.9
1.0% to less than 1.5%	1.1	1.7	2.3	2.9	3.6	4.4	5.2	6.1	7.0	x
1.5% to less than 2.0%	1.1	1.7	2.4	3.1	3.9	4.8	5.8	6.8	x	x
2.0% to less than 2.5%	1.1	1.8	2.5	3.3	4.2	5.3	6.5	x	x	x
2.5% to less than 3.0%	1.2	1.9	2.6	3.6	4.6	5.9	x	x	x	x
3.0% to less than 4.0%	1.2	2.0	3.0	4.2	5.7	x	x	x	x	x
4.0% to less than 5.0%	1.3	2.2	3.4	5.0	x	x	x	x	x	x

Table Notes

(1) Interpolation is allowed for values between those shown.

(2) X = not permitted.

Table 13.2.3x: Total R-Value for roofs constructed with insulated sandwich panels

Climate zone	SA ≤ 0.23	0.23 < SA ≤ 0.32	0.32 < SA ≤ 0.42	0.42 < SA ≤ 0.53	0.53 < SA ≤ 0.64	0.64 < SA ≤ 0.73	0.73 < SA ≤ 0.85	0.85 < SA ≤ 0.96
1 (single storey dwelling)	1.40	3.31	X	X	X	X	X	X
1 (two or more storey dwelling)	1.86	3.31	4.32	X	X	X	X	X
2 (heat flow down)	3.11	3.11	3.31	3.66	3.66	X	X	X
2 (heat flow up)	3.02	3.02	3.22	3.57	3.57	X	X	X
3 (heat flow down)	3.31	3.66	4.32	X	X	X	X	X
3 (heat flow up)	3.22	3.57	4.22	X	X	X	X	X
4	3.22	3.22	3.22	3.22	3.22	X	X	X
5	3.02	3.02	3.02	3.02	3.02	X	X	X
6	3.57	3.57	3.57	3.57	3.57	3.57	3.57	3.57
7	4.22	3.90	3.90	3.57	3.57	3.22	3.22	3.22
8	3.90	3.57	3.57	3.22	3.22	3.02	3.02	3.02

Table Notes

(1) SA = solar absorptance.

(2) Direction of heat flow must be determined in accordance with Table 13.2.3v.

(3) X = not permitted.

Explanatory Information: Table 13.2.3w

- When considering the reduction of insulation because of exhaust fans, flues or recessed downlights, 0.5% of the ceiling area for a 200 m^2 house would permit 2 bathroom heater-light assemblies, a laundry exhaust fan, a kitchen exhaust fan and either approximately 20 recessed down-lights with 50 mm clearance to insulation, 10 recessed downlights with 100 mm clearance to insulation or only 3 recessed downlights with 200 mm clearance to insulation.
- Note that 13.2.3(5) does not require an increase in ceiling insulation for *roof lights*.
- Placing some of the *required* insulation at the roof level may result in a more practical outcome. Insulation at the roof level is effective in warm climates and significantly moderates the roof space extremes and *condensation* risk in cold climates. Note that Part 10.8 contains specific provisions for *condensation*.

Explanatory Information: Thermal bridging calculation methods

The effect of thermal bridging through repeating framing elements such as ceiling joists and the bottom chord of ceiling trusses must be considered when calculating the *Total R-Value* of metal-framed roofs. Other types of thermal bridges may be calculated if considered significant.

13.2.4 Roof lights

[2019: 3.12.1.3]

Roof lights (including any associated shaft and diffuser) serving a habitable room or an interconnecting space such as a corridor, hallway, stairway or the like must have—

(a) a total area of not more than 5% of the *floor area* of the room or space served; and

(b) transparent and translucent elements, including any imperforate ceiling diffuser, with a combined performance of—

(i) for *Total System SHGC*, in accordance with Table 13.2.4; and

(ii) for *Total System U-Value*, not more than U3.9.

Table 13.2.4: Roof lights – Total System SHGC

Roof light shaft index [Note 1]	Total area of roof lights up to 3.5% of the *floor area* of the room or space	Total area of roof lights more than 3.5% and up to 5% of the *floor area* of the room or space
< 1.0	≤ 0.45	≤ 0.29
≥ 1.0 to < 2.5	≤ 0.51	≤ 0.33
≥ 2.5	≤ 0.76	≤ 0.49

Table Notes

(1) The *roof light* shaft index is determined by measuring the distance from the centre of the shaft at the roof to the centre of the shaft at the ceiling level and dividing it by the average internal dimension of the shaft opening at the ceiling level (or the diameter for a circular shaft) in the same units of measurement.

(2) The area of a *roof light* is the area of the roof opening that allows light to enter the building. The total area of *roof lights* is the combined area for all *roof lights* serving the room or space.

Explanatory Information

(1) The *Total System SHGC* and *Total System U-Values* are expressed as Australian Fenestration Rating Council (AFRC) values.

13.2.5 External walls

[2019: 3.12.1.4]

(1) Except for the *external wall* of a sub-floor space below a suspended floor and lightweight wall construction, wall insulation must have a minimum *R-Value*—

(a) in *climate zone* 1, in accordance with Table 13.2.5a; and

(b) in *climate zone* 2, in accordance with Tables 13.2.5c and 13.2.5d as applicable; and

(c) in *climate zone* 3, in accordance with Table 13.2.5e; and

(d) in *climate zone* 4, in accordance with Tables 13.2.5g and 13.2.5h as applicable; and

(e) in *climate zone* 5, in accordance with Tables 13.2.5i and 13.2.5j as applicable; and

(f) in *climate zone* 6, in accordance with Tables 13.2.5k and 13.2.5l as applicable; and

(g) In *climate zone* 7, in accordance with Tables 13.2.5m and 13.2.5n as applicable.

(2) For lightweight wall construction, wall insulation must have a minimum *R-Value*—

(a) in *climate zone* 1, in accordance with Table 13.2.5b; and

(b) in *climate zone* 2, in accordance with Table 13.2.5c, with R0.3 added; and

(c) in *climate zone* 3, in accordance with Table 13.2.5f; and

(d) in *climate zone* 4, in accordance with Table 13.2.5g, with R0.3 added; and

(e) in *climate zone* 5, in accordance with Table 13.2.5i, with R0.3 added; and

(f) in *climate zone* 6, in accordance with Table 13.2.5k, with R0.3 added; and

(g) in *climate zone* 7, in accordance with Table 13.2.5m, with R0.3 added; and

(h) in *climate zone* 8, in accordance with Table 13.2.5o.

(3) In *climate zones* 1 to 5, the solar absorptance of the outer surface of a wall used in (1) or (2) must be not more than 0.7.

(4) The thermal bridging in a metal-framed wall must be addressed by—

(a) achieving the *Total R-Value* in Tables 13.2.5p to 13.2.5r, calculated in accordance with AS/NZS 4859.2; or

(b) complying with one of the options in Tables 13.2.5s to 13.2.5u.

(5) A metal-framed wall that forms part of the building *envelope* must have a thermal break, consisting of a material with an *R-Value* of not less than R0.2, installed at all points of contact between the external cladding and the metal frame if the wall—

(a) does not have a wall lining or has a wall lining that is fixed directly to the metal frame; and

(b) is clad with weatherboards, fibre-cement or the like, or metal sheeting fixed to the metal frame.

(6) The requirements of (5) do not apply to walls constructed using insulated sandwich panels.

Table 13.2.5a: Concrete block walls – minimum insulation R-Value: climate zone 1

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.3	0	X	X	X	X
	> 0 to ≤ 300	Reflective	X	X	X
	> 300 to ≤ 450	0.0	Reflective	1.5	X
	> 450 to ≤ 600	0.0	Reflective	1.0	X
	> 600 to ≤ 900	0.0	0.0	Reflective	2.0
	> 900 to ≤ 1200	0.0	0.0	Reflective	1.0
	> 1200 to ≤ 1500	0.0	0.0	0.0	Reflective
	> 1500 to ≤ 1800	0.0	0.0	0.0	Reflective
	> 1800 to ≤ 2400	0.0	0.0	0.0	Reflective
> 0.3 to ≤ 0.4	0	X	X	X	X
	> 0 to ≤ 300	1.0	X	X	X
	> 300 to ≤ 450	1.0	1.0	X	X
	> 450 to ≤ 600	Reflective	Reflective	2.0	X
	> 600 to ≤ 900	0.0	Reflective	Reflective	X
	> 900 to ≤ 1200	0.0	0.0	Reflective	1.5
	> 1200 to ≤ 1500	0.0	0.0	Reflective	Reflective
	> 1500 to ≤ 1800	0.0	0.0	0.0	Reflective
	> 1800 to ≤ 2400	0.0	0.0	0.0	Reflective
> 0.4 to ≤ 0.5	0	X	X	X	X
	> 0 ≤ 300	1.0	X	X	X
	> 300 to ≤ 450	1.0	1.5	X	X
	> 450 to ≤ 600	Reflective	1.0	X	X
	> 600 to ≤ 900	0.0	Reflective	1.0	X
	> 900 to ≤ 1200	0.0	Reflective	Reflective	2.0
	> 1200 to ≤ 1500	0.0	0.0	Reflective	1.0
	> 1500 to ≤ 1800	0.0	0.0	Reflective	Reflective
	> 1800 to ≤ 2400	0.0	0.0	0.0	Reflective
> 0.5 to ≤ 0.6	0	X	X	X	X
	> 0 to ≤ 300	1.5	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	1.5	X	X
	> 600 to ≤ 900	Reflective	Reflective	1.5	X
	> 900 to ≤ 1200	0.0	Reflective	Reflective	X
	> 1200 to ≤ 1500	0.0	Reflective	Reflective	1.5
	> 1500 to ≤ 1800	0.0	0.0	Reflective	1.0
	> 1800 to ≤ 2400	0.0	0.0	Reflective	Reflective
> 0.6 to ≤ 0.7	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	X	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X
	> 1200 to ≤ 1500	0.0	Reflective	Reflective	2.0
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.0
	> 1800 to ≤ 2400	0.0	0.0	Reflective	Reflective

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) Reflective = *reflective insulation* with an airspace with a minimum width of at least 20 mm. The surface emittance of the reflective surface facing the airspace must be a maximum of 0.1, where the airspace is exposed to the sun during construction to reduce glare (an outward facing surface), or 0.05 if not exposed to the sun (an inward facing surface).

(5) This table shows wall heights for single storey dwellings. For two storey (or more) dwellings with a wall height up to 2.4 m, add R0.5 to the *R-Values* given in this Table. For two storey (or more) dwellings with a wall height greater than 2.4 m, add R1.0.

Table 13.2.5b: Lightweight walls – minimum insulation R-Value: climate zone 1

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.3	0	X	X	X	X
	> 0 to ≤ 300	2.5	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X
	> 1200 to ≤ 1500	Reflective	Reflective	Reflective	2.5
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.5
	> 1800 to ≤ 2400	0.0	0.0	Reflective	1.0
> 0.3 to ≤ 0.4	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X
	>1200 to ≤ 1500	Reflective	Reflective	Reflective	2.5
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.5
	> 1800 to ≤ 2400	0.0	0.0	Reflective	1.0
> 0.4 to ≤ 0.5	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 1200 to ≤ 1500	Reflective	Reflective	Reflective	2.5
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.5
	> 1800 to ≤ 2400	0.0	0.0	Reflective	1.0
> 0.5 to ≤ 0.6	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X
	> 1200 to ≤ 1500	Reflective	Reflective	Reflective	2.5
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.5
	> 1800 to ≤ 2400	0.0	0.0	Reflective	1.0
> 0.6 to ≤ 0.7	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	1.0	X	X	X
	> 450 to ≤ 600	Reflective	2.0	X	X
	> 600 to ≤ 900	Reflective	1.0	2.0	X
	> 900 to ≤ 1200	Reflective	Reflective	1.0	X
	> 1200 to ≤ 1500	Reflective	Reflective	Reflective	2.5
	> 1500 to ≤ 1800	0.0	Reflective	Reflective	1.5
	> 1800 to ≤ 2400	0.0	0.0	Reflective	1.0

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) Reflective = *reflective insulation* with an airspace with a minimum width of at least 20 mm. The surface emittance of the reflective surface facing the airspace must be a maximum of 0.1 where the airspace is exposed to the sun during construction to reduce glare (an outward facing surface), or 0.05 of not exposed to the sun (an inward facing surface).

(5) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings with a wall height up to 2.4 m, add R0.5 to *R-Values* from this Table. For two storey (or more) dwellings with a wall height greater than 2.4 m, add R1.0.

Table 13.2.5c: Masonry veneer wall – minimum insulation R-Value: climate zone 2

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	X	X	X	X
	> 0 to ≤ 300	2.0	X	X	X
	> 300 to ≤ 450	1.5	X	X	X
	> 450 to ≤ 600	1.5	2.0	X	X
	> 600 to ≤ 900	1.5	1.5	2.0	X
	> 900 to ≤ 1200	1.5	1.5	2.5	X
	> 1200 to ≤ 1500	1.5	1.5	1.5	2.5

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.0
> 0.35 to ≤ 0.5	0	X	X	X	X
	> 0 to ≤ 300	2.0	X	X	X
	> 300 to ≤ 450	1.5	X	X	X
	> 450 to ≤ 600	1.5	2.5	X	X
	> 600 to ≤ 900	1.5	1.5	2.5	X
	> 900 to ≤ 1200	1.5	1.5	1.5	X
	> 1200 to ≤ 1500	1.5	1.5	1.5	2.5
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.0
> 0.5 to ≤ 0.7	0	X	X	X	X
	> 0 to ≤ 300	2.0	X	X	X
	> 300 to ≤ 450	1.5	X	X	X
	> 450 to ≤ 600	1.5	2.0	X	X
	> 600 to ≤ 900	1.5	1.5	2.5	X
	> 900 to ≤ 1200	1.5	1.5	1.5	X
	> 1200 to ≤ 1500	1.5	1.5	1.5	X
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.0

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings with a wall height of up to 2.4 m add R0.4 to the *R-Values* from this Table. For two storey (or more) dwellings with a wall height greater than 2.4 m, add R0.8.

Table 13.2.5d: Masonry cavity wall – minimum insulation R-Value: climate zone 2

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	0.25	0.25	0.25	0.51
	> 0 to ≤ 300	0.0	0.25	0.25	0.51
	> 300 to ≤ 450	0.0	0.0	0.25	0.51
	> 450 to ≤ 600	0.0	0.0	0.25	0.51
	> 600 to ≤ 900	0.0	0.0	0.25	0.25
	> 900 to ≤ 1200	0.0	0.25	0.25	0.25
	> 1200 to ≤ 1500	0.0	0.25	0.25	0.25
	> 1500 to ≤ 1800	0.0	0.25	0.25	0.25
> 0.35 to ≤ 0.5	0	0.25	0.25	0.25	0.51
	> 0 to ≤ 300	0.0	0.25	0.25	0.51
	> 300 to ≤ 450	0.0	0.0	0.25	0.51
	> 450 to ≤ 600	0.0	0.0	0.25	0.51
	> 600 to ≤ 900	0.0	0.0	0.25	0.25
	> 900 to ≤ 1200	0.0	0.0	0.0	0.25

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 1200 to ≤ 1500	0.25	0.0	0.25	0.25
	> 1500 to ≤ 1800	0.25	0.25	0.25	0.25
> 0.5 to ≤ 0.7	0	0.25	0.25	0.51	0.51
	> 0 to ≤ 300	0.0	0.25	0.25	0.51
	> 300 to ≤ 450	0.0	0.0	0.25	0.51
	> 450 to ≤ 600	0.0	0.0	0.25	0.51
	> 600 to ≤ 900	0.0	0.0	0.25	0.25
	> 900 to ≤ 1200	0.0	0.0	0.0	0.25
	> 1200 to ≤ 1500	0.0	0.0	0.0	0.25
	> 1500 to ≤ 1800	0.0	0.0	0.25	0.25

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) This Table shows wall heights for single storey dwellings. For two-storey (or more) dwellings, add R0.25 to the *R-Values* given in this Table.

Table 13.2.5e: Concrete block wall – minimum insulation R-Value: climate zone 3

SA	*R-Value*
≤ 0.7	1.5

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.5f: Lightweight wall – minimum insulation R-Value: climate zone 3

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.3	0	X	X	X	X
	> 0 to ≤ 300	2.5	X	X	X
	> 300 to ≤ 450	1.5	X	X	X
	> 450 to ≤ 600	1.5	2.5	X	X
	> 600 to ≤ 900	1.5	1.5	2.5	X
	> 900 to ≤ 1200	1.5	1.5	1.5	X
	> 1200 to ≤ 1500	Reflective	1.5	1.5	2.5
	> 1500 to ≤ 1800	Reflective	1.5	1.5	2.0
	> 1800 to ≤ 2400	Reflective	Reflective	1.5	1.5
> 0.3 to ≤ 0.4	0	X	X	X	X
	> 0 to ≤ 300	2.5	X	X	X
	> 300 to ≤ 450	2.0	X	X	X
	> 450 to ≤ 600	1.5	2.5	X	X
	> 600 to ≤ 900	1.5	1.5	2.5	X
	> 900 to ≤ 1200	1.5	1.5	2.0	X
	> 1200 to ≤ 1500	Reflective	1.5	1.5	2.7

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 1500 to ≤ 1800	Reflective	1.5	1.5	2.0
	> 1800 to ≤ 2400	Reflective	Reflective	1.5	1.5
> 0.4 to ≤ 0.5	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	2.0	X	X	X
	> 450 to ≤ 600	1.5	X	X	X
	> 600 to ≤ 900	1.5	2.0	2.7	X
	> 900 to ≤ 1200	1.5	1.5	2.0	X
	> 1200 to ≤ 1500	1.5	1.5	1.5	X
	> 1500 to ≤ 1800	Reflective	1.5	1.5	2.5
	> 1800 to ≤ 2400	Reflective	Reflective	1.5	1.5
> 0.5 to ≤ 0.6	0	X	X	X	X
	> to ≤ 300	X	X	X	x
	> 300 to ≤ 450	2.0	X	X	X
	> 450 to ≤ 600	1.5	X	X	X
	> 600 to ≤ 900	1.5	2.0	X	X
	> 900 to ≤ 1200	1.5	1.5	2.0	X
	> 1200 to ≤ 1500	1.5	1.5	1.5	X
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.5
	> 1800 to ≤ 2400	Reflective	1.5	1.5	2.0
> 0.6 to ≤ 0.7	0	X	X	X	X
	> 0 to ≤ 300	X	X	X	X
	> 300 to ≤ 450	2.5	X	X	X
	> 450 to ≤ 600	2.0	X	X	X
	> 600 to ≤ 900	1.5	2.0	X	X
	> 900 to ≤ 1200	1.5	1.5	2.5	X
	> 1200 to ≤ 1500	1.5	1.5	2.0	X
	> 1500 to ≤ 1800	Reflective	1.5	1.5	2.7
	> 1800 to ≤ 2400	Reflective	1.5	1.5	2.0

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* for insulation.

(3) X = not permitted.

(4) Reflective = *reflective insulation* with an airspace with a minimum width of at least 20 mm. The surface emittance of the reflective surface facing the airspace must be a maximum 0.1, where the airspace is exposed to the sun during construction to reduce glare (an outward facing surface), or 0.05 if not exposed to the sun (an inward facing surface).

(5) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings with a wall height up to 2.4 m, add R1.0 to the *R-Values* given in this Table. For two storey (or more) dwellings with a wall height greater than 2.4 m, add R1.5.

Table 13.2.5g: Masonry veneer wall – minimum insulation R-Value: climate zone 4

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	2.0	2.5	2.5	X
	> 0 to ≤ 300	2.0	2.0	2.5	X
	> 300 to ≤ 450	2.0	2.0	2.5	3.0
	> 450 to ≤ 600	2.0	2.5	2.5	3.0
	> 600 to ≤ 900	2.5	2.5	2.5	3.0
	> 900 to ≤ 1200	X	3.0	3.0	3.0
	> 1200 to ≤ 1500	X	X	3.0	X
> 0.35 to ≤ 0.5	0	2.0	2.5	2.5	X
	> 0 to ≤ 300	2.0	2.0	2.5	X
	> 300 to ≤ 450	2.0	2.0	2.5	3.0
	> 450 to ≤ 600	2.0	2.0	2.5	3.0
	> 600 to ≤ 900	2.5	2.5	2.5	3.0
	> 900 to ≤ 1200	X	2.5	2.5	3.0
	> 1200 to ≤ 1500	X	X	3.0	3.0
> 0.5 to ≤ 0.7	0	2.0	2.5	2.5	X
	> 0 to ≤ 300	2.0	2.0	2.5	X
	> 300 to ≤ 450	2.0	2.0	2.5	3.0
	> 450 to ≤ 600	2.0	2.0	2.5	3.0
	> 600 to ≤ 900	2.0	2.0	2.5	3.0
	> 900 to ≤ 1200	3.0	2.5	2.5	3.0
	> 1200 to ≤ 1500	X	3.0	2.5	3.0

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.5 to the *R-Values* given in this Table.

Table 13.2.5h: Masonry cavity wall – minimum insulation R-Value: climate zone 4

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	0.25	0.25	0.51	0.75
	> 0 to ≤ 300	0.51	0.51	0.51	0.75
	> 300 to ≤ 450	0.51	0.51	0,51	0.75
	> 450 to ≤ 600	0.51	0.51	0.51	0.75
	> 600 to ≤ 900	1.08	0.75	0.75	1.08
	> 900 to ≤ 1200	1.44	1.08	1.08	1.08
	> 1200 to ≤ 1500	X	1.44	1.44	1.08
	> 1500 to ≤ 1800	X	X	X	1.44

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
> 0.35 to ≤ 0.5	0	0.25	0.25	0.51	0.62
	> 0 to ≤ 300	0.25	0.25	0.51	0.62
	> 300 to ≤ 450	0.51	0.51	0.51	0.62
	> 450 to ≤ 600	0.51	0.51	0.51	0.75
	> 600 to ≤ 900	0.75	0.62	0.62	0.75
	> 900 to ≤ 1200	1.08	1.08	0.75	1.08
	> 1200 to ≤ 1500	X	1.44	1.08	1.08
	> 1500 to ≤ 1800	X	X	1.44	1.44
> 0.5 to ≤ 0.7	0	0.0	0.25	0.25	0.51
	> 0 to ≤ 300	0.25	0.25	0.25	0.51
	> 300 to ≤ 450	0.25	0.25	0.51	0.51
	> 450 to ≤ 600	0.25	0.25	0.51	0.51
	> 600 to ≤ 900	0.25	0.51	0.51	0.62
	> 900 to ≤ 1200	0.51	0.62	0.62	0.75
	> 1200 to ≤ 1500	1.08	1.08	1.08	1.08
	> 1500 to ≤ 1800	1.44	1.44	1.08	1.08

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.25 to the *R-Values* given in this Table.

Table 13.2.5i: Masonry veneer wall – minimum insulation R-Value: climate zone 5

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	1.5	2.0	2.0	2.5
	> 0 to ≤ 300	1.5	2.0	2.0	2.5
	> 300 to ≤ 450	1.5	1.5	2.0	2.5
	> 450 to ≤ 600	1.5	2.0	2.0	2.5
	> 600 to ≤ 900	2.0	2.0	2.0	2.5
	> 900 to ≤ 1200	3.0	2.0	2.0	2.5
	> 1200 to ≤ 1500	X	3.0	2.5	2.5
> 0.35 to ≤ 0.5	0	1.5	2.0	2.0	2.5
	> 0 to ≤ 300	1.5	1.5	2.0	2.5
	> 300 to ≤ 450	1.5	1.5	2.0	2.5
	> 450 to ≤ 600	1.5	1.5	2.0	2.5
	> 600 to ≤ 900	2.0	2.0	2.0	2.5
	> 900 to ≤ 1200	2.5	2.0	2.0	2.5
	> 1200 to ≤ 1500	3.0	2.5	2.5	2.5

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
> 0.5 to ≤ 0.7	0	1.5	2.0	2.0	3.0
	> 0 to ≤ 300	1.5	2.0	2.0	3.0
	> 300 to ≤ 450	1.5	1.5	2.0	2.5
	> 450 to ≤ 600	1.5	2.0	2.0	2.5
	> 600 to ≤ 900	2.0	2.0	2.0	2.5
	> 900 to ≤ 1200	2.5	2.0	2.0	2.5
	> 1200 to ≤ 1500	X	3.0	2.5	2.5

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.5 to the *R-Values* given in this Table.

Table 13.2.5j: Masonry cavity wall – minimum insulation R-Value: climate zone 5

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	0.0	0.0	0.25	0.25
	> 0 to ≤ 300	0.0	0.25	0.25	0.25
	> 300 to ≤ 450	0.25	0.25	0.25	0.25
	> 450 to ≤ 600	0.25	0.25	0.25	0.25
	> 600 to ≤ 900	0.25	0.25	0.25	0.51
	> 900 to ≤ 1200	0.51	0.51	0.51	0.51
	> 1200 to ≤ 1500	0.62	0.51	0.51	0.51
> 0.35 to ≤ 0.5	0	0.0	0.0	0.25	0.25
	> 0 to ≤ 300	0.0	0.0	0.25	0.25
	> 300 to ≤ 450	0.0	0.25	0.25	0.25
	> 450 to ≤ 600	0.25	0.25	0.25	0.25
	> 600 to ≤ 900	0.25	0.25	0.25	0.25
	> 900 to ≤ 1200	0.51	0.25	0.25	0.51
	> 1200 to ≤ 1500	0.62	0.51	0.51	0.51
> 0.5 to ≤ 0.7	0	0.0	0.0	0.0	0.25
	> 0 to ≤ 300	0.0	0.0	0.25	0.25
	> 300 to ≤ 450	0.0	0.0	0.25	0.25
	> 450 to ≤ 600	0.25	0.25	0.25	0.25
	> 600 to ≤ 900	0.25	0.25	0.25	0.25
	> 900 to ≤ 1200	0.51	0.25	0.25	0.25
	> 1200 to ≤ 1500	0.51	0.51	0.51	0.51

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) This Table shows wall heights for single storey dwellings. For two (or more) storey dwellings, add R0.25 to the *R-*

Values shown in this Table.

Table 13.2.5k: Masonry veneer wall – minimum insulation R-Value: climate zone 6

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	2.0	2.4	X	X
	> 0 to ≤ 300	2.4	2.4	X	X
	> 300 to ≤ 450	2.5	X	X	X
	> 450 to ≤ 600	X	X	X	X
	> 600 to ≤ 900	X	X	X	X
> 0.35 to ≤ 0.5	0	2.0	2.4	2.5	X
	> 0 to ≤ 300	2.4	2.5	X	X
	> 300 to ≤ 450	2.4	X	X	X
	> 450 to ≤ 600	X	X	X	X
	> 600 to ≤ 900	X	X	X	X
> 0.5 to ≤ 0.7	0	2.0	2.0	2.4	X
	> 0 to ≤ 300	2.0	2.4	2.5	X
	> 300 to ≤ 450	2.4	2.4	2.5	X
	> 450 to ≤ 600	2.5	2.5	X	X
	> 600 to ≤ 900	X	X	X	X
> 0.7 to ≤ 0.85	0	1.5	2.0	2.4	X
	> 0 to ≤ 300	2.0	2.0	2.4	X
	> 300 to ≤ 450	2.4	2.4	2.4	X
	> 450 to ≤ 600	2.4	2.4	2.4	X
	> 600 to ≤ 900	X	X	X	X

Table Notes

(1) SA = solar absorptance.

(2) R-Values listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.5 to the *R-Values* given in this Table.

Table 13.2.5l: Masonry cavity wall – minimum insulation R-Value: climate zone 6

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	0.51	0.62	1.08	1.44
	> 0 to ≤ 300	1.08	1.08	1.08	1.44
	> 300 to ≤ 450	1.44	1.08	1.08	1.44
	> 450 to ≤ 600	1.44	1.44	1.08	1.44
	> 600 to ≤ 900	X	X	1.44	X
	> 900 to ≤ 1200	X	X	X	X
> 0.35 to ≤ 0.5	0	0.51	0.62	0.75	1.08
	> 0 to ≤ 300	0.75	0.75	1.08	1.44
	> 300 to ≤ 450	1.08	1.08	1.08	1.44

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 450 to ≤ 600	1.44	1.08	1.08	1.44
	> 600 to ≤ 900	X	X	1.44	1.44
	> 900 to ≤ 1200	X	X	X	X
> 0.5 to ≤ 0.7	0	0.25	0.51	0.62	1.08
	> 0 to ≤ 300	0.62	0.62	0.75	1.08
	> 300 to ≤ 450	1.08	0.75	1.08	1.08
	> 450 to ≤ 600	1.44	1.08	1.08	1.08
	> 600 to ≤ 900	X	1.44	1.44	1.44
	> 900 to ≤ 1200	X	X	X	1.44
> 0.7 to ≤ 0.85	0	0.25	0.51	0.51	1.08
	> 0 to ≤ 300	0.62	0.51	0.75	1.08
	> 300 to ≤ 450	1.08	0.62	0.75	1.08
	> 450 to ≤ 600	1.08	1.08	1.08	1.08
	> 600 to ≤ 900	X	1.44	1.08	1.44
	> 900 to ≤ 1200	X	X	1.44	1.44

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.25 to the *R-Values* given in this Table, to a maximum *R-Value* of R1.44.

Table 13.2.5m: Masonry veneer wall – minimum insulation R-Value: climate zone 7

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	1.5	1.5	1.5	2.4
	> 0 to ≤ 300	2.0	1.5	2.0	2.4
	> 300 to ≤ 450	2.4	2.0	2.0	2.4
	> 450 to ≤ 600	X	2.4	2.0	2.4
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X
> 0.35 to ≤ 0.5	0	1.5	1.5	1.5	2.0
	> 0 to ≤ 300	1.5	1.5	2.0	2.4
	> 300 to ≤ 450	2.4	2.0	2.0	2.4
	> 450 to ≤ 600	X	2.0	2.0	2.4
	> 600 to ≤ 900	X	X	2.5	2.4
	> 900 to ≤ 1200	X	X	X	X
> 0.5 to ≤ 0.7	0	1.5	1.5	1.5	2.0
	> 0 to ≤ 300	1.5	1.5	1.5	2.0
	> 300 to ≤ 450	2.0	1.5	1.5	2.0
	> 450 to ≤ 600	2.5	2.0	2.0	2.0
	> 600 to ≤ 900	X	X	2.4	2.4

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 900 to ≤ 1200	X	X	X	X
> 0.7 to ≤ 0.85	0	1.5	1.5	1.5	1.5
	> 0 to ≤ 300	1.5	1.5	1.5	2.0
	> 300 to ≤ 450	2.0	1.5	1.5	2.0
	> 450 to ≤ 600	2.4	2.0	2.0	2.0
	> 600 to ≤ 900	X	X	2.4	2.0
	> 900 to ≤ 1200	X	X	X	2.4

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.5 to the *R-Values* given in this Table.

Table 13.2.5n: Masonry cavity wall – minimum insulation R-Value: climate zone 7

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	1.08	1.44	X	X
> 0.35 to ≤ 0.5	0	1.08	1.44	X	X
> 0.5 to ≤ 0.7	0	0.75	1.44	1.44	X
	> 0 to ≤ 300	1.44	X	X	X
> 0.7 to ≤ 0.85	0	0.75	1.08	1.44	X
	> 0 to ≤ 300	1.44	1.44	X	X

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.25 to the *R-Values* given in this Table.

Table 13.2.5o: Lightweight wall – minimum insulation R-Value: climate zone 8

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
≤ 0.35	0	1.5	2.0	2.0	X
	> 0 to ≤ 300	2.0	2.0	2.4	X
	> 300 to ≤ 450	X	2.4	2.4	X
	> 450 to ≤ 600	X	X	2.5	X
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
> 0.35 to ≤ 0.5	0	1.5	1.5	2.0	2.4
	> 0 to ≤ 300	2.0	2.0	2.0	2.5
	> 300 to ≤ 450	2.5	2.0	2.4	2.5
	> 450 to ≤ 600	X	2.5	2.4	X
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X
> 0.5 to ≤ 0.7	0	1.5	1.5	2.0	2.7
	> 0 to ≤ 300	2.0	2.0	2.0	2.7
	> 300 to ≤ 450	2.7	2.0	2.0	2.7
	> 450 to ≤ 600	X	2.7	2.5	2.5
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X
> 0.7 to ≤ 0.85	0	1.5	1.5	1.5	2.0
	> 0 to ≤ 300	2.0	1.5	2.0	2.4
	> 300 to ≤ 450	2.4	2.0	2.0	2.4
	> 450 to ≤ 600	X	2.4	2.0	2.4
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X

Table Notes

(1) SA = solar absorptance.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) X = not permitted.

(4) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings with a wall height up to 2.4 m, add R0.5 to the *R-Values* given in this Table. For two storey (or more) dwellings with a wall height greater than 2.4 m, add R1.0. In both cases, the maximum insulation level must be not more than R2.7, or R3.1 if there is a reflective airspace.

Table 13.2.5p: Concrete block walls with internal lining fixed to a metal frame: minimum Total R-Value to account for thermal bridging

Wall insulation *R-Value* from Tables 13.2.5a and 13.2.5e	Minimum *Total R-Value* to account for thermal bridging
0.5	0.94
1.0	1.15
1.5	1.66
2.0	2.04
2.5	2.24
2.8	2.38
3.0	2.48

Table Notes

Minimum *Total R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.5q: Lightweight metal-framed walls: minimum Total R-Value to account for thermal bridging

Wall insulation *R-Value required* in accordance with 13.2.5(2)	Minimum *Total R-Value* to account for thermal bridging
1.0	1.32
1.5	1.64
2.0	1.89
2.5	2.06
2.7	2.15
≥3.0	2.27

Table Notes

(1) Where the wall insulation *R-Value* from Tables 13.2.5b to 13.2.5o falls between the values shown in this Table, the *required Total R-Value* may be interpolated.

(2) Minimum *Total R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.5r: Masonry veneer metal-framed walls: minimum Total R-Value to account for thermal bridging

Wall insulation from Tables 13.2.5c, 13.2.5g, 13.2.5i, 13.2.5k and 13.2.5m	Minimum *Total R-Value* to account for thermal bridging
1.5	1.79
2.0	2.08
2.5	2.34
2.7	2.44
≥3.0	2.57

Table Notes

Minimum *Total R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.5s: Concrete block walls with internal lining fixed to a metal frame – thermal bridging mitigation

Wall insulation *R-Values* from Tables 13.2.5a to 13.2.5e	Option 1 – increase insulation between wall framing to specified minimum *R-Value*	Option 2 – add a layer of continuous insulation with specified minimum *R-Value* on the inside or outside of the wall framing
0 or reflective	Not required	Not required
0.5 or 1.0	1.5	0.13
1.5, 2.0 or 2.5	X	0.30

Table Notes

(1) X = not permitted.

(2) Minimum *R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.5t: Lightweight metal-framed walls – thermal bridging mitigation

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation
0 or reflective	Not required

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation
>0 to ≤1.5	Either install *reflective insulation* outside the frame to create a minimum 20 mm reflective airspace between frame and cladding, or increase insulation between frames by R0.5.
>1.5	Either install *reflective insulation* outside the frame to create a minimum 20 mm reflective airspace between frame and cladding, or add a layer of continuous insulation with an *R-Value* of at least R0.30 on the inside or the outside of the frame.

Table Notes

(1) Minimum *R-Value*s are in-situ values. They account for compression of insulation.

(2) The surface emittance of a reflective surface facing an airspace must be a maximum of 0.1.

Table 13.2.5u: Masonry veneer metal-framed walls – thermal bridging mitigation

Wall insulation *R-Value* from Tables 13.2.5c, 13.2.5g, 13.2.5i, 13.2.5k and 13.2.5m	Thermal bridging mitigation options
> 0	Either install *reflective insulation* outside the frame to a minimum 20 mm reflective airspace between the frame and veneer, or add a layer of continuous insulation with an *R-Value* of at least R0.30 on the inside or the outside of the frame.

Table Notes

(1) Minimum *R-Values* are in-situ values. They account for compression of insulation.

(2) The surface emittance of a reflective surface facing an airspace must be a maximum of 0.1.

Explanatory Information

- A lightweight wall has no high thermal mass cladding on the outside or lining on the inside. Typically, this would represent a framed wall, clad externally with timber weatherboards, fibre-cement sheet, metal or autoclaved aerated concrete.
- Because of the high thermal conductance of metal, a thermal break is needed when a metal framing member directly connects the external cladding to the internal lining or the internal environment. For the purposes of 13.2.5(5)(b), expanded polystyrene strips greater than or equal to 12 mm thickness and timber greater than or equal to 20 mm thickness are deemed to achieve an *R-Value* greater than or equal to 0.2.
- Continuous insulation placed outside the *primary insulation layer*, including *reflective insulation*, may also be subject to *vapour permeance* requirements of 10.8.1(2). Many continuous insulation products and foils have a low vapour permeance. Some *reflective insulation* products have perforations to increase their *vapour permeance*. Many perforated *reflective insulation* products are not classified as a water barrier by AS 4200.1. Accordingly, these products are not suitable for use as a *water control layer*.
- Many *reflective insulation* products that use perforations to increase their *vapour permeance* are not suitable for use behind vertical or diagonally orientated timber cladding boards, where *required* by clause 7.5.2 of the ABCB Housing Provisions, or behind open jointed or unsealed cladding systems.

13.2.6 Floors and subfloor walls

[2019: 3.12.1.5]

(1) Floor insulation, where the floor is over an unenclosed space, must achieve the minimum *R-Value* in accordance with Table 13.2.6a.

(2) Floor and subfloor insulation, where the floor is over an enclosed subfloor space, must—

(a) in *climate zone* 1, be subfloor wall insulation with an *R-Value* of R1.5; and

(b) in *climate zone* 2, be subfloor wall insulation in accordance with Table 13.2.6b; and

(c) in *climate zone* 3, be subfloor wall insulation in accordance with Table 13.2.6c; and

(d) in *climate zone* 4, be in accordance with Table 13.2.6d; and

(e) in *climate zone* 5, be in accordance with Table 13.2.6e; and

(f) in *climate zone* 6, be in accordance with Table 13.2.6f; and

(g) in *climate zone* 7, be in accordance with Table 13.2.6g; and

(h) in *climate zone* 8, be in accordance with Table 13.2.6h.

(3) The thermal bridging in a metal-framed floor must be addressed by—

(a) achieving the *Total R-Value* in Table 13.2.6i, calculated by—

(i) using a method that accounts for the effect of thermal bridging in a suspended floor above an enclosed subfloor space; or

(ii) using AS/NZS 4859.2 for all other floors; or

(b) complying with one of the options in Table 13.2.6j.

(4) A concrete slab-on-ground with an in-slab or in-screed heating or cooling system, must have insulation with an *R-Value* greater than or equal to 1.0, installed around the vertical edge of its perimeter.

(5) Except for a waffle-pod slab—

(a) in *climate zones* 6 and 7—

(i) insulation with *R-Value* greater than or equal to 0.64 must be installed around the vertical edge of its perimeter; and

(ii) insulation with an *R-Value* greater than or equal to 0.64 must be installed underneath the slab; and

(b) in *climate zone* 8—

(i) insulation with an *R-Value* greater than or equal to 1.0 must be installed around the vertical edge of its perimeter; and

(ii) insulation with an *R-Value* greater than or equal to 2.0 must be installed underneath the slab.

(6) Insulation required by (4), (5)(a)(i) and (5)(b)(i) must—

(a) be *water resistant*; and

(b) be continuous from the adjacent finished ground level—

(i) to a depth of greater than or equal to 300 mm; or

(ii) for at least the full depth of the vertical edge of the concrete slab-on-ground (see Figure 13.2.6).

(7) The requirements of (4) do not apply to an in-screed heating or cooling system used solely in a bathroom, amenity area or the like.

Table 13.2.6a: Minimum R-Value of floor insulation where the floor is over an unenclosed space

Climate zone	*R-Value*
1	2.0
2	2.0
3	1.5
4	X
5	X

Climate zone	*R-Value*
6	4.0, or 3.5 if used in conjunction with a reflective airspace
7	
8	

Table Notes

(1) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(2) X = not permitted.

Table 13.2.6b: Minimum R-Value of subfloor wall insulation where the floor is over an enclosed subfloor space: climate zone 2

Subfloor wall height (mm)	Minimum subfloor wall insulation *R-Value*
≤600	0.5
>600 to ≤900	1.0
>900 to ≤1200	1.5
>1200 to ≤1500	1.5
>1500 to ≤1800	1.5

Table Notes

(1) Under-floor insulation is not permitted in *climate zone* 2.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) Subfloor wall insulation must not obstruct ventilation openings in the subfloor walls.

Table 13.2.6c: Minimum R-Value of subfloor wall insulation where the floor is over an enclosed subfloor space: climate zone 3

Subfloor wall height (mm)	Minimum subfloor wall insulation *R-Value*
≤600	0.5
>600 to ≤900	0.5
>900 to ≤1200	0.5
>1200 to ≤1500	0.5
>1500 to ≤1800	0.5

Table Notes

(1) Under-floor insulation is not permitted in *climate zone* 3.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

(3) Subfloor wall insulation must not obstruct any ventilation openings in subfloor walls.

Table 13.2.6d: Minimum R-Value of floor and subfloor wall insulation where the floor is over an enclosed subfloor space: climate zone 4

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor space	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
≤600	No	0.5	1.0
≤600	No	1.0	0.5
≤600	Yes	0.0	1.5
≤600	Yes	0.5	1.0
≤600	Yes	2.0	0.5

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor space	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
>600 to ≤900	No	0.0	1.5
>600 to ≤900	No	1.5	0.5
>600 to ≤900	Yes	0.0	1.5
>600 to ≤900	Yes	0.5	1.0
>900 to ≤1200	No	0.0	1.5
>900 to ≤1200	No	0,5	1.0
>900 to ≤1200	Yes	0.5	1.0
>900 to ≤1200	Yes	2.0	0.5
>1200 to ≤1500	No	0.0	1.5
>1200 to ≤1500	Yes	0.0	1.5
>1200 to ≤1500	Yes	0.5	1.0
>1500 to ≤1800	No	0.5	1.5
>1500 to ≤1800	No	1.0	1.0
>1500 to ≤1800	Yes	0.0	2.0

Table Notes

(1) A suspended floor includes a suspended timber-framed floor, suspended metal-framed floor and suspended concrete floor.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.6e: Minimum R-Value of floor and subfloor wall insulation where the floor is over an enclosed subfloor area: climate zone 5

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor surface	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
≤600	No	0.0	1.5
≤600	Yes	0.0	2.0
>600 to ≤900	No	0.0	1.5
>600 to ≤900	Yes	0.0	2.0
>900 to ≤1200	No	0.0	2.0
>900 to ≤1200	Yes	0.0	2.0
>1200 to ≤1500	No	0.0	2.0
>1200 to ≤1500	Yes	0.0	2.0
>1500 to ≤1800	No	0.0	2.5
>1500 to ≤1800	No	0.5	2.0
>1500 to ≤1800	Yes	0.0	2.5
>1500 to ≤1800	Yes	0.5	2.0

Table Notes

(1) A suspended floor includes a suspended timber-framed floor, a suspended metal-framed floor and a suspended concrete floor.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.6f: Minimum R-Value of floor and subfloor wall insulation where the floor is over an enclosed subfloor space: climate zone 6

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor area	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
≤600	No	0.0	2.0
≤600	Yes	0.0	1.5
>600 to ≤900	No	0.0	2.0
>600 to ≤900	Yes	0.0	1.5
>900 to ≤1200	No	0.0	2.0
>900 to ≤1200	Yes	0.0	1.5
>1200 to ≤1500	No	0.0	2.5
>1200 to ≤1500	No	0.5	2.0
>1200 to ≤1500	Yes	0.0	1.5
>1500 to ≤1800	No	0.0	2.5
>1500 to ≤1800	Yes	0.0	2.0
>1500 to ≤1800	Yes	0.5	1.5

Table Notes

(1) A suspended floor includes a suspended timber-framed floor, suspended metal-framed floor and suspended concrete floor.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.6g: Minimum R-Value of floor and subfloor insulation where the floor is over an enclosed subfloor space: climate zone 7

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor space	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
≤600	No	0.0	2.5
≤600	Yes	0.0	1,5
>600 to ≤900	No	0.0	2.5
>600 to ≤900	Yes	0.0	1.5
>900 to ≤1200	No	0.0	3.0
>900 to ≤1200	Yes	0.0	1.5
>1200 to ≤1500	No	0.0	3.0
>1200 to ≤1500	Yes	0.0	1.5
>1500 to ≤1800	No	0.0	3.0
>1500 to ≤1800	Yes	1.0	1.5
>1500 to ≤1800	Yes	0.0	2.0

Table Notes

(1) A suspended floor includes a suspended timber-framed floor, suspended metal-framed floor and suspended concrete floor.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.6h: Minimum R-Value of floor and subfloor wall insulation where the floor is over an enclosed subfloor space: climate zone 8

Subfloor wall height (mm)	*Reflective insulation* facing down over the subfloor space	Minimum subfloor wall insulation *R-Value*	Minimum suspended floor insulation *R-Value*
≤600	No	0.0	2.5
≤600	Yes	0.0	1.5
>600 to ≤900	No	0.0	2.5
>600 to ≤900	Yes	0.0	1.5
>900 to ≤1200	No	0.0	3.0
>900 to ≤1200	Yes	0.0	1.5
>1200 to ≤1500	No	0.0	3.0
>1200 to ≤1500	Yes	0.0	1.5
>1500 to ≤1800	No	0.0	3.0
>1500 to ≤1800	Yes	1.0	1.5
>1500 to ≤1800	Yes	0.0	2.0

Table Notes

(1) A suspended floor includes a suspended timber-framed floor, suspended metal-framed floor and suspended concrete floor.

(2) *R-Values* listed are for the labelled, declared *R-Value* of insulation.

Table 13.2.6i: Metal-framed suspended floor — minimum Total R-Value for floor to account for thermal bridging

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Floor covering	Minimum *Total R-Value* of floor
0.0	Carpet	0.36
0.0	Other	0.22
0.5	Carpet	0.86
0.5	Other	0.71
1.0	Carpet	1.30
1.0	Other	1.15
1.5	Carpet	1.65
1.5	Other	1.50
2.0	Carpet	1.97
2.0	Other	1.83
2.5	Carpet	2.27
2.5	Other	2.11
3.0	Carpet	2.52
3.0	Other	2.37
3.5	Carpet	2.59
3.5	Other	2.47
4.0	Carpet	2.79
4.0	Other	2.65

Table Notes

(1) The *Total R-Value* can be adjusted using area weightings where there is a combination of floor coverings. Invert

the *Total R-Value* for each floor type before applying area weightings.

(2) The *Total R-Value* for the floor plane only includes the floor frame, insulation, flooring and floor coverings. It does not include the internal air film, subfloor airspace, subfloor walls or external air film.

(3) Minimum *Total R-Values* are in-situ values. They account for compression of insulation.

(4) Direction of heat flow must be determined in accordance with Table 13.2.6k.

Table 13.2.6j: Metal-framed suspended floor — thermal bridging mitigation

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Option 1 – increase insulation between floor framing to specified minimum *R-Value*	Option 2– add a layer of continuous insulation product above or below the floor framing with specified *R-Value*
0.5	1.5	0.13
1.0	2.5	0.30
1.5	2.5	0.40
2.0	3.0	0.40
2.5	4.0	0.40
≥ 3.0	X	0.60

Table Notes

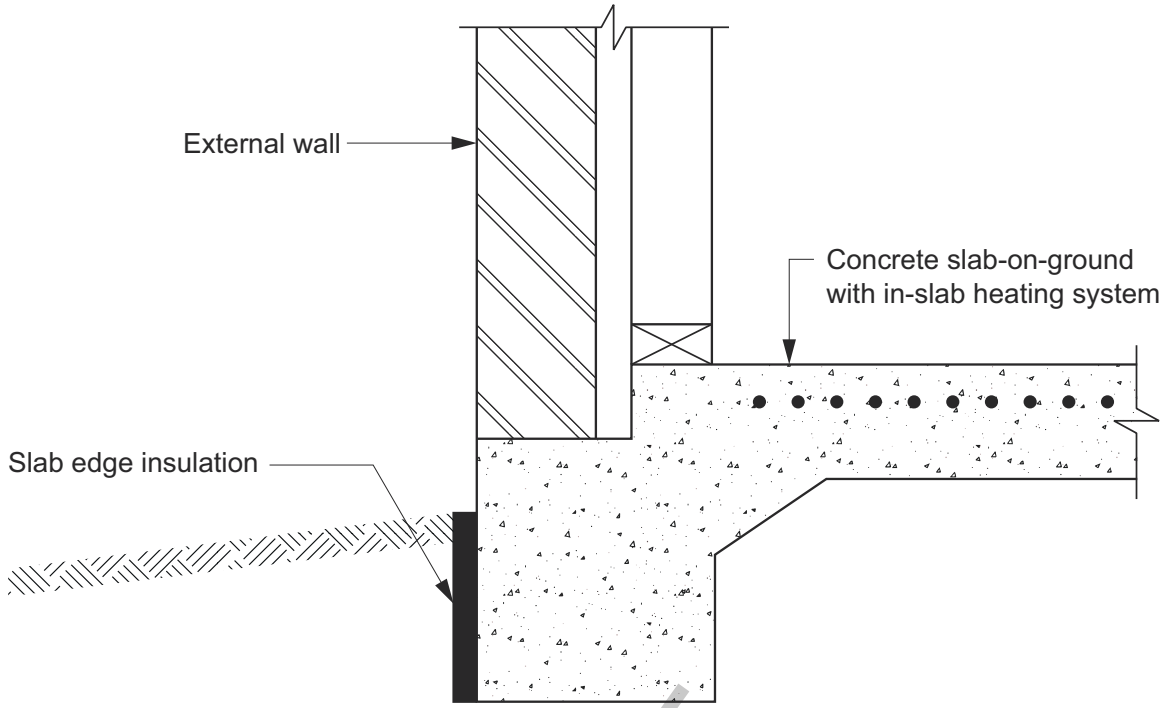
(1) X = not permitted.

(2) Minimum *R-Values* are in-situ values. They account for compression of insulation.

Table 13.2.6k: Floor — direction of heat flow

Climate zone	Direction of heat flow
1	Up
2	Up
3	Up
4	Down
5	Down
6	Down
7	Down
8	Down

Figure 13.2.6: Insulation of slab edge



Explanatory Information

- For 13.2.6(3) the effect of thermal bridging through repeating framing elements must be considered when calculating the *Total R-Value* of metal-framed floors. Other types of thermal bridges may be calculated if considered significant.
- 13.2.6(7) provides an exemption for an in-screed heating or cooling system used solely in bathrooms, amenity areas and the like, as these are typically small areas.
- Care should be taken to ensure that the type of termite management system selected is compatible with the slab edge insulation.

13.2.7 Attached Class 10a buildings

[2019: 3.12.1.6]

A Class 10a building attached to a Class 1 building must—

(a) have an external fabric that achieves the *required* level of thermal performance for a Class 1 building; or

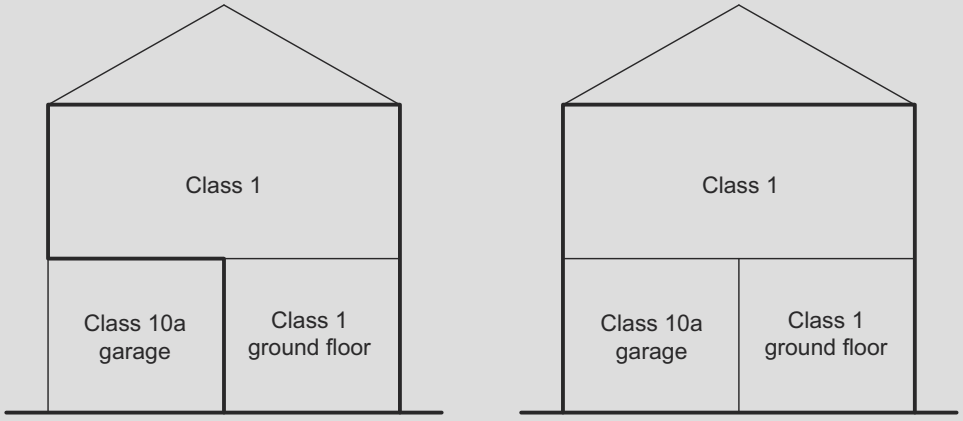
(b) be separated from the Class 1 building with construction having the *required* level of thermal performance for the Class 1 building.

Explanatory Information

The attachment of a Class 10a building, such as a garage, glasshouse, solarium, pool enclosure or the like should not compromise the thermal performance of the Class 1 building. In addition, the Class 10a building may be insulated and so assist the Class 1 building achieve the *required* thermal performance.

Explanatory Figure 13.2.7 below depicts examples of a Class 1 building with an attached Class 10a garage.

Figure 13.2.7 (explanatory): Attached Class 10a building examples



OPTION (a) – Elevation **OPTION (b) – Elevation**

Figure Notes

In (a), the thermal performance *required* for the Class 1 building may be achieved by including the walls and floor of the Class 1 building that adjoin the Class 10a garage.

In (b), the thermal performance *required* for the Class 1 building may be achieved by including the outside walls and floor of the Class 10a garage.

Part 13.3 External glazing

13.3.1 Application of Part 13.3

[2019: 3.12.2]

(1) This Part applies to—

(a) a Class 1 building; and

(b) a Class 10a building with a *conditioned space*.

(2) Part 13.3 must be applied as directed in H6D2(1)(b).

13.3.2 External glazing — winter

[2019: 3.12.2.1]

(1) In *climate zones* 2 to 8, the ratio of the conductance (C_U) and solar heat gain (C_{SHGC}) of the *glazing* in each *storey*, including any *mezzanine*, must—

(a) not exceed the allowances obtained from Table 13.3.2a; and

(b) be calculated in accordance with the following formula:

$$\frac{[(A_1 \times U_1 \times BC_1 \times OC_1 \times R_{W1}) + (A_2 \times U_2 \times BC_2 \times OC_2 \times R_{W2}) + \ldots]}{[(A_1 \times SHGC_1 \times E_{W1} \times R_{W1} \times BS_{W1} \times L_{W1} \times F_{W1} \times H_{W1}) + (A_2 \times SHGC_2 \times E_{W_2} \times R_{W2} \times BS_{W2} \times L_{W2} \times F_{W2} \times H_{W2}) + \ldots]}$$

(2) In the formula at (1)(b)—

(a) $A_{1,2,etc}$

= the area of each *glazing* element; and

(b) $U_{1,2,etc}$

= the *Total System U-Value* of each *glazing* element; and

(c) $SHGC_{1,2,etc}$

= the *Total System SHGC* for each *glazing* element, not exceeding 0.7; and

(d) $E_{W1,W2,etc}$

= the winter exposure factor for each *glazing* element obtained from Tables 13.3.2b to 13.3.2q; and

(e) $BC_{1,2,etc}$

= the bedroom conductance factor obtained from Table 13.3.2r; and

(f) $OC_{1,2,etc}$

= the orientation sector conductance factor obtained from Tables 13.3.2s to 13.3.2y; and

(g) $R_{W1,W2,etc}$

= the room type factor in Tables 13.3.2z to 13.3.2ag; and

(h) $BS_{W1,W2,etc}$

= the bedroom solar heat gain factor in Tables 13.3.2z to 13.3.2ag; and

(i) $L_{W1,W2,etc}$

= the factor in Tables 13.3.2z to 13.3.2ag for each *glazing* element located on a floor level above the lowest floor level; and

(j) $F_{W1,W2,etc}$

= the frame factor in Tables 13.3.2z to 13.3.2ag for each *glazing* element; and

(k) $H_{W1,W2,etc}$

= the floor factor in Tables 13.3.2z to 13.3.2ag for each *glazing* element.

(3) For the purposes of this clause—

(a) orientation sectors must be determined in accordance with Figure 13.3.2a; and

(b) P/H must be determined in accordance with Figure 13.3.2b.

Table 13.3.2a: Maximum conductance to solar heat gain ratio (C_U/C_{SHGC})

Climate zone	Floor in direct contact with the ground	Suspended floor
2	9.60	9.37
3	19.10	14.75
4	10.25	8.04
5 (lightweight wall)	8.89	8.32
5 (concrete or masonry wall)	8.79	10.12
6	8.45	6.06
7	7.02	7.96
8	4.93	9.41

Table 13.3.2b: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 2

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.49	1.48	1.08	0.47	0.41	0.46	1.05	1.44
0.05	1.44	1.40	1.00	0.40	0.34	0.41	0.97	1.38
0.10	1.38	1.36	0.95	0.38	0.32	0.38	0.93	1.31
0.20	1.21	1.21	0.85	0.34	0.30	0.34	0.84	1.17
0.40	1.00	0.97	0.68	0.28	0.25	0.28	0.70	0.97
0.60	0.83	0.80	0.60	0.25	0.22	0.25	0.59	0.81
0.80	0.62	0.64	0.49	0.21	0.21	0.23	0.51	0.66
1.00	0.43	0.54	0.40	0.20	0.20	0.19	0.43	0.55
1.20	0.26	0.43	0.35	0.18	0.19	0.18	0.40	0.45
1.40	0.22	0.37	0.29	0.16	0.18	0.17	0.36	0.37
1.60	0.18	0.30	0.28	0.16	0.17	0.16	0.30	0.33
1.80	0.15	0.26	0.24	0.15	0.15	0.15	0.26	0.27
2.00	0.12	0.19	0.21	0.14	0.15	0.15	0.25	0.26

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2c: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 2

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.67	1.36	1.20	0.52	0.19	0.85	1.18	1.51
0.05	1.62	1.29	1.12	0.45	0.16	0.75	1.09	1.45
0.10	1.56	1.26	1.06	0.42	0.15	0.71	1.05	1.37
0.20	1.36	1.11	0.95	0.38	0.14	0.62	0.95	1.22
0.40	1.13	0.90	0.76	0.31	0.12	0.52	0.79	1.01
0.60	0.94	0.74	0.67	0.28	0.10	0.46	0.66	0.85
0.80	0.70	0.59	0.55	0.24	0.10	0.41	0.57	0.69
1.00	0.49	0.50	0.45	0.22	0.09	0.35	0.48	0.57
1.20	0.30	0.40	0.39	0.20	0.09	0.33	0.46	0.47
1.40	0.25	0.34	0.32	0.18	0.08	0.31	0.40	0.39
1.60	0.20	0.27	0.31	0.18	0.08	0.29	0.34	0.35
1.80	0.17	0.24	0.27	0.17	0.07	0.27	0.30	0.29
2.00	0.14	0.18	0.24	0.16	0.07	0.27	0.29	0.28

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2d: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 3

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.36	1.16	0.75	0.38	0.38	0.43	1.05	1.41
0.05	1.35	1.12	0.70	0.33	0.33	0.38	1.00	1.38
0.10	1.25	1.07	0.66	0.32	0.32	0.37	0.96	1.30
0.20	1.11	0.95	0.60	0.28	0.30	0.33	0.86	1.18
0.40	0.89	0.78	0.51	0.24	0.27	0.27	0.74	0.98
0.60	0.67	0.60	0.41	0.21	0.26	0.23	0.59	0.79
0.80	0.45	0.48	0.37	0.19	0.23	0.22	0.51	0.63
1.00	0.30	0.41	0.30	0.17	0.21	0.21	0.45	0.51
1.20	0.21	0.31	0.26	0.15	0.21	0.18	0.37	0.43
1.40	0.16	0.28	0.21	0.14	0.20	0.17	0.33	0.37
1.60	0.12	0.24	0.20	0.13	0.18	0.16	0.32	0.31
1.80	0.11	0.17	0.16	0.13	0.18	0.14	0.26	0.28
2.00	0.09	0.17	0.15	0.12	0.18	0.14	0.24	0.24

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2e: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 3

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.92	1.29	0.97	0.82	0.75	1.07	1.24	1.69
0.05	1.90	1.24	0.90	0.72	0.66	0.94	1.18	1.65
0.10	1.76	1.18	0.86	0.69	0.63	0.91	1.13	1.56
0.20	1.57	1.05	0.77	0.62	0.60	0.81	1.01	1.41
0.40	1.25	0.86	0.66	0.51	0.54	0.68	0.87	1.17

P/H	North	North east	East	South east	South	South west	West	North west
0.60	0.94	0.66	0.53	0.46	0.51	0.59	0.70	0.94
0.80	0.63	0.53	0.47	0.41	0.45	0.55	0.60	0.76
1.00	0.42	0.45	0.39	0.36	0.42	0.52	0.53	0.61
1.20	0.29	0.35	0.34	0.33	0.42	0.46	0.44	0.52
1.40	0.23	0.31	0.28	0.31	0.39	0.42	0.39	0.44
1.60	0.17	0.27	0.26	0.28	0.36	0.39	0.38	0.37
1.80	0.15	0.19	0.21	0.28	0.36	0.36	0.31	0.34
2.00	0.13	0.19	0.20	0.26	0.36	0.36	0.29	0.29

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2f: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 4

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.48	1.40	0.91	0.47	0.46	0.51	1.11	1.57
0.05	1.45	1.34	0.84	0.40	0.38	0.43	1.03	1.51
0.10	1.43	1.30	0.81	0.37	0.36	0.40	0.98	1.46
0.20	1.22	1.18	0.74	0.34	0.33	0.36	0.88	1.31
0.40	1.11	1.01	0.62	0.29	0.29	0.31	0.75	1.13
0.60	0.92	0.83	0.54	0.25	0.25	0.27	0.64	0.92
0.80	0.80	0.68	0.47	0.23	0.23	0.25	0.57	0.77
1.00	0.64	0.61	0.41	0.20	0.21	0.22	0.48	0.66
1.20	0.46	0.47	0.36	0.18	0.21	0.21	0.44	0.57
1.40	0.35	0,43	0.33	0.17	0.20	0.20	0.39	0.48
1.60	0.26	0.38	0.31	0.17	0.18	0.18	0.34	0.42
1.80	0.20	0.32	0.28	0.16	0.18	0.17	0.31	0.36
2.00	0.18	0.30	0.24	0.14	0.17	0.16	0.29	0.30

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2g: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 4

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.38	1.12	1.00	0.71	0.56	0.87	1.02	1.26
0.05	1.35	1.08	0.91	0.60	0.46	0.73	0.95	1.21
0.10	1.34	1.04	0.89	0.56	0.45	0.69	0.90	1.17
0.20	1.13	0.95	0.80	0.51	0.40	0.62	0.82	1.05
0.40	1.04	0.81	0.67	0.43	0.35	0.53	0.70	0.91
0.60	0.85	0.67	0.59	0.38	0.30	0.47	0.59	0.74
0.80	0.74	0.55	0.52	0.34	0.29	0.42	0.53	0.62
1.00	0.60	0.49	0.44	0.31	0.26	0.38	0.44	0.53
1.20	0.43	0.38	0.40	0.27	0.26	0.36	0.41	0.46
1.40	0.33	0.35	0.36	0.25	0.24	0.33	0.36	0.39
1.60	0.24	0.31	0.34	0.25	0.22	0.31	0.31	0.34

P/H	North	North east	East	South east	South	South west	West	North west
1.80	0.18	0.26	0.30	0.24	0.22	0.29	0.29	0.29
2.00	0.17	0.24	0.26	0.22	0.21	0.27	0.26	0.24

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2h: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 5 (lightweight wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.61	1.55	1.00	0.49	0.44	0.47	1.02	1.58
0.05	1.56	1.49	0.91	0.41	0.37	0.40	0.94	1.51
0.10	1.56	1.43	0.86	0.39	0.36	0.38	0.90	1.47
0.20	1.30	1.27	0.77	0.35	0.32	0.34	0.80	1.32
0.40	1.19	1.05	0.64	0.30	0.28	0.29	0.66	1.10
0.60	0.97	0.87	0.52	0.26	0.25	0.25	0.56	0.90
0.80	0.78	0.71	0.46	0.24	0.23	0.23	0.50	0.73
1.00	0.64	0.55	0.36	0.21	0.22	0.20	0.43	0.63
1.20	0.43	0.48	0.33	0.20	0.20	0.19	0.35	0.50
1.40	0.32	0.36	0.27	0.19	0.19	0.18	0.34	0.43
1.60	0.22	0.32	0.25	0.18	0.17	0.16	0.28	0.36
1.80	0.18	0.26	0.21	0.16	0.17	0.16	0.24	0.32
2.00	0.14	0.20	0.20	0.15	0.17	0.14	0.23	0.24

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2i: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 5 (concrete or masonry wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.61	1.55	1.00	0.43	0.33	0.43	1.11	1.66
0.05	1.56	1.49	0.91	0.36	0.28	0.36	1.01	1.59
0.10	1.56	1.43	0.86	0.34	0.27	0.35	0.98	1.54
0.20	1.30	1.27	0.77	0.31	0.24	0.31	0.87	1.39
0.40	1.19	1.05	0.64	0.26	0.21	0.26	0.72	1.16
0.60	0.97	0.87	0.52	0.23	0.19	0.23	0.61	0.95
0.80	0.78	0.71	0.46	0.21	0.17	0.21	0.55	0.77
1.00	0.64	0.55	0.36	0.19	0.16	0.19	0.47	0.66
1.20	0.43	0.48	0.33	0.18	0.15	0.18	0.38	0.53
1.40	0.32	0.36	0.27	0.17	0.14	0.17	0.36	0.45
1.60	0.22	0.32	0.25	0.15	0.13	0.14	0.30	0.38
1.80	0.18	0.26	0.21	0.14	0.13	0.14	0.26	0.34
2.00	0.14	0.20	0.20	0.13	0.13	0.13	0.25	0.25

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2j: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 5 (light-weight wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.61	1.20	1.00	0.65	0.48	0.95	1.19	1.47
0.05	1.56	1.15	0.91	0.55	0.40	0.81	1.09	1.40
0.10	1.56	1.11	0.86	0.52	0.39	0.78	1.05	1.37
0.20	1.30	0.98	0.77	0.47	0.35	0.68	0.94	1.23
0.40	1.19	0.81	0.64	0.40	0.30	0.59	0.77	1.02
0.60	0.97	0.67	0.52	0.35	0.27	0.51	0.66	0.84
0.80	0.78	0.55	0.46	0.32	0.25	0.46	0.59	0.68
1.00	0.64	0.42	0.36	0.29	0.23	0.42	0.50	0.59
1.20	0.43	0.37	0.33	0.27	0.22	0.39	0.41	0.46
1.40	0.32	0.28	0.27	0.25	0.21	0.37	0.39	0.40
1.60	0.22	0.24	0.25	0.23	0.18	0.32	0.32	0.33
1.80	0.18	0.20	0.21	0.22	0.18	0.32	0.28	0.30
2.00	0.14	0.15	0.20	0.20	0.18	0.29	0.27	0.22

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2k: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 5 (concrete or masonry wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.71	1.24	1.00	0.63	0.44	0.94	1.19	1.54
0.05	1.66	1.19	0.91	0.53	0.37	0.80	1.09	1.47
0.10	1.66	1.14	0.86	0.50	0.36	0.77	1.05	1.43
0.20	1.39	1.01	0.77	0.45	0.32	0.68	0.94	1.28
0.40	1.27	0.84	0.64	0.39	0.28	0.58	0.77	1.07
0.60	1.03	0.69	0.52	0.34	0.25	0.51	0.66	0.87
0.80	0.83	0.57	0.46	0.31	0.23	0.46	0.59	0.71
1.00	0.68	0.43	0.36	0.27	0.22	0.41	0.50	0.61
1.20	0.46	0.38	0.33	0.26	0.20	0.39	0.41	0.49
1.40	0.34	0.28	0.27	0.24	0.19	0.36	0.39	0.42
1.60	0.24	0.25	0.25	0.23	0.17	0.31	0.32	0.35
1.80	0.19	0.21	0.21	0.21	0.17	0.31	0.28	0.31
2.00	0.15	0.16	0.20	0.19	0.17	0.29	0.27	0.23

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2l: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 6

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.52	1.44	1.28	0.77	0.77	0.74	1.32	1.45
0.05	1.47	1.36	1.17	0.65	0.65	0.63	1.22	1.38
0.10	1.46	1.31	1.12	0.61	0.61	0.59	1.14	1.35

P/H	North	North east	East	South east	South	South west	West	North west
0.20	1.25	1.18	0.99	0.54	0.54	0.53	1.05	1.23
0.40	1.14	1.02	0.85	0.46	0.47	0.45	0.90	1.04
0.60	0.98	0.87	0.72	0.39	0.41	0.38	0.78	0.90
0.80	0.86	0.74	0.61	0.36	0.38	0.36	0.69	0.75
1.00	0.69	0.58	0.54	0.32	0.34	0.31	0.59	0.66
1.20	0.56	0.54	0.46	0.31	0.31	0.30	0.54	0.55
1.40	0.42	0.41	0.42	0.27	0.31	0.28	0.48	0.49
1.60	0.35	0.37	0.35	0.26	0.29	0.25	0.42	0.42
1.80	0.26	0.30	0.34	0.24	0.27	0.23	0.41	0.38
2.00	0.20	0.27	0.32	0.22	0.25	023	0.36	0.30

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2m: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 6

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.62	1.31	1.16	0.72	0.49	0.90	1.10	1.44
0.05	1.56	1.24	1.06	0.60	0.41	0.76	1.01	1.37
0.10	1.55	1.19	1.02	0.57	0.39	0.72	0.95	1.34
0.20	1.33	1.07	0.90	0.51	0.35	0.64	0.88	1.23
0.40	1.22	0.93	0.77	0.43	0.30	0.54	0.75	1.04
0.60	1.04	0.79	0.65	0.37	0.26	0.46	0.65	0.90
0.80	0.92	0.67	0.55	0.33	0.24	0.44	0.58	0.75
1.00	0.73	0.53	0.49	0.30	0.22	0.38	0.49	0.65
1.20	0.60	0.50	0.42	0.29	0.20	0.36	0.45	0.55
1.40	0.45	0.38	0.38	0.25	0.20	0.34	0.40	0.49
1.60	0.37	0.34	0.32	0.24	0.18	0.30	0.35	0.42
1.80	0.27	0.28	0.30	0.22	0.17	0.28	0.34	0.38
2.00	0.21	0.25	0.29	0.21	0.16	0.28	0.30	0.30

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2n: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 7

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.87	1.92	1.20	0.52	0.46	0.53	1.13	1.80
0.05	1.81	1.83	1.12	0.44	0.38	0.45	1.04	1.73
0.10	1.81	1.80	1.06	0.41	0.36	0.42	0.99	1.69
0.20	1.70	1.68	0.99	0.37	0.33	0.38	0.90	1.54
0.40	1.46	1.46	0.84	0.32	0.27	0.32	0.75	1.36
0.60	1.34	1.28	0.73	0.28	0.25	0.28	0.66	1.15
0.80	1.14	1.10	0.64	0.25	0.22	0.25	0.59	1.00
1.00	1.04	0.98	0.59	0.22	0.21	0.22	0.51	0.85
1.20	0.82	0.82	0.49	0.21	0.20	0.21	0.45	0.76

P/H	North	North east	East	South east	South	South west	West	North west
1.40	0.75	0.80	0.48	0.19	0.18	0.20	0.41	0.58
1.60	0.58	0.58	0.44	0.18	0.17	0.17	0.38	0.54
1.80	0.47	0.55	0.35	0.17	0.17	0.17	0.35	0.47
2.00	0.35	0.46	0.35	0.15	0.16	0.17	0.30	0.40

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2o: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 7

P/H	North	North east	East	South east	South	South west	West	North east
0.00	1.87	1.43	1.20	0.75	0.53	0.93	1.13	1.62
0.05	1.81	1.37	1.12	0.63	0.44	0.78	1.04	1.56
0.10	1.81	1.34	1.06	0.59	0.42	0.73	0.99	1.53
0.20	1.70	1.25	0.99	0.53	0.38	0.66	0.90	1.38
0.40	1.46	1.09	0.84	0.45	0.32	0.56	0.75	1.22
0.60	1.34	0.95	0.73	0.40	0.29	0.49	0.66	1.04
0.80	1.14	0.82	0.64	0.36	0.26	0.44	0.59	0.90
1.00	1.04	0.73	0.59	0.32	0.24	0.39	0.51	0.77
1.20	0.82	0.61	0.49	0.30	0.23	0.37	0.45	0.68
1.40	0.75	0.60	0.48	0.28	0.21	0.34	0.41	0.52
1.60	0.58	0.43	0.44	0.26	0.20	0.29	0.38	0.49
1.80	0.47	0.41	0.35	0.24	0.20	0.29	0.35	0.42
2.00	0.35	0.34	0.35	0.22	0.18	0.29	0.30	0.36

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2p: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 8

P/H	North	North east	East	South east	South	South west	West	North west
0.00	2.30	2.40	1.66	0.67	0.36	0.65	1.59	2.30
0.05	2.23	2.28	1.50	0.56	0.30	0.54	1.43	2.19
0.10	2.20	2.20	1.44	0.53	0.28	0.51	1.37	2.11
0.20	1.86	1.98	1.29	0.47	0.26	0.46	1.23	1.89
0.40	1.68	1.65	1.05	0.40	0.22	0.39	1.00	1.56
0.60	1.40	1.34	0.90	0.34	0.19	0.33	0.86	1.29
0.80	1.19	1.10	0.76	0.30	0.18	0.29	0.71	1.06
1.00	0.94	0.96	0.66	0.29	0.16	0.26	0.59	0.91
1.20	0.64	0.75	0.57	0.26	0.15	0.25	0.53	0.74
1.40	0.52	0.68	0.51	0.24	0.14	0.23	0.47	0.60
1.60	0.37	0.50	0.43	0.23	0.14	0.21	0.43	0.50
1.80	0.27	0.45	0.39	0.20	0.13	0.19	0.37	0.46
2.00	0.23	0.41	0.33	0.20	0.12	0.19	0.33	0.36

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2q: Orientation sector winter exposure factor (E_W) — suspended floor — climate zone 8

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.39	1.27	1.22	0.80	0.59	0.90	1.05	1.28
0.05	1.35	1.21	1.10	0.66	0.49	0.74	0.95	1.22
0.10	1.33	1.17	1.05	0.63	0.46	0.71	0.91	1.17
0.20	1.12	1.05	0.95	0.56	0.42	0.63	0.82	1.05
0.40	1.02	0.88	0.77	0.47	0.35	0.53	0.66	0.87
0.60	0.85	0.71	0.66	0.41	0.31	0.46	0.57	0.72
0.80	0.72	0.58	0.56	0.36	0.29	0.40	0.47	0.59
1.00	0.57	0.51	0.48	0.34	0.26	0.36	0.39	0.51
1.20	0.39	0.40	0.42	0.30	0.25	0.34	0.35	0.41
1.40	0.32	0.36	0.38	0.29	0.23	0.32	0.31	0.33
1.60	0.22	0.27	0.32	0.27	0.22	0.29	0.29	0.28
1.80	0.17	0.24	0.29	0.24	0.21	0.27	0.25	0.25
2.00	0.14	0.22	0.24	0.24	0.20	0.27	0.22	0.20

Table Notes

For P/H between those shown in this Table, either use the next highest P/H or interpolate.

Table 13.3.2r: Bedroom conductance factor (BC)

Climate zone	Floor in direct contact with the ground	Suspended floor
2	0.90	0.70
3	1.11	0.70
4	1.10	0.95
5 (lightweight or masonry veneer wall)	1.20	0.60
5 (concrete or masonry wall)	0.70	1.20
6	1.10	1.10
7	1.08	0.80
8	0.83	0.82

Table 13.3.2s: Orientation sector conductance factor (OC): climate zone 2

Floor type	North	North east	East	South east	South	South west	West	North east
Floor in direct contact with the ground	1.11	0.97	0.83	0.81	0.79	0.82	0.84	0.98
Suspended floor	1.20	0.98	0.75	0.75	0.75	0.78	0.80	1.00

Table 13.3.2t: Orientation sector conductance factor (OC): climate zone 3

Floor type	North	North east	East	South east	South	South west	West	North west
Floor in direct contact with the ground	1.25	1.08	0.91	0.86	0.80	1.00	1.20	1.23

Floor type	North	North east	East	South east	South	South west	West	North west
Suspended floor	1.20	1.15	1.10	0.95	0.80	1.01	1.21	1.21

Table 13.3.2u: Orientation sector conductance factor (OC): climate zone 4

Floor type	North	North east	East	South east	South	South west	West	North west
Floor in direct contact with the ground	1.15	0.93	0.70	0.75	0.80	0.80	0.80	0.98
Suspended floor	1.20	1.05	0.90	0.90	0.90	0.90	0.90	1.05

Table 13.3.2v: Orientation sector conductance factor (OC): climate zone 5

Wall construction	Floor type	North	North east	East	South east	South	South west	West	North west
Lightweight or masonry veneer	Floor in direct contact with the ground	1.20	1.00	0.80	0.75	0.70	0.75	0.80	1.00
Lightweight or masonry veneer	Suspended floor	1.20	1.00	0.80	0.80	0.80	0.85	0.90	1.05
Concrete or masonry	Floor in direct contact with the ground	1.00	0.90	0.80	0.85	0.90	0.90	0.90	0.95
Concrete or masonry	Suspended floor	1.00	0.98	0.95	0.93	0.90	0.93	0.95	0.98

Table 13.3.2w: Orientation sector conductance factor (OC): climate zone 6

Floor type	North	North east	East	South east	South	South west	West	North west
Floor in direct contact with the ground	1.05	0.98	0.90	0.85	0.80	0.85	0.90	0.98
Suspended floor	1.00	0.90	0.80	0.80	0.80	0.80	0.80	0.90

Table 13.3.2x: Orientation sector conductance factor (OC): climate zone 7

Floor type	North	North east	East	South east	South	South west	West	North west
Floor in direct contact with the ground	1.30	1.05	0.80	0.80	0.80	0.80	0.80	1.05
Suspended floor	1.30	1.10	0.90	0.90	0.90	0.90	0.90	1.10

Table 13.3.2y: Orientation sector conductance factor (OC): climate zone 8

Floor type	North	North east	East	South east	South	South west	West	North west
Floor in direct contact with the ground	1.30	1.10	0.90	0.88	0.85	0.88	0.90	1.10
Suspended floor	1.20	1.00	0.80	0.75	0.70	0.75	0.80	1.00

Table 13.3.2z: Winter solar heat gain factors: climate zone 2

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.40	1.00
Bedroom solar heat gain factor (BS_W)	1.80	1.02
Level factor (L_W) for all floor levels above the lowest floor	1.10	1.20
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.98	0.97
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.99
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.03	1.03
Floor factor (for tiled or vinyl covered floor) (H_W)	1.14	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2aa: Winter solar heat gain factor: climate zone 3

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.26	1.00
Bedroom solar heat gain factor (BS_W)	0.79	0.50
Level factor (L_W) for all levels above the lowest floor	1.19	1.30

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.97	0.97
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.04	1.04
Floor factor (for tiled or vinyl covered floor) (H_W)	1.15	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2ab: Winter solar heat gain factors: climate zone 4

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.60	1.00
Bedroom solar heat gain factor (BS_W)	0.70	0.71
Level factor (L_W) for all levels above the lowest floor	1.30	1.40
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.98	0.98
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.04	1.04
Floor factor (for tiled or vinyl covered floor) (H_W)	1.03	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2ac: Winter solar heat gain factors: climate zone 5 — lightweight or masonry veneer wall

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.60	1.00
Bedroom solar heat gain factor (BS_W)	1.20	0.57
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.20
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.97	0.90
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.93
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.04	1.00

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Floor factor (for tiled or vinyl covered floor) (H_W)	1.05	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2ad: Winter solar heat gain factors: climate zone 5 — concrete or masonry wall

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.40	0.30
Bedroom solar heat gain factor (BS_W)	1.00	0.60
Level factor (L_W) for all floor levels above the lowest floor	1.40	1.10
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.97	0.90
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.04	1.00
Floor factor (for tiled or vinyl covered floor) (H_W)	1.10	Not applicable

Table Notes

(1) This Table only applies to dwellings with both high mass external and internal walls, for example masonry *cavity* walls and masonry internal walls.

(2) Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2ae: Winter solar heat gain factors: climate zone 6

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.60	1.00
Bedroom solar heat gain factor (BS_W)	0.70	1.35
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.40
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	0.93	0.83
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	0.96	0.96
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.00	1.00
Floor factor (for tiled or vinyl covered floor) (H_W)	0.95	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2af: Winter solar heat gain factors: climate zone 7

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom and a room which is not a *conditioned space*	0.60	1.00
Bedroom solar heat gain factor (BS_W)	1.22	0.50
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.10
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.97	0.97
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.05	1.05
Floor factor (for tiled or vinyl covered floor) (H_W)	1.03	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.2ag: Winter solar heat gain factors: climate zone 8

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_W) for a bedroom or a which is not a *conditioned space*	0.50	1.00
Bedroom solar heat gain factor (BS_W)	1.52	0.32
Level factor (L_W) for all floor levels above the lowest floor	1.15	0.70
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.40	0.96	0.96
Frame factor (F_W) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.68	1.00	1.00
(H_W)	0.91	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Figure 13.3.2a: Orientation sectors

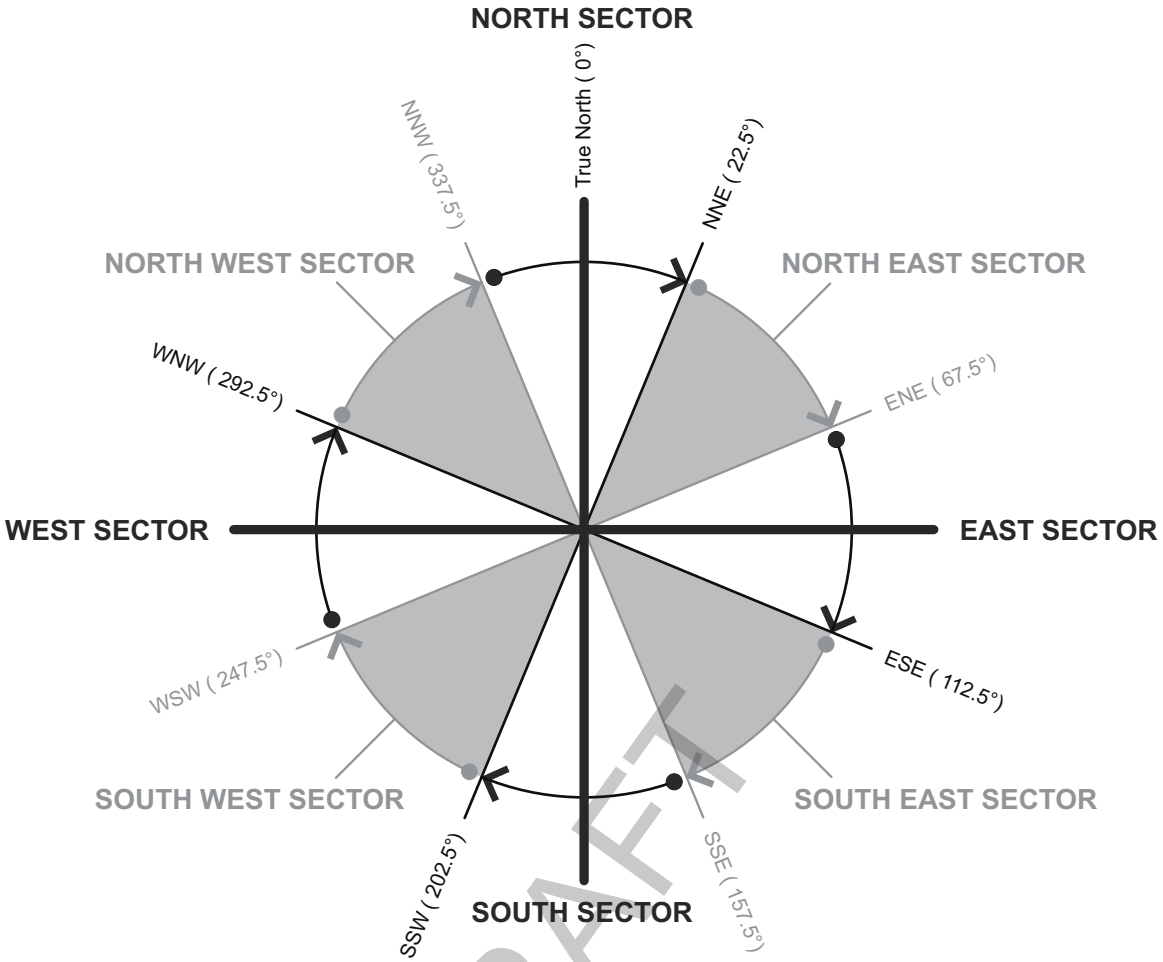


Figure Notes

(1) The orientation sector for a wall or *glazing* element is the sector that contains a line drawn perpendicular to the face of the wall or *glazing* element.

(2) This Figure is based on True North and all angles are measured clockwise from True North. Survey angles on site plans are usually marked in angles from True North. These angles can be used to establish True North for a particular site.

(3) Magnetic North, found by a magnetic compass, varies from True North over time and by different amounts in different locations. Magnetic North is not an acceptable approximation of True North.

(4) The eight orientation sectors shown in this Figure do not overlap at their boundaries. For example, north sector begins just clockwise after the NNW line and ends exactly on the NNE line. The start and end of other sectors are determined in a similar way, as indicated by the other curved arrows.

Figure 13.3.2b: Method of measuring P and H

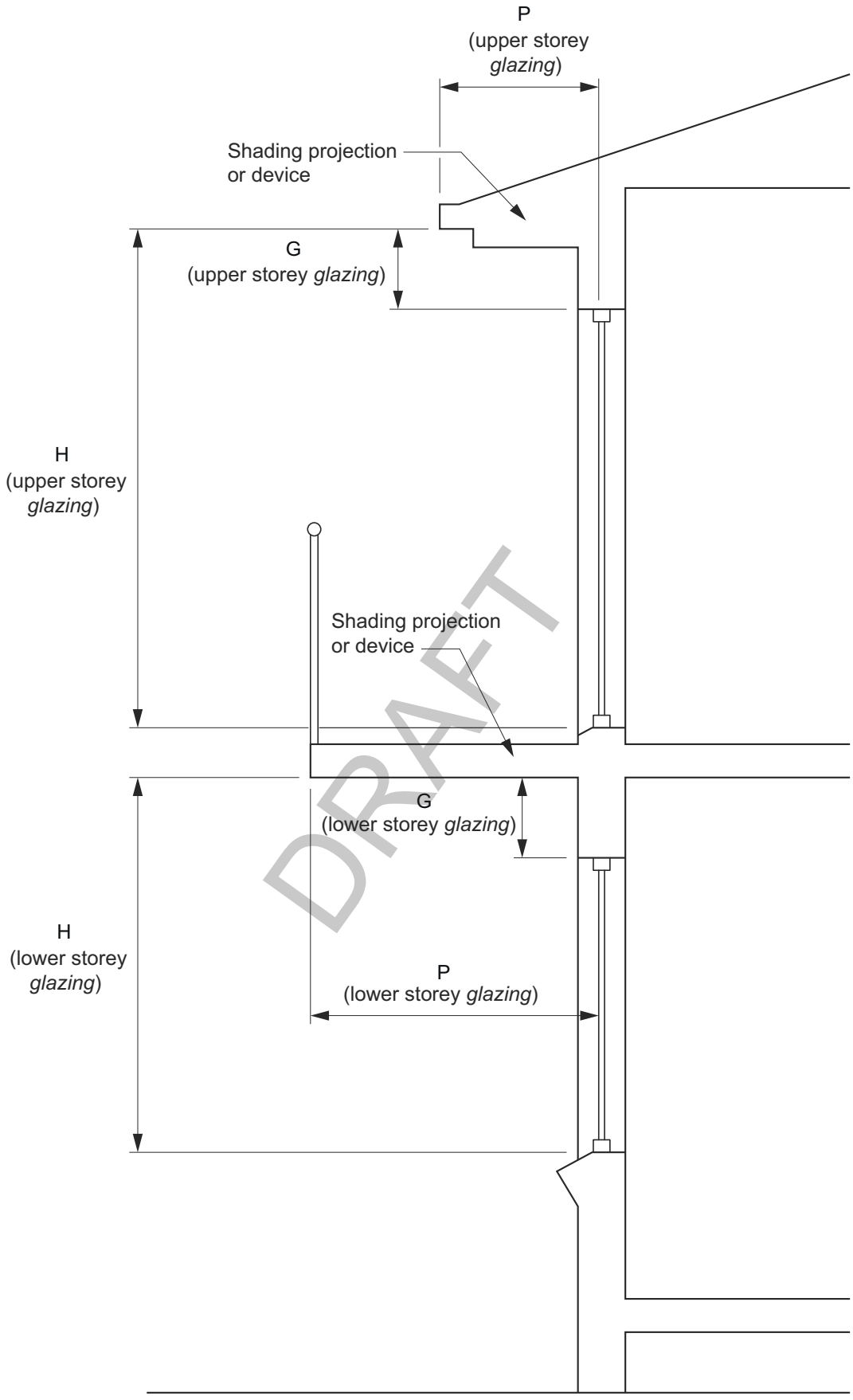


Figure Notes

(1) An external shading device that complies with 13.3.4(b) is considered to achieve a P/H value of 2.00.

(2) Where G exceeds 500 mm, the value of P must be halved.

Explanatory Information

- There is little or no need for heating at any time of the year in *climate zone* 1. Therefore, this clause does not apply in *climate zone* 1.
- For the bedroom conductance factor (BC), the conductance heat loss from *windows* in bedrooms and unconditioned areas has less impact on the heating loads of a dwelling than conductance heat loss from *windows* in a living area due to the different time of day that the rooms are occupied. Bedrooms are typically not occupied during the day when outdoor temperatures and solar heat gains are higher.
- For the orientation sector conductance factor (OC) in a room which has higher solar heat gain through the *glazing*, the average temperature in the room will be higher than an orientation which has lower solar heat gain through the *glazing*.

13.3.3 External glazing — summer

[New for 2022]

(1) In *climate zones* 1 to 7, the aggregate solar heat gain of the *glazing* in each *storey* of a building, including any *mezzanine*, must—

(a) not exceed the allowance resulting from multiplying the *floor area* of each *storey*, measured within the enclosing walls, by the constant C_{SHGC} obtained from Table 13.3.3a; and

(b) be calculated in accordance with the following formula:

$$(A_1 \times SHGC_1 \times E_{S1} \times R_{S1} \times L_{S1} \times F_{S1} \times H_{S1}) + (A_2 \times SHGC_2 \times E_{S2} \times R_{S2} \times L_{S2} \times F_{S2} \times H_{S2}) + \ldots$$

(2) In the formula at (1)(b)—

(a) $A_{1,2,etc}$

= the area of each *glazing* element; and

(b) $SHGC_{1,2,etc}$

= the *Total System SHGC* for each *glazing* element not exceeding 0.7; and

(c) $E_{S1,S2,etc}$

= the summer exposure factor for each *glazing* element obtained from Tables 13.3.3b to 13.3.3q; and

(d) $R_{S1,S2,etc}$

= the factor in Tables 13.3.3r to 13.3.3y for each *glazing* element located in a bedroom or room which is not a *conditioned space*; and

(e) $L_{S1,S2,etc}$

= the factor in Tables 13.3.3r to 13.3.3y for each *glazing* element located on a floor level above the lowest floor; and

(f) $F_{S2,S2,etc}$

= the frame factor in Tables 13.3.3r to 13.3.3y for each *glazing* element; and

(g) $H_{S1,S2,etc}$

= the floor factor in Tables 13.3.3r to 13.3.3y for each *glazing* element.

(3) For the purposes of this clause—

(a) orientation sectors must be determined in accordance with Figure 13.3.2a; and

(b) P/H must be measured in accordance with Figure 13.3.2b.

Table 13.3.3a: Constant for solar heat gain coefficient (C_{SHGC}): climate zones 1 to 7

Floor type	*Ventilation opening* area	*Climate zone*							
		1	2	3	4	5 (lightweight wall)	5 (concrete or brick wall)	6	7
Floor in direct contact with the ground	5%	0.0672	0.0595	0.0945	0.0604	0.0484	0.0657	0.0786	0.0762
	10%	0.0718	0.0640	0.0985	0.0626	0.0538	0.0695	0.0817	0.0821
	15%	0.0770	0.0682	0.1001	0.0641	0.0569	0.0714	0.0832	0.0871
	20%	0.0827	0.0719	0.1007	0.0650	0.0587	0.0723	0.0840	0.0912
Suspended floor	5%	0.0431	0.0324	0.0768	0.0651	0.0334	0.0630	0.0963	0.0750
	10%	0.0497	0.0404	0.0783	0.0697	0.0426	0.0683	0.0989	0.0778
	15%	0.0541	0.0458	0.0792	0.0721	0.0477	0.0710	0.1001	0.0789
	20%	0.0570	0.0494	0.0796	0.0734	0.0505	0.0723	0.1007	0.0793

Table Notes

(1) The *ventilation opening* area is the total area of each *ventilation opening* divided by the *floor area* of the storey, including any *mezzanine*.

(2) No *window* may have a design *ventilation opening* greater than 90% because the window frame will always obstruct some of the area of the opening.

(3) Where the *ventilation opening* area is more than 20%, the C_{SHGC} value corresponding to 20% ventilation opening area is to be used.

(4) Where the floor construction of a storey, including any *mezzanine*, is partly in direct contact with the ground and partly suspended, the constant is to be—

(a) interpolated between the constants in proportion to the *floor area* of each floor type; or

(b) the constant for a suspended floor.

(5) If the *ventilation opening* area is between the values shown in this Table, the constant may be interpolated.

Table 13.3.3b: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 1

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.35	1.64	1.69	1.62	1.13	1.65	1.72	1.66
0.05	1.14	1.45	1.56	1.47	0.98	1.52	1.60	1.46
0.10	1.07	1.33	1.45	1.40	0.88	1.42	1.50	1.35
0.20	0.96	1.15	1.32	1.23	0.72	1.22	1.30	1.17
0.40	0.78	0.88	1.03	0.90	0.55	0.98	1.08	0.92
0.60	0.65	0.72	0.86	0.77	0.44	0.78	0.86	0.74
0.80	0.57	0.61	0.69	0.61	0.39	0.68	0.75	0.62
1.00	0.49	0.51	0.59	0.54	0.33	0.56	0.62	0.55
1.20	0.47	0.45	0.48	0.43	0.29	0.51	0.55	0.51
1.40	0.44	0.41	0.42	0.39	0.29	0.42	0.48	0.43
1.60	0.39	0.35	0.37	0.34	0.23	0.38	0.44	0.41
1.80	0.34	0.35	0.35	0.29	0.22	0.36	0.39	0.35
2.00	0.31	0.33	0.30	0.27	0.21	0.31	0.36	0.33

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3c: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 1

P/H	North	North east	East	South East	South	South west	West	North west
0.00	0.61	0.96	1.43	1.19	0.70	1.15	1.32	0.92
0.05	0.51	0.84	1.32	1.08	0.61	1.06	1.23	0.81
0.10	0.48	0.78	1.23	1.03	0.55	0.99	1.15	0.75
0.20	0.43	0.67	1.12	0.90	0.45	0.85	1.00	0.65
0.40	0.35	0.51	0.88	0.66	0.34	0.68	0.83	0.51
0.60	0.29	0.42	0.73	0.57	0.28	0.54	0.66	0.41
0.80	0.26	0.35	0.59	0.45	0.24	0.47	0.58	0.35
1.00	0.22	0.30	0.50	0.39	0.20	0.39	0.48	0.30
1.20	0.21	0.26	0.41	0.32	0.18	0.35	0.42	0.28
1.40	0.20	0.24	0.36	0.29	0.18	0.29	0.37	0.24
1.60	0.18	0.21	0.31	0.25	0.15	0.26	0.34	0.23
1.80	0.15	0.21	0.30	0.21	0.14	0.25	0.30	0.20
2.00	0.14	0.19	0.26	0.20	0.13	0.22	0.28	0.18

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3d: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 2

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.59	1.08	1.50	0.93	0.40	1.05	1.78	1.19
0.05	0.49	0.94	1.35	0.82	0.33	0.95	1.64	1.06
0.10	0.45	0.87	1.28	0.77	0.31	0.88	1.52	0.97
0.20	0.39	0.76	1.13	0.68	0.28	0.79	1.33	0.84

P/H	North	North east	East	South east	South	South west	West	North west
0.40	0.32	0.57	0.90	0.54	0.22	0.63	1.10	0.65
0.60	0.27	0.45	0.74	0.44	0.18	0.52	0.89	0.48
0.80	0.24	0.38	0.62	0.36	0.16	0.43	0.77	0.42
1.00	0.21	0.31	0.53	0.31	0.13	0.38	0.63	0.34
1.20	0.19	0.28	0.43	0.27	0.12	0.32	0.55	0.30
1.40	0.17	0.25	0.39	0.25	0.12	0.28	0.48	0.26
1.60	0.16	0.24	0.34	0.22	0.10	0.25	0.41	0.24
1.80	0.14	0.21	0.30	0.20	0.09	0.24	0.37	0.22
2.00	0.14	0.19	0.27	0.19	0.09	0.21	0.36	0.20

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3e: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 2

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.43	0.81	1.16	0.75	0.36	1.06	1.88	1.11
0.05	0.36	0.71	1.05	0.67	0.30	0.96	1.72	0.99
0.10	0.33	0.66	0.99	0.62	0.29	0.89	1.60	0.90
0.20	0.28	0.57	0.87	0.55	0.25	0.80	1.40	0.78
0.40	0.23	0.43	0.69	0.44	0.20	0.64	1.16	0.60
0.60	0.20	0.34	0.57	0.36	0.17	0.52	0.94	0.45
0.80	0.17	0.29	0.48	0.30	0.15	0.44	0.81	0.39
1.00	0.16	0.23	0.41	0.25	0.12	0.38	0.66	0.32
1.20	0.14	0.21	0.33	0.22	0.11	0.32	0.57	0.28
1.40	0.13	0.19	0.30	0.20	0.11	0.29	0.50	0.24
1.60	0.11	0.18	0.27	0.18	0.10	0.26	0.43	0.22
1.80	0.10	0.16	0.23	0.16	0.09	0.25	0.39	0.20
2.00	0.10	0.15	0.21	0.15	0.08	0.21	0.38	0.19

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3f: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 3

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.95	1.51	1.70	1.53	0.92	1.45	1.50	1.41
0.05	0.80	1.36	1.58	1.40	0.80	1.31	1.39	1.26
0.10	0.75	1.23	1.50	1.33	0.76	1.24	1.31	1.16
0.20	0.65	1.06	1.32	1.17	0.64	1.09	1.17	1.02
0.40	0.54	0.81	1.06	0.92	0.53	0.90	0.92	0.78
0.60	0.48	0.62	0.89	0.75	0.43	0.71	0.78	0.62
0.80	0.41	0.51	0.71	0.61	0.38	0.63	0.66	0.49
1.00	0.34	0.42	0.60	0.52	0.34	0.54	0.58	0.41
1.20	0.32	0.38	0.50	0.44	0.29	0.46	0.47	0.36
1.40	0.29	0.32	0.42	0.40	0.28	0.40	0.45	0.32

P/H	North	North east	East	South east	South	South west	West	North west
1.60	0.29	0.29	0.40	0.35	0.22	0.39	0.39	0.29
1.80	0.26	0.28	0.36	0.31	0.22	0.35	0.36	0.27
2.00	0.26	0.26	0.30	0.31	0.21	0.30	0.30	0.24

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3g: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 3

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.78	1.30	1.56	1.36	0.79	1.16	1.09	1.11
0.05	0.66	1.18	1.45	1.24	0.68	1.05	1.01	0.99
0.10	0.62	1.06	1.38	1.17	0.65	0.99	0.95	0.91
0.20	0.53	0.91	1.21	1.04	0.55	0.87	0.85	0.80
0.40	0.45	0.70	0.97	0.82	0.46	0.72	0.67	0.62
0.60	0.39	0.54	0.81	0.67	0.37	0.57	0.57	0.48
0.80	0.34	0.44	0.65	0.54	0.32	0.50	0.48	0.39
1.00	0.28	0.36	0.55	0.46	0.29	0.43	0.42	0.32
1.20	0.27	0.33	0.46	0.39	0.25	0.37	0.34	0.29
1.40	0.24	0.28	0.39	0.36	0.24	0.32	0.33	0.25
1.60	0.24	0.25	0.36	0.31	0.19	0.31	0.28	0.23
1.80	0.21	0.24	0.33	0.28	0.19	0.28	0.26	0.21
2.00	0.21	0.23	0.28	0.28	0.18	0.24	0.22	0.19

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3h: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 4

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.83	1.13	1.05	0.68	0.31	0.99	1.90	1.46
0.05	0.70	1.05	0.98	0.63	0.27	0.91	1.77	1.33
0.10	0.64	0.95	0.93	0.59	0.25	0.85	1.70	1.22
0.20	0.49	0.83	0.84	0.53	0.23	0.76	1.52	1.05
0.40	0.35	0.63	0.69	0.44	0.19	0.62	1.23	0.81
0.60	0.31	0.48	0.56	0.36	0.16	0.53	1.04	0.59
0.80	0.28	0.36	0.47	0.32	0.14	0.45	0.86	0.47
1.00	0.23	0.29	0.41	0.27	0.12	0.39	0.74	0.39
1.20	0.22	0.25	0.35	0.24	0.11	0.35	0.65	0.33
1.40	0.18	0.22	0.29	0.22	0.09	0.33	0.55	0.27
1.60	0.18	0.19	0.29	0.20	0.09	0.29	0.48	0.26
1.80	0.16	0.17	0.24	0.18	0.08	0.25	0.46	0.22
2.00	0.15	0.16	0.21	0.15	0.08	0.24	0.38	0.21

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3i: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 4

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.79	1.13	1.12	0.68	0.29	0.64	1.05	1.06
0.05	0.66	1.05	1.05	0.63	0.25	0.59	0.98	0.97
0.10	0.61	0.95	0.99	0.59	0.23	0.55	0.94	0.89
0.20	0.52	0.83	0.90	0.53	0.21	0.49	0.84	0.77
0.40	0.43	0.63	0.74	0.44	0.17	0.40	0.68	0.59
0.60	0.36	0.48	0.59	0.36	0.15	0.34	0.58	0.43
0.80	0.32	0.36	0.50	0.32	0.13	0.29	0.47	0.34
1.00	0.29	0.29	0.44	0.27	0.11	0.25	0.41	0.29
1.20	0.25	0.25	0.37	0.24	0.10	0.23	0.36	0.24
1.40	0.23	0.22	0.31	0.22	0.09	0.21	0.30	0.20
1.60	0.21	0.19	0.30	0.20	0.08	0.19	0.26	0.19
1.80	0.19	0.17	0.26	0.18	0.07	0.16	0.26	0.16
2.00	0.19	0.16	0.22	0.15	0.07	0.16	0.21	0.15

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3j: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 5 (lightweight or masonry veneer wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.62	0.79	0.83	0.67	0.48	1.04	1.69	1.19
0.05	0.52	0.70	0.75	0.60	0.40	0.92	1.55	1.07
0.10	0.47	0.64	0.71	0.55	0.38	0.86	1.44	0.96
0.20	0.38	0.55	0.62	0.49	0.34	0.76	1.29	0.85
0.40	0.29	0.42	0.50	0.40	0.27	0.62	1.05	0.64
0.60	0.26	0.33	0.41	0.33	0.23	0.51	0.85	0.49
0.80	0.23	0.27	0.35	0.28	0.20	0.43	0.68	0.41
1.00	0.20	0.22	0.29	0.24	0.18	0.37	0.60	0.32
1.20	0.18	0.19	0.25	0.21	0.15	0.33	0.52	0.28
1.40	0.16	0.17	0.22	0.19	0.14	0.29	0.44	0.25
1.60	0.15	0.16	0.20	0.16	0.13	0.27	0.39	0.22
1.80	0.14	0.15	0.18	0.15	0.12	0.23	0.35	0.21
2.00	0.13	0.12	0.17	0.15	0.11	0.21	0.33	0.19

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3k: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 5 (concrete or masonry wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.98	1.14	1.07	0.60	0.24	0.78	1.50	1.36
0.05	0.83	1.01	0.96	0.53	0.20	0.69	1.37	1.22
0.10	0.76	0.92	0.91	0.49	0.19	0.65	1.28	1.10
0.20	0.61	0.80	0.80	0.44	0.17	0.57	1.14	0.98

P/H	North	North east	East	South east	South	South west	West	North west
0.40	0.47	0.61	0.64	0.36	0.13	0.47	0.93	0.73
0.60	0.42	0.48	0.52	0.29	0.12	0.38	0.75	0.56
0.80	0.36	0.39	0.45	0.25	0.10	0.32	0.60	0.47
1.00	0.31	0.33	0.38	0.21	0.09	0.28	0.53	0.36
1.20	0.29	0.27	0.32	0.19	0.08	0.25	0.46	0.32
1.40	0.25	0.24	0.29	0.17	0.07	0.22	0.39	0.28
1.60	0.24	0.23	0.26	0.14	0.06	0.20	0.35	0.25
1.80	0.22	0.21	0.23	0.13	0.06	0.17	0.31	0.24
2.00	0.20	0.18	0.22	0.13	0.06	0.16	0.29	0.22

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3l: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 5 (lightweight or masonry veneer wall)

P/H	North	North east	East	South East	South	South west	West	North west
0.00	0.67	0.93	1.05	0.61	0.27	0.67	1.16	0.99
0.05	0.57	0.82	0.94	0.54	0.23	0.59	1.06	0.89
0.10	0.52	0.75	0.89	0.51	0.22	0.55	0.99	0.80
0.20	0.42	0.65	0.78	0.45	0.19	0.49	0.88	0.71
0.40	0.32	0.49	0.62	0.36	0.15	0.40	0.72	0.53
0.60	0.29	0.39	0.51	0.30	0.13	0.33	0.58	0.41
0.80	0.25	0.31	0.44	0.26	0.11	0.28	0.46	0.34
1.00	0.21	0.26	0.37	0.22	0.10	0.24	0.41	0.27
1.20	0.20	0.22	0.32	0.19	0.09	0.21	0.36	0.23
1.40	0.17	0.20	0.28	0.17	0.08	0.19	0.30	0.21
1.60	0.16	0.19	0.26	0.15	0.07	0.17	0.27	0.18
1.80	0.15	0.17	0.22	0.13	0.07	0.15	0.24	0.17
2.00	0.14	0.14	0.21	0.13	0.06	0.14	0.22	0.16

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3m: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 5 (concrete or masonry wall)

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.82	1.04	1.07	0.72	0.41	0.78	1.17	1.10
0.05	0.69	0.91	0.96	0.64	0.34	0.69	1.07	0.99
0.10	0.63	0.84	0.91	0.59	0.32	0.65	1.00	0.89
0.20	0.51	0.72	0.80	0.53	0.29	0.57	0.89	0.79
0.40	0.39	0.55	0.64	0.43	0.23	0.47	0.73	0.59
0.60	0.35	0.44	0.52	0.35	0.20	0.38	0.59	0.46
0.80	0.30	0.35	0.45	0.30	0.17	0.32	0.47	0.38
1.00	0.26	0.29	0.38	0.26	0.15	0.28	0.41	0.29
1.20	0.24	0.25	0.32	0.23	0.13	0.25	0.36	0.26

P/H	North	North east	East	South east	South	South west	West	North west
1.40	0.21	0.22	0.29	0.20	0.12	0.22	0.31	0.23
1.60	0.20	0.21	0.26	0.17	0.11	0.20	0.27	0.20
1.80	0.18	0.19	0.23	0.16	0.10	0.17	0.24	0.19
2.00	0.17	0.16	0.22	0.16	0.10	0.16	0.23	0.18

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3n: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 6

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.01	1.19	1.15	0.78	0.49	1.10	1.82	1.55
0.05	0.85	1.07	1.05	0.70	0.42	1.01	1.69	1.41
0.10	0.78	0.99	0.99	0.67	0.39	0.96	1.63	1.30
0.20	0.62	0.85	0.88	0.59	0.35	0.86	1.46	1.14
0.40	0.43	0.64	0.71	0.49	0.29	0.70	1.17	0.86
0.60	0.36	0.47	0.61	0.41	0.25	0.61	0.99	0.64
0.80	0.31	0.39	0.50	0.34	0.21	0.53	0.86	0.50
1.00	0.26	0.32	0.42	0.29	0.18	0.44	0.73	0.45
1.20	0.24	0.26	0.37	0.26	0.18	0.41	0.62	0.36
1.40	0.22	0.24	0.32	0.23	0.15	0.36	0.55	0.33
1.60	0.19	0.21	0.28	0.22	0.14	0.33	0.49	0.26
1.80	0.18	0.20	0.26	0.20	0.14	0.29	0.44	0.25
2.00	0.17	0.19	0.24	0.19	0.14	0.27	0.40	0.21

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3o: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 6

P/H	North	North east	East	South east	South	South west	West	North west
0.00	0.88	1.05	1.04	0.57	0.24	0.96	2.00	1.54
0.05	0.75	0.95	0.95	0.51	0.21	0.88	1.86	1.40
0.10	0.68	0.88	0.89	0.48	0.20	0.83	1.79	1.29
0.20	0.55	0.75	0.79	0.42	0.18	0.75	1.60	1.13
0.40	0.38	0.57	0.64	0.35	0.14	0.61	1.29	0.86
0.60	0.32	0.42	0.55	0.29	0.12	0.53	1.09	0.63
0.80	0.27	0.34	0.45	0.25	0.10	0.46	0.94	0.50
1.00	0.23	0.28	0.38	0.21	0.09	0.38	0.80	0.45
1.20	0.21	0.23	0.33	0.19	0.09	0.36	0.69	0.36
1.40	0.19	0.21	0.29	0.17	0.08	0.31	0.60	0.32
1.60	0.17	0.19	0.25	0.16	0.07	0.28	0.54	0.26
1.80	0.16	0.18	0.23	0.14	0.07	0.26	0.49	0.25
2.00	0.15	0.17	0.22	0.14	0.07	0.24	0.44	0.21

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3p: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 7

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.06	1.30	1.36	1.09	0.77	1.11	1.49	1.39
0.05	0.91	1.17	1.23	0.96	0.65	0.99	1.36	1.26
0.10	0.84	1.08	1.16	0.93	0.61	0.93	1.29	1.15
0.20	0.68	0.94	1.04	0.81	0.54	0.83	1.14	1.01
0.40	0.44	0.72	0.85	0.67	0.46	0.67	0.93	0.75
0.60	0.35	0.57	0.73	0.58	0.40	0.58	0.79	0.60
0.80	0.31	0.44	0.60	0.51	0.34	0.50	0.66	0.47
1.00	0.28	0.37	0.54	0.43	0.30	0.43	0.55	0.38
1.20	0.24	0.31	0.46	0.39	0.28	0.38	0.48	0.32
1.40	0.21	0.26	0.40	0.35	0.25	0.34	0.41	0.28
1.60	0.20	0.23	0.37	0.31	0.24	0.32	0.39	0.25
1.80	0.19	0.22	0.31	0.28	0.22	0.29	0.34	0.22
2.00	0.18	0.21	0.30	0.27	0.22	0.26	0.31	0.21

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3q: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 7

P/H	North	North east	East	South east	South	South west	West	North west
0.00	1.15	1.17	0.97	0.75	0.51	0.77	1.07	1.24
0.05	1.00	1.05	0.88	0.66	0.43	0.69	0.98	1.12
0.10	0.91	0.97	0.83	0.64	0.41	0.65	0.93	1.03
0.20	0.74	0.85	0.74	0.56	0.36	0.58	0.82	0.90
0.40	0.48	0.65	0.61	0.46	0.30	0.47	0.67	0.67
0.60	0.38	0.51	0.52	0.40	0.26	0.40	0.57	0.54
0.80	0.34	0.40	0.43	0.35	0.22	0.35	0.48	0.42
1.00	0.30	0.33	0.38	0.30	0.20	0.30	0.40	0.34
1.20	0.26	0.28	0.33	0.27	0.18	0.26	0.34	0.28
1.40	0.23	0.23	0.29	0.24	0.17	0.24	0.30	0.25
1.60	0.22	0.21	0.26	0.22	0.16	0.22	0.28	0.22
1.80	0.20	0.20	0.22	0.19	0.14	0.20	0.24	0.20
2.00	0.19	0.19	0.22	0.18	0.14	0.18	0.23	0.19

Table Notes

For P/H between those in this Table, either use the next lowest P/H or interpolate.

Table 13.3.3r: Summer solar heat gain factors: climate zone 1

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.60	0.57
Level factor (L_S) for all other floor levels	1.20	1.35

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.91	0.87
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.15	1.21
Floor factor (for tiled or vinyl covered floor) (H_S)	0.75	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken 1.0.

Table 13.3.3s: Summer solar heat gain factors: climate zone 2

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.60	0.40
Level factor (L_S) for all other floor levels	1.20	1.10
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.91	0.68
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.90
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.19	1.00
Floor factor (for tiled or vinyl covered floor) (H_S)	0.75	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3t: Summer solar heat gain factors: climate zone 3

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.90	0.70
Level factor (L_S) for all other floor levels	1.70	1.90
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.88	0.88
Frame factor (F_S) for frames with a solar absorptance of < 0.40 to < 0.68	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.21	1.21
Floor factor (for tiled or vinyl covered floor (H_S)	0.89	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3u: Summer solar heat gain factors: climate zone 4

Type factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.35	0.80
Level factor (L_S) for all other floor levels	1.10	1.20
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.88	0.88
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.91
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.19	1.00
Floor factor (for tiled or vinyl covered floor) (H_S)	0.91	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3v: Summer solar heat gain factors: climate zone 5 (lightweight or masonry veneer wall)

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.45	0.52
Level factor (L_S) for all other floor levels	1.20	1.45
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.88	0.73
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.78
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.20	1.00
Floor factor (for tiled or vinyl covered floor) (H_S)	0.65	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3w: Summer solar heat gain factors: climate zone 5 (concrete or masonry wall)

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.50	0.35
Level factor (L_S) for all other floor levels	1.40	1.30

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.89	0.90
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	0.95
Frame factor (F_S) for frames with a solar absorptance of ≥ 68	1.18	1.00
Floor factor (for tiled or vinyl covered floor) (H_S)	0.60	Not applicable

Table Notes

(1) This Table only applies to dwellings with both high mass external and internal walls, for example masonry *cavity* external and internal walls.

(2) Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3x: Summer solar heat gain factors: climate zone 6

Type of factor	Factor for a floor in direct contact with the ground	Factor for suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.60	0.80
Level factor (L_S) for all other floor levels	1.40	1.60
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.84	0.83
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	0.90	0.96
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.00	1.00
Floor factor (for tiled or vinyl covered floor) (H_S)	0.80	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Table 13.3.3y: Summer solar heat gain factors: climate zone 7

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R_S) for a bedroom and a room which is not a *conditioned space*	0.40	0.40
Level factor (L_S) for all other floor levels	1.40	1.30
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.40	0.91	0.85
Frame factor (F_S) for frames with a solar absorptance of > 0.40 to < 0.68	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.68	1.00	1.00

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Floor factor (for tiled or vinyl covered floor) (H_S)	0.85	Not applicable

Table Notes

Where a factor is listed as 'Not applicable', the value of the factor must be taken as 1.0.

Explanatory Information

- There is little or no need for cooling at any time of the year in *climate zone* 8. Therefore, this clause does not apply in *climate zone* 8.
- By referring to '*glazing* elements', 13.3.3 require *Total System U-Values* and *Total System SHGCs* to be assessed for the combined effect of glass and frames. The measurement of these *Total System U-Values* and *Total System SHGCs* is specified in the Technical Protocols and Procedures Manual for Energy Rating of Fenestration by the Australian Fenestration Rating Council (AFRC) for *glazing* elements of representative size and arrangements.
- Various assessors using AFRC procedures might refer to their published performance values by slightly different terms including 'U Factor' or 'Uw' for *Total System U-Value* or 'SHGC' for *Total System SHGC*. Such values can be used under 13.3.3 provided they measure the combined glass and frame performance according to AFRC requirements.
- For the room factor, the solar heat gains to bedrooms and unconditioned areas have less impact on the cooling loads of dwellings than solar heat gains to a living area due to the different time of day that the rooms are occupied. Bedrooms are typically not occupied during the day when outdoor temperatures and solar heat gains are higher.
- For the frame factor, the darker the window frame, the greater the solar heat gain through the frame. Radiation gains from *windows* are multiplied by this factor.
- For the floor factor, this is only applied for dwellings with a floor in contact with the ground. If a room has a tiled surface or is a polished slab, radiation gains in this room are multiplied by this factor.

13.3.4 Shading

[2019: 3.12.2.2]

Where shading is *required* to comply with 13.3.2 or 13.3.3, it must—

(a) be provided by an external permanent projection, such as a verandah, balcony, fixed canopy, eaves, shading hood or carport, which—

(i) extends horizontally on both sides of the *glazing* for a distance greater than or equal to the projection distance P in Figure 13.3.2b; or

(ii) provide 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 the summer solar radiation; and

(ii) if adjustable, is readily operated either manually, mechanically or electronically by the building occupants.

Explanatory Information

(1) Shading devices can include fixed louvres, shading screens and other types of perforated or fixed angle slatted shades. However, such devices need to be designed for the climate and latitude to ensure that summer sun penetration is restricted, while winter sun access is achieved. Winter access refers to the availability of winter solar gains to offset conducted heat losses.

(2) The impact of shading is assessed with respect to the solar heat gain of the *glazing*. The requirements of 13.3.2 and 13.3.3 consider solar heat gain to be either beneficial or detrimental to the energy efficiency of a building based on seasonal variation (winter/summer), *climate zone*, orientation and P/H. Higher P/H values are more beneficial in minimising summer solar heat gain where as lower P/H values are more beneficial in allowing winter access.

(3) Gutters can only be considered as providing shading if attached to a shading projection such as a verandah, fixed

canopy, eaves, shading hood, balcony or the like.

(4) Shading devices can be either attached or located adjacent to the building. For example, a free-standing lattice screen may be considered to provide shading to *glazing* if it complies with 13.3.4(b).

(5) An adjustable shading device in 13.3.4(b)(ii) should be readily operated from a safe location or platform that does not require ladders, rigging, harnessing, or the like.

Part 13.4 Building sealing

13.4.1 Application of Part 13.4

[2019: 3.12.3]

(1) This Part applies to—

(a) a Class 1 building; and

(b) a Class 10a building with a *conditioned space*.

(2) The provisions of (1) do not apply to the following:

(a) A building in *climate zones* 1, 2, 3 and 5 where the only means of air-conditioning is by using an evaporative cooler.

(b) A permanent building *ventilation opening* that is necessary for the safe operation of a gas appliance.

(3) Part 13.4 must be applied as directed in H6D2(1)(a) or (b).

Explanatory Information

- An evaporatively cooled building in *climate zones* 4 and 6 must be sealed because of the likelihood of the building being heated during colder periods.
- Appropriate ventilation requirements for gas appliances can be obtained from relevant legislation, referenced standards and product installation manuals.

13.4.2 Chimneys and flues

[2019: 3.12.3.1]

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.

Explanatory Information

- The requirements of this Part are to be read in conjunction with the fire safety requirements in Part 12.4 of the ABCB Housing Provisions.
- A solid-fuel burning appliance is a heater that burns materials such as timber, coal and the like. This clause does not apply to gas and liquid fuel burning appliances.

13.4.3 Roof lights

[2019: 3.12.3.2]

(1) A *roof light* must be sealed, or capable of being sealed, when serving—

(a) a *conditioned space*; or

(b) a *habitable room* in *climate zones* 4, 5, 6, 7 and 8.

(2) A *roof light required* by (1) to be sealed, or capable of being sealed, must be constructed with—

(a) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or

(b) a weatherproof seal; or

(c) a shutter system readily operated either manually, mechanically or electronically by the occupant.

Explanatory Information

A *roof light* should be sealed regardless of which room it serves in *climate zones* 4, 5, 6, 7 and 8. For example, a *roof light* located in a hallway should be sealed to stop the transfer of cold air into adjoining *conditioned spaces*. This principle also applies to external doors and *windows*, exhaust fans, wall and floor junctions and evaporative coolers.

13.4.4 External windows and doors

[2019: 3.12.3.3]

(1) An external door, internal door between a Class 1 building and an unconditioned Class 10a building, openable *window* and other such opening must be sealed when serving—

(a) a *conditioned space*; or

(b) a *habitable room* in *climate zones* 4, 5, 6, 7 and 8.

(2) A seal to restrict air infiltration—

(a) for the bottom edge of a door, must be a draft protection device; and

(b) for the other edges of a door or the edges of an openable *window* or other such opening, may be a foam or rubber compressible strip, fibrous seal or the like.

(3) A *window* complying with the maximum air infiltration rates specified in AS 2047 need not comply with (2)(b).

13.4.5 Exhaust fans

[2019: 3.12.3.4]

An exhaust fan must be fitted with a sealing device such as a self-closing damper, filter or the like when serving—

(a) a *conditioned space*; or

(b) a *habitable room* in *climate zones* 4, 5, 6, 7 and 8.

Explanatory Information

An exhaust fan is considered to be adequately sealed if it is fitted with a filter such as the type commonly used in kitchen range hoods.

13.4.6 Construction of ceilings, walls and floors

[2019: 3.12.3.5]

(1) Ceilings, walls, floors and any opening such as a *window* frame, door frame, *roof light* frame or the like must be constructed to minimise air leakage in accordance with (2) when forming part of the external fabric of—

(a) a *conditioned space*; or

(b) a *habitable room* in *climate zones* 4, 5, 6, 7 and 8.

(2) Construction *required* by (1) must be—

(a) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or

(b) sealed at junctions and penetrations with—

(i) close-fitting architrave, skirting or cornice; or

(ii) expanding foam, rubber compressive strip, caulking or the like.

Explanatory Information

- A close fitting internal lining system is considered suitable to include an allowance for minimum lining movement

gaps at wall, floor and ceiling junctions.

- Caulking includes sealant, mastic or other gap filling material.
- In 13.4.6(2)(b), penetrations include *windows*, doors, *roof lights* , flues, exhaust fans, heating and cooling ductwork and the like.

13.4.7 Evaporative coolers

[2019: 3.12.3.6]

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* in *climate zones* 4, 5, 6, 7 or 8.

Explanatory Information

The self-closing damper should create an effective seal against air infiltration.

Part 13.5 Ceiling fans

13.5.1 Application of Part 13.5

[2019: 3.12.4]

(1) This Part applies to a *habitable room* in a Class 1 building.

(2) Part 13.5 must be applied as directed in H6D2(1)(b).

13.5.2 Ceiling fans

[2019: 3.12.4.3]

Ceiling fans must be installed in accordance with Table 13.5.2 in—

(a) *climate zones* 1, 2 and 3; and

(b) *climate zone* 5 in New South Wales and Queensland.

Table 13.5.2: Minimum ceiling fan requirements in climate zones 1, 2, 3 and 5

Size of room (m²)	Minimum number and diameter (mm) of ceiling fans *required* in a bedroom in *climate zones* 1, 2 and 3	Minimum number and diameter (mm) of ceiling fans *required* in a *habitable room* other than a bedroom in *climate zones* 1, 2, 3 and 5 (NSW and Qld)
<15	1 x 900	1 x 900
≥15<20	1 x 1200	1 x 1200
≥20<25	1 x 1200	1 x 1400
≥25<30	1 x 1400	2 x 1200
≥30<45	1 x 1400	2 x 1400
≥45<50	2 x 1400	3 x 1200
≥50	2 x 1400	3 x 1400

Part 13.6 Whole-of-home energy usage

13.6.1 Application of Part 13.6

[New for 2022]

(1) This Part applies to—

(a) a Class 1 building; and

(b) a Class 10a building with a *conditioned space*.

(2) Part 13.6 must be applied as directed in H6D2(2).

13.6.2 Net equivalent energy usage

[New for 2022]

(1) The net equivalent energy usage of a building, calculated in accordance with (a), must not exceed the allowance calculated in accordance with (b)—

(a) $(A \times E_E) + E_P + E_S - E_R$

, where—

(i) A

= the floor area factor obtained by multiplying the total floor area of the building by the adjustment factor in Table 13.6.2a; and

(ii) E_E

= the *main space conditioning* and *main water heater* efficiency factor obtained from the ABCB Standard for Whole-of-Home Efficiency Factors; and

(iii) E_P

= the swimming pool pump energy usage in (2); and

(iv) E_S

= the spa pump energy usage in (3); and

(v) E_R

= the installed capacity of on-site photovoltaics (kW); and

(b) $A \times E_F$

, where—

(i) A

= the floor area factor obtained from multiplying the total floor area of the building by the adjustment factor in Table 13.6.2a; and

(ii) E_F

= the energy factor obtained from in Table 13.6.2b.

(2) The swimming pool pump energy usage (E_P) must be determined in accordance with the following formula: $E_P = V \times F_P / 1000$

, where—

(a) E_P

= the swimming pool pump energy usage; and

(b) V

= the volume of the swimming pool to the nearest 1000 litres; and

(c) F_P

= the swimming pool pump factor as per Table 13.6.2c.

(3) The spa pump energy usage (E_S) must be determined in accordance with the following formula: $E_S = V \times F_S / 100$

, where—

(a) E_S

= the spa pump energy usage; and

(b) V

= the volume of the spa to the nearest 100 litres; and

(c) F_S

= the spa pump factor as per Table 13.6.2d.

Table 13.6.2a: Floor area adjustment factor

Total floor area m^2	Floor area factor	Total floor area m^2	Floor area factor	Total floor area m^2	Floor area factor	Total floor area m^2	Floor area factor
<50	0.0123	160–169	0.0097	280–289	0.0087	400–409	0.0080
50–59	0.0119	170–179	0.0096	290–299	0.0086	410–419	0.0079
60–69	0.0116	180–189	0.0095	300–309	0.0085	420–429	0.0079
70–79	0.0113	190–199	0.0094	310–319	0.0085	430–439	0.0078
80–89	0.0111	200–209	0.0093	320–329	0.0084	440–449	0.0078
90–99	0.0108	210–219	0.0092	330–339	0.0083	450–459	0.0077
100–109	0.0106	220–229	0.0091	340–349	0.0083	460–469	0.0077
110–119	0.0105	230–239	0.0090	350–359	0.0082	470–479	0.0077
120–129	0.0103	240–249	0.0090	360–369	0.0082	480–489	0.0076
130–139	0.0101	250–259	0.0089	370–379	0.0081	490–499	0.0076
140–149	0.0100	260–269	0.0088	380–389	0.0081	500	0.0075
150–159	0.0099	270–279	0.0087	390–399	0.0080	—	—

Table Notes

(a) The total floor area is measured within the inside face of the *external walls* of the Class 1 building and includes any conditioned, attached Class 10a building.

(b) Where values fall between ranges given, the floor area must be rounded up to the nearest whole square metres of floor area.

Table 13.6.2b: Energy factor (E_F)

Climate zone	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
1	—	—	1.91	2.77	—	—	—	3.25
2	—	1.32	—	1.78	—	—	—	—
3	—	—	1.23	2.46	—	—	—	2.87

Climate zone	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
4	—	1.80	—	—	1.86	—	1.25	2.34
5	—	1.75	—	2.28	1.79	—	—	2.35
6	—	2.40	—	—	2.51	—	1.63	3.20
7	2.56	2.33	—	—	—	3.08	1.62	—
8	—	3.99	—	—	—	3.92	2.82	—

Table 13.6.2c: Swimming pool pump factor (F_P) (kW/1000 litres.annum)

Pool pump GEMS star rating	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
1 or unrated	0.056	0.060	0.028	0.046	0.068	0.061	0.049	0.063
1.5	0.048	0.050	0.023	0.039	0.057	0.052	0.041	0.053
2	0.041	0.044	0.020	0.034	0.050	0.045	0.036	0.046
2.5	0.037	0.039	0.018	0.030	0.044	0.040	0.032	0.041
3	0.033	0.035	0.016	0.027	0.039	0.035	0.028	0.036
3.5	0.029	0.031	0.014	0.024	0.035	0.032	0.025	0.033
4	0.026	0.028	0.013	0.021	0.032	0.029	0.023	0.029
4.5	0.024	0.025	0.012	0.019	0.029	0.026	0.021	0.027
5	0.022	0.023	0.011	0.018	0.026	0.023	0.019	0.024
5.5	0.020	0.021	0.010	0.016	0.023	0.021	0.017	0.022
6	0.018	0.019	0.009	0.014	0.021	0.019	0.015	0.020
6.5	0.016	0.017	0.008	0.013	0.019	0.017	0.014	0.018
7	0.014	0.015	0.007	0.012	0.017	0.016	0.012	0.016
7.5	0.013	0.013	0.006	0.010	0.015	0.014	0.011	0.014
8	0.011	0.012	0.006	0.009	0.014	0.012	0.010	0.013
8.5	0.010	0.011	0.005	0.008	0.012	0.011	0.009	0.011
9	0.009	0.009	0.004	0.007	0.011	0.010	0.008	0.010
9.5	0.008	0.008	0.004	0.006	0.009	0.008	0.007	0.009
10	0.007	0.007	0.003	0.005	0.008	0.007	0.006	0.007

Table 13.6.2d: Spa pump factor (F_S) (kW/100 litres.annum)

Spa pump GEMS star rating	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
All types	0.067	0.071	0.033	0.055	0.081	0.073	0.058	0.075

Explanatory Information

The ABCB Standard for Whole-of-Home Efficiency Factors can be accessed at www.abcb.gov.au.

Part 13.7 Services

13.7.1 Application of Part 13.7

[2019: 3.12.5]

(1) This Part applies to—

(a) a Class 1 building; and

(b) a Class 10a building; and

(c) a Class 10b *swimming pool* associated with a Class 1 or 10a building.

(2) Part 13.7 must be applied as directed in H6D2(2).

13.7.2 Insulation of services

[2019: 3.12.5.1]

Thermal insulation for central heating water *piping* and heating and cooling ductwork must—

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

(b) be able to withstand the temperatures within the *piping* or ductwork; and

(c) use thermal insulation material in accordance with AS/NZS 4859.1.

Explanatory Information

The central heating water *piping* provisions apply to systems designed to heat the building via water, such as a hydronic heating system.

13.7.3 Central heating water piping

[2019: 3.12.5.2]

(1) Central heating water *piping* that is not within a *conditioned space* must be thermally insulated to achieve the minimum material *R-Values* as set out in (2) to (6).

(2) Internal *piping* including—

(a) flow and return *piping* that is—

(i) within an unventilated wall space; or

(ii) within an internal floor between storeys; or

(iii) between ceiling insulation and a ceiling; and

(b) heated water piping encased within a concrete floor slab (except that which is part of a floor heating system),

must, in all *climate zones*, have a minimum material *R-Value* of 0.4.

(3) *Piping* located within a ventilated wall space, an enclosed building subfloor or a roof space, including—

(a) flow and return *piping*; and

(b) cold water supply *piping* within 500 mm of the connection to the central water heating system; and

(c) relief valve *piping* within 500 mm of the connection to the central water heating system,

must have a minimum material *R-Value* in accordance with (5).

(4) *Piping* located outside the building or in an unenclosed building subfloor or roof space, including—

(a) flow and return *piping*; and

(b) cold water supply *piping* within 500 mm of the connection to the central water heating system; and

(c) relief valve *piping* within 500 mm of the connection to the central water heating system,

must have a minimum material *R-Value* in accordance with (6).

(5) *Piping* referred to in (3) must have a minimum material *R-Value* of—

(a) in *climate zones* 1, 2, 3 and 5 — 0.6; and

(b) in *climate zones* 4, 6 and 7 — 0.9; and

(c) in *climate zone* 8 — 1.3.

(6) *Piping* referred to in (4) must have a minimum material *R-Value* of—

(a) in *climate zones* 1, 2, 3 and 5 — 0.6; and

(b) in *climate zones* 4, 6 and 7 — 1.3; and

(c) in *climate zone* 8 — 1.3.

Explanatory Information

- The insulation levels in the following table are typical examples of materials that can be used to insulate central heating water *piping* calculated in accordance with AS/NZS 4859.1.
- The *R-Value* is that of the insulation and not the *Total R-Value* of the pipe, air film and insulation. Where *piping* has a significant inherent *R-Value* it may be subtracted from the material *R-Value required*. However, the inherent *R-Value* of most piping is not sufficient to satisfy the requirements of 13.7.3.
- *Piping* within a timber member, such as that passing through a wall stud, is considered to have sufficient insulation for the purposes of 13.7.3.
- The following table provides examples for the *R-Value* of the insulation used for smaller diameter *piping*.

Table 13.7.3 (explanatory): R-Value of insulation used for smaller diameter piping

Insulation	*R-Value*
9 mm of closed cell polymer	0.4
13 mm of closed cell polymer	0.6
19 mm of closed cell polymer	0.9
25 mm of closed cell polymer	1.3
25 mm of glasswool	1.3

13.7.4 Heating and cooling ductwork

[2019: 3.12.5.3]

(1) Heating and cooling ductwork and fittings must—

(a) achieve the material *R-Value* in (4); and

(b) 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 AS 4254.1 and AS 4254.2 for a Class C seal; or

(ii) for flexible ductwork, with a draw band in conjunction with a sealant or adhesive tape.

(2) Duct insulation must—

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

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

(c) where located outside the building, under a suspended floor, in an attached Class 10a building or in a roof

space—

(i) be protected by an outer sleeve of protective sheeting to prevent the insulation becoming damp; and

(ii) have the outer protective sleeve sealed with adhesive tape not less than 48 mm wide creating an airtight and waterproof seal.

(3) The requirements of (1) do not apply to heating and cooling ductwork and fittings located within the insulated building *envelope* including a service riser within the *conditioned space*, internal floors between storeys and the like.

(4) The material *R-Value required* by (1)(a) must be determined in accordance with the following:

(a) In a heating-only system or cooling-only system including an evaporative cooling system—

(i) ductwork must have a minimum material *R-Value* of—

(A) in *climate zones* 1 to 7 — 1.0; and

(B) in *climate zone* 8 — 1.5; and

(ii) fittings must have a minimum material *R-Value* of 0.4.

(b) In a combined heating and refrigerated cooling system—

(i) ductwork must have a minimum material *R-Value* of—

(A) in *climate zones* 1, 3, 4, 6 and 7 — 1.5; and

(B) in *climate zones* 2 and 5 — 1.0; and

(C) in *climate zone* 8 — 1.5; and

(ii) fittings must have a minimum material *R-Value* of 0.4.

(c) For the purposes of (b)(i), the minimum material *R-Value required* for ductwork may be reduced by 0.5 for combined heating and refrigerated cooling systems in *climate zones* 1, 3, 4, 6 and 7 if the ducts are—

(i) under a suspended floor with an enclosed perimeter; or

(ii) in a roof space that has an insulation of greater than or equal to R0.5 directly beneath the roofing.

Explanatory Information

- Ductwork within a fully insulated building may still benefit from insulation particularly when the system is only operating for short periods.
- In some *climate zones* condensation may create problems with uninsulated ductwork, in which case insulation should still be considered.
- An enclosed perimeter treatment means that the airspace under the floor is enclosed between ground and floor level by walls which have only the required subfloor vents.
- Insulation for refrigerated cooling ductwork should have a vapour barrier to prevent possible damage by condensation.
- The insulation levels in the following tables are typical examples of materials that can be used to insulate ductwork and the *R-Values* they contribute. Other methods are available for meeting the minimum material *R-Value required* by 13.7.4(4). These values do not take into account all issues that may reduce the effectiveness of insulation. AS/NZS 4859.1 should be used to confirm in-situ values.
- For fittings, 11 mm polyurethane typically provides an *R-Value* of 0.4.
- Any flexible ductwork used for the transfer of products, initiating from a heat source that contains a flame, must also have the fire hazard properties *required* by H3D2(2).

Table 13.7.4a (explanatory): R-Values for typical ductwork insulation materials – flexible ductwork

Insulating material and thickness	*R-Value*
45 mm glasswool (11 kg/m^3)	1.0
70 mm polyester (6.4 kg/m^3)	1.0
63 mm glasswool (11 kg/m^3)	1.5
90 mm polyester (8.9 kg/m^3)	1.5
85 mm glasswool (11 kg/m^3)	2.0

Table 13.7.4b (explanatory): R-Value for typical ductwork insulation materials – sheetmetal ductwork – external insulation

Insulating material and thickness	*R-Value*
38 mm glasswool (22 kg/m^3)	1.0
50 mm polyester (20 kg/m^3)	1.1
50 mm glasswool (22 kg/m^3)	1.5
75 mm polyester (20 kg/m^3)	1.7

Table 13.7.4c (explanatory): R-Values for typical ductwork insulation materials – sheetmetal ductwork – internal insulation

Insulating material and thickness	*R-Value*
38 mm glasswool (32 kg/m^3)	1.0
50 mm polyester (32 kg/m^3)	1.3
50 mm glasswool (32 kg/m^3)	1.5

13.7.5 Electric resistance space heating

[2019: 3.12.5.4]

An electric resistance space heating system that serves more than one room must have—

(a) separate isolating switches for each room; and

(b) a separate temperature controller and time switch for each group of rooms with common heating needs; and

(c) power loads of not more than 110 W/m^2 for living areas, and 150 W/m^2 for bathrooms.

13.7.6 Artificial lighting

[2019: 3.12.5.5]

(1) The *lamp power density* or *illumination power density* of artificial lighting, excluding heaters that emit light, must not exceed the allowance of—

(a) 5 W/m^2 in a Class 1 building; and

(b) 4 W/m^2 on a verandah, balcony or the like attached to a Class 1 building; and

(c) 3 W/m^2 in a Class 10a building associated with a Class 1 building.

(2) The *illumination power density* allowance in (1) may be increased by dividing it by the relevant *illumination power density* adjustment factor for a control device in (6) as applicable.

(3) 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.

(4) If halogen lamps are installed, they must be separately switched from fluorescent lamps.

(5) Artificial lighting around the perimeter of a building must—

(a) be controlled by a daylight sensor; or

(b) have an average light source efficacy of not less than 40 Lumens/W.

(6) The following *illumination power density* adjustment factors apply to control devices for artificial lighting:

(a) Lighting timer for corridor lighting: 0.7.

(b) Motion detector —

(i) 0.9, where —

(A) at least 75% of the area of a space is controlled by one or more motion detectors; or

(B) an area of less than 200 m^2 is switched as a block by one or more motion detectors; and

(i) 0.7, where up to 6 lights are switched as a block by one or more detectors; and

(ii) 0.55, where up to 2 lights are switched as a block by one or more detectors.

(c) Manual dimming system where not less than 75% of the area of a space is controlled by manually operated dimmers: 0.85.

(d) Programmable dimming system where not less than 75% of the area of a space is controlled by programmable dimmers: 0.85.

(e) Dynamic dimming system, with automatic compensation for lumen depreciation, the design lumen depreciation factor is not less than —

(i) 0.9 for fluorescent lights; or

(ii) 0.8 for high pressure discharge lights.

(f) Fixed dimming 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 — equal to the % of full power to which the dimmer is set divided by 0.95.

(g) Daylight sensor and dynamic lighting control device, with dimmed or stepped switching of lights adjacent to *windows*:

(i) Lights within the space adjacent to *windows* other than *roof lights* for a distance from the *window* equal to the depth of the floor at *window* head height: 0.5.

(ii) Lights within the space adjacent to *roof lights*: 0.6.

(7) For the purposes of (6)(c), 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.

(8) For the purposes of (6)(d), programmed dimming is where pre-selected scenes or levels are automatically selected by the time of day, photoelectric cell or occupancy sensor.

(9) For the purposes of (6)(e), dynamic dimming is where the lighting level is varied automatically by a photoelectric cell to either proportionately compensate for the availability of daylight or the lumen depreciation of the lamps.

(10) For the purposes of (6)(f), fixed dimming is where lights are controlled to a level and that level cannot be adjusted by the user.

(11) For the purposes of (6)(g)(i) and (ii), 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.

Explanatory Information

- There are two approaches available for achieving compliance with (1) in Class 1 and associated Class 10a buildings. These are through the determination of the *lamp power density* or the *illumination power density*.
- The first step in achieving compliance is to determine the relevant *lamp power density* or *illumination power density* allowance. Generally, the *lamp power density* or *illumination power density* is the relevant value in (1)(a), (b) or (c), however the *illumination power density* allowance can be increased in accordance with (2) if a control device is used.
- When *illumination power density* and one or more control devices are used, the adjustment factor is only applied to the space(s) served by the control device. The adjusted allowance for this space is then combined with the allowances for the remaining spaces using an area weighted average, which subsequently increases the allowance provided in (1)(a), (b) or (c).
- Where no control device is used the adjustment factor is equal to 1.
- The second step in achieving compliance is to assess the overall *lamp power density* or overall *illumination power density* of the building.
- The overall *lamp power density* is calculated by adding the maximum power ratings of all of the permanently wired lamps in a space and dividing this sum by the area of the space.
- The overall *illumination power density* is calculated by adding the illumination power load for each space and dividing this sum by the area of the space.

- Control device factors in (2) are only applied to the *illumination power density*, not the overall *illumination power density*.
- To comply with (1), the overall *lamp power density* or overall *illumination power density* must be less than or equal to the allowance.
- Trading of allowances between (1)(a), (b) and (c) is not permitted.
- (1)(b) includes outdoor living spaces such as verandahs, balconies, patios, alfresco spaces or the like that are attached to a Class 1 building.
- The artificial lighting requirements in 13.7.6 are to be read in conjunction with the artificial lighting requirements in 10.5.2.
- The artificial lighting around the perimeter of a building does not need to comply to a maximum power density as neither the lighting required or the area of the space can be easily defined. Instead, external lights are required to be controlled by daylight sensors or to be efficient.
- In (4), separate switching is required for halogen lamps to facilitate less frequent usage. This is because they are significantly less energy efficient that fluorescent lamps.

13.7.7 Water heater in a heated water supply system

[2019: 3.12.5.6]

A water heater in a heated water supply system must be designed and installed in accordance with Part B2 of NCC Volume Three — Plumbing Code of Australia.

13.7.8 Swimming pool heating and pumping

[2019: 3.12.5.7]

(1) Heating for a *swimming pool* must be by—
  (a) a solar heater not boosted by electric resistance heating; or
  (b) a heater using reclaimed energy; or
  (c) a gas heater; or
  (d) a heat pump; or
  (e) a combination of (a) to (d).

(2) Where some or all of the heating *required* by (1) is by a gas heater or a heat pump, the *swimming pool* must have—
  (a) a cover with a minimum *R-Value* of 0.05, unless located in a *conditioned space*; and
  (b) a time switch to control the operation of the heater.

(3) A time switch must be provided to control the operation of a circulation pump for a *swimming pool*.

(4) For the purposes of 13.7.8, a *swimming pool* does not include a spa pool.

Explanatory Information

Some jurisdictions may have requirements for a pool cover under the Smart Approved WaterMark Scheme.

13.7.9 Spa pool heating and pumping

[2019: 3.12.5.8]

(1) Heating for a spa pool that shares a water recirculation system with a *swimming pool* must be by—

(a) a solar heater; or

(b) a heater using reclaimed energy; or

(c) a gas heater; or

(d) a heat pump; or

(e) a combination of (a) to (d).

(2) Where some or all of the heating *required* by (1) is by a gas heater or a heat pump, the spa pool must have—

(a) a cover; and

(b) a push button and a time switch to control the operation of the heater.

(3) A time switch must be provided to control the operation of a circulation pump for a spa pool having a capacity of 680 L or more.

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