National Construction Code

Housing Provisions Standard

Australian Building Codes Board

2022

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Part 10.8 Condensation management

10.8.1 ~~Pliable building membrane~~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/NZS 4200.1; and

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

(c) ~~be a vapour permeable membrane for *climate zones* 6, 7 and 8; and~~

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

(2) Where *pliable building membranes*, *sarking-type materials* or insulation layers are installed on the exterior side of the primary insulation layer of an *external wall* they must have a *vapour permeance* of no 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~~2~~) 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.

10.8.2 Flow rate and discharge of exhaust systems

[2019: 3.8.7.3]

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

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

(i) 25 L/s where operated on demand; or

(ii) 10 L/s where operated continuously; and

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

(i) 40 L/s where operated on demand; or

(ii) 12 L/s where operated continuously.

(2) Exhaust from a kitchen, kitchen range hood, bathroom, *sanitary compartment*, or a vented clothes dryer must be discharged directly or via a shaft or duct to *outdoor air*.

(3) An exhaust system serving a bathroom or *sanitary compartment* that is not naturally ventilated must—

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

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

(4) A bathroom, *sanitary compartment* or room with a venting clothes dryer that is not naturally ventilated must be provided with make-up air in accordance with Table 10.8.2.

(~~2~~) ~~Exhaust from a bathroom, *sanitary compartment*, or laundry must be discharged—~~

(a) ~~directly or via a shaft or duct to *outdoor air*; or~~

(b) ~~to a roof space that is ventilated in accordance with 10.8.3.~~

Table 10.8.2: Make-up air requirements

Exhaust airflow rate (L/s)	Make-up air requirement
≤ 20	10 mm door undercut

Exhaust airflow rate (L/s)	Make-up air requirement
> 20 and ≤ 40	20 mm door undercut
> 40 and ≤ 60	30 mm door undercut
> 60 and ≤ 80	40 mm door undercut
> 80 and ≤ 100	50 mm door undercut
> 100	In accordance with section 3.8 of AS 1668.2

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 immediately above the primary insulation layer; 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 sarking of a tiled roof where the sarking has a *vapour permeance* of not less than 1.14 µg/N.s.

(2) The requirements of 1 do not apply to a roof that is subject to Bushfire Attack Level FZ requirements.

~~(1) Where an exhaust system covered by 10.8.2 discharges into a roof space, the roof space must be ventilated to *outdoor air* through evenly distributed openings.~~

~~(2) Openings *required* by (1) must have a total unobstr of the respective ceiling area if the roof pitch is more than 22°, or 1/150 of the respective ceili is not more than 22°.~~

~~(3) 30% of the total unobstructed area *required* by (2) must be located not more than 900 mm below the ridge or highest point of the roof space, measured vertically, with the remaining *required* area provided by eave vents.~~

Table 10.8.3: Roof space ventilation requirements

Roof pitch	Ventilation openings
< 10°	25,000 mm²/m provided at each of two opposing ends
> 10° and < 15°	25,000 mm²/m provided at the eaves and 5,000 mm²/m at high level
≥ 15° and < 75°	7,000 mm²/m provided at the eaves and 5,000 mm²/m at high level, plus an additional 18,000 mm²/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.

13 Energy efficiency

13.7~~6~~.8	Swimming pool heating and pumping
13.7~~6~~.9	Spa pool heating and pumping

Part 13.1 Scope and application of Section 13

NSW Part 13.1

NT Part 13.1

13.1.1 Scope

[New for 2022]

This Section of the ABCB Housing Provisions sets out the *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) ~~Air movement~~Ceiling fans (see Part 13.5).

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

(f) Services (see ~~Part 13.6~~Part 13.7).

SA 13.1.2

13.1.2 Application

[New for 2022]

The application of Section 13 of the ABCB Housing Provisions is subject to the following:

(a) The Governing Requirements of NCC 2022 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

(1) For 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.

(2) 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: Airspace adjoining 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* and the *R-Value* to be achieved.

Explanatory Information: Adjoining sheets of roll membrane

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

Explanatory Information: Compression of bulk insulation

The *R-Value* of bulk insulation is reduced if it is compressed. The allocated space for bulk insulation must therefore allow the insulation to be installed so that it maintains its correct thickness when using 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 polystyrene boards, may be necessary to ensure that the insulation achieves its *required R-Value*.

Explanatory Information: Airspaces

The *R-Value* of *reflective insulation* and its adjoining airspace is affected by the width of the airspace between a reflective side of the *reflective insulation* and the building lining or cladding. ~~For further information on reflective insulation, refer to the explanatory information accompanying 13.2.2.~~

Explanatory Information: ~~Condensation~~

~~Artificial cooling of buildings in some climates can cause *condensation* to form inside the layers of the building *envelope*. Such *condensation* can cause significant structural or cosmetic damage to the *envelope* before it is detected. Associated mould growth may also create health risks to the occupants. Effective control of *condensation* is a complex issue. In some locations a fully sealed vapour barrier may need to be installed on the more humid, or generally warmer, side of the insulation. Note that Part 10.8 contains specific provisions for *condensation*.~~

13.2.3 Roofs

[2019: 3.12.1.2]

(1) Roof insulation must achieve the minimum *R-Value* ~~Subject to (2) and (5), a roof must~~

- (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.
- (a) ~~achieve the specified in Tables 13.2.3a to 13.2.3g as appropriate, for the direction of heat flow; and~~
- (b) ~~where a pitched roof has a flat ceiling, have greater than or equal to 50% of the added insulation laid on the ceiling.~~

(2) In *climate zones* 1~~, 2, 3, 4 and~~ to 5 the, solar absorptance of the upper surface of a roof in (1) must not be more than 0.64. ~~Total R-Value specified in Tables 13.2.3a to 13.2.3g as appropriate, is reduced by 0.5 where~~

(a) ~~the *required* insulation is laid on the ceiling; and~~

(b) ~~the roof space is ventilated by—~~

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

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

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

(C) ~~have an aggregate fixed open area of greater than or equal to 1% of the ceiling area; or~~

(ii) ~~having—~~

(A) ~~not less than 2 wind driven roof ventilators having an aggregate opening area of greater than or equal to 0.14 m^2; and~~

(B) ~~gable vents, ridge vents, eave vents, roof vents or the like that have an aggregate fixed open area of greater than or equal to 0.2% of the ceiling area.~~

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

(a) be downward facing; and

(b) have an emissivity of not more than 0.05; and

(c) be adjacent to a roof space—

(i) of not less than 20 mm; and

(ii) in accordance with 10.8.3.

(4) Where, for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the *R-Value* of insulation in the remainder of the ceiling in accordance with Table 13.2.3s.

(5) The thermal bridging in a steel-framed roof must be addressed by—

(a) achieving the *Total R-Value* in Tables 13.2.3t and 13.2.3u, calculated in accordance with AS/NZS 4859.2; or

(b) complying with one of the options in Tables 13.2.3v or 13.2.3w.

(6~~3~~) A roof that—

(a) ~~is required to achieve a minimum ; and~~

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

(c) 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.

(~~4~~) ~~A roof, or roof and associated ceiling, is deemed to have the following :~~

(a) ~~For a flat roof, skillion roof and cathedral ceiling with a ceiling lining under the rafter, unventilated and constructed as shown in Figure 13.2.3a:~~

(i) ~~Downwards direction of heat flow: = 0.48~~

(ii) ~~Upwards direction of heat flow: = 0.36.~~

(b) ~~For a flat roof, skillion roof and cathedral ceiling with exposed rafters, unventilated and constructed as shown in Figure 13.2.3b:~~

(i) ~~Downwards direction of heat flow: = 0.44.~~

(ii) ~~Upwards direction of heat flow: = 0.38.~~

(c) ~~For a tiled pitched roof with flat ceiling constructed as shown in Figure 13.2.3c:~~

(i) ~~Ventilated roof space:~~

(A) ~~Downwards direction of heat flow: = 0.74.~~

(B) ~~Downwards direction of heat flow: = 0.23.~~

(i) ~~Unventilated roof space:~~

(A) ~~Downwards direction of heat flow: = 0.56.~~

(B) ~~Downwards direction of heat flow: = 0.41.~~

(d) ~~For a metal pitched roof with flat ceiling constructed as shown in Figure 13.2.3d:~~

(i) ~~Ventilated roof space:~~

(A) ~~Downwards direction of heat flow: = 0.72.~~

(B) ~~Downwards direction of heat flow: = 0.21.~~

(ii) ~~Unventilated roof space:~~

(A) ~~Downwards direction of heat flow: = 0.54.~~

(B) ~~Downwards direction of heat flow: = 0.39.~~

(~~5~~) ~~For the purposes of (4)(a) to (d):~~

(a) ~~The of the roof and ceiling construction shown in Figures 13.2.3a to 13.2.3d is based there being a roof space.~~

(b) ~~If the roof space is filled, the roof space *R-Value* needs to be subtracted from the of the roof and ceiling materials.~~

(c) ~~The of the unventilated roof and ceiling construction in Figure 13.2.3c for tiled roofs is based on there being a *sarking-type material* which would prevent ventilation of the roof space through gaps in the roof tiles.~~

(~~6~~) ~~Where, for operational or safety reasons associated with exhaust fans, flues or recessed downlights, the area of required ceiling insulation is reduced, the loss of insulation must be compensated for by increasing the R-Value of insulation in the remainder of the ceiling in accordance with Table 13.2.3h.~~

(7) Where the minimum ~~*R-Value*~~ of ceiling insulation required to satisfy (1) is not stated in Table 13.2.3s~~Table 13.2.3h~~, interpolation may be used to determine the adjusted minimum ~~*R-Value*~~.

Table 13.2.3a: Pitched roof with flat 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	0	1.5	2.0	2.5	3.0	3.5
Vented	No	0	2.5	4.5	X	X	X
Standard	Yes	0	1.5	2.0	2.5	4.0	X
Standard	No	0	3.5	X	X	X	X
Vented	Yes	1.0	1.5	1.5	2.0	2.5	3.0
Vented	No	1.0	2.0	3.0	4.0	5.0	X
Standard	Yes	1.0	1.5	1.5	2.0	3.0	4.0
Standard	No	1.0	2.0	3.5	5.5	X	X
Vented	Yes	1.5	1.5	2.0	2.0	2.0	2.0
Vented	No	1.5	2.0	2.5	3.0	4.0	5.0
Standard	Yes	1.5	1.5	1.5	2.0	2.5	3.0
Standard	No	1.5	2.0	3.5	4.0	6.0	X

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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3b: Pitched roof with flat 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	0	1.5	1.5	1.5	1.5	2.0
Vented	No	0	2.0	2.5	4.0	5.0	X
Standard	Yes	0	1.5	1.5	2.0	3.0	4.0
Standard	No	0	2.5	4.0	6.0	X	X
Vented	Yes	1.0	1.5	1.5	1.5	1.5	1.5
Vented	No	1.0	1.5	1.5	1.5	1.5	2.5
Standard	Yes	1.0	1.5	1.5	1.5	1.5	2.5
Standard	No	1.0	1.5	1.5	1.5	1.5	4.0
Vented	Yes	1.5	1.5	1.5	1.5	1.5	1.5
Vented	No	1.5	1.5	1.5	1.5	2.0	2.0
Standard	Yes	1.5	1.5	1.5	1.5	1.5	2.0
Standard	No	1.5	1.5	1.5	2.0	2.0	2.5
Vented	Yes	2.0	1.5	1.5	1.5	2.0	2.0
Vented	No	2.0	1.5	1.5	1.5	1.5	1.5
Standard	Yes	2.0	1.5	1.5	1.5	1.5	1.5
Standard	No	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—

(i) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3c: Pitched roof with flat 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	0	2.5	2.5	2.5	2.5
Vented	No	0	2.5	3.0	3.0	3.5

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
Standard	Yes	0	2.5	2.5	2.5	2.5
Standard	No	0	3.0	3.0	3.5	4.0
Vented	Yes or No	0.5	2.5	2.5	2.5	2.5
Standard	Yes	0.5	2.5	2.5	2.5	2.5
Standard	No	0.5	2.5	2.5	2.5	3.0
Either Vented or Standard	Either Yes or No	1.0	2.5	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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3d: Pitched roof with flat 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	2.5	2.5	2.5	2.5	2.5
Vented	No	0	3.5	4.0	4.5	5.0	X
Standard	Yes	0	2.0	2.0	2.5	2.5	2.5
Standard	No	0	3.5	4.0	5.0	X	X
Vented	Yes	0.5	2.0	2.0	2.0	2.0	2.0
Vented	No	0.5	3.0	3.5	3.5	4.0	4.5
Standard	Yes	0.5	2.0	2.0	2.5	2.5	2.5
Standard	No	0.5	3.0	3.0	3.5	4.0	5.0
Vented	Yes	1.0	2.0	2.5	2.5	2.5	2.5
Vented	No	1.0	2.5	3.0	3.0	3.0	3.5
Standard	Yes	1.0	2.0	2.0	2.0	2.0	2.5
Standard	No	1.0	2.5	2.5	3.0	3.0	3.5
Vented	Yes	1.5	2.0	2.0	2.5	2.5	2.5
Vented	No	1.5	2.5	3.0	3.0	3.0	3.0
Standard	Yes	1.5	2.0	2.5	2.5	2.5	3.0
Standard	No	1.5	2.0	2.0	2.5	2.5	2.5
Vented	Yes	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
Vented	No	2.0	2.5	2.5	3.0	3.0	3.0
Standard	Yes	2.0	2.0	2.0	2.5	2.5	2.5
Standard	No	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—

(i) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3e: Pitched roof with flat 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	3.0	3.5
Vented	No	0	3.5	3.5
Standard	Yes	0	3.0	3.0
Standard	No	0	3.5	3.5
Vented	Yes	0.5	3.0	3.0
Vented	No	0.5	3.5	3.5
Standard	Yes	0.5	3.0	3.0
Standard	No	0.5	3.5	3.5
Vented	Yes	1.0	3.0	3.0
Vented	No	1.0	3.5	3.5
Standard	Either Yes or No	1.0	3.0	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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3f: Pitched roof with flat 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	3.0	2.5
Vented	No	0	3.0	3.0
Standard	Yes	0	2.5	2.5
Standard	No	0	3.0	3.0
Vented	Yes	0.5	2.5	2.5
Vented	No	0.5	3.0	3.0
Standard	Yes	0.5	2.5	2.5
Standard	No	0.5	3.0	3.0
Vented	Yes	1.0	2.5	2.5
Vented	No	1.0	3.0	3.0
Standard	Yes	1.0	2.5	2.5
Standard	No	1.0	2.5	2.5
Vented	Yes	1.5	2.5	2.5
Vented	No	1.5	3.0	3.0
Standard	Yes	1.5	2.5	2.5
Standard	No	1.5	2.5	2.5
Vented	Yes	2.0	2.5	2.5
Vented	No	2.0	2.5	2.5
Standard	Yes	2.0	2.5	2.5
Standard	No	2.0	3.0	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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3g: Pitched roof with flat 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	0.0	4.0	3.5
Vented	No	0.0	4.0	4.0
Standard	Yes	0.0	3.5	3.5
Standard	No	0.0	4.0	4.0
Vented	Yes	0.5	4.0	3.5
Vented	No	0.5	4.0	4.0
Standard	Yes	0.5	3.5	3.5
Standard	No	0.5	4.0	4.0
Vented	Yes	1.0	3.5	3.5
Vented	No	1.0	3.5	3.5
Standard	Yes	1.0	3.0	3.0
Standard	No	1.0	3.5	3.5
Vented	Yes	1.5	3.5	3.5
Vented	No	1.5	3.5	3.5
Standard	Yes	1.5	3.0	3.0
Standard	No	1.5	3.5	3.5
Vented	Yes	2.0	3.5	3.5
Vented	No	2.0	3.5	3.5
Standard	Yes	2.0	3.0	3.0
Standard	No	2.0	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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3h: Pitched roof with flat 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	0	4.5	4.5	4.5	4.5	4.5	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
Vented	No	0	5.0	4.5	4.5	4.5	4.0	4.0	3.5	3.5
Standard	Yes	0	4.5	5.0	4.5	4.0	4.0	4.0	4.0	4.0
Standard	No	0	5.0	4.5	4.5	4.0	4.0	3.5	3.5	3.5
Vented	Yes	1.0	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Vented	No	1.0	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Standard	Yes	1.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Standard	No	1.0	4.5	4.5	4.0	4.0	4.0	4.0	3.5	3.5
Vented	Yes	1.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Vented	No	1.5	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0
Standard	Yes	1.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Standard	No	1.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vented	Yes	2.0	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Vented	No	2.0	4.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0
Standard	Yes	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Standard	No	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—

(i) has one wind-driven roof ventilator per 50 m² of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m² of respective ceiling area, in addition to roof vents; or

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3i: Pitched roof with flat 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
Standard	No	0	4.5	4.0	4.0	3.5	3.5	3.0	3.0	3.0
Vented	No	0	4.5	4.5	4.5	4.0	4.0	3.5	3.5	3.0
Standard	Yes	0	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
Vented	Yes	0	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0
Standard	No	1.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5	3.5
Vented	No	1.0	4.5	4.5	4.0	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	4.0	3.5	3.5
Vented	Yes	1.0	4.5	4.5	4.0	4.0	4.0	4.0	4.0	4.0
Standard	No	1.5	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5
Vented	No	1.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0
Standard	Yes	1.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5
Vented	Yes	1.5	4.5	4.5	4.5	4.5	4.0	4.0	4.0	4.0
Standard	No	2.0	4.0	4.0	4.0	4.0	4.0	4.0	3.5	3.5
Vented	No	2.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0
Standard	Yes	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vented	Yes	2.0	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0

Table Notes

(1) SA = Solar Absorptance.

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

(i) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) Under-roof insulation refers to either foil-faced bulk insulation or foil sarking installed at the roof level with the low-emittance surface facing downwards.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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) A roof is considered 'Vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on the top of the ceiling or a combination of both.

The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) 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) A roof is considered 'Vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) 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) A roof is considered 'Vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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) A roof is considered 'Vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) 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
No	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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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) A roof is considered 'Vented' if it—

(a) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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	0.64 < SA ≤ 0.96
Yes	4.0	3.5
No	4.0	4.0

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 respective ceiling area, in addition to roof vents; or

(b) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(c) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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
No	5.0	4.5	4.5	4.0	4.0	3.5	3.5	3.5
Yes	4.5	4.5	4.5	4.0	4.0	4.0	4.0	4.0

Table Notes

(1) SA = Solar Absorptance.

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

(i) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents; or

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

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
No	4.5	4.0	4.0	3.5	3.5	3.0	3.0	3.0
Yes	4.0	4.0	4.0	4.0	4.0	3.5	3.5	3.5

Table Notes

(1) SA = Solar Absorptance.

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

(i) has one wind-driven roof ventilator per 50 m^2 of respective ceiling area, in addition to roof vents; or

(ii) has one powered roof ventilator per 200 m^2 of respective ceiling area, in addition to roof vents.

(iii) complies with .

(3) If a roof is not 'Vented', it is a 'Standard' roof.

(4) In 6, 7 and 8, roof ventilation must comply with .

(5) The can be achieved by installing insulation under the roof or on top of the ceiling or a combination of both. The of under-roof and ceiling insulation is additive for this element.

(6) The of is not to be included in the of any under-roof or ceiling insulation.

(7) are the material (bag) of insulation.

(8) X = not permitted.

Table 13.2.3s~~h~~: 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(a)										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	~~6.0~~
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	~~*~~

Percentage of ceiling area uninsulated	Minimum *R-Value* of ceiling insulation required to satisfy 13.2.3(a)										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	~~6.0~~
~~5.0% or more~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~

Table Notes

X = not permitted.

(1) ~~Where the minimum *R-Value* of ceiling insulation required to satisfy 13.2.3(1) is greater than or equal to 6.0, adjustment to compensate for loss of ceiling insulation area is not permitted.~~

Table 13.2.3t: Pitched steel-framed roof with flat ceiling – Minimum Total R-Value to account for thermal bridging

Minimum *R-Value* from Tables 13.2.3a to 13.2.3i, and Table 13.2.3s if applicable	Minimum ceiling *Total R-Value*
1.0	1.05
1.5	1.49
2.0	1.87
2.5	2.25
3.0	2.59
3.5	2.90
4.0	3.19
4.5	3.46
5.0	3.72
5.5	3.95
6.0	4.17

Table Notes

The *Total R-Value* calculation must only include the ceiling frame, insulation and lining. It is not to include the internal air film, roof space or roof lining.

Table 13.2.3u: Flat, skillion or cathedral steel-framed roof – Minimum Total R-Value to account for thermal bridging

Minimum *R-Value* from Tables 13.2.3j to 13.2.3r, and Table 13.2.3s if applicable	Minimum *Total R-Value* to account for thermal bridging – Heat flow down	Minimum *Total R-Value* to account for thermal bridging – Heat flow up
0.0	0.63	0.53
1.0	1.65	1.55
1.5	2.13	2.03
2.0	2.59	2.50
2.5	3.04	2.94
3.0	3.47	3.37
3.5	3.88	3.79
4.0	4.28	4.18
4.5	4.67	4.57
5.0	5.04	4.94
5.5	5.40	5.30
6.0	5.75	5.65

Table Notes

Direction of heat flow must be determined in accordance with Table 13.2.3x.

Table 13.2.3v: Thermal bridging mitigation for pitched steel-framed roof with flat ceiling

Minimum *R-Value* from Tables 13.2.3a to 13.2.3i, and Table 13.2.3s if applicable	Option 1 – Increase insulation between ceiling framing to specified minimum *R-Value*	Option 2 – Add insulation strip with specified minimum *R-Value* over ceiling framing	Option 3 – Add a layer of continuous insulation with specified minimum *R-Value* above or below the ceiling framing
1.0	2.0	0.26	0.25
1.5	2.5	0.38	0.26
2.0	3.5	0.51	0.38
2.5	4.0	0.51	0.38
3.0	5.0	0.51	0.38
3.5	5.0	0.51	0.38
4.0	X	0.51	0.38
4.5	X	0.51	0.38
5.0	X	0.51	0.38
5.5	X	0.51	0.51
6.0	X	0.51	0.51

Table Notes

(1) X = not permitted.

(2) Continuous insulation in Option 3 must have a *vapour permeance* of no less than that required of the insulation between ceiling framing.

Table 13.2.3w: Thermal bridging mitigation for a flat, skillion or cathedral steel-framed roof

Minimum *R-Value* from Tables 13.2.3a to 13.2.3i, and Table 13.2.3s if applicable	Option 1 – Increase insulation between ceiling framing to specified minimum *R-Value*	Option 2 – Add insulation strip with specified minimum *R-Value* over ceiling framing	Option 3 – Add a layer of continuous insulation with specified minimum *R-Value* above or below the ceiling framing
1.0	1.5	0.75	0.25
1.5	2.5	0.75	0.25
2.0	3.5	1.00	0.38
2.5	4.5	1.00	0.50
3.0	6.0	1.00	0.50
3.5	X	1.00	0.50
4.0	X	1.00	0.50
4.5	X	1.00	0.63
5.0	X	1.00	0.63
5.5	X	1.00	0.75
6.0	X	1.00	0.75

Table Notes

(1) X = not permitted.

(2) Continuous insulation in Option 3 must have a *vapour permeance* of no less than that required of the insulation between ceiling framing.

Table 13.2.3x: 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 13.2.3a: ~~Roof – minimum Total R-values (climate zone 1)~~

~~Direction of heat flow~~	~~Upper surface solar absorptance value~~	~~Minimum~~
~~Down~~	~~≤ 0.4~~	~~3.1~~
~~Down~~	~~> 0.4 but ≤ 0.6~~	~~4.1~~
~~Down~~	~~> 0.6~~	~~5.1~~

Table 13.2.3b: ~~Roof – minimum Total R-values (climate zone 2 – altitude less than 300 m)~~

~~Direction of heat flow~~	~~Upper surface solar absorptance value~~	~~Minimum~~
~~Down~~	~~≤ 0.4~~	~~4.1~~
~~Down~~	~~> 0.4 but ≤ 0.6~~	~~4.6~~
~~Down~~	~~> 0.6~~	~~5.1~~

Table Notes

~~Altitude means the height above the Australian Height Datum at the location where the building is to be constructed.~~

Table 13.2.3c: ~~Roof – minimum Total R-values (climate zone 2 – altitude 300 m or more)~~

~~Direction of heat flow~~	~~Upper surface solar absorptance value~~	~~Minimum~~
~~Down~~	~~≤ 0.4~~	~~4.1~~
~~Down~~	~~> 0.4 but ≤ 0.6~~	~~4.6~~
~~Down~~	~~> 0.6~~	~~5.1~~

Table Notes

~~Altitude means the height above the Australian Height Datum at the location where the building is to be constructed.~~

Table 13.2.3d: ~~Roof – minimum Total R-values (climate zone 3)~~

~~Direction of heat flow~~	~~Upper surface solar absorptance value~~	~~Minimum~~
~~Down and Up~~	~~≤ 0.4~~	~~4.1~~
~~Down and Up~~	~~> 0.4 but ≤ 0.6~~	~~4.6~~

Direction of heat flow	Upper surface solar absorptance value	Minimum
Down and Up	> 0.6	5.1

Table 13.2.3e: Roof—minimum Total R-values (climate zones 4 and 5)

Direction of heat flow	Upper surface solar absorptance value	Minimum
Up	≤ 0.4	4.1
Up	> 0.4 but ≤ 0.6	4.6
Up	> 0.6	5.1

Table 13.2.3f: Roof—minimum Total R-values (climate zones 6 and 7)

Direction of heat flow	Upper surface solar absorptance value	Minimum
Up	≤ 0.4	4.6
Up	> 0.4 but ≤ 0.6	5.1
Up	> 0.6	5.1

Table 13.2.3g: Roof—minimum Total R-values (climate zone 8)

Direction of heat flow	Upper surface solar absorptance value	Minimum
Up	≤ 0.4	6.3
Up	> 0.4 but ≤ 0.6	6.3
Up	> 0.6	6.3

Figure 13.2.3a: Flat roof, skillion roof and cathedral ceiling with a ceiling lining under the rafter

Figure Notes

(1) The *Total R-Value* of the roof and ceiling construction in Figure 13.2.3a is based on there being a roof space.

(2) If the roof space is filled, the roof space *R-Value* needs to be subtracted from the *Total R-Value* of the roof and ceiling materials.

Figure 13.2.3b: Flat roof, skillion roof and cathedral ceiling with exposed rafters

Figure Notes

(1) The *Total R-Value* of the roof and ceiling construction in Figure 13.2.3b is based on there being a roof space.

(2) If the roof space is filled, the roof space *R-Value* needs to be subtracted from the *Total R-Value* of the roof and ceiling materials.

Figure 13.2.3c: Tiled pitched roof with flat ceiling

Figure Notes

(1) The *Total R-Value* of the roof and ceiling construction in Figure 13.2.3c is based on there being a roof space.

(2) If the roof space is filled, the roof space *R-Value* needs to be subtracted from the *Total R-Value* of the roof and ceiling materials.

(3) The *Total R-Value* of the unventilated roof and ceiling construction in Figure 13.2.3c for tiled roofs are based on there being *sarking type material* which would prevent ventilation of the roof space through the gaps in the roof tiles.

Figure 13.2.3d: ~~Metal pitched roof with flat ceiling~~

Figure Notes

(1) ~~The *Total R-Value* of the roof and ceiling construction in Figure 13.2.3d is based on there being a roof space.~~

(2) ~~If the roof space is filled, the roof space *R-Value* needs to be subtracted from the *Total R-Value* of the roof and ceiling materials.~~

Explanatory Information: ~~Tables 13.2.3a to 13.2.3g~~

(1) ~~The term 'as appropriate' used in reference to Tables 13.2.3a to 13.2.3g, means the table used must be appropriate to the *climate zone* in which the building is to be located.~~

(2) ~~The roof space ventilation option, in *climate zones* 1, 2, 3, 4 and 5, applies to a pitched roof with a flat ceiling to ensure that efficient cross ventilation is achieved in the roof space to remove hot air. Roof space ventilation is generally not suitable for most flat, skillion, cathedral ceiling and similar roof types because of the lack of space between the ceiling and roof.~~

(3) ~~Care should be taken to ensure that the roof *ventilation openings* do not allow rain penetration and that they comply with appropriate bushfire provisions.~~

(4) ~~Gaps between roof tiles with sarking (or *reflective insulation* at rafter level) and metal sheet roofing are not acceptable methods of providing roof space ventilation.~~

(5) ~~Compliance with the ventilation provisions in 13.2.3(2)(b) may result in the ingress of wind driven rain, fine dust, corrosive aerosols, or stimulate the growth of mould or fungus in the roof enclosure. Consideration should therefore be given to the surrounding environmental features, including exposure to marine or industrial environments, prior to adopting this as an alternative to the roof insulation provisions in 13.2.3(2)(b)(ii).~~

(6) ~~A low solar absorptance roof reduces the flow of heat from solar radiation better than a high solar absorptance roof. A roof with a solar absorptance value of less than 0.4 typically corresponds to a roof of light colour such as white, off white or cream. Typical absorptance values based on ASTM E903 are shown in explanatory Table 13.2.3a below.~~

(7) ~~The direction of heat flow in Tables 13.2.3a to 13.2.3g, as appropriate, is considered to be the predominant direction of heat flow for the hours of occupation of the building. It takes into account the higher rate of occupancy of houses at night time rather than day time.~~

(8) ~~The weight of roof or ceiling insulation, particularly if additional ceiling insulation is used for compliance with the energy efficiency provisions, needs to be considered in the selection of plasterboard, plasterboard fixings and building framing.~~

Table 13.2.3a (explanatory): ~~Typical absorbtance values~~

~~Colour~~	~~Value~~
~~Slate (dark grey)~~	~~0.90~~
~~Red, green~~	~~0.75~~
~~Yellow, buff~~	~~0.60~~
~~Zinc aluminium — dull~~	~~0.55~~
~~Galvanised steel — dull~~	~~0.55~~
~~Light grey~~	~~0.45~~
~~Off white~~	~~0.35~~
~~Light cream~~	~~0.30~~

Explanatory Information: ~~Typical construction~~

(1) ~~Figures 13.2.3a to 13.2.3d provide examples of various roof and ceiling construction. The *R-Value* of the *required* insulation is calculated by subtracting the inherent *Total R-Value* of the roof and ceiling construction from the *Total R-Value* in Tables 13.2.3a to 13.2.3g. The inherent *Total R-Value* of the typical roof and ceiling has been determined by adding together the *R-Values* of the outdoor air film, roof cladding, roof airspace, ceiling sheet lining and internal film.~~

(2) The *Total R Value* of the roof and ceiling materials may need to be adjusted if other building elements such as sarking are also installed. For example, sarking or sheet insulation under tiles may change a roof space from "ventilated" to "unventilated".

Explanatory Information: Thermal bridging

Irrespective of the framing material used, the minimum added *R Value* specified in Figures 13.2.3a to 13.2.3d, Figures 13.2.5b to 13.2.5i and Table 13.2.6a is deemed to include the effect of thermal bridging created by framing members in situations other than described in the explanatory information regarding thermal breaks.

Explanatory Information: Thermal break

Because of the high thermal conductance of metal, a thermal break is to be provided where the ceiling lining of a house is fixed directly to the underside of the metal purlins or metal battens of a metal deck roof or where there is no ceiling lining. The purpose of the thermal break is to ensure that the thermal performance of this form of roof construction is comparable to that of a similar roof with timber purlins or timber battens.

A thermal break may be provided by materials such as timber, expanded polystyrene strips, plywood or compressed bulk insulation. The material used as a thermal break must separate the metal purlins or metal battens from the metal deck roofing and achieve the specified *R Value*. *Reflective insulation* alone is not suitable for use as a thermal break because it requires an adjoining airspace to achieve the specified *R Value* (see explanatory information regarding choice of insulation)

For the purposes of 13.2.3(3), expanded polystyrene strips of not less than 12 mm thickness, compressed bulk insulation, and timber of not less than 20 mm thickness are considered to achieve an *R Value* of not less than 0.2.

Explanatory Information: Location of insulation

The thermal performance of the roof may vary depending on the position of the insulation, the climatic conditions, the design of the house and the way in which it is operated. For example, insulation installed under the roof, rather than on the ceiling, of a conditioned house with a large roof space is less effective because of the additional volume of roof airspace that would need to be heated or cooled. Conversely, for an unconditioned house, the use of *reflective insulation* is more effective when placed directly under the roof.

Explanatory Information: Choice of insulation

There are a number of different insulation products that may be used to achieve the minimum added *R Value*. However, care should be taken to ensure that the choice made is appropriate for the construction and climatic conditions as the location and relationship between options in Figures 13.2.3a to 13.2.3d, Figures 13.2.5b to 13.2.5i and Table 13.2.6a may not be suitable in all circumstances for both practical and technical reasons. For instance, in some *climate zones*, insulation should be installed with due consideration of *condensation* and associated interaction with adjoining building materials. As an example, *reflective insulation* or sarking installed on the cold side of the building *envelope* should be vapour permeable. Note that Part 10.8 contains specific provisions for *condensation*.

Reflective insulation is considered to provide the following additional *R Values* when used in conjunction with the *Total R Value* of a pitched roof and flat ceiling construction described in Figures13.2.3a to 13.2.3d. To achieve these values, the *reflective insulation* must be laid directly under the roof cladding and have a minimum airspace of 15 mm between a reflective side of the *reflective insulation* and the adjoining lining or roof cladding (see 13.2.2(2)).

The actual *R Value* added by *reflective insulation* and its adjoining airspace should be determined for each product in accordance with relevant standards, taking into consideration factors such as the number of adjacent airspaces, dimensions of the adjacent airspace, whether the space is ventilated and the presence of an anti-glare coating. When *reflective insulation* has an anti-glare coating on one side, the emittance value of that side will be greater than the value of the uncoated side. See explanatory Tables 13.2.3b to 13.2.3d

Also, where another emittance value for *reflective insulation* is used (other than the value used in the table below), care should be taken to ensure that the number of airspaces allowed for is consistent with the form of construction and whether the airspace is reflective, partially reflective or non-reflective. Where bulk insulation fills the airspace, the *Total R Value* should be reduced to take account of the loss of airspace.

Table 13.2.3b (explanatory): ~~R-Value added by reflective insulation — pitched roof (>10°) with horizontal ceiling~~

~~Emittance of added *reflective insulation*~~	~~Direction of heat flow~~ [Note 1]	~~*R-Value* added — unventilated roof space~~	~~*R-Value* added — ventilated roof space~~ [Note 2]
~~0.2 outer/0.05 inner~~	~~Down~~	~~1.12~~	~~1.21~~
~~0.2 outer/0.05 inner~~	~~Up~~	~~0.75~~	~~0.59~~
~~0.9 outer/0.05 inner~~	~~Down~~	~~0.92~~	~~1.01~~
~~0.9 outer/0.05 inner~~	~~Up~~	~~0.55~~	~~0.40~~

Table Notes

(1) ~~The *required* direction of heat flow applicable in each of the *climate zones* specified in Tables 13.2.3a to 13.2.3g.~~

(2) ~~Ventilated roof space means ventilated in accordance with 13.2.3(2).~~

Table 13.2.3c (explanatory): ~~R-Value added by reflective insulation — flat skillion or pitched roof (≤ 10°) with horizontal ceiling~~

~~Emittance of added *reflective insulation*~~	~~Direction of heat flow~~ [Note]	~~*R-Value* added~~
~~0.2 outer/0.05 inner~~	~~Down~~	~~1.28~~
~~0.2 outer/0.05 inner~~	~~Up~~	~~0.68~~
~~0.9 outer/0.05 inner~~	~~Down~~	~~1.06~~
~~0.9 outer/0.05 inner~~	~~Up~~	~~0.49~~

Table Notes

~~The required direction of heat flow applicable in each of the climate zones specified in Tables 13.2.3a to 13.2.3g.~~

Table 13.2.3d (explanatory): ~~R-Value added by reflective insulation — pitched roof with cathedral ceilings~~

~~Emittance of added *reflective insulation*~~	~~Direction of heat flow~~ [Note]	~~*R-Value* added — pitch > 15° to ≤ 25°~~	~~*R-Value* added — pitch > 25° to ≤ 35°~~	~~*R-Value* added — pitch > 35° to ≤ 45°~~
~~0.2 outer/0.05 inner~~	~~Down~~	~~0.96~~	~~0.86~~	~~0.66~~
~~0.2 outer/0.05 inner~~	~~Up~~	~~0.72~~	~~0.74~~	~~0.77~~
~~0.9 outer/0.05 inner~~	~~Down~~	~~0.74~~	~~0.64~~	~~0.44~~
~~0.9 outer/0.05 inner~~	~~Up~~	~~0.51~~	~~0.51~~	~~0.53~~

Table Notes

~~The required direction of heat flow applicable in each of the climate zones specified in Tables 13.2.3a to 13.2.3g.~~

Explanatory Information: Table 13.2.3s~~h~~

(1) 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.

(2) Note that Table 13.2.3s~~h~~ refers to the *R-Value* of the insulation located on the ceiling and not the *Total R-Value* required of the roof. The roof has an inherent *R-Value* and there may also be insulation at the roof line.

(3) Note that 13.2.3(6) does not require an increase in ceiling insulation for *roof lights*.

(4) 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*.

13.2.4 Roof lights

[2019: 3.12.1.3]

(1) *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.

(a) ~~if the *roof lights* are not *required* for compliance with H4D5 or—~~

(i) ~~comply with Table 13.2.4; and~~

(ii) ~~have an aggregate area of not more than 3% of the total *floor area* of the storey served; or~~

(b) ~~if the *roof lights* are *required* for compliance with H4D5 or H4D6—~~

(i) ~~have an area not more than 150% of the minimum area *required* by H4D6; and~~

(ii) ~~have transparent and translucent elements, including any imperforate ceiling diffuser with—~~

(A) ~~a *U-value* not more than 0.29; and~~

(B) ~~a *U-value* not more than 2.9.~~

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.

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

(~~2~~) ~~For the purposes of Table 13.2.4, the following applies:~~

(a) ~~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.~~

(b) ~~The *roof light* area index is the total area of *roof lights* serving the room or space as a percentage of the *floor area* of the room or space.~~

(c) ~~The total area of *roof lights* is the combined area for all roof lights serving the room or space.~~

(d) ~~The area of a *roof light* is the area of the roof opening that allows light to enter the building.~~

(e) ~~The thermal performance of an imperforate ceiling diffuser may be included in the *U-value* of the *roof light*.~~

(~~3~~) ~~The total area of roof lights serving the room or space as a percentage of the *floor area* of the room or space must not be more than 5% unless allowed by (1)(b).~~

Table 13.2.4: ~~Roof lights – thermal performance of transparent and translucent elements~~

~~Roof light shaft index~~	~~Roof light area index ≤ 2%~~	~~Roof light area index > 2% to ≤ 3%~~	~~Roof light area index > 3% to ≤ 4%~~	~~Roof light area index > 4% to ≤ 5%~~
~~<0.5~~	~~≤0.83~~	~~≤0.57~~	~~≤0.43~~	~~≤0.34~~
	~~≤8.5~~	~~≤5.7~~	~~≤4.3~~	~~≤3.4~~
~~≥0.5 to <1.0~~	~~≤0.83~~	~~≤0.72~~	~~≤0.54~~	~~≤0.43~~
	~~≤8.5~~	~~≤5.7~~	~~≤4.3~~	~~≤3.4~~
~~≥1.0 to <2.5~~	~~≤0.83~~	~~≤0.83~~	~~≤0.69~~	~~≤0.55~~
	~~≤8.5~~	~~≤5.7~~	~~≤4.3~~	~~≤3.4~~
~~≥2.5~~	~~≤0.83~~	~~≤0.83~~	~~≤0.83~~	~~≤0.83~~
	~~≤8.5~~	~~≤5.7~~	~~≤4.3~~	~~≤3.4~~

Explanatory Information

(1) ~~The and are expressed as Australian Fenestration Rating Council (AFRC) values.~~

(2) ~~The and are for a *roof light* with or without a ceiling diffuser. A *roof light* may achieve the *required* performance on its own or in conjunction with a ceiling diffuser.~~

(3) ~~The and for some simple types of *roof lights* are shown in the tables below. Lower *U Value* figures represent higher thermal resistance. Lower *SHGC* figures represent less solar heat transmission. The table gives worst case assessments, which can be improved by obtaining generic or custom product assessments from suppliers, manufacturers, industry associations (including their online resources) and from competent assessors.~~

Table 13.2.4a (explanatory): ~~Worst case whole roof light element performance values without a ceiling diffuser or with a perforated ceiling diffuser~~

~~Translucent or transparent element description~~	~~Domed panel~~	~~Flat, framed panel~~
~~Single layer clear~~	~~: 0.80~~	~~: 0.79~~
	~~: 8.4~~	~~: 8.0~~
~~Single tinted~~	~~: 0.66~~	~~: 0.63~~
	~~: 8.4~~	~~: 7.9~~
~~Single layer translucent ("opal")~~	~~: 0.57~~	~~: 0.56~~
	~~: 8.4~~	~~: 7.9~~
~~Double layer clear~~	~~: 0.71~~	~~: 0.70~~
	~~: 5.4~~	~~: 4.9~~

Table 13.2.4b (explanatory): ~~Worst case whole roof light element performance values with an imperforate ceiling diffuser~~

~~Translucent or transparent element description~~	~~Domed panel~~	~~Flat, framed panel~~
~~Single layer clear~~	~~: 0.72~~	~~: 0.71~~
	~~: 4.3~~	~~: 4.2~~
~~Single tinted~~	~~: 0.59~~	~~: 0.57~~
	~~: 4.3~~	~~: 4.2~~
~~Single layer translucent ("opal")~~	~~: 0.51~~	~~: 0.50~~
	~~: 4.3~~	~~: 4.2~~
~~Double layer clear~~	~~: 0.64~~	~~: 0.63~~

Translucent or transparent element description	Domed panel	Flat, framed panel
	: 3.4	: 3.2

13.2.5 External walls

[2019: 3.12.1.4]

(1) Each part of an external wall must satisfy the requirements of —

(a) (2) for all walls; or

(b) (3) for walls with a surface density greater than or equal to 220 kg/m^2, except for —

(i) opaque non-glazed openings such as doors (including garage doors), vents, penetrations, shutters and the like; and

(ii) unless covered by (3).

(2) Each part of an external wall must —

(a) in *climate zones* 1, 2, 3, 4 and 5 —

(i) achieve a minimum of 2.8; or

(ii) achieve a minimum of 2.4 and shade the external wall of the storey with a verandah, balcony, eaves, carport or the like, which projects at a minimum angle of 15 degrees in accordance with Figure 13.2.5a; or

(b) in *climate zones* 6 and 7, achieve a minimum of 2.8; or

(c) in *climate zone* 8, achieve a minimum of 3.8.

(3) Each part of an external wall with a wall surface density of greater than or equal to 220 kg/m2 must —

(a) in *climate zones* 1, 2 and 3 —

(i) for a storey, other than one with a storey above, shade the wall with a verandah, balcony, eaves, carport or the like that projects at a minimum angle of 15 degrees in accordance with Figure 13.2.5a; and

(ii) when the external walls are not shaded in accordance with (i) and there is another storey above, external glazing complies with 13.3.2 with the applicable value for C_{SHGC} in Tables 13.3.2a to 13.3.2c reduced by 20%; and

(iii) incorporate insulation with an *R Value* of greater than or equal to 0.5; and

(iv) on the lowest storey containing *habitable rooms*, have either —

(A) a concrete slab on ground floor; or

(B) masonry internal walls; or

(b) in *climate zone* 5 (option a) —

(i) for a storey, other than one with a storey above, shade the wall with a verandah, balcony, eaves, carport or the like that projects at a minimum angle of 15 degrees in accordance with Figure 13.2.5a; and

(ii) when the external walls are not shaded in accordance with (i) and there is another storey above, external glazing complies with 13.3.2 with the applicable value for C_{SHGC} in Table 13.3.2c reduced by 15%; and

(iii) incorporate insulation with an *R Value* of greater than or equal to 0.5; and

(iv) on the lowest storey containing *habitable rooms*, have either —

(A) a concrete slab on ground floor; or

(B) masonry internal walls; or

(c) in *climate zone* 5 (option b) —

(i) shade the wall with a verandah, balcony, eaves, carport or the like that projects at a minimum angle of 15 degrees in accordance with Figure 13.2.5a; and

(ii) have external glazing that complies with 13.3.2 with the applicable value for C_{SHGC} in Table 13.3.2c reduced by 15%; and

(iii) on the lowest storey containing *habitable rooms*, have either —

(A) ~~a concrete slab on ground floor; or~~

(B) ~~masonry internal walls; or~~

(d) ~~in *climate zones* 4 and 6 (option a)—~~

(i) ~~have external- that complies with 13.3.2 with the applicable value for C_u in Tables 13.3.2d and 13.3.2f reduced by 15%; and~~

(ii) ~~incorporate insulation with an *R-Value* of greater than or equal to 0.5; and~~

(iii) ~~on the lowest storey containing *habitable rooms*, have either—~~

(A) ~~a concrete slab on ground floor; or~~

(B) ~~masonry internal walls; or~~

(e) ~~in *climate zones* 4 and 6 (option b), have external glazing that complies with 13.3.2 with the applicable value for C_u in Tables 13.3.2d and 13.3.2f reduced by 20%; or~~

(f) ~~in *climate zones* 4 and 6 (option c)—~~

(i) ~~incorporate insulation with an *R-Value* of greater than or equal to 1.0; and~~

(ii) ~~on the lowest storey containing *habitable rooms*, have either—~~

(A) ~~a concrete slab on ground floor; or~~

(B) ~~masonry internal walls; or~~

(g) ~~in *climate zone* 7 (option a)—~~

(i) ~~have external glazing that complies with 13.3.2 with the applicable value for C_u in Table 13.3.2g reduced by 15%; and~~

(ii) ~~incorporate insulation with an *R-Value* of greater than or equal to 1.0; or~~

(h) ~~in *climate zone* 7 (option b)—~~

(i) ~~have external glazing that complies with 13.3.2 with the applicable value for C_u in Table 13.3.2g reduced by 20%; and~~

(ii) ~~incorporate insulation with an *R-Value* of greater than or equal to 0.5; or~~

(i) ~~in *climate zone* 7 (option c), incorporate insulation with an *R-Value* of greater than or equal to 1.5; or~~

(j) ~~in *climate zone* 8, achieve a minimum of 3.8.~~

(1) Except for the external walls of sub-floor spaces below suspended floors and lightweight wall construction, wall insulation must achieve the minimum *R-Value*—

(a) in *climate zone* 1, in accordance with Tables 13.2.5a and 13.2.5b as applicable; 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 Tables 13.2.5e and 13.2.5f as applicable; 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; and

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

(2) For lightweight wall construction, wall insulation must achieve the 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 steel-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 13.2.5w.

(~~4~~5) A wall in (2) that—

(a) has lightweight external cladding such as weatherboards, fibre-cement or metal sheeting fixed to the metal frame; and

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

must have a thermal break, consisting of a material with an *R-Value* greater than or equal to 0.2, installed between the external cladding and the metal frame.

(~~5~~) ~~A wall constructed in accordance with Figure 13.2.5b to 13.2.5i is deemed to have the Total R-Value specified in that Figure.~~

Table 13.2.5a: Concrete block walls – minimum requirement for 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

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 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
	> 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) are the material (bag) of insulation.

(3) X = not permitted.

(4) For a wall, reflective means that the wall structure contains an air space with a minimum width of at least 20 mm. The surface emissivity of the reflective surface facing the air space must be a maximum of 0.08, where the air space 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 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 requirement for 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

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 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
	> 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) are the material (bag) of insulation.

(3) X = not permitted.

(4) For a wall, reflective means that the wall structure contains an air space with a minimum width of at least 20 mm. The surface emissivity of the reflective surface facing the air space must be a maximum of 0.08 where the air space 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 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: Brick veneer wall – minimum requirement for 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 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
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.0
> 0.35 to ≤ 0.5	> 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 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	2.7
	> 1500 to ≤ 1800	1.5	1.5	1.5	2.0

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) 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 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: Brick cavity wall – minimum requirement for 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

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	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
	> 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) are the material (bag) of insulation.

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

Table 13.2.5e: Concrete block wall – minimum requirement for 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	0.5	0.5	0.5	0.5
	> 0 to ≤ 300	0.0	0.5	0.5	0.5
	> 300 to ≤ 450	0.0	0.5	0.5	0.5
	> 450 to ≤ 600	0.0	0.5	0.5	0.5
	> 600 to ≤ 900	0.0	0.0	0.5	0.5
	> 900 to ≤ 1200	0.0	0.0	0.5	0.5
	> 1200 to ≤ 1500	0.0	0.0	0.5	0.5
	> 1500 to ≤ 1800	0.0	0.0	0.5	0.5
	> 1800 to ≤ 2400	0.0	0.0	0.5	0.5
> 0.3 to ≤ 0.4	0	0.5	0.5	0.5	0.5
	> 0 to ≤ 300	0.5	0.5	0.5	0.5
	> 300 to ≤ 450	0.0	0.5	0.5	0.5
	> 450 to ≤ 600	0.0	0.5	0.5	0.5
	> 600 to ≤ 900	0.0	0.0	0.5	0.5
	> 900 to ≤ 1200	0.0	0.0	0.5	0.5
	> 1200 to ≤ 1500	0.0	0.0	0.5	0.5

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	0.0	0.0	0.5	0.5
	> 1800 to ≤ 2400	0.0	0.0	0.5	0.5
> 0.4 to ≤ 0.5	0	0.5	0.5	0.5	1.0
	> 0 to ≤ 300	0.5	0.5	0.5	1.0
	> 300 to ≤ 450	0.5	0.5	0.5	0.5
	> 450 to ≤ 600	0.0	0.5	0.5	0.5
	> 600 to ≤ 900	0.0	0.5	0.5	0.5
	> 900 to ≤ 1200	0.0	0.0	0.5	0.5
	> 1200 to ≤ 1500	0.0	0.0	0.5	0.5
	> 1500 to ≤ 1800	0.0	0.0	0.5	0.5
	> 1800 to ≤ 2400	0.0	0.0	0.5	0.5
> 0.5 to ≤ 0.6	0	0.5	0.5	0.5	1.0
	> 0 to ≤ 300	0.5	0.5	0.5	1.0
	> 300 to ≤ 450	0.5	0.5	0.5	1.0
	> 450 to ≤ 600	0.5	0.5	0.5	1.0
	> 600 to ≤ 900	0.0	0.5	0.5	0.5
	> 900 to ≤ 1200	0.0	0.5	0.5	0.5
	> 1200 to ≤ 1500	0.0	0.0	0.5	0.5
	> 1500 to ≤ 1800	0.0	0.0	0.5	0.5
	> 1800 to ≤ 2400	0.0	0.0	0.5	0.5
> 0.6 to ≤ 0.7	0	0.5	0.5	1.0	1.0
	> 0 to ≤ 300	0.5	0.5	0.5	1.0
	> 300 to ≤ 450	0.5	0.5	0.5	1.0
	> 450 to ≤ 600	0.5	0.5	0.5	1.0
	> 600 to ≤ 900	0.5	0.5	0.5	1.0
	> 900 to ≤ 1200	0.0	0.5	0.5	0.5
	> 1200 to ≤ 1500	0.0	0.5	0.5	0.5
	> 1500 to ≤ 1800	0.0	0.5	0.5	0.5
	> 1800 to ≤ 2400	0.0	0.0	0.5	0.5

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) of insulation.

(3) This Table shows wall heights for single storey dwellings. For two storey (or more) dwellings, add R0.5 to the values given in this Table.

Table 13.2.5f: Lightweight wall – minimum requirement for 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 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	1.0	1.5	2.5	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	1.0	1.0	1.5	X
	> 1200 to ≤ 1500	Reflective	1.0	1.5	2.5
	> 1500 to ≤ 1800	Reflective	1.0	1.0	2.0
	> 1800 to ≤ 2400	Reflective	Reflective	1.0	1.5
> 0.3 to ≤ 0.4	> 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	1.0	1.5	2.5	X
	> 900 to ≤ 1200	1.0	1.5	2.0	X
	> 1200 to ≤ 1500	Reflective	1.0	1.5	2.7
	> 1500 to ≤ 1800	Reflective	1.0	1.0	2.0
	> 1800 to ≤ 2400	Reflective	Reflective	1.0	1.5
> 0.4 to ≤ 0.5	> 300 to ≤ 450	2.0	X	X	X
	> 450 to ≤ 600	1.5	X	X	X
	> 600 to ≤ 900	1.0	2.0	2.7	X
	> 900 to ≤ 1200	1.0	1.5	2.0	X
	> 1200 to ≤ 1500	1.0	1.0	1.5	X
	> 1500 to ≤ 1800	Reflective	1.0	1.5	2.5
	> 1800 to ≤ 2400	Reflective	Reflective	1.0	1.5
> 0.5 to ≤ 0.6	> 300 to ≤ 450	2.0	X	X	X
	> 450 to ≤ 600	1.5	X	X	X
	> 600 to ≤ 900	1.0	2.0	X	X
	> 900 to ≤ 1200	1.0	1.5	2.0	X
	> 1200 to ≤ 1500	1.0	1.0	1.5	X
	> 1500 to ≤ 1800	1.0	1.0	1.5	2.5
	> 1800 to ≤ 2400	Reflective	1.0	1.0	2.0
> 0.6 to ≤ 0.7	> 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	1.0	1.5	2.5	X
	> 1200 to ≤ 1500	1.0	1.0	2.0	X
	> 1500 to ≤ 1800	Reflective	1.0	1.5	2.7
	> 1800 to ≤ 2400	Reflective	1.0	1.0	2.0

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) for insulation.

(3) X = not permitted.

(4) For a wall, reflective means that the wall structure contains an air space with a minimum width of at least 20 mm. The surface emissivity of the reflective surface facing the air space must be a maximum 0.08, where the air space 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 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: Brick veneer wall – minimum requirement for 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) are the material (bag) 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 given in this Table.

Table 13.2.5h: Brick cavity wall – minimum requirement for 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
> 0.35 to ≤ 0.5	0	0.25	0.25	0.51	0.62

SA	Overhang (mm)	Wall height (m)			
		≤ 2.4	> 2.4 to ≤ 2.7	> 2.7 to ≤ 3.0	> 3.0 to ≤ 3.6
	> 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) are the material (bag) 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 given in this Table.

Table 13.2.5i: Brick veneer wall – minimum requirement for 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
> 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

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	1.5	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) are the material (bag) 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 given in this Table.

Table 13.2.5j: Brick cavity wall – minimum requirement for 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) are the material (bag) of insulation.

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

Table 13.2.5k: Brick veneer wall – minimum requirement for 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	2.7	X	X
	> 0 to ≤ 300	2.7	2.7	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	2.7	2.5	X
	> 0 to ≤ 300	2.7	2.5	X	X
	> 300 to ≤ 450	2.7	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	2.7	X
	> 0 to ≤ 300	2.0	2.7	2.5	X
	> 300 to ≤ 450	2.7	2.7	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	2.7	X
	> 0 to ≤ 300	2.0	2.0	2.7	X
	> 300 to ≤ 450	2.7	2.7	2.7	X
	> 450 to ≤ 600	2.7	2.7	2.5	X
	> 600 to ≤ 900	X	X	X	X

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) 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 given in this Table.

Table 13.2.5l: Brick cavity wall – minimum requirement for 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
	> 1.44 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
	> 450 to ≤ 600	1.44	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
	> 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) are the material (bag) 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 given in this Table, to a maximum of R1.44.

Table 13.2.5m: Brick veneer wall – minimum requirement for 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	2.7
	> 0 to ≤ 300	2.0	1.5	2.0	2.7
	> 300 to ≤ 450	2.7	2.0	2.0	2.7
	> 450 to ≤ 600	X	2.7	2.0	2.7
	> 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	2.7
	> 300 to ≤ 450	2.7	2.0	2.0	2.7
	> 450 to ≤ 600	X	2.0	2.0	2.7
	> 600 to ≤ 900	X	X	2.5	2.7
	> 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	2.7	2.7
	> 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
> 0.7 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	2.7	2.0	2.0	2.0
	> 600 to ≤ 900	X	X	2.7	2.0
	> 900 to ≤ 1200	X	X	X	2.7

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) 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 given in this Table.

Table 13.2.5n: Brick cavity wall – minimum requirement for 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) are the material (bag) 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 given in this Table.

Table 13.2.5o: Lightweight wall – minimum requirement for 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	2.7	X
	> 300 to ≤ 450	X	2.7	2.7	X
	> 450 to ≤ 600	X	X	2.5	X
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X
> 0.35 to ≤ 0.5	0	1.5	1.5	2.0	2.7
	> 0 to ≤ 300	2.0	2.0	2.0	2.5
	> 300 to ≤ 450	2.5	2.0	2.7	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
	> 450 to ≤ 600	X	2.5	2.7	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	2.7
	> 300 to ≤ 450	2.7	2.0	2.0	2.7
	> 450 to ≤ 600	X	2.7	2.0	2.7
	> 600 to ≤ 900	X	X	X	X
	> 900 to ≤ 1200	X	X	X	X

Table Notes

(1) SA = Solar Absorptance.

(2) are the material (bag) 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 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 steel-framed walls: 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
0.0	0.40
0.5	0.90
1.0	1.28
1.5	1.58
2.0	1.83
2.5	2.03
2.8	2.14
3.0	2.20

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

Wall insulation *R-Value* from Tables 13.2.5b, 13.2.5f and 13.2.5o	Minimum *Total R-Value* to account for thermal bridging
1.5	1.72
2.0	2.06
2.5	2.35
2.7	2.46

Wall insulation *R-Value* from Tables 13.2.5b, 13.2.5f and 13.2.5o	Minimum *Total R-Value* to account for thermal bridging
3.0	2.61
3.2	2.70

Table 13.2.5r: Brick veneer steel-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	1.77
2.0	2.12
2.5	2.43
2.7	2.54
3.0	2.70
3.2	2.80

Table 13.2.5s: Concrete block steel-framed walls – thermal bridging mitigation

Wall insulation from Tables 13.2.5a to 13.2.5o	Option 1: increase insulation between wall framing to specified minimum *R-Value*	Option 2: add insulation strip with specified minimum *R-Value* over wall framing	Option 3: add a layer of continuous insulation with specified minimum *R-Value* on the inside or outside of the wall framing
0.5	1.0	0.25	0.13
1.0	2.5	0.25	0.13
1.5	X	0.38	0.25
2.0	X	0.38	0.25
2.5	X	0.38	0.25

Table Notes

X = not permitted.

Table 13.2.5t: Lightweight steel-framed walls – thermal bridging mitigation – climate zones 1 to 3

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation
≤ 1.5	Create a minimum 20 mm reflective airspace between insulation and cladding
> 1.5	Line outer surface of the frame with minimum 10 mm insulation with an *R-Value* of at least R0.26 and create minimum 20 mm reflective airspace between insulation and cladding
≤ 1.5 and reflective wrap	Not required
> 1.5 to ≤ 2.0 and reflective wrap	Line outer surface of the frame with minimum 10 mm insulation with an *R-Value* of at least R0.26
> 2.0 to ≤ 2.5 and reflective wrap	Provide additional continuous uncompressed R0.6 insulation to the outside of the frame
> 2.5 and reflective wrap	

Table 13.2.5u: Lightweight steel-framed walls – thermal bridging mitigation – climate zones 4 to 8

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging options
≤ 1.5	Increase insulation between frames to R2.2 and line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.26
	Increase insulation between frames to R1.8 and add an additional continuous insulation product with an *R-Value* of at least R0.26
> 1.5 to ≤ 2.0	Increase insulation between frames to R2.7 and line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.26
	Increase insulation between frames to R1.8 and add an additional continuous insulation product with an *R-Value* of at least R0.26
> 2.0 to ≤ 2.5	Increase insulation between the frames to R2.7 and line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.45
	Increase insulation between frames to at least R2.7 and add an additional continuous insulation product with an *R-Value* of at least R0.3
> 2.5 to ≤ 2.7	Increase insulation between the frames to R2.7 and line the outer surface of the frames with additional insulation with an *R-Value* of at least R0.6
	Increase insulation between the frames to R2.7 and add an additional continuous insulation product with an *R-Value* of at least R0.6
> 2.7	Line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.6

Table 13.2.5v: Brick veneer steel-framed walls – thermal bridging mitigation – climate zones 1 to 3

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation
≤ 1.5	Either add a reflective pliable moisture permeable membrane on the external side of the frame with an outward facing emissivity of no more than 0.1, a continuous insulation product with an *R-Value* of at least R0.38, or add R0.6 to the frame only
> 1.5 to ≤ 2.0	
> 2.0 to ≤ 2.5	Either add a reflective pliable moisture permeable membrane on the external side of the frame with an outward facing emissivity of no more than 0.1, a continuous insulation product with an *R-Value* of at least R0.51, or add R0.6 to the frame only
> 2.5 to ≤ 2.7	Either add a reflective pliable moisture permeable membrane on the external side of the frame with an outward facing emissivity of no more than 0.1, a continuous insulation product with an *R-Value* of at least R0.51, or add R0.6 to the frame only
> 2.7	Line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.6
≤ 1.5 and reflective wrap	Increase insulation between frames to R2.0
> 1.5 to ≤ 2.0 and reflective wrap	Increase insulation between frames to R2.5
> 2.0 to ≤ 2.5 and reflective wrap	Provide additional continuous uncompressed insulation to

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation
	the outside of frames with an *R-Value* of at least R0.25
> 2.5 to ≤ 2.7 and reflective wrap	
> 2.7 and reflective wrap	Line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.6

Table 13.2.5w: Brick veneer steel-framed walls – thermal bridging mitigation – climate zones 4 to 8

Wall insulation *R-Value* from Tables 13.2.5a to 13.2.5o	Thermal bridging mitigation options
≤ 1.5	Increase insulation between frames to R2.2 or add R0.6 to frame only
	Add a continuous insulation product with an *R-Value* of at least R0.25 or add R0.6 to frame only
> 1.5 to ≤ 2.0	Increase insulation between frames to R2.5 and line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.38, or add R0.6 to frame only
	Add a continuous insulation product with an *R-Value* of at least R0.38 or add R0.6 to frame only
> 2.0 to ≤ 2.5	Add a continuous insulation product with an *R-Value* of at least R0.51 or add R0.6 to frame only
> 2.5 to ≤ 2.7	Add a continuous insulation product with an *R-Value* of at least R0.51 or add R0.6 to frame only
> 2.7	Line the outer surface of the frame with additional insulation with an *R-Value* of at least R0.6

Figure ~~13.2.5a~~: ~~Measurement of a projection for wall shading~~

Figure Notes

~~Guttering can be considered as providing shading if attached to a shading projection.~~

Figure ~~13.2.5b~~: ~~Weatherboard external wall construction — Total R-Value of 0.48~~

Figure 13.2.5: ~~Fibre-cement sheet external wall construction — Total R-Value of 0.42~~

Figure ~~13.2.5d~~: ~~Clay masonry veneer external wall construction — Total R-Value of 0.56~~

Figure ~~13.2.5e~~: ~~Concrete blockwork masonry external wall construction — Total R-Value of 0.54~~

Figure ~~13.2.5f~~: ~~Cavity clay masonry external wall construction — Total R-Value of 0.69~~

Figure ~~13.2.5g~~: ~~Externally insulated clay masonry (reverse clay masonry veneer) external wall construction — Total R-Value of 0.53~~

Figure ~~13.2.5h~~: ~~Externally insulated concrete masonry external wall construction — Total R-Value of 0.46~~

Figure ~~13.2.5i~~: ~~Autoclaved aerated concrete masonry external wall construction — Total R-Value of 2.42~~

Explanatory Information

(1) ~~In 13.2.5(1), surface density is the mass on one vertical square metre of wall.~~

(2) ~~In 13.2.5(2), guttering can be considered as providing shading if attached to a shading projection.~~

(3) 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 or steel.

(4) The thermal performance of metal and timber-framed walls is affected by conductive thermal bridging by the framing members and convective thermal bridging at gaps between the framing and any added bulk insulation. Metal framed walls are more prone to conductive thermal bridging than timber-framed walls.

(5) 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. The purpose of the thermal break is to ensure that the thermal performance of the metal framed wall is comparable to that of a similarly clad timber-framed wall.

(6) A thermal break may be provided by materials such as timber battens, plastic strips or polystyrene insulation sheeting. The material used as a thermal break must separate the metal frame from the cladding and achieve the specified *R-Value*.

(7) For the purposes of 13.2.5(45)(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.

(8) ~~The *R-Value* of the thermal break is not included when calculating the *Total R-Value* of the wall, if the thermal break is only applied to the metal frame, because this calculation is done for locations free of framing members.~~

(9) ~~Figures 13.2.5a to 13.2.5i provide examples of typical types of wall construction. The additional *R-Valuerequired* can be calculated by subtracting the inherent *Total R-Value* of the typical wall construction in Figures 13.2.5a to 13.2.5i from the *requiredTotal R-Value*. The inherent *Total R-Value* of the typical wall construction has been arrived at by adding together the *R-Values* for outdoor air film, wall cladding or veneer, wall *cavity* or airspace, internal lining and internal air film. Where a *cavity* or airspace is filled the *Total R-Value* should be reduced by 0.17 to take account for the loss of the *cavity* or airspace.~~

(10) ~~*Reflective insulation* with one reflective surface having an emittance and direction as indicated, is considered to achieve the following *R-Values* when used in conjunction with the *Total R-Value* of a wall construction, as described in Figures 13.2.5a to 13.2.5i. The actual *R-Value* added by *reflective insulation* should be determined for each product in accordance with the standard prescribed in 13.2.2(1), which takes into consideration factors such as the number of adjacent airspaces, dimensions of the adjacent airspace, whether the airspace is ventilated and the presence of an anti-glare coating.~~

(11) ~~For further information on *reflective insulation*, refer to the explanatory information following 13.2.2.~~

(12) ~~Walls with a surface density of 220 kg/m^2 or more are deemed to achieve acceptable levels of thermal performance in certain *climate zones* due to their ability to store heat and therefore slow the heat transfer through the building *fabric*. These walls are defined by surface density (kg/m^2), which is the mass of one vertical square metre of wall, in order to reduce the complexity when measuring the mass of walls with voids.~~

(13) ~~The following are examples of some typical wall constructions that achieve a surface density of 220 kg/m^2:~~

- (a) ~~Two leaves each of 90 mm thick or greater clay or concrete masonry.~~
- (b) ~~140 mm thick or greater dense weight hollow concrete or clay blocks with —~~
  - (i) ~~10 mm plasterboard or render; and~~
  - (ii) ~~at least one concrete grouted horizontal bond beam; and~~
  - (iii) ~~vertical cores filled with concrete grout at centres not exceeding 1000 mm.~~
- (c) ~~140 mm thick or greater concrete wall panels and dense weight hollow concrete or clay blocks with all vertical cores filled with concrete grout.~~
- (d) ~~190 mm thick or greater dense weight hollow concrete or clay blocks with —~~
  - (i) ~~at least one concrete grouted horizontal bond beam; and~~
  - (ii) ~~vertical cores filled with concrete grout at centres not exceeding 1800 mm.~~
- (e) ~~Earth wall construction with a minimum wall thickness of 200 mm.~~

Table 13.2.5 (explanatory): ~~Explanatory information for R-Values added by reflective insulation~~

~~Wall construction~~	~~Reflective airspace details~~	~~*R-Value* added by *reflective insulation*~~
~~Concrete or masonry with internal plasterboard on battens~~	~~One 20 mm reflective airspace located between *reflective insulation* (of not more than 0.05 emittance inwards) and plasterboard.~~	~~0.48~~
~~*External wall* cladding (70 mm timber frame with internal lining)~~	~~One 70 mm reflective airspace located between *reflective insulation* (of not more than 0.05 emittance inwards) and plasterboard.~~	~~0.43~~
~~Masonry veneer (70 mm timber frame with internal lining)~~	~~One 70 mm reflective airspace located between *reflective insulation* and plasterboard; and one 25 mm anti-glare airspace located between *reflective insulation* (of not more than 0.2 emittance outwards) and masonry.~~	~~0.95~~
~~*Cavity* masonry~~	~~No airspace between the *reflective insulation* and the inner leaf of masonry; and one 35 mm anti-glare airspace located between *reflective insulation* (of not more than 0.2 emittance outwards) and the outer leaf of masonry.~~	~~0.50~~

13.2.6 Floors and subfloor walls

[2019: 3.12.1.5]

(~~1~~) ~~A suspended floor, other than an intermediate floor in a building with more than one storey —~~

(a) ~~must achieve the specified in Table 13.2.6a; and~~

(b) ~~with an in-slab or in-screed heating or cooling system, must be insulated —~~

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

(ii) ~~underneath the slab with insulation having an *R-Value* greater than or equal to 2.0 which may include insulation installed to meet the requirements of (a); and~~

(c) ~~that is enclosed beneath, must have a barrier installed at or below floor level to prevent convection within the wall cavity, from the airspace under the floor.~~

(~~2~~) ~~A floor is deemed to have the Total R-Value specified in Table 13.2.6b and Table 13.2.6a.~~

(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 steel-framed floor must be addressed by—

(a) achieving the *Total R-Value* in Table 13.2.6i, calculated in accordance with AS/NZS 4859.2; or

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

(~~3~~4) A concrete slab-on-ground—

(a) 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; and

(b) when in *climate zones* 6, 7 or 8, must be a waffle pod slab; and

(c) when in *climate zone* 8, must be insulated—

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

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

(~~4~~5) Insulation required by (~~3~~4)(a) and (~~3~~4)(~~b~~c)(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).

(~~5~~6) The requirements of ~~(1)(b), and~~ (~~3~~4)(a) 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
6	4.0, or 3.5 if used in conjunction with a reflective air space
7	
8	

Table Notes

X = Not permitted.

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

Subfloor wall height	Minimum subfloor wall insulation *R-Value*
600	0.5
900	1.0
1200	1.5
1500	1.5
1800	1.5

Table Notes

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

(2) *R-Values* are the material (bag) *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	Minimum subfloor wall insulation *R-Value*
600	0.5
900	0.5
1200	0.5
1500	0.5
1800	0.5

Table Notes

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

(2) *R-Values* are the material (bag) *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	Reflective insulation facing down over the subfloor space	Minimum suspended floor insulation *R-Value*	Minimum subfloor wall insulation *R-Value*
600	No	0.5	1.0
600	No	1.0	0.5
600	Yes	1.5	0.0
600	Yes	0.5	2.0
600	Yes	1.0	0.5
900	No	1.5	0.0
900	No	0.5	1.5
900	Yes	1.0	0.5
900	Yes	1.5	0.0
1200	No	1.0	0.5
1200	No	1.5	0.0
1200	Yes	0.5	2.0
1200	Yes	1.0	0.5
1500	No	1.5	0.0
1500	Yes	1.0	0.5
1500	Yes	1.5	0.0
1800	No	1.0	1.0
1800	No	1.5	0.5
1800	Yes	2.0	0.0

Table Notes

A suspended floor includes a suspended timber floor, suspended steel-framed floor and suspended concrete floor.

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	Reflective insulation facing down over the subfloor surface	Minimum suspended floor insulation *R-Value*	Minimum subfloor wall insulation *R-Value*
600	No	1.5	Not required
600	Yes	2.0	Not required
900	No	1.5	Not required
900	Yes	2.0	Not required
1200	No	2.0	Not required
1200	Yes	2.0	Not required
1500	No	2.0	Not required
1500	Yes	2.0	Not required
1800	No	2.0	0.5
1800	No	2.5	Not required
1800	Yes	2.0	0.5
1800	Yes	2.5	Not required

Table Notes

A suspended floor includes a suspended timber floor, a suspended steel-framed floor and a suspended concrete floor.

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	Reflective insulation facing down over the subfloor area	Minimum suspended floor insulation *R-Value*	Minimum subfloor wall insulation *R-Value*
600	No	2.0	0.0
600	Yes	1.5	0.0
900	No	2.0	0.0
900	Yes	1.5	0.0
1200	No	2.0	0.0
1200	Yes	1.5	0.0
1500	No	2.5	0.0
1500	No	2.0	0.5
1500	Yes	1.5	0.0
1800	No	2.5	0.0
1800	Yes	2.0	0.0
1800	Yes	1.5	0.5
Unenclosed	No	4.0	Not applicable
Unenclosed	Yes	3.5	Not applicable

Table Notes

A suspended floor includes a suspended timber floor, suspended steel-framed floor and suspended concrete floor.

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	Reflective insulation facing down over the subfloor space	Minimum suspended floor insulation *R-Value*	Minimum subfloor wall insulation *R-Value*
600	No	2.5	Not required
600	Yes	1.5	Not required
900	No	2.5	Not required
900	Yes	1.5	Not required
1200	No	3.0	Not required
1200	Yes	1.5	Not required
1500	No	3.0	Not required
1500	Yes	1.5	Not required
1800	No	3.0	Not required
1800	Yes	1.5	1.0
1800	Yes	2.0	Not required

Table Notes

A suspended floor includes a suspended timber floor, suspended steel-framed floor and suspended concrete floor.

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	Reflective insulation facing down over the subfloor space	Minimum suspended floor insulation *R-Value*	Minimum subfloor wall insulation *R-Value*
600	No	2.5	Not required
600	Yes	1.5	Not required
900	No	2.5	Not required
900	Yes	1.5	Not required
1200	No	3.0	Not required
1200	Yes	1.5	Not required
1500	No	3.0	Not required
1500	Yes	1.5	Not required
1800	No	3.0 or more	Not required
1800	Yes	1.5	1.0
1800	Yes	2.0	Not required

Table Notes

A suspended floor includes a suspended timber floor, suspended steel-framed floor and suspended concrete floor.

Table 13.2.6i: Suspended floor — minimum Total R-Value

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Floor covering	*Total R-Value*: heat flow up	*Total R-Value*: heat flow down
0.0	Carpet	0.50	0.55

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Floor covering	*Total R-Value*: heat flow up	*Total R-Value*: heat flow down
0.0	Tile	0.29	0.34
0.0	Floating timber	0.34	0.39
0.5	Carpet	1.03	1.08
0.5	Tile	0.83	0.88
0.5	Floating timber	0.87	0.92
1.0	Carpet	1.83	1.88
1.0	Tile	1.62	1.67
1.0	Floating timber	1.67	1.72
1.5	Carpet	2.20	2.25
1.5	Tile	2.00	2.05
1.5	Floating timber	2.05	2.10
2.0	Carpet	2.29	2.34
2.0	Tile	2.08	2.13
2.0	Floating timber	2.13	2.18
2.5	Carpet	2.63	2.68
2.5	Tile	2.42	2.47
2.5	Floating timber	2.47	2.52
3.0	Carpet	2.94	2.99
3.0	Tile	2.73	2.78
3.0	Floating timber	2.78	2.83
3.5	Carpet	3.24	3.29
3.5	Tile	3.03	3.08
3.5	Floating timber	3.08	3.13
4.0	Carpet	3.50	3.55
4.0	Tile	3.29	3.34
4.0	Floating timber	3.34	3.39

Table Notes

(1) The area weighted *Total R-Values* can be used where there is a combination of floor coverings.

(2) The *Total R-Value* for the floor is for the floor component only. The *R-Value* of the subfloor and subfloor walls is not included in this calculation.

Table 13.2.6j: Suspended floor — thermal bridging mitigation

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Option 1: add a layer of continuous insulation above or below the floor framing~~add an insulation strip over floor framing~~	Option 2: add an insulation strip over floor framing~~add a layer of continuous insulation above or below the floor framing~~
1.0	R1.0 insulation between frames and R0.26 continuous insulation	R1.0 insulation between frames and R0.51 insulation to frame
1.5	R1.5 insulation between frames and R0.38 continuous insulation	R1.5 insulation between frames and R0.51 insulation to frame
2.0	R2.0 insulation between frames and R0.51 continuous insulation	R2.0 insulation between frames and R0.64 insulation to frame

Floor insulation from Tables 13.2.6a and 13.2.6d to 13.2.6h as applicable	Option 1: add a layer of continuous insulation above or below the floor framing~~add an insulation strip over floor framing~~	Option 2: add an insulation strip over floor framing~~add a layer of continuous insulation above or below the floor framing~~
2.5	R2.5 insulation between frames and R0.51 continuous insulation	R2.5 insulation between frames and R0.64 insulation to frame
3.0	R3.0 insulation between frames and R0.51 continuous insulation	R3.0 insulation between frames and R0.64 insulation to frame
3.5	R3.5 insulation between frames and R0.51 continuous insulation	R3.5 insulation between frames and R0.64 insulation to frame
4.0	R4.0 insulation between frames and R0.51 continuous insulation	R4.0 insulation between frames and R0.64 insulation to frame

Table 13.2.6a: ~~Suspended floor – minimum Total R-Value~~

~~Climate zone~~	~~Direction of heat flow~~	~~Minimum~~
~~1~~	~~Up~~	~~1.5~~
~~2~~	~~Up~~	~~1.0~~
~~3~~	~~Up~~	~~1.5~~
~~4~~	~~Down~~	~~2.25~~
~~5~~	~~Down~~	~~1.0~~
~~6~~	~~Down~~	~~2.25~~
~~7~~	~~Down~~	~~2.75~~
~~8~~	~~Down~~	~~3.25~~

Table Notes

~~For an enclosed perimeter treatment, the underfloor airspace and its enclosure may be included in the Total R-Value calculation.~~

Table 13.2.6b: ~~Total R-Value for typical suspended timber floor~~

~~Enclosure and height of floor and direction of heat flow~~	~~: Cavity masonry~~	~~: 190 mm concrete masonry~~	~~: Single skin masonry~~	~~: 9 mm fibre cement sheet~~
~~Enclosed ≤0.6 m high with an upwards heat flow~~	~~1.00~~	~~0.93~~	~~0.88~~	~~0.77~~
~~Enclosed ≤0.6 m high with a downwards heat flow~~	~~1.11~~	~~1.06~~	~~1.01~~	~~0.90~~
~~Enclosed >0.6 m but to ≤1.2 m high with an upwards heat flow~~	~~0.86~~	~~0.81~~	~~0.76~~	~~0.65~~
~~Enclosed >0.6 m but to ≤1.2 m high with a downwards heat flow~~	~~1.00~~	~~0.94~~	~~0.89~~	~~0.77~~
~~Enclosed >1.2 m to ≤2.4 m high with an upwards heat flow~~	~~0.76~~	~~0.72~~	~~0.67~~	~~0.57~~

Enclosure and height of floor and direction of heat flow	: Cavity masonry	: 190 mm concrete masonry	: Single skin masonry	: 9 mm fibre cement sheet
Enclosed >1.2 m to ≤2.4 m high with a downwards heat flow	0.89	0.84	0.79	0.69
Unenclosed with an upwards heat flow	0.39	0.39	0.39	0.39
Unenclosed with a downwards heat flow	0.51	0.51	0.51	0.51

Table Notes

(1) The height of the floor is measured from ground surface to the underside of the floor or the insulation.

(2) For the purposes of calculating the of a floor, the *R-Value* attributable to an in-slab or in-screed heating or cooling system is ignored.

Table 13.2.6c: Total R-Value for typical suspended concrete floor

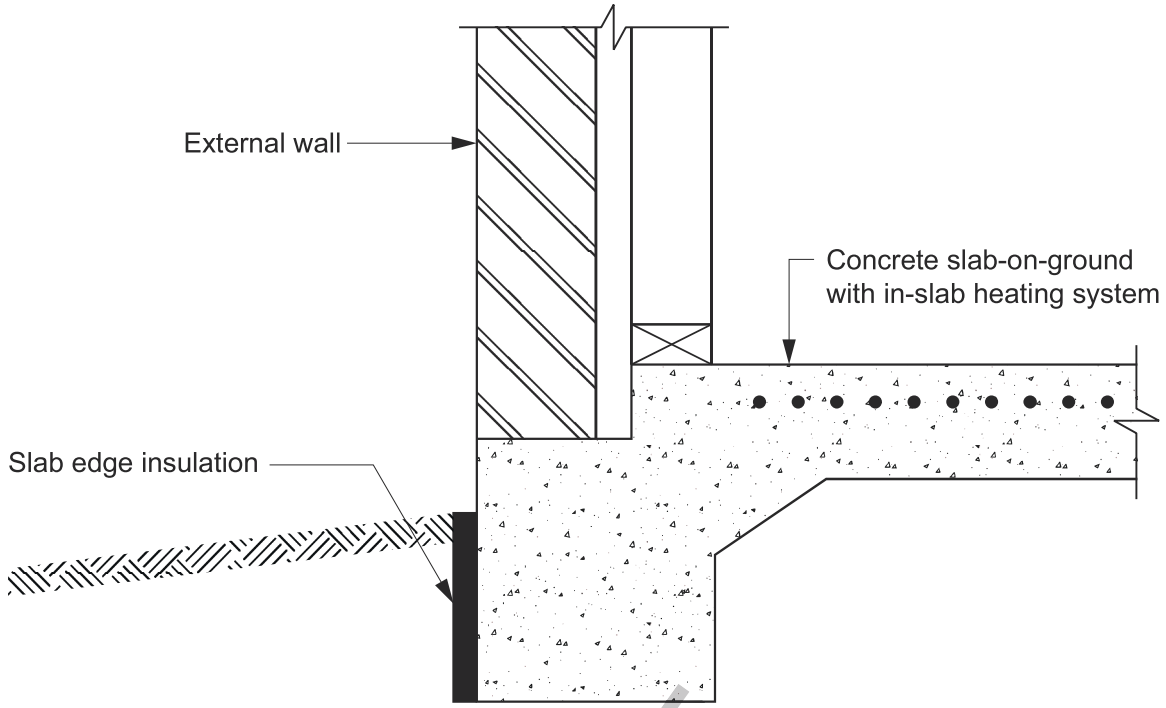
Enclosure and height of floor and direction of heat flow	: Cavity masonry	: 190 mm concrete masonry	: Single skin masonry	: 9 mm fibre cement sheet
Enclosed ≤0,6 m high with an upwards heat flow	0.93	0.88	0.83	0.72
Enclosed ≤0.6 m high with an downwards heat flow	1.06	1.01	0.96	0.85
Enclosed >0.6 m but to ≤1.2 m high with an upwards heat flow	0.81	0.76	0.71	0.60
Enclosed >0.6 m but to ≤1.2 m high with a downwards heat flow	0.94	0.89	0.84	0.72
Enclosed >1.2 m to ≤2.4 m high with an upwards heat flow	0.71	0.67	0.62	0.52
Enclosed >1.2 m to ≤2.4 m high with a downwards heat flow	0.84	0.79	0.74	0.64
Unenclosed with an upwards heat flow	0.34	0.34	0.34	0.34
Unenclosed with a downwards heat flow	0.46	0.46	0.46	0.46

Table Notes

(1) The height of the floor is measured from ground surface to the underside of the floor or the insulation.

(2) For the purposes of calculating the of a floor, the *R-Value* attributable to an in-slab or in-screed heating or cooling system is ignored.

Figure 13.2.6: Insulation of slab edge



Explanatory Information

(1) ~~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.~~

(2) ~~The barrier required by 13.2.6(1)(c) could be an imperforate flashing.~~

(3) ~~Specific solutions for concrete slab and timber floors can be found in documents and online resources prepared by industry associations and product suppliers.~~

(4) ~~Tables 13.2.6b and 13.2.6c provide examples of the inherent *Total R-Values* of enclosed and unenclosed suspended floors of two typical types of construction. Any added *R-Value* can be calculated by subtracting the inherent *R-Value* of the typical construction in Tables 13.2.6b and 13.2.6c from the required *Total R-Value* in Table 13.2.6a.~~

(5) ~~Any non-reflective building membrane fixed between or under floor joists is considered to add an *R-Value* of 0.2 to the *Total R-Value* of the base construction described in Tables 13.2.6b and 13.2.6c. *Reflective insulation* will achieve a higher value which will need to be determined for each product in accordance with relevant standards. Typically, a reflective building membrane attached beneath the floor joists of an unenclosed floor, with a single bright side facing upwards to a 90 mm airspace, can add an *R-Value* of 0.43 for heat flow upwards and 1.32 for heat flow downwards. Double sided *reflective insulation* with a 90 mm airspace installed under an enclosed floor can add an *R-Value* of 0.55 for heat flow upwards and 1.97 for heat flow downwards. Both examples allow for dust on the upper surface.~~

(6) ~~A reflective or non-reflective building membrane should be installed with due consideration of potentially damaging *condensation* in some *climate zones* and associated interaction with adjoining building materials.~~

(7) ~~For further information on *reflective insulation*, refer to the explanatory information accompanying Figures 13.2.3a to 13.2.3d.~~

(8) 13.2.6(~~5~~6) 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.

(9) Care should be taken to ensure that the type of termite management system selected is compatible with the slab edge insulation.

(10) Heat flow through is considered to occur in each *climate zone* as per Explanatory Table 13.2.6.

Table 13.2.6 (explanatory): 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

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~~; or~~.

(c) ~~in *climate zone 5*—~~

(i) ~~be enclosed with masonry walls other than where there are doors and *glazing*; and~~

(ii) ~~be separated from the Class 1 building with a masonry wall that extends to the ceiling or roof; and~~

(iii) ~~achieve a *Total R-Value* in the roof equivalent to that *required* by Tables 13.2.3a to 13.3.2h as appropriate for the Class 1 building; and~~

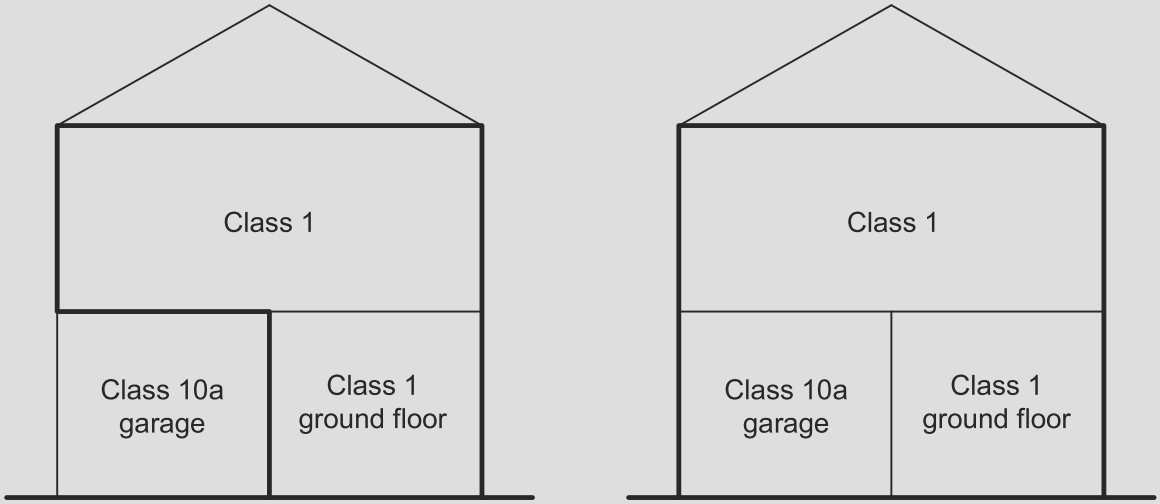
(iv) ~~not have a garage door facing the east or west orientation other than if the Class 1 building complies with 13.3.2 with the applicable value for C_{SUGG} in Tables 13.3.2a to 13.3.2h as appropriate reduced by 15%.~~

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.

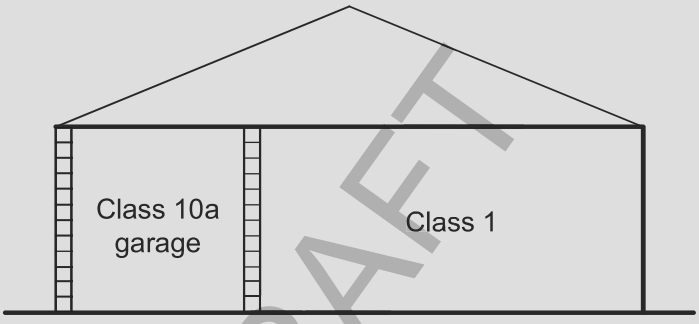
Explanatory Figure 13.2.7 below depicts examples of a Class 1 building with an attached Class 10a garage.

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

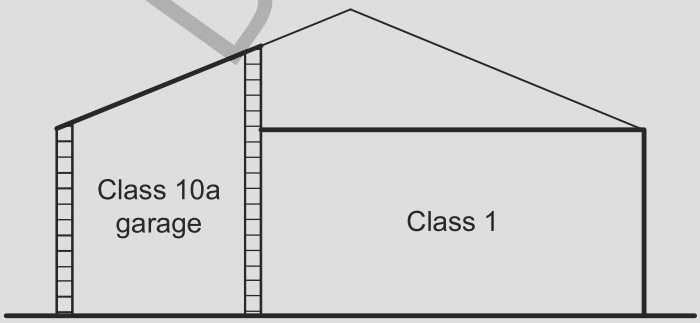


OPTION (a) – Elevation

OPTION (b) – Elevation



OPTION (c)(i) – Elevation



OPTION (c)(ii) – 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.

~~In (c), in climate zone 5, the thermal performance of the Class 1 building may be achieved by ensuring that the roof of the Class 10a building satisfies Tables 13.2.3a to 13.2.3h and the walls are of masonry construction.~~

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)(a) or (b).

13.3.2 External glazing: winter

[2019: 3.12.2.1]

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

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

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

$$\frac{[(A1 \times U1 \times BC1 \times OC1 \times R1) + (A2 \times U2 \times BC2 \times OC2 \times R2) + ...]}{[(A1 \times SHGC1 \times EW1 \times BSW1 \times LW1 \times FW1 \times HW1 \times RW1) + (A2 \times SHGC2 \times EW2 \times BSW2 \times LW2 \times FW2 \times HW2 \times R2) + ...]}$$

(2) In the formula at (1)(b)—

(a) $A1,2,etc$ = the area of each *glazing* element; and

(b) $U1,2,etc$ = the *Total System U-Value* of each *glazing* element; and

(c) $SHGC1,2,etc$ = the *Total System SHGC* for each *glazing* element, not exceeding 0.7; and

(d) $EW1,W2,etc$ = the winter exposure factor for each *glazing* element obtained from Tables 13.3.2b to 13.3.2q, as appropriate; and

(e) $BC1,2,etc$ = the bedroom conductance factor obtained from Tables 13.3.2r and 13.3.2s; and

(f) $OC1,2,etc$ = the orientation sector conductance factor obtained from Tables 13.3.2t to 13.3.2z; and

(g) $R1,2,etc$ = the room type factor in Tables 13.3.2aa to 13.3.2ah; and

(h) $BSW1,W2,etc$ = the bedroom solar gain factor in Tables 13.3.2aa to 13.3.2ah; and

(i) $LW1,W2,etc$ = the factor in Tables 13.3.2aa to 13.3.2ah for each *glazing* element located on a floor level above the lowest floor level; and

(j) $FW1,W2,etc$ = the factor in Tables 13.3.2aa to 13.3.2ah for each *glazing* element; and

(k) $HW1,W2,etc$ = the factor in Tables 13.3.2aa to 13.3.2ah for each *glazing* element where the adjoining floor is in direct contact with the ground and is tiled.

(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	8.31
5 (concrete or brick wall)	8.79	10.13
6	8.45	6.06
7	7.59	9.27
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 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 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 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
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 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

P/H	North	North east	East	South east	South	South west	West	North west
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 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
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 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 13.3.2i: Orientation sector winter exposure factor (E_W) — floor in direct contact with the ground: climate zone 5 (concrete or brick 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 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 13.3.2k: Orientation sector winter exposure factor (E_W) — suspended floor: climate zone 5 (concrete or brick 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

P/H	North	North east	East	South east	South	South west	West	North west
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 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	1.61	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 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	0.94	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 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
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 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 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

P/H	North	North east	East	South east	South	South west	West	North west
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 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 13.3.2r: Bedroom conductance factor BC: climate zones 2 to 4 and 6 to 8

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
6	0.95	1.10
7	1.08	0.80
8	0.83	0.82

Table 13.3.2s: Bedroom conductance factor BC: climate zone 5

Climate zone	Floor in direct contact with the ground with lightweight or brick veneer wall	Suspended floor with lightweight or brick veneer wall	Floor in direct contact with the ground with concrete or brick wall	Suspended floor with concrete or brick wall
5	1.20	0.60	0.70	1.20

Table 13.3.2t: 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 13.3.2u: 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
Suspended floor	1.20	1.15	1.10	0.95	0.80	1.01	1.21	1.21

Table 13.3.2v: 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 13.3.2w: 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 brick 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 brick veneer	Suspended floor	1.20	1.00	0.80	0.80	0.80	0.85	0.90	1.05
Concrete or brick	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 brick	Suspended floor	1.00	0.98	0.95	0.93	0.90	0.93	0.95	0.98

Table 13.3.2x: 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	0.83	0.60	0.60	0.60	0.60	0.60	0.83
Suspended floor	1.00	0.90	0.80	0.80	0.80	0.80	0.80	0.90

Table 13.3.2y: 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 13.3.2z: 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 13.3.2aa: 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) for a bedroom and a room which is not a conditioned space	0.40	1.00
Level factor (L_W) for all floor levels above the lowest floor	1.10	1.20
Bedroom solar gain factor (BS_W)	1.80	1.02
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.03	1.03
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	0.99
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.98	0.97
Hard floor surface factor (H_W)	1.14	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be

interpolated.

(2) 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 3

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.26	1.00
Level factor (L_W) for all levels above the lowest floor	1.19	1.30
Bedroom solar gain factor (BS_W)	0.79	0.50
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.04	1.04
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.97	0.97
Hard floor surface factor (H_W)	1.15	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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 4

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.60	1.00
Level factor (L_W) for all levels above the lowest floor	1.30	1.40
Bedroom solar gain factor (BS_W)	0.70	0.71
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.04	1.04
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.98	0.98
Hard floor surface factor (H_W)	1.03	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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 — lightweight or brick veneer wall

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.60	1.00
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.20
Bedroom solar gain factor (BS_W)	1.20	0.57
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.04	1.00
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	0.93
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.97	0.90
Hard floor surface factor (H_W)	1.05	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(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 5 — concrete or brick wall

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.40	0.30
Level factor (L_W) for all floor levels above the lowest floor	1.40	1.10
Bedroom solar gain factor (BS_W)	1.00	0.60
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.04	1.00
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.97	0.90
Hard floor surface factor (H_W)	1.10	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

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

(3) 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 6

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.70	1.00
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.40
Bedroom solar gain factor (BS_W)	1.10	1.35
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of 0.50	0.96	0.96
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.93	0.83
Hard floor surface factor (H_W)	0.97	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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 7

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) for a bedroom and a room which is not a conditioned space	0.60	1.00
Level factor (L_W) for all floor levels above the lowest floor	1.30	1.10
Bedroom solar gain factor (BS_W)	1.22	0.50
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	0.92	0.92
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	1.05	1.05
Hard floor surface factor (H_W)	1.03	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

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

Table 13.3.2ah: 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) for a bedroom or a which is not a conditioned space	0.50	1.00
Level factor (L_W) for all floor levels above the lowest floor	1.15	0.70
Bedroom solar gain factor (BS_W)	1.52	0.32
Frame factor (F_W) for frames with a solar absorptance of ≥ 0.85	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_W) for frames with a solar absorptance of ≤ 0.35	0.96	0.96
Hard floor surface factor (H_W)	0.91	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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

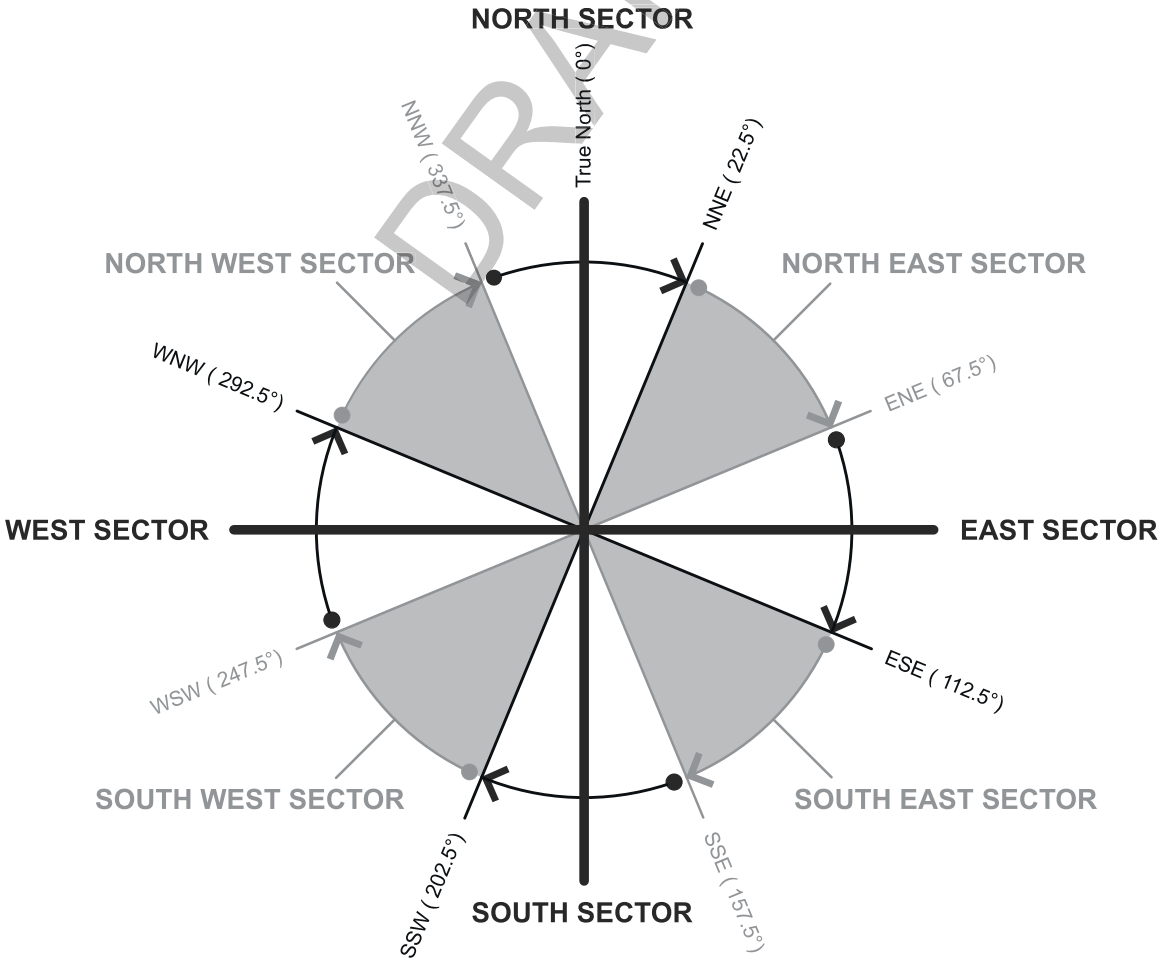


Figure Notes

(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

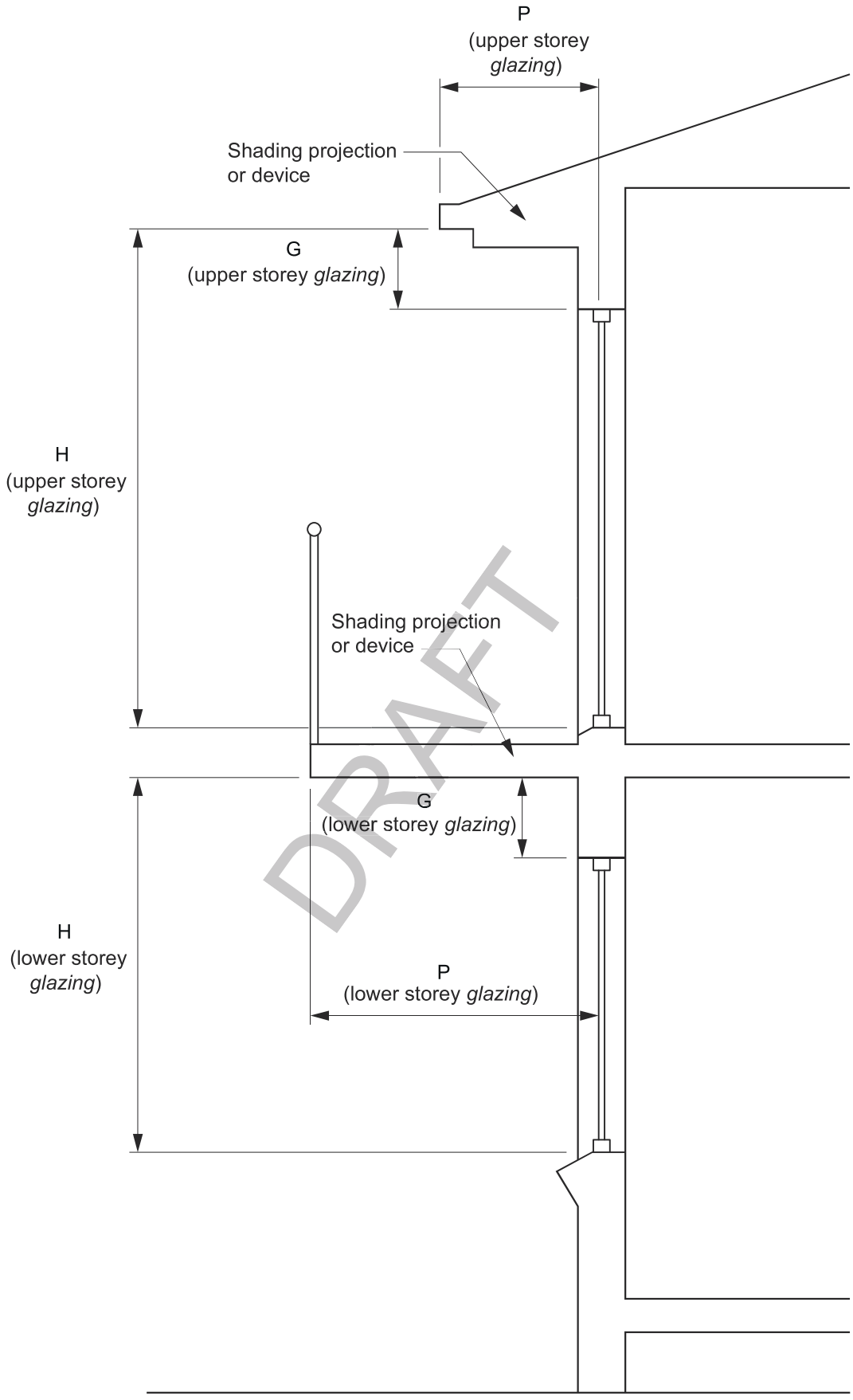


Figure Notes

(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

(1) Winter *glazing* exposure factors are not needed for *climate zone* 1.

(2) For exposure factors between those shown in Tables 13.3.2b to 13.3.2q, either use the next highest P/H or interpolate.

(3) 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.

(4) For the bedroom conductance factor (BC), the conduction heat loss from windows in bedrooms and unconditioned areas has less impact on the heating loads of a dwellings than conduction 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.

(5) For the orientation sector conductance factor (OC) in a room which has higher heat gain through the window, the average temperature in the room will be higher than an orientation which has lower heat gain through the window. This difference in temperatures affects the conduction heat losses through the window.

~~13.3.2~~ ~~External glazing~~

[~~2019: 3.12.2.1~~]

(~~1~~) ~~The aggregate conductance of the glazing in each storey, including any mezzanine, of a building must~~

(a) ~~not exceed the allowances resulting from~~

(i) ~~in *climate zone* 1, multiplying the area of the storey, including any mezzanine, measured within the enclosing walls, by the constant C_U obtained from Table 13.3.2a; and~~

(ii) ~~in *climate zones* 2 to 8, using the constant C_U obtained from Tables 13.3.2b to 13.3.2h, as appropriate; and~~

(b) ~~be calculated in accordance with the following calculation~~

(i) ~~in *climate zone* 1:~~ $(A1 \times U1) + (A2 \times U2) + (A3 + U3) + \ldots$, ~~where~~

(A) ~~= the area of each glazing element; and~~

(B) ~~= the *Total System U-Value* of each glazing element; and~~

(ii) ~~in *climate zones* 2 to 8:~~ $[(A1 + U1) + (A2 + U2) + \ldots] / [(A1 \times SHGC1 \times EW1) + (A2 \times SHGC2 \times EW2) + \ldots]$, ~~where~~

(A) ~~= the area of each glazing element; and~~

(B) ~~= the *Total System U-Value* of each glazing element; and~~

(C) ~~= the for each glazing element; and~~

(D) ~~= the winter exposure factor for each *glazing* element obtained from Tables 13.3.2i to 13.3.2o.~~

(~~2~~) ~~The aggregate solar heat gain of the glazing in each storey, including any mezzanine, of a building must~~

(a) ~~not exceed the allowances resulting from multiplying the area of the storey, including any mezzanine, measured within the enclosing walls, by the constant C_{SHGC} obtained from Tables 13.3.2a to 13.3.2h, as appropriate; and~~

(b) ~~be calculated in accordance with the following calculation:~~ $(A1 \times SHGC1 \times ES1) + (A2 \times SHGC2 \times ES2) + \ldots$, ~~where~~

(i) ~~= the area of each glazing element; and~~

(ii) ~~= the for each glazing element; and~~

(iii) ~~= the summer exposure factor for each *glazing* element obtained from Tables 13.3.2p to 13.3.2w.~~

(~~3~~) ~~For the purposes of Tables 13.3.2a to 13.3.2h, the following applies:~~

(a) ~~A storey has Standard air movement if all *habitable rooms* comply with .~~

(b) ~~A storey has High air movement if the total *ventilation opening* area serving the *habitable room* is~~

(i) ~~in *climate zones* 1, 2, 3, 4 and 5, not less than that for Standard air movement without a ceiling fan or evaporative cooler, but with ceiling fans complying with 13.5.4 installed in all *habitable rooms*; or~~

(ii) ~~greater than or equal to twice that for Standard air movement without a ceiling fan or evaporative cooler.~~

(c) ~~Where the *ventilation opening* area serving the *habitable rooms* is between Standard and High, interpolation may be used to determine the applicable CSHCC.~~

(d) ~~Where the floor construction of a storey, including a mezzanine, is partly in direct contact with the ground and partly suspended, the constants for conductance and solar heat gain are to be—~~

(i) ~~interpolated between the constants for the two constructions in proportion to their respective areas; or~~

(ii) ~~those for a suspended floor.~~

(~~4~~) ~~For the purposes of this clause—~~

(a) ~~summer and winter exposure for each *climate zone* must be determined in accordance with Tables 13.3.2i to 13.3.2w; and~~

(b) ~~orientation sectors are as shown in Figure 13.3.2a; and~~

(c) ~~p and h are to be measured using the method shown in Figure 13.3.2b.~~

Table 13.3.2a: ~~Constants for conductance and solar heat gain—climate zone 1~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHCC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~1.650~~	~~0.063~~
~~Floor in direct contact with the ground~~	~~High~~	~~1.650~~	~~0.069~~
~~Suspended floor~~	~~Standard~~	~~1.485~~	~~0.057~~
~~Suspended floor~~	~~High~~	~~1.485~~	~~0.063~~

Table 13.3.2b: ~~Constants for conductance and solar heat gain—climate zone 2~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHCC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~18.387~~	~~0.074~~
~~Floor in direct contact with the ground~~	~~High~~	~~18.387~~	~~0.081~~
~~Suspended floor~~	~~Standard~~	~~16.548~~	~~0.067~~
~~Suspended floor~~	~~High~~	~~16.548~~	~~0.074~~

Table 13.3.2c: ~~Constants for conductance and solar heat gain—climate zone 3~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHCC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~14.641~~	~~0.062~~
~~Floor in direct contact with the ground~~	~~High~~	~~14.641~~	~~0.068~~
~~Suspended floor~~	~~Standard~~	~~13.177~~	~~0.056~~
~~Suspended floor~~	~~High~~	~~13.177~~	~~0.062~~

Table 13.3.2d: ~~Constants for conductance and solar heat gain—climate zone 4~~

~~Floor construction~~	~~Air movement (refer 13.3.2(c))~~	~~Constant C_u~~	~~Constant C_{SHGC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~7.929~~	~~0.097~~
~~Floor in direct contact with the ground~~	~~High~~	~~7.929~~	~~0.107~~
~~Suspended floor~~	~~Standard~~	~~7.136~~	~~0.087~~
~~Suspended floor~~	~~High~~	~~7.136~~	~~0.096~~

Table 13.3.2e: ~~Constants for conductance and solar heat gain—climate zone 5~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHGC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~13.464~~	~~0.122~~
~~Floor in direct contact with the ground~~	~~High~~	~~13.464~~	~~0.134~~
~~Suspended floor~~	~~Standard~~	~~12.118~~	~~0.110~~
~~Suspended floor~~	~~High~~	~~12.118~~	~~0.124~~

Table 13.3.2f: ~~Constants for conductance and solar heat gain—climate zone 6~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHGC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~6.418~~	~~0.153~~
~~Floor in direct contact with the ground~~	~~High~~	~~6.418~~	~~0.168~~
~~Suspended floor~~	~~Standard~~	~~5.776~~	~~0.138~~
~~Suspended floor~~	~~High~~	~~5.776~~	~~0.152~~

Table 13.3.2g: ~~Constants for conductance and solar heat gain—climate zone 7~~

~~Floor construction~~	~~Air movement (refer to 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHGC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~5.486~~	~~0.189~~
~~Floor in direct contact with the ground~~	~~High~~	~~5.486~~	~~0.208~~
~~Suspended floor~~	~~Standard~~	~~4.937~~	~~0.170~~
~~Suspended floor~~	~~High~~	~~4.937~~	~~0.187~~

Table 13.3.2h: ~~Constants for conductance and solar heat gain—climate zone 8~~

~~Floor construction~~	~~Air movement (refer 13.3.2(3))~~	~~Constant C_u~~	~~Constant C_{SHGC}~~
~~Floor in direct contact with the ground~~	~~Standard~~	~~3.987~~	~~0.234~~

Floor construction	Air movement (refer 13.3.2(3))	Constant C_u	Constant C_{unco}
Floor in direct contact with the ground	High	3.087	0.257
Suspended floor	Standard	3.588	0.211
Suspended floor	High	3.588	0.232

Table 13.3.2i: Orientation Sector winter exposure factor (EW) for climate zone 2

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	1.86	1.44	0.86	0.40	0.37	0.41	0.91	1.48
0.05	1.80	1.37	0.80	0.34	0.31	0.36	0.84	1.42
0.10	1.73	1.33	0.76	0.32	0.29	0.34	0.81	1.34
0.20	1.51	1.18	0.68	0.29	0.27	0.30	0.73	1.20
0.40	1.25	0.95	0.54	0.24	0.23	0.25	0.61	0.99
0.60	1.04	0.78	0.48	0.21	0.20	0.22	0.51	0.83
0.80	0.78	0.62	0.39	0.18	0.19	0.20	0.44	0.68
1.00	0.54	0.53	0.32	0.17	0.18	0.17	0.37	0.56
1.20	0.33	0.42	0.28	0.15	0.17	0.16	0.35	0.46
1.40	0.28	0.36	0.23	0.14	0.16	0.15	0.31	0.38
1.60	0.22	0.29	0.22	0.14	0.15	0.14	0.26	0.34
1.80	0.19	0.25	0.19	0.13	0.14	0.13	0.23	0.28
2.00	0.15	0.19	0.17	0.12	0.14	0.13	0.22	0.27

Table 13.3.2j: Orientation Sector winter exposure factor (EW) for climate zone 3

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	1.92	1.49	0.88	0.32	0.25	0.33	0.95	1.56
0.05	1.90	1.44	0.82	0.28	0.22	0.29	0.91	1.52
0.10	1.76	1.37	0.87	0.27	0.21	0.28	0.87	1.44
0.20	1.57	1.22	0.70	0.24	0.20	0.25	0.78	1.30
0.40	1.25	1.00	0.60	0.20	0.18	0.21	0.67	1.08
0.60	0.94	0.77	0.48	0.18	0.17	0.18	0.54	0.87
0.80	0.63	0.61	0.43	0.16	0.15	0.17	0.46	0.70
1.00	0.42	0.52	0.35	0.14	0.14	0.16	0.41	0.56
1.20	0.29	0.40	0.31	0.13	0.14	0.14	0.34	0.48
1.40	0.23	0.36	0.25	0.12	0.13	0.13	0.30	0.41
1.60	0.17	0.31	0.24	0.11	0.12	0.12	0.29	0.34
1.80	0.15	0.22	0.19	0.11	0.12	0.11	0.24	0.31
2.00	0.13	0.22	0.18	0.10	0.12	0.11	0.22	0.27

Table 13.3.2k: Orientation Sector winter exposure factor (EW) for climate zone 4

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	1.97	1.51	0.83	0.39	0.35	0.39	0.85	1.53
0.05	1.93	1.45	0.76	0.33	0.29	0.33	0.79	1.47
0.10	1.91	1.40	0.74	0.31	0.28	0.31	0.75	1.42
0.20	1.62	1.28	0.67	0.28	0.25	0.28	0.68	1.28
0.40	1.48	1.09	0.56	0.24	0.22	0.24	0.58	1.10
0.60	1.22	0.90	0.49	0.21	0.19	0.21	0.49	0.90
0.80	1.06	0.74	0.43	0.19	0.18	0.19	0.44	0.75
1.00	0.85	0.66	0.37	0.17	0.16	0.17	0.37	0.64
1.20	0.61	0.51	0.33	0.15	0.16	0.16	0.34	0.56
1.40	0.47	0.47	0.30	0.14	0.15	0.15	0.30	0.47
1.60	0.34	0.41	0.28	0.14	0.14	0.14	0.26	0.41
1.80	0.26	0.35	0.25	0.13	0.14	0.13	0.24	0.35
2.00	0.24	0.32	0.22	0.12	0.13	0.12	0.22	0.29

Table 13.3.2l: Orientation Sector winter exposure factor (EW) for climate zone 5

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	2.01	1.48	0.77	0.39	0.37	0.39	0.85	1.58
0.05	1.95	1.42	0.70	0.33	0.31	0.33	0.78	1.51
0.10	1.95	1.36	0.66	0.31	0.30	0.32	0.75	1.47
0.20	1.63	1.21	0.59	0.28	0.27	0.28	0.67	1.32
0.40	1.49	1.00	0.49	0.24	0.23	0.24	0.55	1.10
0.60	1.21	0.83	0.40	0.21	0.21	0.21	0.47	0.90
0.80	0.98	0.68	0.35	0.19	0.19	0.19	0.42	0.73
1.00	0.80	0.52	0.28	0.17	0.18	0.17	0.36	0.63
1.20	0.54	0.46	0.25	0.16	0.17	0.16	0.29	0.50
1.40	0.40	0.34	0.21	0.15	0.16	0.15	0.28	0.43
1.60	0.28	0.30	0.19	0.14	0.14	0.13	0.23	0.36
1.80	0.22	0.25	0.16	0.13	0.14	0.13	0.20	0.32
2.00	0.18	0.19	0.15	0.12	0.14	0.12	0.19	0.24

Table 13.3.2m: Orientation Sector winter exposure factor (EW) for climate zone 6

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	1.90	1.43	0.80	0.45	0.43	0.45	0.88	1.53
0.05	1.84	1.35	0.73	0.38	0.36	0.38	0.81	1.45
0.10	1.82	1.30	0.70	0.36	0.34	0.36	0.76	1.42
0.20	1.56	1.17	0.62	0.32	0.30	0.32	0.70	1.30

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.40	1.43	1.03	0.53	0.27	0.26	0.27	0.60	1.10
0.60	1.22	0.86	0.45	0.23	0.23	0.23	0.52	0.95
0.80	1.08	0.73	0.38	0.21	0.21	0.22	0.46	0.79
1.00	0.86	0.58	0.34	0.19	0.19	0.19	0.39	0.69
1.20	0.70	0.54	0.29	0.18	0.17	0.18	0.36	0.58
1.40	0.53	0.41	0.26	0.16	0.17	0.17	0.32	0.52
1.60	0.44	0.37	0.22	0.15	0.16	0.15	0.28	0.44
1.80	0.32	0.30	0.21	0.14	0.15	0.14	0.27	0.40
2.00	0.25	0.27	0.20	0.13	0.14	0.14	0.24	0.32

Table 13.3.2n: Orientation Sector winter exposure factor (EW) for climate zone 7

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	2.08	1.63	0.83	0.38	0.35	0.38	0.75	1.50
0.05	2.01	1.56	0.77	0.32	0.29	0.32	0.69	1.44
0.10	2.01	1.53	0.73	0.30	0.28	0.30	0.66	1.41
0.20	1.89	1.43	0.68	0.27	0.25	0.27	0.60	1.28
0.40	1.62	1.24	0.58	0.23	0.21	0.23	0.50	1.13
0.60	1.49	1.09	0.50	0.20	0.19	0.20	0.44	0.96
0.80	1.27	0.94	0.44	0.18	0.17	0.18	0.39	0.83
1.00	1.16	0.83	0.41	0.16	0.16	0.16	0.34	0.71
1.20	0.91	0.70	0.34	0.15	0.15	0.15	0.30	0.63
1.40	0.83	0.68	0.33	0.14	0.14	0.14	0.27	0.48
1.60	0.64	0.49	0.30	0.13	0.13	0.12	0.25	0.45
1.80	0.52	0.47	0.24	0.12	0.13	0.12	0.23	0.39
2.00	0.39	0.39	0.24	0.11	0.12	0.12	0.20	0.33

Table 13.3.2o: Orientation Sector winter exposure factor (EW) for climate zone 8

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	1.93	1.48	0.81	0.47	0.45	0.47	0.81	1.46
0.05	1.87	1.41	0.73	0.39	0.38	0.39	0.73	1.39
0.10	1.85	1.36	0.70	0.37	0.35	0.37	0.70	1.34
0.20	1.56	1.22	0.63	0.33	0.32	0.33	0.63	1.20
0.40	1.41	1.02	0.51	0.28	0.27	0.28	0.51	0.99
0.60	1.18	0.83	0.44	0.24	0.24	0.24	0.44	0.82
0.80	1.00	0.68	0.37	0.21	0.22	0.21	0.36	0.67
1.00	0.79	0.59	0.32	0.20	0.20	0.19	0.30	0.58
1.20	0.54	0.46	0.28	0.18	0.19	0.18	0.27	0.47
1.40	0.44	0.42	0.25	0.17	0.18	0.17	0.24	0.38

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
1.60	0.31	0.31	0.21	0.16	0.17	0.15	0.22	0.32
1.80	0.23	0.28	0.19	0.14	0.16	0.14	0.19	0.29
2.00	0.19	0.25	0.16	0.14	0.15	0.14	0.17	0.23

Table 13.3.2p: Orientation Sector summer exposure factor (ES) for climate zone 1

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	0.52	0.84	1.29	1.24	0.87	1.27	1.32	0.85
0.05	0.44	0.74	1.19	1.13	0.75	1.17	1.23	0.75
0.10	0.41	0.68	1.11	1.07	0.68	1.09	1.15	0.69
0.20	0.37	0.59	1.01	0.94	0.55	0.94	1.00	0.60
0.40	0.30	0.45	0.79	0.69	0.42	0.75	0.83	0.47
0.60	0.25	0.37	0.66	0.59	0.34	0.60	0.66	0.38
0.80	0.22	0.31	0.53	0.47	0.30	0.52	0.58	0.32
1.00	0.19	0.26	0.45	0.41	0.25	0.43	0.48	0.28
1.20	0.18	0.23	0.37	0.33	0.22	0.39	0.42	0.26
1.40	0.17	0.21	0.32	0.30	0.22	0.32	0.37	0.22
1.60	0.15	0.18	0.28	0.26	0.18	0.29	0.34	0.21
1.80	0.13	0.18	0.27	0.22	0.17	0.28	0.30	0.18
2.00	0.12	0.17	0.23	0.21	0.16	0.24	0.28	0.17

Table 13.3.2q: Orientation Sector summer exposure factor (ES) for climate zone 2

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	0.72	1.05	1.22	1.04	0.72	1.12	1.34	1.11
0.05	0.60	0.92	1.10	0.92	0.60	1.01	1.23	0.99
0.10	0.55	0.85	1.04	0.86	0.57	0.94	1.14	0.90
0.20	0.47	0.74	0.92	0.76	0.50	0.84	1.00	0.78
0.40	0.39	0.56	0.73	0.61	0.40	0.67	0.83	0.60
0.60	0.33	0.44	0.60	0.49	0.33	0.55	0.67	0.45
0.80	0.29	0.37	0.50	0.41	0.29	0.46	0.58	0.39
1.00	0.26	0.30	0.43	0.35	0.24	0.40	0.47	0.32
1.20	0.23	0.27	0.35	0.30	0.22	0.34	0.41	0.28
1.40	0.21	0.24	0.32	0.28	0.21	0.30	0.36	0.24
1.60	0.19	0.23	0.28	0.25	0.19	0.27	0.31	0.22
1.80	0.17	0.20	0.24	0.22	0.17	0.26	0.28	0.20
2.00	0.17	0.19	0.22	0.21	0.16	0.22	0.27	0.19

Table 13.3.2r: ~~Orientation Sector summer exposure factor (ES) for climate zone 3~~

~~P/H (refer Figure 13.3.2a)~~	~~North~~	~~North east~~	~~East~~	~~South east~~	~~South~~	~~South west~~	~~West~~	~~North west~~
~~0.00~~	~~0.56~~	~~1.04~~	~~1.42~~	~~1.18~~	~~0.66~~	~~1.16~~	~~1.36~~	~~1.01~~
~~0.05~~	~~0.47~~	~~0.94~~	~~1.32~~	~~1.08~~	~~0.57~~	~~1.05~~	~~1.26~~	~~0.90~~
~~0.10~~	~~0.44~~	~~0.85~~	~~1.25~~	~~1.02~~	~~0.54~~	~~0.99~~	~~1.19~~	~~0.83~~
~~0.20~~	~~0.38~~	~~0.73~~	~~1.10~~	~~0.90~~	~~0.46~~	~~0.87~~	~~1.06~~	~~0.73~~
~~0.40~~	~~0.32~~	~~0.56~~	~~0.88~~	~~0.71~~	~~0.38~~	~~0.72~~	~~0.84~~	~~0.56~~
~~0.60~~	~~0.28~~	~~0.43~~	~~0.74~~	~~0.58~~	~~0.31~~	~~0.57~~	~~0.71~~	~~0.44~~
~~0.80~~	~~0.24~~	~~0.35~~	~~0.59~~	~~0.47~~	~~0.27~~	~~0.50~~	~~0.60~~	~~0.35~~
~~1.00~~	~~0.20~~	~~0.29~~	~~0.50~~	~~0.40~~	~~0.24~~	~~0.43~~	~~0.53~~	~~0.29~~
~~1.20~~	~~0.19~~	~~0.26~~	~~0.42~~	~~0.34~~	~~0.21~~	~~0.37~~	~~0.43~~	~~0.26~~
~~1.40~~	~~0.17~~	~~0.22~~	~~0.35~~	~~0.31~~	~~0.20~~	~~0.32~~	~~0.41~~	~~0.23~~
~~1.60~~	~~0.17~~	~~0.20~~	~~0.33~~	~~0.27~~	~~0.16~~	~~0.31~~	~~0.35~~	~~0.21~~
~~1.80~~	~~0.15~~	~~0.19~~	~~0.30~~	~~0.24~~	~~0.16~~	~~0.28~~	~~0.33~~	~~0.19~~
~~2.00~~	~~0.15~~	~~0.18~~	~~0.25~~	~~0.24~~	~~0.15~~	~~0.24~~	~~0.27~~	~~0.17~~

Table 13.3.2s: ~~Orientation Sector summer exposure factor (ES) for climate zone 4~~

~~P/H (refer Figure 13.3.2a)~~	~~North~~	~~North east~~	~~East~~	~~South east~~	~~South~~	~~South west~~	~~West~~	~~North west~~
~~0.00~~	~~0.72~~	~~1.19~~	~~1.40~~	~~1.05~~	~~0.57~~	~~0.99~~	~~1.31~~	~~1.12~~
~~0.05~~	~~0.61~~	~~1.10~~	~~1.31~~	~~0.97~~	~~0.49~~	~~0.91~~	~~1.22~~	~~1.02~~
~~0.10~~	~~0.56~~	~~1.00~~	~~1.24~~	~~0.91~~	~~0.46~~	~~0.85~~	~~1.17~~	~~0.94~~
~~0.20~~	~~0.43~~	~~0.87~~	~~1.12~~	~~0.82~~	~~0.41~~	~~0.76~~	~~1.05~~	~~0.84~~
~~0.40~~	~~0.30~~	~~0.66~~	~~0.92~~	~~0.67~~	~~0.34~~	~~0.62~~	~~0.85~~	~~0.62~~
~~0.60~~	~~0.27~~	~~0.50~~	~~0.74~~	~~0.56~~	~~0.29~~	~~0.53~~	~~0.72~~	~~0.45~~
~~0.80~~	~~0.24~~	~~0.38~~	~~0.63~~	~~0.49~~	~~0.25~~	~~0.45~~	~~0.59~~	~~0.36~~
~~1.00~~	~~0.20~~	~~0.31~~	~~0.55~~	~~0.42~~	~~0.22~~	~~0.39~~	~~0.51~~	~~0.30~~
~~1.20~~	~~0.19~~	~~0.26~~	~~0.46~~	~~0.37~~	~~0.20~~	~~0.35~~	~~0.45~~	~~0.25~~
~~1.40~~	~~0.16~~	~~0.23~~	~~0.39~~	~~0.34~~	~~0.17~~	~~0.33~~	~~0.38~~	~~0.21~~
~~1.60~~	~~0.16~~	~~0.20~~	~~0.38~~	~~0.30~~	~~0.16~~	~~0.29~~	~~0.33~~	~~0.20~~
~~1.80~~	~~0.14~~	~~0.18~~	~~0.32~~	~~0.27~~	~~0.14~~	~~0.25~~	~~0.32~~	~~0.17~~
~~2.00~~	~~0.13~~	~~0.17~~	~~0.28~~	~~0.23~~	~~0.14~~	~~0.24~~	~~0.26~~	~~0.16~~

Table 13.3.2t: ~~Orientation Sector summer exposure factor (ES) for climate zone 5~~

~~P/H (refer Figure 13.3.2a)~~	~~North~~	~~North east~~	~~East~~	~~South east~~	~~South~~	~~South west~~	~~West~~	~~North west~~
~~0.00~~	~~0.82~~	~~1.09~~	~~1.19~~	~~0.96~~	~~0.68~~	~~1.04~~	~~1.30~~	~~1.16~~
~~0.05~~	~~0.69~~	~~0.96~~	~~1.07~~	~~0.85~~	~~0.57~~	~~0.92~~	~~1.19~~	~~1.04~~
~~0.10~~	~~0.63~~	~~0.88~~	~~1.01~~	~~0.79~~	~~0.54~~	~~0.86~~	~~1.11~~	~~0.94~~
~~0.20~~	~~0.51~~	~~0.76~~	~~0.89~~	~~0.70~~	~~0.48~~	~~0.76~~	~~0.99~~	~~0.83~~

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.40	0.39	0.58	0.71	0.57	0.38	0.62	0.81	0.62
0.60	0.35	0.46	0.58	0.47	0.33	0.51	0.65	0.48
0.80	0.30	0.37	0.50	0.40	0.28	0.43	0.52	0.40
1.00	0.26	0.31	0.42	0.34	0.25	0.37	0.46	0.31
1.20	0.24	0.26	0.36	0.30	0.22	0.33	0.40	0.27
1.40	0.21	0.23	0.32	0.27	0.20	0.29	0.34	0.24
1.60	0.20	0.22	0.29	0.23	0.18	0.27	0.30	0.21
1.80	0.18	0.20	0.25	0.21	0.17	0.23	0.27	0.20
2.00	0.17	0.17	0.24	0.21	0.16	0.21	0.25	0.19

Table 13.3.2u: Orientation Sector summer exposure factor (ES) for climate zone 6

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	0.84	1.08	1.15	0.87	0.61	1.05	1.40	1.24
0.05	0.71	0.97	1.05	0.78	0.52	0.96	1.30	1.13
0.10	0.65	0.90	0.99	0.74	0.49	0.91	1.25	1.04
0.20	0.52	0.77	0.88	0.65	0.44	0.82	1.12	0.91
0.40	0.36	0.58	0.71	0.54	0.36	0.67	0.90	0.69
0.60	0.30	0.43	0.61	0.45	0.31	0.58	0.76	0.51
0.80	0.26	0.35	0.50	0.38	0.26	0.50	0.66	0.40
1.00	0.22	0.29	0.42	0.32	0.23	0.42	0.56	0.36
1.20	0.20	0.24	0.37	0.29	0.23	0.39	0.48	0.29
1.40	0.18	0.22	0.32	0.26	0.19	0.34	0.42	0.26
1.60	0.16	0.19	0.28	0.24	0.18	0.31	0.38	0.21
1.80	0.15	0.18	0.26	0.22	0.17	0.28	0.34	0.20
2.00	0.14	0.17	0.24	0.21	0.17	0.26	0.31	0.17

Table 13.3.2v: Orientation Sector summer exposure factor (E S) for climate zone 7

P/H (refer Figure 13.3.2a)	North	North east	East	South east	South	South west	West	North west
0.00	0.96	1.17	1.21	0.94	0.64	0.91	1.19	1.18
0.05	0.83	1.05	1.10	0.83	0.54	0.81	1.09	1.07
0.10	0.76	0.97	1.04	0.80	0.51	0.76	1.03	0.98
0.20	0.62	0.85	0.93	0.70	0.45	0.68	0.91	0.86
0.40	0.40	0.65	0.76	0.58	0.38	0.55	0.74	0.64
0.60	0.32	0.51	0.65	0.50	0.33	0.47	0.63	0.51
0.80	0.28	0.40	0.54	0.44	0.28	0.41	0.53	0.40
1.00	0.25	0.33	0.48	0.37	0.25	0.35	0.44	0.32
1.20	0.22	0.28	0.41	0.34	0.23	0.31	0.38	0.27
1.40	0.19	0.23	0.36	0.30	0.21	0.28	0.33	0.24

P/H (refer Figure 13.3.2a)	North	North-east	East	South-east	South	South-west	West	North-west
1.60	0.18	0.21	0.33	0.27	0.20	0.26	0.31	0.21
1.80	0.17	0.20	0.28	0.24	0.18	0.24	0.27	0.19
2.00	0.16	0.19	0.27	0.23	0.18	0.21	0.25	0.18

Table 13.3.2w: Orientation Sector summer exposure factor (ES) for climate zone 8

P/H (refer Figure 13.3.2a)	North	North-east	East	South-east	South	South-west	West	North-west
0.00	0.85	1.12	1.20	0.96	0.68	1.01	1.27	1.16
0.05	0.71	0.99	1.09	0.85	0.57	0.90	1.16	1.04
0.10	0.65	0.90	1.02	0.79	0.54	0.84	1.09	0.95
0.20	0.52	0.79	0.90	0.70	0.48	0.73	0.98	0.83
0.40	0.39	0.60	0.73	0.57	0.39	0.61	0.79	0.63
0.60	0.34	0.46	0.60	0.48	0.33	0.50	0.66	0.49
0.80	0.30	0.37	0.50	0.41	0.29	0.43	0.53	0.40
1.00	0.25	0.30	0.42	0.35	0.25	0.37	0.47	0.33
1.20	0.23	0.28	0.37	0.31	0.23	0.33	0.39	0.26
1.40	0.21	0.23	0.32	0.29	0.20	0.29	0.34	0.24
1.60	0.20	0.21	0.30	0.25	0.18	0.25	0.31	0.22
1.80	0.19	0.20	0.25	0.22	0.17	0.23	0.28	0.20
2.00	0.16	0.18	0.23	0.21	0.16	0.22	0.24	0.19

Figure 13.3.2a: Orientation sectors

Figure 13.3.2b: Method of measuring p and h

Figure Notes

(1) An external shading device that complies with 13.3.3(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: Exposure factors

(1) Winter exposure factors are not needed for *climate zone* 1.

(2) For exposure factors between those in Tables 13.3.2i to 13.3.2o, either use the next highest P/H or interpolate.

(3) For exposure factors between those in Tables 13.3.2p to 13.3.2w, either use the next lowest P/H or interpolate.

Explanatory Information: Conductance and performance values for external glazing

(1) The conductance formula for *climate zone* 1 differs from the formula for all other *Climate zones* because there is little or no need for heating at any time of the year in climate zone 1. The conductance allowance is calculated to limit the rate of heat conduction through glazing into an air conditioned interior from a hotter outside environment. The limit is set at a level that allows the use of basic *glazing* systems in dwellings with average *glazing* areas whether or not they are air conditioned.

(2) The conductance formula for *climate zones* 2 to 8 is based on wintertime conditions to account for the balance between potential solar gains and heat loss by conduction through *glazing*. The calculation favours orientations with higher potential solar gains in winter and the use of shading rather than glass toning. The improved insulation performance of *glazing* resulting from the calculations will also be beneficial under summertime conditions when

~~outside temperatures exceed inside temperatures.~~

(3) ~~By referring to "*glazing* elements", 13.3.2 requires *and Total System SHGCs* to be assessed for the combined effect of glass and frames. The measurement of these *and Total System SHGCs* is specified in the Technical Protocols and Procedures Manual for Energy Rating of Fenestration Products by the Australian Fenestration Rating Council (AFRC).~~

(4) ~~Various assessors using AFRC procedures might refer to their published performance values by slightly different terms including "U factor" or "Uw" for or "SHGC" for *Total System SHGC*. Such values can be used under 13.3.2 provided they measure the combined glass and frame performance according to AFRC requirements.~~

(5) ~~*and Total System SHGC* are shown for some simple types of *glazing* elements in the table below. Lower figures indicate better *glazing* performance, although its effect on a dwelling's energy efficiency can vary depending on the climate and orientation of the *glazing*. Explanatory Table 13.3.2a gives worst case assessments, which can be improved by obtaining generic or custom product assessments from suppliers, manufacturers, industry associations (including their online resources) and from competent assessors.~~

(6) ~~Typical ranges of generic ratings are set out in Explanatory Tables 13.2.3b to 13.3.2c below to illustrate the levels of performance available through such assessments. Numbers from this table should not be used in compliance calculations.~~

(7) ~~Custom assessments consider *glazing* element components in most detail and return the highest levels of assessed performance for a given type of *glazing* element. Generic assessments consider the components of *glazing* elements in less detail and return lower levels of assessed performance.~~

(8) ~~The calculations for conductance and solar heat gain both consider seasonal solar radiation, orientation, shading and the solar performance of the *glazing*.~~

Table 13.3.2a (explanatory): ~~Worst case whole glazing element performance values~~

~~Glass description~~	~~Framing type~~		~~*Total System SHGC*~~
~~Single clear~~	~~Aluminium~~	~~7.9~~	~~0.81~~
	~~Timber or uPVC~~	~~5.6~~	~~0.77~~
~~Tinted single~~	~~Aluminium~~	~~7.9~~	~~0.65~~
	~~Timber or uPVC~~	~~5.6~~	~~0.61~~
~~Clear double (3/6/3)~~	~~Aluminium~~	~~6.2~~	~~0.72~~
	~~Timber or uPVC~~	~~3.8~~	~~0.68~~

Table 13.3.2b (explanatory): ~~Indicative ranges of whole glazing element performance—single glazed (monolithic or laminated)—aluminium frame~~

~~Glass description~~	~~Comment~~	~~range~~	~~*Total System SHGC* range~~
~~Clear~~	~~Minimum variation in glass U Value and SHGC for different glass thicknesses.~~	~~7.9 – 5.5~~	~~0.81 – 0.64~~
~~Tinted~~	~~Glass SHGC depends on glass thickness and type of tint.~~	~~7.9 – 5.6~~	~~0.65 – 0.33~~
~~Coated~~	~~Glass U Value and SHGC depend on coating type.~~	~~7.8 – 3.8~~	~~0.68 – 0.36~~
~~Tinted and coated~~	~~Glass U Value depends on coating type and glass SHGC depends on coating type, type of tint, and glass thickness.~~	~~7.8 – 3.8~~	~~0.45 – 0.31~~

Table 13.3.2c (explanatory): ~~Indicative ranges of whole glazing element performance—single glazed (monolithic or laminated)—timber or uPVC frame~~

~~Glass description~~	~~Comment~~	~~range~~	~~Total System SHGC range~~
~~Clear~~	~~Minimum variation in glass U Value and SHGC for different glass thicknesses.~~	~~5.6 – 4.3~~	~~0.77 – 0.51~~
~~Tinted~~	~~Glass SHGC depends on glass thickness and type of tint.~~	~~5.6 – 4.3~~	~~0.61 – 0.25~~
~~Coated~~	~~Glass U Value and SHGC depend on coating type.~~	~~5.5 – 2.9~~	~~0.64 – 0.27~~
~~Tinted and coated~~	~~Glass U Value depends on coating type and glass SHGC depends on coating type, type of tint, and glass thickness.~~	~~5.5 – 3.1~~	~~0.42 – 0.23~~

Table 13.3.2d (explanatory): ~~Indicative ranges of whole glazing element performance—double glazed—aluminium frame~~

~~Glass description~~	~~Comment~~	~~range~~	~~Total System SHGC range~~
~~Clear~~	~~Glass U Value depends on cavity width.~~	~~6.2 – 3.1~~	~~0.72 – 0.63~~
~~Tinted~~	~~Glass U Value depends on cavity width and glass SHGC depends on type of tint, tinted glass thickness and on cavity width.~~	~~6.2 – 3.1~~	~~0.57 – 0.36~~
~~Coated~~	~~Glass U Value depends on cavity width and type of coating and glass SHGC depends on type of coating and cavity width.~~	~~6.1 – 2.4~~	~~0.60 – 0.22~~
~~Tinted and coated~~	~~Glass U Value depends on cavity width and type of coating and glass SHGC depends on type of coating, tinted glass thickness and cavity width.~~	~~6.1 – 2.5~~	~~0.41 – 0.21~~

Table 13.3.2e (explanatory): ~~Indicative ranges of whole glazing element performance—double glazed—timber or uPVC~~

~~Glass description~~	~~Comment~~	~~range~~	~~Total System SHGC range~~
~~Clear~~	~~Glass U Value depends on cavity width.~~	~~3.8 – 2.5~~	~~0.68 – 0.47~~
~~Tinted~~	~~Glass U Value depends on cavity width and glass SHGC depends on type of tint, tinted glass thickness and on cavity width.~~	~~3.8 – 2.5~~	~~0.57 – 0.27~~

Glass description	Comment	range	Total System SHGC range
Coated	Glass U Value depends on cavity width and type of coating and glass SHGC depends on type of coating and cavity width.	3.8 – 2.1	0.59 – 0.17
Tinted and coated	Glass U Value depends on cavity width and type of coating and glass SHGC depends on type of coating, tinted glass thickness and cavity width.	3.8 – 2.1	0.37 – 0.16

Explanatory Information: Tables 13.3.2a to 13.3.2h

(1) A floor in direct contact with the ground includes a concrete slab on ground or concrete slab on fill.

(2) A suspended floor includes a suspended timber floor, suspended steel framed floor or suspended concrete floor.

(3) In general, a floor in direct contact with the ground more readily assimilates solar heat gains than a suspended floor. Consequently, lower stringency levels apply to *glazing* in a storey that has a floor in direct contact with the ground.

(4) Whether a storey has Standard or High air movement depends upon the total *ventilation opening* area provided to *habitable rooms* on that storey and the presence of ceiling fans. The additional *ventilation opening* area *required* for High air movement without fans can be distributed to any of the *habitable rooms* on the storey. In *climate zones* 1 to 5, the storey can achieve High air movement when the total *ventilation opening* area is as for Standard air movement (without a ceiling fan or evaporative cooler) but with ceiling fans installed in every *habitable room*. Explanatory Table 13.3.2f below shows an example for *climate zone* 2.

(5) The provisions of Part 13.3 assume that internal *window* coverings will be installed for privacy reasons. This assumption is already incorporated in the allowances for *glazing*.

Table 13.3.2f (explanatory): Air movement with/without ceiling fans

Air movement	With ceiling fans	Without ceiling fans
Standard	10%	7.5%
High	20%	10%

Explanatory Information: Tables 13.3.2i to 13.3.2w

(1) Higher exposure factor (E_w) values in Tables 13.3.2i to 13.3.2o indicate greater exposure to desirable winter solar gains and should be adopted as far as possible.

(2) Higher exposure factor (E_s) values in Tables 13.3.2p to 13.3.2w indicate greater exposure to unwanted summer solar gains and should be avoided as far as possible.

Explanatory Information: Orientation sectors (Figure 13.3.2a)

(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) Figure 13.3.2a 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 Figure 13.3.2a 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 outer curved arrows.

13.3.3 External glazing — summer

[New for 2022]

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

(a) not exceed the allowances 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 calculation:

$$(A1 \times SHGC1 \times ES1 \times RS1 \times LS1 \times FS1 \times HS1) + (AS2 \times SHGC2 \times ES2 \times RS2 \times LS2 \times FS2 \times HS2) + ...$$

(2) In the formula at (1)(b)—

(a) = the area of each *glazing* element; and

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

(c) $ES1,S2,etc$ = the summer exposure factor for each *glazing* element obtained from Tables 13.3.3b to 13.3.3q, as appropriate; and

(d) $RS1,S2,etc$ = 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) $LS1,S2,etc$ = 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) $FS1,S2,etc$ = the factor in Tables 13.3.3r to 13.3.3y for each *glazing* element; and

(g) $HS1,S2,etc$ = the factor in Tables 13.3.3r to 13.3.3y for each *glazing* element where the adjoining floor is in direct contact with the ground and is tiled.

(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	0.1044
	10%	0.0718	0.0640	0.0985	0.0626	0.0538	0.0695	0.0817	0.1104
	15%	0.0770	0.0682	0.1001	0.0641	0.0569	0.0714	0.0832	0.1153
	20%	0.0827	0.0719	0.1007	0.0650	0.0587	0.0723	0.0840	0.1195
Suspended floor	5%	0.0431	0.0324	0.0768	0.0651	0.0334	0.0630	0.0964	0.0782
	10%	0.0497	0.0404	0.0783	0.0697	0.0426	0.0991	0.0991	0.0810
	15%	0.0541	0.0458	0.0792	0.0721	0.0477	0.0683	0.1003	0.0820
	20%	0.0570	0.0494	0.0796	0.0734	0.0505	0.0723	0.1008	0.0824

Table Notes

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

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

(4) The *ventilation opening* area cannot be less than 5%. If the *ventilation opening* area is more than 20%, then use the C_{SHGC} value for 20% given in this Table.

(5) 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 area of each floor type; or

(b) the constant for a suspended floor.

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 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 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
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

P/H	North	North east	East	South east	South	South west	West	North west
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 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 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
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 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	0.84	1.15	1.21	1.06	0.72	1.01	0.98	1.09
0.10	0.77	1.06	1.14	0.99	0.68	0.94	0.91	0.99
0.20	0.66	0.93	1.01	0.87	0.60	0.84	0.80	0.86
0.40	0.55	0.70	0.80	0.70	0.48	0.67	0.66	0.66
0.60	0.46	0.55	0.66	0.56	0.40	0.55	0.54	0.50
0.80	0.41	0.46	0.55	0.47	0.35	0.46	0.46	0.43
1.00	0.36	0.38	0.47	0.40	0.29	0.40	0.38	0.35
1.20	0.32	0.34	0.39	0.35	0.26	0.34	0.33	0.31
1.40	0.29	0.30	0.35	0.32	0.25	0.30	0.29	0.26
1.60	0.27	0.29	0.31	0.29	0.23	0.27	0.25	0.24
1.80	0.24	0.25	0.26	0.25	0.20	0.26	0.22	0.22
2.00	0.24	0.24	0.24	0.24	0.19	0.22	0.22	0.21

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 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

P/H	North	North east	East	South east	South	South west	West	North west
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 13.3.3j: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 5 (lightweight or brick 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 13.3.3k: Orientation sector summer exposure factor (E_S) — floor in direct contact with the ground: climate zone 5 (concrete or brick 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
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 13.3.3l: Orientation sector summer exposure factor (E_S) — suspended floor: climate zone 5 (lightweight or brick 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 13.3.3m: Orientation summer exposure factor (E_S) — suspended floor: climate zone 5 (concrete or brick 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
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 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

P/H	North	North east	East	South east	South	South west	West	North west
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 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 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 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 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) 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
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.85	1.15	1.19
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.91	0.87
Hard floor surface factor (H_S)	0.75	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

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

Table 13.3.2s: 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) 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 ≥ 0.85	1.19	1.00

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 0.50	1.00	0.90
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.91	0.68
Hard floor surface factor (H_S)	0.75	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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) 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 ≥ 0.85	1.21	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	0.88
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.88	0.89
Hard floor surface factor (H_S)	0.89	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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) 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 ≥ 0.85	1.19	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	0.91
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.88	0.88
Hard floor surface factor (H_S)	0.91	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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 brick veneer wall)

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) 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 ≥ 0.85	1.20	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	0.78
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.88	0.73
Hard floor surface factor (H_S)	0.65	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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 brick wall)

Type of factor	Factor for a floor in direct contact with the ground	Factor for a suspended floor
Room factor (R) 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
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.85	1.18	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	0.95
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.89	0.90
Hard floor surface factor (H_S)	0.60	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

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

(3) 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) 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 ≥ 0.85	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	0.90	0.96
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.84	0.83
Hard floor surface factor (H_S)	0.80	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

(2) 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) 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	1.20	1.30
Frame factor (F_S) for frames with a solar absorptance of ≥ 0.85	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of 0.50	1.00	1.00
Frame factor (F_S) for frames with a solar absorptance of ≤ 0.35	0.78	0.85
Hard floor surface factor (H_S)	0.85	Not applicable

Table Notes

(1) Where the solar absorptance of a metal frame falls between the values shown in this Table, the factor may be interpolated.

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

Explanatory Information

(1) Summer *glazing* exposure factors are not needed for *climate zone* 8.

(2) For exposure factors between those in Tables 13.3.3b to 13.3.3q, either use the next lowest P/H or interpolate.

(3) By referring to '*glazing* elements', 13.3.2 and 13.3.3 (this clause) 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.

(4) 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 13.3.2 and this clause provided they measure the combined glass and frame performance according to AFRC requirements.

(5) ~~Total System U-Values and Total System SHGCs are shown for some simple types of glazing in Explanatory Table 13.3.3a. Lower figures indicate better glazing performance, although its effect on a dwelling's energy efficiency can vary depending on the climate and the orientation of the glazing. The table gives worst case assessments, which can be improved by obtaining generic or custom product assessments from suppliers, manufacturers, industry associations (including their online resources) and from competent assessors.~~

(6) Typical ranges of generic ratings are set out in Explanatory Tables 13.3.3a~~b~~ to 13.3.3~~c~~d to illustrate the levels of performance available through such assessments. Numbers from these tables should not be used in compliance calculations.

(7) ~~Custom assessments consider glazing element components in most detail and return the highest levels of assessed performance for a given type of glazing. Generic assessments consider the components of glazing elements in less detail and return lower levels of assessed performance.~~

(8) 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.

(9) Frame factor: The darker the window frame, the greater the heat gain through the frame. Radiation gains from windows are multiplied by this factor.

(10) Hard 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.

Table 13.3.3a (explanatory): Indicative ranges of whole glazing element performance: single glazed (monolithic or laminated) — aluminium frame

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Clear	Minimum variation in glass U-Value and SHGC for different glass thicknesses	7.9 - 5.5	0.81 - 0.64
Tinted	Glass SHGC depends on glass thickness and type of tint	7.9 - 5.6	0.65 - 0.33
Coated	Glass U-Value and SHGC depend on coating type	7.8 - 3.8	0.68 - 0.36
Tinted + coated	Glass U-Value depends on coating type. Glass SHGC depends on coating type, type of tint and glass thickness	7.8 - 3.8	0.45 - 0.31

Table 13.3.3b: Indicative ranges for whole glazing element performance: single glazed (monolithic or laminated) — timber or uPVC frame

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Clear	Minimum variation in glass U-Value and SHGC for different glass thicknesses	5.6 - 4.3	0.77 - 0.51
Tinted	Glass SHGC depends on glass thickness and type of tint	5.6 - 4.3	0.61 - 0.25

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Coated	Glass U-Value depends on coating type	5.5 - 2.9	0.64 - 0.27
Tinted + coated	Glass U-Value depends on coating type. Glass SHGC depends on coating type, type of tint and glass thickness	5.5 - 3.1	0.42 - 0.23

Table 13.3.3c (explanatory): Indicative ranges of whole glazing element performance: double glazed — aluminium frame

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Clear	Glass U-Value depends on cavity width	6.2 - 3.1	0.72 - 0.63
Tinted	Glass U-Value depends on cavity width. Glass SHGC depends on type of tint, tinted glass thickness and cavity width,	6.2 - 3.1	0.57 - 0.36
Coated	Glass U-Value depends on cavity width and type of coating. Glass SHGC depends on type of coating.	6.1 - 2.4	0.60 - 0.22
Tinted + coated	Glass U-Value depends on cavity width and type of coating. Glass SHGC depends on type of coating, tinted glass thickness and cavity width.	6.1 - 2.5	0.41 - 0.21

Table 13.3.3d (explanatory): Indicative ranges of whole glazing element performance: double glazed — timber or uPVC

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Clear	Glass U-Value depends on cavity width	3.8 - 2.5	0.68 - 0.47
Tinted	Glass U-Value depends on cavity width. Glass SHGC depends on type of tint, tinted glass thickness and on cavity width.	3.8 - 2.5	0.57 - 0.27
Coated	Glass U-Value depends on cavity width and type of coating. Glass SHGC depends on type of coating and cavity width.	3.8 - 2.1	0.59 - 0.17

Glass description	Comment	*Total System U-Value* range	*Total System SHGC* range
Tinted + coated	Glass U-Value depends on cavity width and type of coating. Glass SHGC depends on type of coating, tinted glass thickness and cavity width.	3.8 - 2.1	0.37 - 0.16

13.3.~~3~~4 Shading

[2019: 3.12.2.2]

Where shading is *required* to comply with 13.3.2, 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 for the window. The requirements of 13.3.2 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.~~3~~4(b).

(5) An adjustable shading device in 13.3.~~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

(1) 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.

(2) 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

(1) 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.

(2) 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

(1) A close fitting internal lining system is considered suitable to include an allowance for minimum lining movement gaps at wall, floor and ceiling junctions.

(2) Caulking includes sealant, mastic or other gap filling material.

(3) 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 ~~Air movement~~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)(a) or (b).

~~13.5.2 Air movement~~

[2019: 3.12.4.1]

(~~1~~) ~~Air movement must be provided to *habitable rooms* in accordance with Table 13.5.2.~~

(~~2~~) ~~Air movement *required* by (1) may be provided through an opening from an adjoining room (including an enclosed verandah) if—~~

(a) ~~the adjoining room is not a *sanitary compartment*; and~~

(b) ~~the opening between the adjoining room and the *habitable room* complies with Table 13.5.2 as if it were a *ventilation opening* to the *habitable room* or a proportion thereof if some ventilation is provided from another source; and~~

(c) ~~the *ventilation opening* to the adjoining room complies with Table 13.5.2 for the *floor area* of the adjoining room and the proportion of the *habitable room* that is ventilated from the adjoining room.~~

(~~3~~) ~~The requirements of (1) do not apply to buildings in Region D severe tropical cyclone areas (see Figure 2.2.3 provided the *external walls* are shaded with a verandah, balcony, eaves, carport or the like that projects at a minimum angle of 15 degrees in accordance with Figure 13.2.5a.~~

Table 13.5.2: ~~Minimum total ventilation opening area as a percentage of the floor area for each habitable room~~

~~Climate zone~~	~~Without a ceiling fan or evaporative cooler~~	~~With a ceiling fan~~	~~With an evaporative cooler~~
~~1~~	~~10%~~	~~7.5%~~	~~10% (see Note)~~
~~2~~	~~10%~~	~~7.5%~~	~~10% (see Note)~~
~~3~~	~~10%~~	~~7.5%~~	~~7.5%~~
~~4~~	~~10%~~	~~5%~~	~~5%~~
~~5~~	~~7.5%~~	~~5%~~	~~7.5% (see Note)~~
~~6, 7 and 8~~	~~As required by Part 10.6~~	~~As required by Part 10.6~~	~~As required by Part 10.6~~

Table Notes

~~Because evaporative coolers are less effective than ceiling fans in more humid locations, the requirement for ventilation opening in climate zones 1, 2 and 5 with an evaporative cooler is the same as without one.~~

Notes

~~In humid locations, such as Darwin and Cairns, evaporative coolers would not provide the same cooling effect as in drier climates. Although they would provide some benefit from air movement if operated in 'fan only' mode, they would cause discomfort, possible condensation and possible mould growth if operated in evaporative 'water on' mode. However, even though a concession is not given in climate zones 1, 2 and 5, there are location, particularly in climate zone 5, where evaporative coolers would be effective.~~

~~13.5.3 Ventilation openings~~

[2019: 3.12.4.2]

(~~1~~) ~~In *climate zones* 1, 2, 3, 4 and 5, the total *ventilation opening* area *required* by Table 13.5.2 to a *habitable room* must—~~

(a) ~~be connected by a breeze path complying with (2) to another *ventilation opening* in another room or space; or~~

(b) ~~be provided by a minimum of two *ventilation openings* located within the same *habitable room*, with each *ventilation opening* having an area of not less than 25% of the area *required* by Table 13.5.2.~~

(~~2~~) ~~A breeze path *required* by (1)(a) must—~~

(a) ~~pass through not more than two openings in the internal walls with each opening having an area of not less than 1.5 m²; and~~

(b) ~~have a distance along the breeze path between *ventilation openings* of not more than 20 m.~~

Explanatory Information

(1) ~~*Ventilation openings* should be designed to allow the interior of the building to take full advantage of any natural breeze. Careful consideration should be given to the type and location of openings to ensure optimum effect is achieved and that internal 'dead air' pockets are avoided.~~

(2) ~~An opening may serve more than one breeze path.~~

(3) ~~Two openings are stated in (2)(a) as limit of the number of openings permitted in a breeze path. These are typically doorways. Larger openings, such as those between adjoining lounge and dining areas in the same space are unlikely to restrict air movement significantly.~~

13.5.2~~4~~ Ceiling fans ~~and evaporative coolers~~

[2019: 3.12.4.3]

Ceiling fans in *climate zones* 1, 2 and 3 and *climate zone* 5 in Queensland and New South Wales ~~or evaporative coolers required to comply with H6D3, Tables 13.3.2a to 13.3.2h, as appropriate or Table 13.5.2~~ must—

(a) be permanently installed; and

(b) have a speed controller; and

(c) comply with Table 13.5.2.~~for ceiling fans, serve the whole room, with the floor area that a single fan serves not exceeding—~~

(i) ~~15 m² if it has a blade rotation diameter of greater than or equal to 900 mm; and~~

(ii) ~~25 m² if it has a blade rotation diameter of greater than or equal to 1200 mm.~~

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 *climate zone* 1, 2 and 3 in bedrooms	Minimum number and diameter (mm) of ceiling fans required in *climate zone* 1, 2, 3 and 5 in daytime habitable spaces
<10	X	X
≥10<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

Table Notes

(1) Daytime habitable spaces are living rooms, rumpus rooms and the like and not in circulation spaces like hallways and entry foyers.

(2) X = not required.

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 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) $(A \times EE) + EP + ES - ER$, where—

(i) A = the floor area factor is obtained by multiplying the total floor area of the building by the adjustment factor in Table 13.6.2a; and

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

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

(iv) ES = spa pump energy usage in (3); and

(v) ER = installed capacity of photovoltaics (kW); and

(b) $A \times EF$, 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) EF = the energy factor obtained from in Table 13.6.2b.

(2) The swimming pool pump energy usage (EP) must be determined in accordance with the following formula: $EP = V \times FP / 1000$, where—

(a) EP = swimming pool pump energy usage; and

(b) V = the volume of the swimming pool to the nearest 1000 litres; and

(c) FP = 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: $ES = V \times FS / 100$, where—

(a) ES = the spa pump energy usage; and

(b) V = the volume of the spa to the nearest 100 litres; and

(c) FS = the spa pump factor as per Table 13.6.2d.

Table 13.6.2a: Floor Area adjustment factor

Total floor area	Floor area factor	Total floor area	Floor area factor	Total floor area	Floor area factor	Total floor area	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

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.

Table 13.6.2b: Energy factor

Climate zone	Jurisdiction	Energy factor E_F
1	QLD	2.77
1	WA	3.25
1	NT	1.91
2	NSW	1.32
2	QLD	1.78
3	QLD	2.46
3	WA	2.87
3	NT	1.23
4	NSW	1.80
4	VIC	1.25
4	SA	1.86
4	WA	2.34
5	NSW	1.75
5	QLD	2.28
5	SA	1.79
5	WA	2.35
6	NSW	2.40
6	VIC	1.63
6	SA	2.51
6	WA	3.20
7	NSW	2.33
7	VIC	1.62

Climate zone	Jurisdiction	Energy factor E_F
7	TAS	3.08
7	ACT	2.56
8	NSW	3.99
8	VIC	2.82
8	TAS	3.92

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

Pool pump GEMS star rating	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	Australian Capital Territory
1 or unrated	0.060	0.049	0.046	0.068	0.063	0.061	0.028	0.056
1.5	0.050	0.041	0.039	0.057	0.053	0.052	0.023	0.048
2	0.044	0.036	0.034	0.050	0.046	0.045	0.020	0.041
2.5	0.039	0.032	0.030	0.044	0.041	0.040	0.018	0.037
3	0.035	0.028	0.027	0.039	0.036	0.035	0.016	0.033
3.5	0.031	0.025	0.024	0.035	0.033	0.032	0.014	0.029
4	0.028	0.023	0.021	0.032	0.029	0.029	0.013	0.026
4.5	0.025	0.021	0.019	0.029	0.027	0.026	0.012	0.024
5	0.023	0.019	0.018	0.026	0.024	0.023	0.011	0.022
5.5	0.021	0.017	0.016	0.023	0.022	0.021	0.010	0.020
6	0.019	0.015	0.014	0.021	0.020	0.019	0.009	0.018
6.5	0.017	0.014	0.013	0.019	0.018	0.017	0.008	0.016
7	0.015	0.012	0.012	0.017	0.016	0.016	0.007	0.014
7.5	0.013	0.011	0.010	0.015	0.014	0.014	0.006	0.013
8	0.012	0.010	0.009	0.014	0.013	0.012	0.006	0.011
8.5	0.011	0.009	0.008	0.012	0.011	0.011	0.005	0.010
9	0.009	0.008	0.007	0.011	0.010	0.010	0.004	0.009
9.5	0.008	0.007	0.006	0.009	0.009	0.008	0.004	0.008
10	0.007	0.006	0.005	0.008	0.007	0.007	0.003	0.007

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

Pool pump GEMS star rating	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Northern Territory	Australian Capital Territory
All types	0.071	0.058	0.055	0.081	0.075	0.073	0.033	0.067

Explanatory Information

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

Part 13.7~~6~~ Services

13.7~~6~~.1 Application of Part 13.7~~6~~

[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~~6~~ must be applied as directed in H6D2(2).

13.7~~6~~.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~~6~~.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) (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

(1) 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.

(2) 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 13.76.3.

(3) *Piping* within a timber member, such as that passing through a wall stud, is considered to have sufficient insulation for the purposes of 13.76.3.

(4) The following table provides examples for the *R-Value* of the insulation used for smaller diameter *piping*.

Table 13.76.3 (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

13.76.4 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

(1) Ductwork within a fully insulated building may still benefit from insulation particularly when the system is only operating for short periods.

(2) In some *climate zones* condensation may create problems with uninsulated ductwork, in which case insulation should still be considered.

(3) 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.

(4) Insulation for refrigerated cooling ductwork should have a vapour barrier to prevent possible damage by condensation.

(5) 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~~6~~.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.

(6) For fittings, 11 mm polyurethane typically provides an *R-Value* of 0.4.

(7) 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~~6~~.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~~6~~.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~~6~~.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~~6~~.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~~.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 manually operated 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

(1) 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*.

(2) 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.

(3) 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).

(4) Where no control device is used the adjustment factor is equal to 1.

(5) The second step in achieving compliance is to assess the overall *lamp power density* or overall *illumination power density* of the building.

(6) 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.

(7) 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.

(8) Control device factors in (2) are only applied to the *illumination power density*, not the overall *illumination power*

density.

(9) To comply with (1), the overall *lamp power density* or overall *illumination power density* must be less than or equal to the allowance.

(10) Trading of allowances between (1)(a), (b) and (c) is not permitted.

(11) (1)(b) includes outdoor living spaces such as verandahs, balconies, patios, alfresco spaces or the like that are attached to a Class 1 building.

(12) The artificial lighting requirements in 13.7~~6~~.6 are to be read in conjunction with the artificial lighting requirements in 10.5.2.

(13) 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.

(14) 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~~6~~.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~~6~~.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 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.~~6~~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~~6~~.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.

Schedule 1 Definitions

Abbreviations

Symbols

Glossary

Abbreviations

Abbreviation	Definitions
ABCB	Australian Building Codes Board
AC	Alternating Current
ACP	Aluminium Composite Panel
AS	Australian Standard
ASET	Available Safe Egress Time
ASTM	American Society for Testing and Materials
BCA	Building Code of Australia
BE	Fire blocks evacuation route
CCT	Correlated Colour Temperature
CF	Challenging fire
CHF	Critical Heat Flux
CRF	Critical Radiant Flux
CS	Fire starts in a concealed space
C_{SHGC}	Constant for solar heat gain
CSIRO	Commonwealth Scientific and Industrial Research Organisation
C_U	Constant for conductance
DC	Direct Current
FED	Fractional Effective Dose
FI	Fire brigade intervention
FRL	Fire Resistance Level
GEMS	Greenhouse and Energy Minimum Standards
GRP	Glass fibre reinforced polyester
HRR	Heat Release Rate
HS	Horizontal fire spread
IS	Rapid fire spread involving internal surface linings
ISO	International Organisation for Standardisation
LED	Light-Emitting Diode
MEPS	Minimum Energy Performance Standards
NABERS	National Australian Built Environment Rating System
NATA	National Association of Testing Authorities
NatHERS	Nationwide House Energy Rating Scheme
NCC	National Construction Code
PBDB	Performance-based design brief
PCA	Plumbing Code of Australia
PMV	Predicted Mean Vote
ppm	parts per million
PVC	Polyvinyl chloride
RC	Robustness check
RSET	Required Safe Egress Time
R_W	Weighted sound reduction index

Amenity: An attribute which contributes to the health, physical independence, comfort and well-being of people.

Ancillary element: An element that is secondary to and not an integral part of another element to which it is attached.

Annual exceedance probability: The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.

Annual greenhouse gas emissions: The theoretical amount of greenhouse gas emissions attributable to the energy used annually by a building's *services*, excluding kitchen exhaust and the like.

Appropriate authority: For the purposes of the Fire Safety Verification Method, means the relevant authority with the statutory responsibility to determine the particular matter satisfies the relevant *Performance Requirement*.

Explanatory Information

The Appropriate Authority is typically the building surveyor or building certifier charged with the statutory responsibility to determine building compliance and issue the building permit / approval and occupancy certificate / approval.

NSW Appropriate authority

Appropriate authority: The relevant authority with the statutory responsibility to determine the particular matter.

Appropriately qualified person: A person recognised by the *appropriate authority* as having qualifications and/or experience in the relevant discipline in question.

Approved disposal system: A system for the disposal of sewage, sullage or stormwater approved by an authority having jurisdiction.

Articulated masonry: Masonry construction in which special provisions have been made for movement by articulation.

NSW Assembly building

SA Assembly building

Assembly building: A building where people may assemble for—

(a) civic, theatrical, social, political or religious purposes including a library, theatre, public hall or place of worship; or

(b) educational purposes in a *school*, *early childhood centre*, preschool, or the like; or

(c) entertainment, recreational or sporting purposes including—

(i) a discotheque, nightclub or a bar area of a hotel or motel providing live entertainment or containing a dance floor; or

(ii) a cinema; or

(iii) a sports stadium, sporting or other club; or

(d) transit purposes including a bus station, railway station, airport or ferry terminal.

Assessment Method: A method that can be used for determining that a *Performance Solution* or *Deemed-to-Satisfy Solution* complies with the *Performance Requirements*.

Assumed cooling thermostat set point: The cooling thermostat set point used to calculate *cooling degree hours*, and equal to $17.8 + 0.31Tm$, where Tm is the mean January outdoor air temperature measured in degrees Celsius.

Atrium: A space within a building that connects 2 or more *storeys* and—

(a) is enclosed at the top by a floor or roof (including a glazed roof structure); and

(b) includes any adjacent part of the building not separated by an appropriate barrier to fire; but

(c) does not include a stairwell, rampwell or the space within a *shaft*; and

(d) for the purposes of (a) a space is considered enclosed if the area of the enclosing floor or roof is greater than 50% of the area of the space, measured in plan, of any of the *storeys* connected by the space.

Atrium well: A space in an *atrium* bounded by the perimeter of the openings in the floors or by the perimeter of the floors and the *external walls*.

Automatic: Designed to operate when activated by a heat, smoke or fire sensing device.

Available safe egress time (ASET)

(1) The time between ignition of a fire and the onset of untenable conditions in a specific part of a building.

Connections: The parts that fix the members into the structure, through which the loads pass.

Construction activity actions: Actions due to stacking of building materials or the use of equipment, including cranes and trucks, during construction or actions which may be induced by floor to floor propping.

Containment protection: The installation of a *backflow prevention device* at the *point of connection* of a *Network Utility Operator's* water supply to a site.

Contaminant: Any substance (including gases, liquids, solids or micro-organisms), energy (excluding noise) or heat, that either by itself or in combination with the same, similar or other substances, energy or heat, changes or is likely to change the physical, chemical or biological condition of water.

Controlled fill: Material that has been placed and compacted in layers with compaction equipment (such as a vibrating plate) within a defined moisture range to a defined density requirement.

Cooling degree hours: For any one hour when the mean outdoor air temperature is above the *assumed cooling thermostat set point*, the degree Celsius air temperature difference between the mean outdoor air temperature and the *assumed cooling thermostat set point*.

Cooling load: The calculated amount of energy removed from the cooled spaces of the building annually by artificial means to maintain the desired temperatures in those spaces.

Critical radiant flux (CRF): The critical heat flux at extinguishment (CHF in kW/m^2) as determined by AS ISO 9239.1.

Cross-connection: Any actual or potential connection between a water supply and any *contaminant*.

Curtain wall: A non-*loadbearing external wall* that is not a *panel wall*.

Daily outdoor temperature range: The difference between the maximum and minimum temperatures that occur in a day.

Damp-proof course (DPC): A continuous layer of impervious material placed in a masonry wall or pier, or between a wall or pier and a floor, to prevent the upward or downward migration of water.

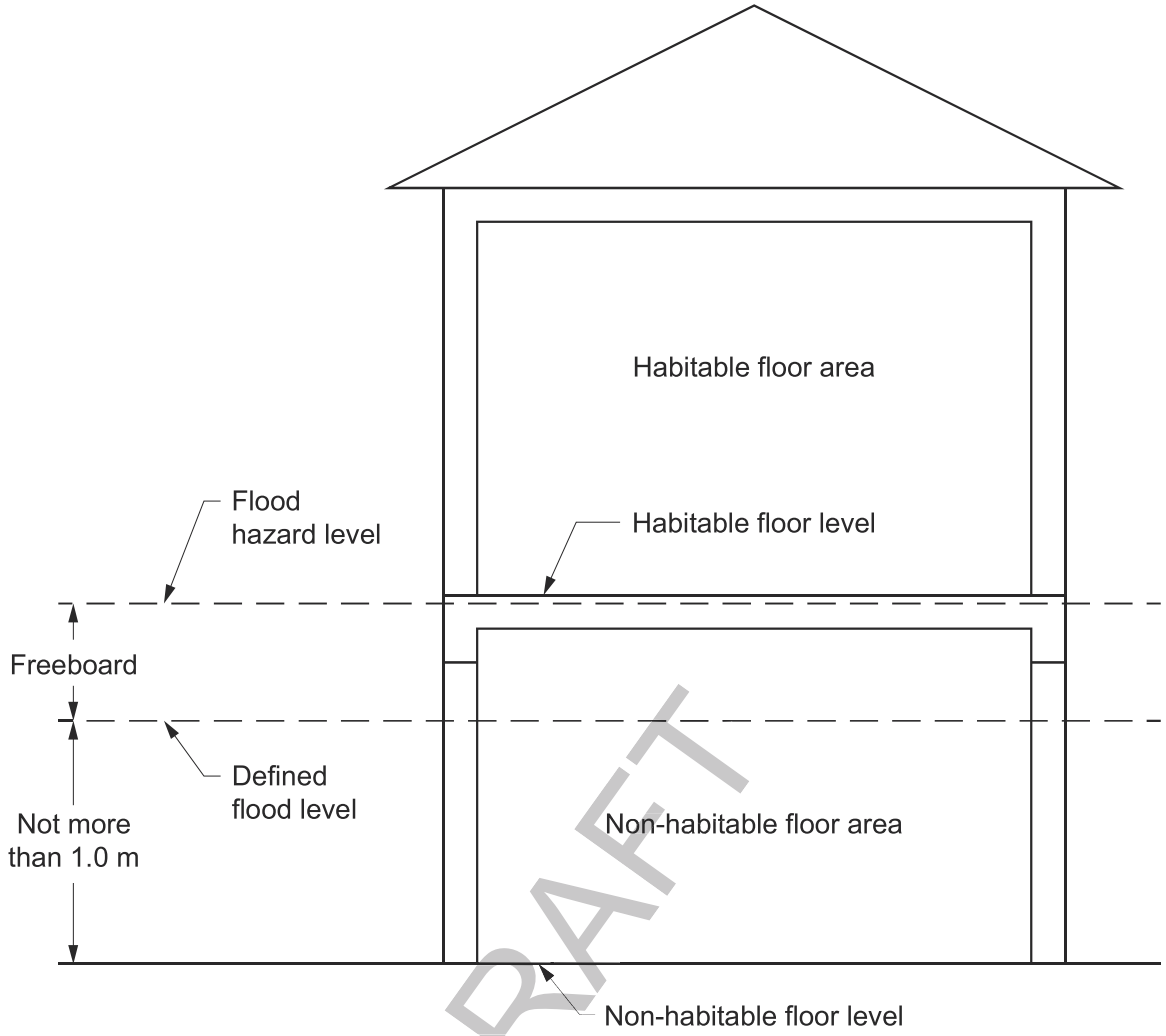
Deemed-to-Satisfy Provisions: Provisions which are deemed to satisfy the *Performance Requirements*.

Deemed-to-Satisfy Solution: A method of satisfying the *Deemed-to-Satisfy Provisions*.

Defined flood event (DFE): The flood event selected for the management of flood hazard for the location of specific development as determined by the *appropriate authority*.

Defined flood level (DFL): The flood level associated with a *defined flood event* relative to a specified datum (see Figure 3).

Figure 3: Identification of defined flood level, flood hazard level and freeboard



Dehumidification gram hours: For any one hour when the mean humidity is more than 15.7g/kg, the grams per kilogram of absolute humidity difference between the mean outdoor absolute humidity and 15.7g/kg.

NSW Designated bushfire prone area

Designated bushfire prone area: Land which has been designated under a power of legislation as being subject, or likely to be subject, to bushfires.

Design bushfire: The characteristics of a bushfire, its initiation, spread and development, which arises from weather conditions, topography and fuel (vegetation) in a given setting, used to determine *fire actions*.

Design fire: The quantitative description of a representation of a fire within the *design scenario*.

Design scenario: The specific scenario of which the sequence of events is quantified and a *fire safety engineering* analysis is conducted against.

Design wind speed: The design gust wind speed for the area where the building is located, calculated in accordance with AS/NZS 1170.2 or AS 4055 (see Table 4~~3~~ for wind classes).

Table 4: Wind classes

Non-cyclonic Region A and B	Cyclonic Region C and D
N1, N2, N3	C1
N4, N5, N6 (these wind classes are covered in the Housing Provisions Part 2.2, Structural provisions).	C2, C3, C4 (these wind classes are covered in the Housing Provisions Part 2.2, Structural provisions).

Table Notes

(1) Wind classification map identifying wind regions is contained in Housing Provisions Part 2.2 (see Figure 2.2.3).

Electric passenger lift: A power-operated lift for raising or lowering people in a car in which the motion of the car is obtained from an electric motor mechanically coupled to the hoisting mechanism.

Electrohydraulic passenger lift: A power-operated lift for raising or lowering people in a car in which the motion of the car is obtained from the action of liquid under pressure acting on a piston or ram, the pressure being generated by a pump driven by an individual electric motor.

Energy value: The net cost to society including, but not limited to, costs to the building user, the environment and energy networks.

Engaged pier: A pier bonded to a masonry wall by course bonding of masonry units or by masonry ties.

Envelope

(1) For the purposes of Section J in Volume One, the parts of a building's *fabric* that separate a *conditioned space* or *habitable room* from—

(a) the exterior of the building; or

(b) a non-*conditioned space* including—

(i) the floor of a rooftop plant room, lift-machine room or the like; and

(ii) the floor above a *carpark* or warehouse; and

(iii) the *common wall* with a *carpark*, warehouse or the like.

(2) For the purposes of Part H6 in Volume Two and Section 13 of the Housing Provisions, the parts of a building's *fabric* that separate artificially heated or cooled spaces from—

(a) the exterior of the building; or

(b) other spaces that are not artificially heated or cooled.

Equivalent: Equivalent to the level of health, safety and amenity provided by the *Deemed-to-Satisfy Provisions*.

Evacuation route: The continuous path of travel (including *exits*, *public corridors* and the like) from any part of a building, including within a *sole-occupancy unit* in a Class 2 or 3 building or Class 4 part, to a *safe place*.

Evacuation time: The time calculated from when the emergency starts for the occupants of the building to evacuate to a *safe place*.

Exit

(1) Any, or any combination of the following if they provide egress to a road or *open space*:

(a) An internal or external stairway.

(b) A ramp.

(c) A *fire-isolated passageway*.

(d) A doorway opening to a road or *open space*.

(2) A *horizontal exit* or a *fire-isolated passageway* leading to a *horizontal exit*.

TAS Expert Judgement

Expert Judgement: The judgement of an expert who has the qualifications and experience to determine whether a *Performance Solution* or *Deemed-to-Satisfy Solution* complies with the *Performance Requirements*.

Explanatory Information

Contemporary and relevant qualifications and/or experience are necessary to determine whether a *Performance Solution* complies with the *Performance Requirements*. The level of qualification and/or experience may differ depending on the complexity of the proposal and the requirements of the regulatory authority. Practitioners should seek advice from the authority having jurisdiction or *appropriate authority* for clarification as to what will be accepted.

Exposed joint: A construction joint, control joint, expansion joint, contraction joint or movement joint that is exposed to rainwater.

External wall

(1) For the purposes of Volume One, an outer wall of a building which is not a *common wall*.

(2) For the purposes of Volume Two, an outer wall of a building which is not a *separating wall*.

Extra-low voltage: A *voltage* not exceeding 50 V AC or 120 V ripple-free DC.

Gradual failure: Relatively slow collapse of a structure that occurs through significant plastic deformation and/or moment redistribution.

Green Star: The building sustainability rating scheme managed by the Green Building Council of Australia.

Group number: The number of one of 4 groups of materials used in the regulation of *fire hazard properties* and applied to materials used as a finish, surface, lining, or attachment to a wall or ceiling.

Habitable room: A room used for normal domestic activities, and—

(a) includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom; but

(b) excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes-drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.

Hazard Rating: A level of potential toxicity that may cause contamination in a drinking water system~~.~~, having a~~Theeerae Ating~~ of ~~either~~ *Low Hazard*, *Medium Hazard* or *High Hazard*, ~~is~~ determined in accordance with NCC Volume Three. ~~Specification 41, for any Deemed-to-Satisfy Solution.~~

Health-care building: A building whose occupants or patients undergoing medical treatment generally need physical assistance to evacuate the building during an emergency and includes—

(a) a public or private hospital; or

(b) a nursing home or similar facility for sick or disabled persons needing full-time care; or

(c) a clinic, day surgery or procedure unit where the effects of the predominant treatment administered involve patients becoming non-ambulatory and requiring supervised medical care on the premises for some time after the treatment.

Heated water: Water that has been intentionally heated; normally referred to as hot water or warm water.

Heating degree hours: For any one hour when the mean outdoor air temperature is less than 18°C, the degrees Celsius temperature difference between the mean outdoor air temperature and 18°C.

Heating load: The calculated amount of energy delivered to the heated spaces of the building annually by artificial means to maintain the desired temperatures in those spaces.

Heat release: The thermal energy produced by combustion (measured in kJ).

Heat release rate (HRR): The rate of thermal energy production generated by combustion, measured in kW (preferred) or MW.

High Hazard: Any condition, device or practice which, in connection with a water supply, has the potential to cause death.

High wind area: A region that is subject to *design wind speed* more than N3 or C1 (see Table 3).

Hob: The upstand at the perimeter to a shower area.

Horizontal exit: A *required* doorway between 2 parts of a building separated from each other by a *fire wall*.

Hours of operation: The number of hours when the occupancy of the building is greater than 20% of the peak occupancy.

House energy rating software

(1) For the purposes of Volume One, means software accredited under the Nationwide House Energy Rating Scheme.

(2) For the purposes of Volume Two—

(a) applied to H6V2—software accredited or previously accredited under the Nationwide House Energy Rating Scheme and the additional functionality provided in non-regulatory mode; and

(b) applied to H6D3—software accredited under the Nationwide House Energy Rating Scheme.

Explanatory Information

The Nationwide House Energy Rating Scheme (NatHERS) refers to the Australian Governments' scheme that facilitates consistent energy ratings from software tools which are used to assess the potential thermal efficiency of dwelling envelopes.

Housing Provisions: The requirements for Class 1 and 10 buildings referenced in Volume Two of the National Construction Code, as published by the Australian Building Codes Board.

a lamp is usually marked on the fitting as the maximum allowable wattage.

The area of the space refers to the area the lights serve. This could be considered a single room, open plan space, verandah, balcony or the like, or the total area of all these spaces.

Landing: An area at the top or bottom of a *flight* or between two *flights*.

Latent heat gain: The heat gained by the vapourising of liquid without change of temperature.

Lateral support: A support (including footing, buttress, cross wall, beam, floor or braced roof structure) that effectively restrains the wall or pier at right angles to the face of the wall or pier.

Lightweight construction: Construction which incorporates or comprises—

(a) sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by impact, pressure or abrasion; or

(b) concrete and concrete products containing pumice, perlite, vermiculite, or other soft material similarly susceptible to damage by impact, pressure or abrasion; or

(c) masonry having a width of less than 70 mm.

Loadbearing: Intended to resist vertical forces additional to those due to its own weight.

Loadbearing wall: For the purposes of H1D4, H2D3 and Section 4 of the Housing Provisions, means any wall imposing on the footing a load greater than 10 kN/m.

Loss: Physical damage, financial loss or loss of *amenity*.

Low Hazard: Any condition, device or practice which, in connection with a water supply, would constitute a nuisance by colour, odour or taste but does not have the potential to injure or endanger health.

Low lead: Where a plumbing product or material in contact with drinking water is calculated using a weighted average lead content of no more than 0.25%.

Low rainfall intensity area: An area with a 5 minute rainfall intensity for an *annual exceedance probability* of 5% ~~average recurrence interval of 20 years~~ of not more than 125 mm/hour.

Explanatory Information

Rainfall intensity figures can be obtained from Tables 7.4.3d to 7.4.3k in the Housing Provisions.

Low-rise, low-speed constant pressure lift: A power-operated low-rise, low-speed device for raising or lowering people with limited mobility on a carriage that is controlled by the application of constant pressure to a control.

Low-rise platform lift: A power-operated device for raising or lowering people with limited mobility on a platform, that is controlled automatically or by the application of constant pressure to a control.

Low voltage: A *voltage* exceeding *extra-low voltage*, but not exceeding 1000 V AC or 1500 V DC.

Luminance contrast: The light reflected from one surface or component, compared to the light reflected from another surface or component.

Main water heater: The domestic hot water unit in the dwelling connected to at least one shower and the largest number of hot water outlets.

Main space conditioning: Either—

(a) the *service* that supplies to at least 70% of the conditioned area of the dwelling, or

(b) if no one heating or cooling appliance serves at least 70% of the conditioned area of the dwelling, the appliance that results in the highest net equivalent energy usage when calculated in accordance with J3D14(1)(a).

Notes

(1) If a multi-split air-conditioner unit is installed, it is considered to be a single heating or cooling *service*.

(2) A series of separate heaters or coolers of the one type can be considered a single heater or cooler type with a performance level of that of the unit with the lowest efficiency.

Explanatory Information

The purpose of the definition for main space conditioning is to provide information on which heating or cooling or

appliance should be selected when showing compliance with J3D14(1)(a) and ABCB Housing Provisions clause 13.6.2(1)(a) when more than one type and efficiency of appliance are present. In J3D14(1)(a) the formula that determines ER allows the selection of only one heating or cooling system. This definition requires that if any one appliance serves at 70% of the floor area that is heated or cooled it should be used as the basis of determining ER. If, however, no one system serves at least 70% of the area, then the appliance that results in the highest net equivalent energy usage when calculated in accordance with J3D14(1)(a) should be selected.

Massive timber: An element not less than 75 mm thick as measured in each direction formed from solid and laminated timber.

Maximum acceptable annual probability of structural failure of structures, buildings, members and connections: The probability that, in any year, there could be a structural failure leading to collapse of either the whole of the structure or building, or significant members and/or their connections, expressed as 1 in … (e.g. 1 in 1,000 meaning a probability of 1 in 1,000 that the failure could occur).

Maximum retained water level: The point where surface water will start to overflow out of the shower area.

Medium Hazard: Any condition, device or practice which, in connection with a water supply, has the potential to injure or endanger health.

Members: The parts of a structure or component that provide resistance to structural actions.

Members and connections that do not provide primary building support: Those components of a building or other structure that are not necessary to resist collapse of other members, parts of the building or the whole building, including but are not limited to—

(a) non-*loadbearing* walls including framing, wall cladding, roof cladding, roof purlins and battens, mezzanine floors; and

(b) connections and fixings that fix in position only those members that do not provide primary building support.

Members and connections that provide primary building support: Those components of a building or other structure that provide the structural system resisting collapse of other members, parts of the building or the whole building under the design actions, including but are not limited to—

(a) beams, columns, trusses, portal frames, posts, *loadbearing* walls, floor systems, footings, foundations and earth retaining structures; and

(b) connections and fixings that transfer loads between members that provide primary building support.

Membrane: A barrier impervious to moisture.

Explanatory Information

A barrier may be a single or multi-part system.

Mezzanine: An intermediate floor within a room.

Minimum Acceptable Annual Structural Reliability Index of Structures, Buildings, Members and Connections: The Structural Reliability Index (β), determined in accordance with the ABCB Structural Reliability Handbook (Version 2022.1) that corresponds to the maximum acceptable annual probability of structural failure tabulated in Table B1P1.

Minimum Energy Performance Standards (MEPS): The Minimum Energy Performance Standards for equipment and appliances established through the Greenhouse and Energy Minimum Standards Act 2012.

Mixed construction: A building consisting of more than one form of construction, particularly in double-storey buildings.

Mould: A fungal growth that can be produced from conditions such as dampness, darkness, or poor ventilation.

Multiple resistance paths: Situations where the failure of a part of a building or structure is resisted collectively by more than one member or connection, such that the failure of any member or connection will result in the transfer of loads to the other members and connections with sufficient combined capacity to resist the total applied loads.

NABERS Energy for Apartment Buildings: The National Australian Built Environment Rating System for apartment building energy efficiency, which is managed by the New South Wales Government.

NABERS Energy for Hotels: The National Australian Built Environment Rating System for hotel building energy efficiency, which is managed by the New South Wales Government.

NABERS Energy for Offices: The National Australian Built Environment Rating Systems for office energy efficiency, which is managed by the New South Wales Government.

NABERS Energy for Shopping Centres: The National Australian Built Environment Rating System for shopping centre

energy efficiency, which is managed by the New South Wales Government.

TAS Network Utility Operator

Network Utility Operator: A person who—

(a) undertakes the piped distribution of *drinking water* or *non-drinking water* for supply; or

(b) is the operator of a sewerage system or a stormwater *drainage* system.

Explanatory Information

A Network Utility Operator in most States and Territories is the water and sewerage authority licensed to supply water and receive sewage and/or stormwater. The authority operates or proposes to operate a network that undertakes the distribution of water for supply and undertakes to receive sewage and/or stormwater drainage. This authority may be a licensed utility, local government body or council.

Non-combustible

(1) Applied to a material — means not deemed *combustible* as determined by AS 1530.1 — Combustibility Tests for Materials.

(2) Applied to construction or part of a building — means constructed wholly of materials that are not deemed *combustible*.

Non-drinking water: Water which is not intended primarily for human consumption, but which may have other uses. ~~drinking water.~~

Non-transient actions: The combination of structural actions in which the combined magnitude of the permanent gravity action and imposed gravity action is equal to or greater than 50% of the magnitude of the total combined actions.

Occupant traits

(1) For the purposes of Volume One, the features, needs and profile of the occupants in a *habitable room* or space.

(2) For the purposes of Volume Two, the features, needs and profile of the occupants in a room or space.

Explanatory Information

For the purpose of Volume Two, this term is used to describe the characteristics of the occupants and their associated requirements in relation to a room or space.

For example, in relation to a bedroom, the following occupant characteristics and associated requirements should be considered:

- Characteristics: height, mobility and how often the space will be used.
- Requirements: a sleeping space and a space to undertake leisure activities.

Occupiable outdoor area: A space on a roof, balcony or similar part of a building—

(a) that is open to the sky; and

(b) to which access is provided, other than access only for maintenance; and

(c) that is not *open space* or directly connected with *open space*.

TAS On-site wastewater management system

On-site wastewater management system: A system ~~installed on premises that~~ that receives and/or treats wastewater generated and discharges ~~on the premises and applies~~ the resulting effluent to an *approved disposal system* or re-use system.

Open-deck carpark: A carpark in which all parts of the parking *storeys* are cross-ventilated by permanent unobstructed openings in not fewer than 2 opposite or approximately opposite sides, and—

(a) each side that provides ventilation is not less than $^{1}/_{6}$ of the area of any other side; and

(b) the openings are not less than ½ of the wall area of the side concerned.

Open space: A space on the allotment, or a roof or similar part of a building adequately protected from fire, open to the sky and connected directly with a public road.

Open spectator stand: A tiered stand substantially open at the front.

system, a system of *loadbearing* walls and the like) which could result in loss of life or injury should it fail.

Sudden failure: Relatively rapid collapse of a structure that occurs with little warning with little plastic deformation and/or moment redistribution.

Surface water: All naturally occurring water, other than sub-surface water, which results from rainfall on or around the *site* or water flowing onto the *site*.

Swimming pool: Any excavation or structure containing water and principally used, or that is designed, manufactured or adapted to be principally used for swimming, wading, paddling, or the like, including a bathing or wading pool, or spa.

Tapered tread: A stair tread with a walking area that grows smaller towards one end.

Thermal comfort level: The level of thermal comfort in a building expressed as a *PMV* sensation scale.

Thermal energy load: The sum of the *heating load* and the *cooling load*.

Total R-Value: The sum of the *R-Values* of the individual component layers in a composite element including any building material, insulating material, airspace, thermal bridging and associated surface resistances, expressed in m^2.K/W.

Total System Solar Heat Gain Coefficient (SHGC)

(1) For the purposes of Volume One, the fraction of incident irradiance on a *wall-glazing construction* or a *roof light* that adds heat to a building's space.

(2) For the purposes of Volume Two, the fraction of incident irradiance on *glazing* or a *roof light* that adds heat to a building's space.

Total System U-Value

(1) For the purposes of Volume One, the thermal transmittance of the composite element allowing for the effect of any airspaces, thermal bridging and associated surface resistances, expressed in W/m^2.K.

(2) For the purposes of Volume Two, means the thermal transmittance of the composite element allowing for the effect of any airspaces and associated surface resistances, expressed in W/m^2.K.

Transient actions: The combination of structural actions in which the combined magnitude of the permanent gravity action and imposed gravity action is less than 50% of the magnitude of the total combined actions.

Treatment area: An area within a *patient care area* such as an operating theatre and rooms used for recovery, minor procedures, resuscitation, intensive care and coronary care from which a patient may not be readily moved.

Uncontrolled discharge: Any unintentional release of fluid from a *plumbing* and *drainage* system and includes leakage and seepage.

Unique wall: For the purposes of F1V1 in Volume One and H2V1 in Volume Two, a wall which is neither a *cavity wall* nor a *direct fix cladding wall*.

Unobstructed opening: For the purposes of Section 8 of the Housing Provisions, a glazed area that a person could mistake for an open doorway or clearway and walk into the glazed panel.

Unreinforced masonry: Masonry that is not reinforced.

Vapour permeance: The degree that water vapour is able to diffuse through a material, measured in µg/N.s and tested in accordance with the ASTM-E96 Water Method at 23°C.

Vapour pressure: The pressure at which water vapour is in thermodynamic equilibrium with its condensed state.

Ventilation opening: An opening in the *external wall*, floor or roof of a building designed to allow air movement into or out of the building by natural means including a permanent opening, an openable part of a *window*, a door or other device which can be held open.

Verification Method: A test, inspection, calculation or other method that determines whether a *Performance Solution* complies with the relevant *Performance Requirements*.

Vessel: For the purposes of Volume One and Part 10.2 of the Housing Provisions, an open, pre-formed, pre-finished concave receptacle capable of holding water, usually for the purpose of washing, including a basin, sink, bath, laundry tub and the like.

Visibility: The maximum distance at which an object of defined size, brightness and contrast can be seen and recognised.

Voltage: A difference of potential, measured in Volts (V) and includes *extra-low voltage* and *low voltage*.

Volume

(1) In relation to a building — the volume of the total space of the building measured above the lowest floor (including, for a suspended floor, any subfloor space), over the enclosing walls, and to the underside of the roof covering.

No.	Date	Title	Volume One	Volume Two	Housing Provisions	Volume Three
AS/NZS 4859 Part 2	2018	Thermal insulation materials for buildings — Design	~~J3D3~~J4D3, Spec 37	N/A	N/A	N/A
AS 5113	2016	Classification of external walls of buildings based on reaction-to-fire performance (incorporating amendment 1)	C1V3	N/A	N/A	N/A
AS 5146 Part 1	2015	Reinforced autoclaved aerated concrete — Structures (incorporating amendment 1)	B1D4	H1D7	N/A	N/A
AS 5216	2018	Design of post-installed and cast-in fastenings in concrete	B1D4	N/A	2.2.4	N/A
AS/NZS 5601 Part1	2013	Gas installations, Part 1: General installations	J1V4	H6V3	N/A	N/A
AS 5637 Part 1	2015	Determination of fire hazard properties — Wall and ceiling linings	Spec 7, Schedule 2	Schedule 2	Schedule 2	Schedule 2
AS ISO 9239 Part 1	2003	Reaction to fire tests for floorings — Determination of the burning behaviour using a radiant heat source	Schedule 2	Schedule 2	Schedule 2	Schedule 2
AS/NZS ISO 9972	2015	Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method	J1V4	H6V3	N/A	N/A
AIRAH-DA07	2020	Criteria for moisture control design analysis in buildings	F8V1	H4V5	N/A	N/A
AIRAH-DA09	1998	Air conditioning load estimation	Spec 35	N/A	N/A	N/A
AIRAH-DA28	2011	Building management and control systems	Spec 34	N/A	N/A	N/A
ANSI/ASHRAE Standard 55	2013	Thermal environmental conditions for human occupancy	Schedule 2	Schedule 2	Schedule 2	Schedule 2
ANSI/ASHRAE Standard 140	2007	Standard method of test for the evaluation of building energy analysis computer programs	J1V1, J1V2, J1V3	H6V2	N/A	N/A
ASTM E2073-10	2010	Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings	Spec 25	N/A	N/A	N/A
ASTM E72-15	2015	Standard Test Methods of Conducting Strength Tests of Panels for Building Construction	Spec 6	N/A	N/A	N/A
ASTM E695-03	2003	Standard Test Method of Measuring Relative Resistance of Wall, Floor and Roof Construction to Impact Loading	Spec 6	N/A	N/A	N/A

No.	Date	Title	Volume One	Volume Two	Housing Provisions	Volume Three
ASTM E903	2012	Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres	N/A	N/A	13.2.3	N/A
ASTM E96	2016	Standard Test Methods for Water Vapor Transmission of Materials	Schedule 1	Schedule 1	Schedule 1	Schedule 1
AHRI 460	2005	Performance rating of remote mechanical-draft air-cooled refrigerant condensers	~~J5D13~~J6D13	N/A	N/A	N/A
AHRI 551/591	2015	Performance rating of water-chilling and heat pump water-heating packages using the vapor compression cycle.	Spec 33, ~~J5D11~~J6D11	N/A	N/A	N/A
ABCB	2011	Protocol for Structural Software, Version 2011.2	B1D5	H1D6	2.2.5	N/A
ABCB	2012	Standard for Construction of Buildings in Flood Hazard Areas, Version 2012.3	B1D6	H1D10	N/A	N/A
ABCB	2022	Fire Safety Verification Method	C1V4, D1V4, E1V1, E2V1, E3V1, E4V2	N/A	N/A	N/A
ABCB	2019	Standard for NatHERS Heating and Cooling Load Limits, Version 2019.1	~~J2D3~~J3D3	Spec 42	N/A	N/A
CIBSE Guide A	2015	Environmental design	Spec 34, Spec 35, ~~J3D3~~J4D3, ~~J3D7~~J4D7	N/A	N/A	N/A
N/A	2002	Disability Standards for Accessible Public Transport	F4D12~~F2D12~~, I2D1	N/A	N/A	N/A
N/A	2010	Education and Care Services National Law Act (Vic)	Schedule 2	Schedule 2	Schedule 2	Schedule 2
European Union Commission Regulation 547/2012	2012	Eco-design requirements for water pumps	~~J5D8~~J6D8	N/A	N/A	N/A
European Union Commission Regulation 622/Annexx II, point 2	2012	Eco-design requirements for glandless standalone circulators and glandless circulators integrated in products	~~J5D8~~J6D8	N/A	N/A	N/A