Australian Building Codes Board

Housing Provisions Standard

2022

Copyright and Licence Notice

Australian Building Codes Board

GPO Box 2013, Canberra ACT 2601

Phone: 1300 134 631

Email: ncc@abcb.gov.au

Web: abcb.gov.au

Attribution

Disclaimer

By accessing or using this publication, you agree to the following:

While care has been taken in the preparation of this publication, it may not be complete or up-to-date. You can ensure that you are using a complete and up-to-date version by checking the Australian Building Codes Board website (abcb.gov.au).

The Australian Building Codes Board, the Commonwealth of Australia and States and Territories of Australia do not accept any liability, including liability for negligence, for any loss (howsoever caused), damage, injury, expense or cost incurred by any person as a result of accessing, using or relying upon this publication, to the maximum extent permitted by law. No representation or warranty is made or given as to the currency, accuracy, reliability, merchantability, fitness for any purpose or completeness of this publication or any information which may appear on any linked websites, or in other linked information sources, and all such representations and warranties are excluded to the extent permitted by law.

This publication is not legal or professional advice. Persons rely upon this publication entirely at their own risk and must take responsibility for assessing the relevance and accuracy of the information in relation to their particular circumstances.

Part 3.2 Earthworks

3.2.1 Un-retained bulk earthworks – site cut and fill

[2019: 3.1.1.1, 3.1.1.2]

(1) A *site* cut using an un-retained embankment must be—

(a) within the allotment; and

(b) not within the zone of influence of any existing structure on the property, or the allotment boundary as defined in Table 3.2.1 and Figure 3.2.1a; and

(c) not deeper than 2 m from the natural ground level at any point.

(2) Fill, using an un-retained embankment must—

(a) be placed within the allotment; and

(b) be placed at a gradient which complies with Table 3.2.1 and Figure 3.2.1b; and

(c) be placed and mechanically compacted in layers not more than 150 mm; and

(d) be not more than 2 m in height from the natural ground level at any point; and

(e) where used to support footings or slabs, be placed and compacted in accordance with Part 4.2; and

(f) have *surface water* diverted away from any existing structure on the property or adjoining allotment in accordance with 3.3.3.

Table 3.2.1: Un-retained embankment slope ratios

Soil class (see 4.2.2 for material description)	Site cut (excavation) (maximum embankment slope ratio, angle of site cut H:L Note 1)	Compacted fill (maximum embankment slope ratio, angle of batter H:L Note 1)
Stable rock (Class A)	8:1	3:3
Sand (Class A)	1:2	1:2
Firm clay (Class M-E)	1:1	1:2
Soft clay (Class M-E)	2:3	Not suitable

Table Notes

(1) See Figures 3.2.1a and 3.2.1b for some examples of un-retained embankment slopes.

(2) Retaining walls must be installed in accordance with H1D3(2) where—

(a) the embankment slope is steeper than described in this Table; or

(b) the soil type is not described in this Table.

Figure 3.2.1a: Site cut and fill using un-retained embankments — Site cut commencing at the allotment boundary or affecting an adjoining property

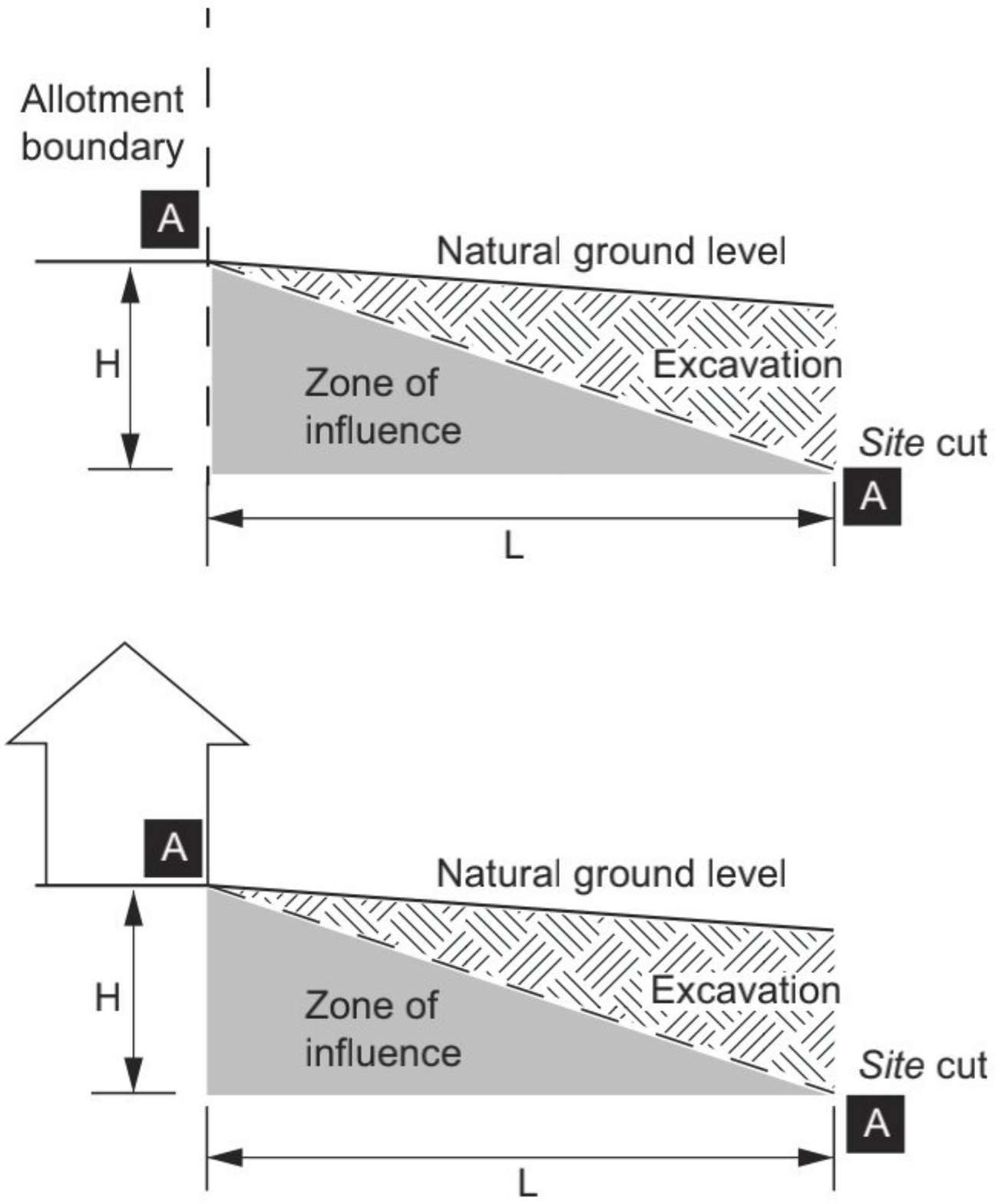


Figure Notes

(1) The angle for line A-A is defined as the maximum embankment slope ratio H:L in Table 3.2.1 and is taken from the bottom of the footing and identifies the area suitable for excavation.

(2) Consideration must be given for drainage of *surface water*, particularly where fill affects an adjoining property.

Figure 3.2.1b: **Site cut and fill using un-retained embankments — Fill commencing at the allotment boundary or affecting an adjoining property**

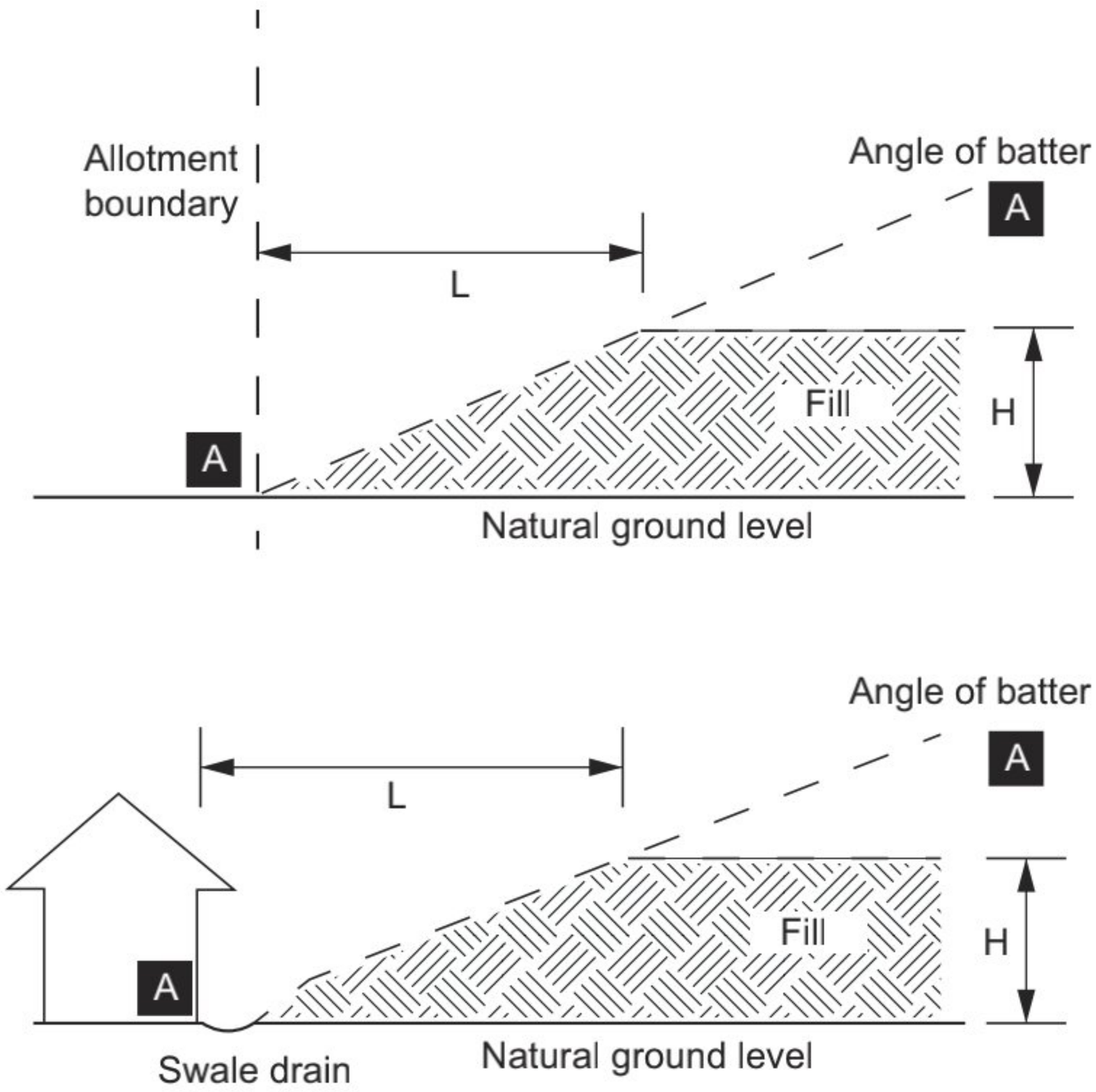


Figure Notes

(1) The angle for line A-A is defined as the maximum embankment slope ratio H:L in Table 3.2.1 and is taken from the bottom of the footing and identifies the area suitable for fill.

(2) Consideration must be given for drainage of *surface water*, particularly where fill affects an adjoining property.

Part 3.3 Drainage

3.3.1 Application

[New for 2022]

(1) Part 3.3 is subject to the limitations set out in H2D2(b).

(2) Part 3.3 need not be complied with if H2D2(a) is complied with.

3.3.2 Drainage requirements

[2019: 3.1.3.2]

Drainage systems must be installed as follows:

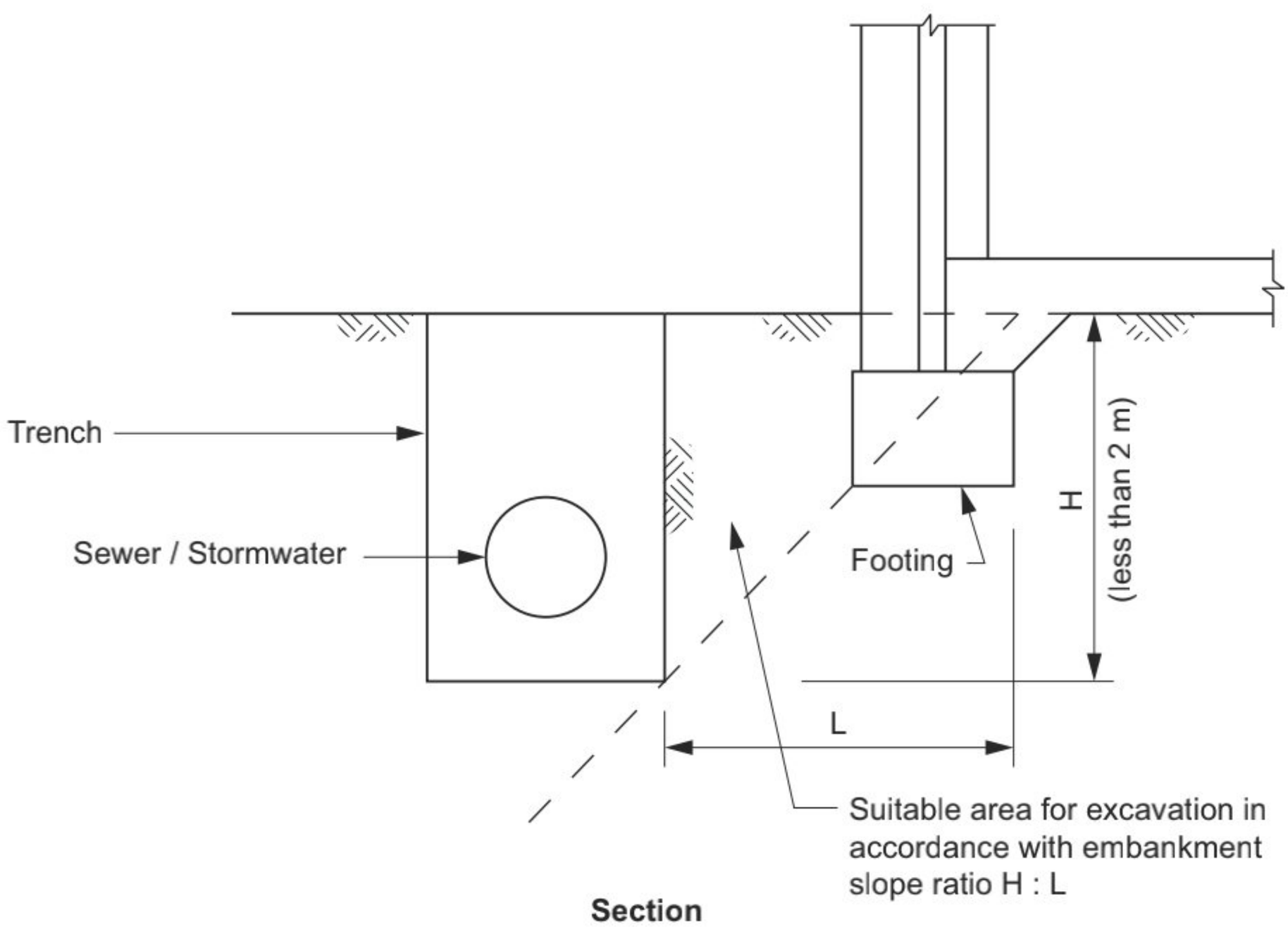
(a) Areas adjoining and under buildings — *surface water* drainage in accordance with 3.3.3; and

(b) Where *site* conditions exist that create a need for subsoil water to be diverted away from footings, basements, retaining walls etc — sub-soil drainage in accordance with 3.3.4; and

(c) Where underground drainage from roof areas is *required* or permitted — underground stormwater drainage in accordance with 3.3.5; and

(d) Excavation for drains adjacent to existing footings must be within the area described in Figure 3.3.2 as being safe for excavation.

Figure 3.3.2: Excavation for drains adjacent to footings



Section

Figure Notes

(1) Any excavation below the area defined as being safe for excavation will need additional protection measures to be determined by appropriately qualified persons.

(2) Slope ratio H:L is determined using Table 3.2.1.

3.3.3 Surface water drainage

[2019: 3.1.3.3]

Surface water must be diverted away from a Class 1 building as follows:

(a) Slab-on-ground — finished ground level adjacent to a building: the external finished surface surrounding the slab must be drained to move *surface water* away from the building and graded to give a slope of not less than (see Figure 3.3.3a) —

(i) 25 mm over the first 1 m from the building—

(A) in *low rainfall intensity areas* for surfaces that are reasonably impermeable (such as concrete or clay paving); or

(B) for any reasonably impermeable surface that forms part of an access path or ramp provided for the purposes of Clauses 1.1(2) or (4)(c) of the ABCB Standard for Livable Housing Design; or

(ii) 50 mm over the first 1 m from the building in any other case.

(b) Slab-on-ground — finished slab heights: the height of the slab-on-ground above external finished surfaces must be not less than (see Figure 3.3.3a) —

(i) 100 mm above the finished ground level in *low rainfall intensity areas* or sandy, well-drained areas; or

(ii) 50 mm above impermeable (paved or concrete) areas that slope away from the building in accordance with (a); or

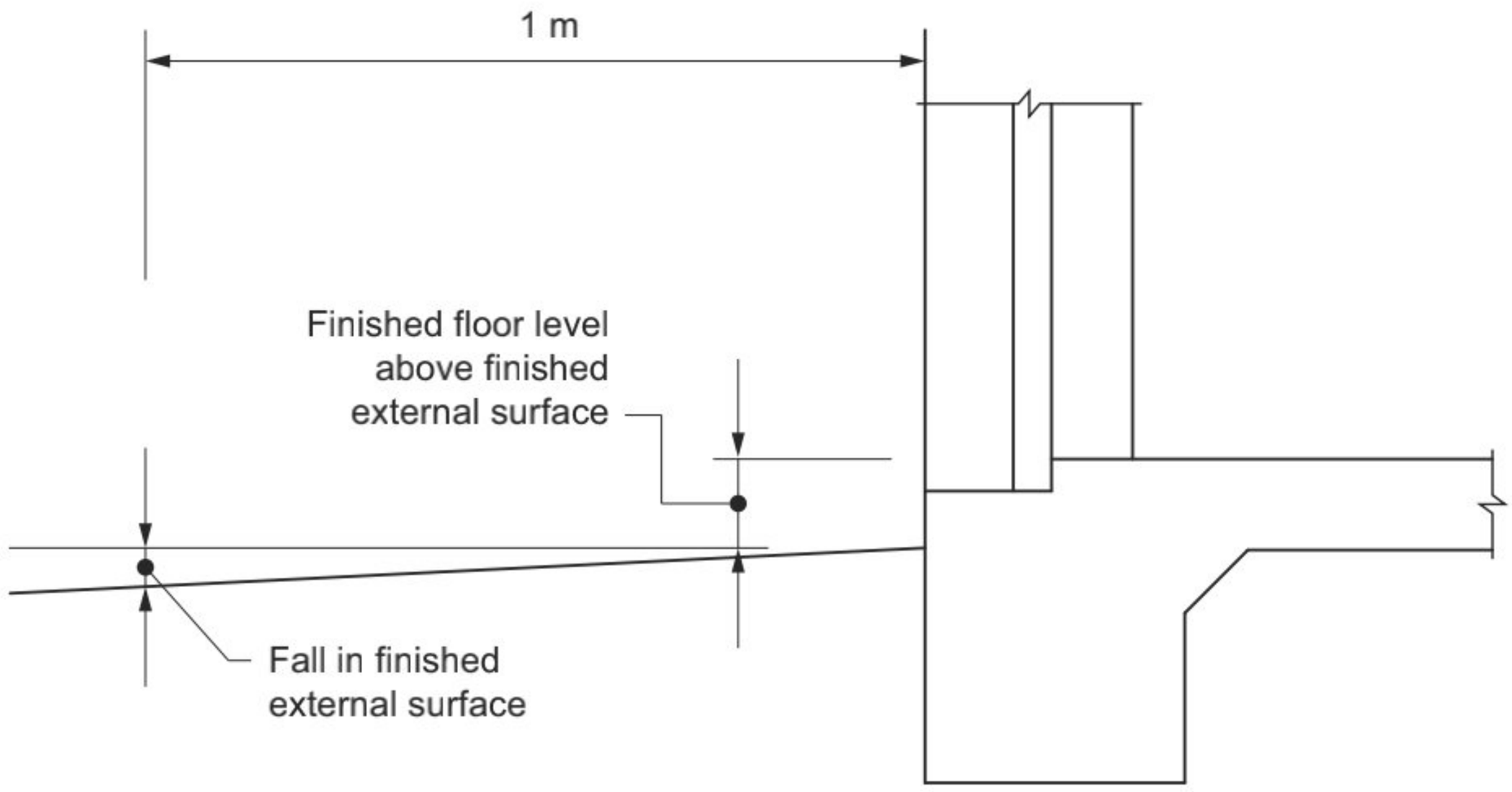
(iii) 150 mm in any other case.

(c) The ground beneath suspended floors must be graded so that the area beneath the building is above the adjacent external finished ground level and *surface water* is prevented from ponding under the building (see Figure 3.3.3b).

Limitations

3.3.3 does not apply to a landing area provided for the purposes of Clause 2.3 of the ABCB Standard for Livable Housing Design, except for a channel drain or drainage surface provided under Clause 2.4 of that standard.

Figure 3.3.3a: Site surface drainage



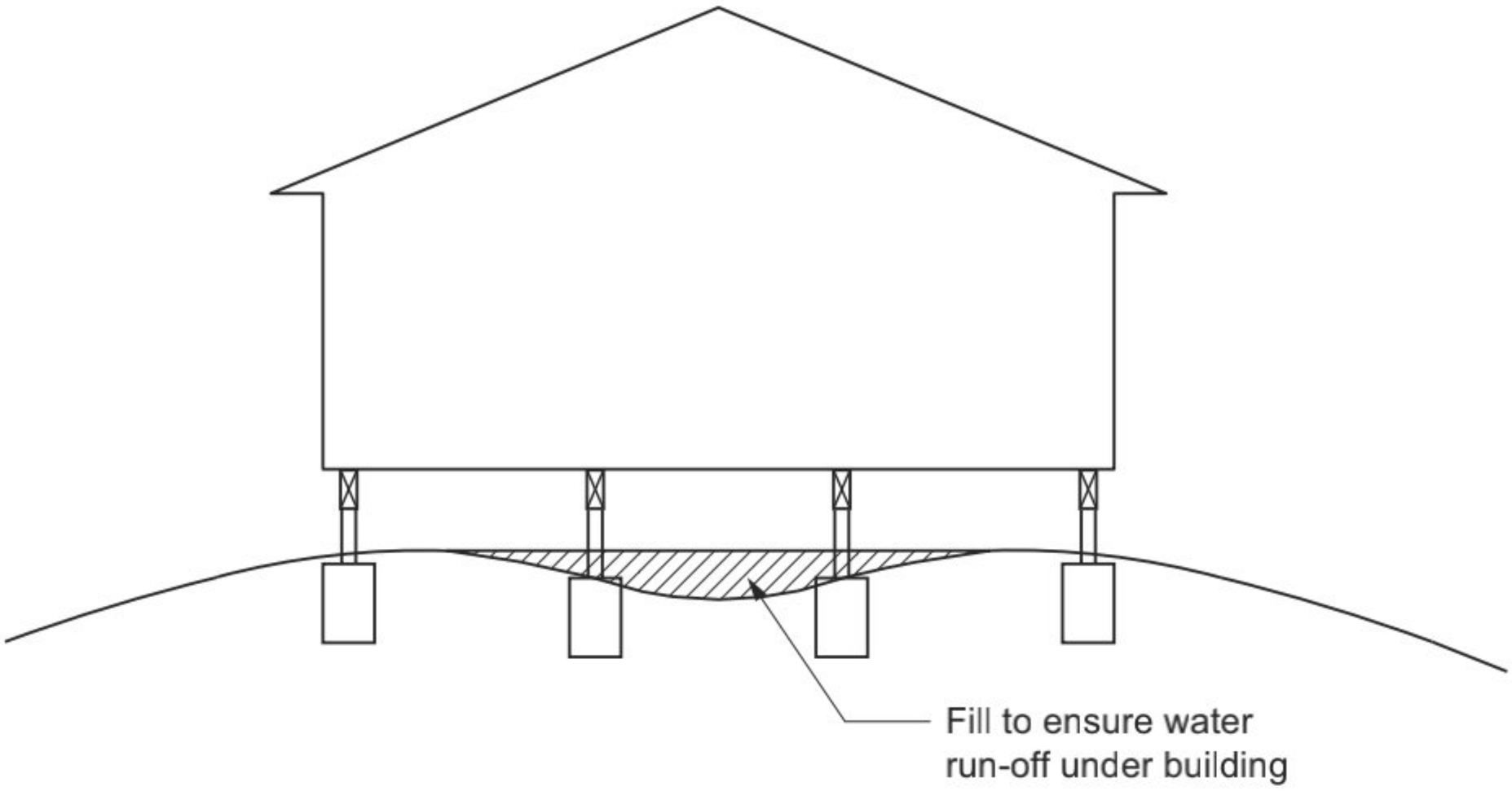
Elevation

Figure Notes

(1) For fall in finished external surface, see 3.3.3(a).

(2) For finished floor level above finished external surface, see 3.3.3(b).

Figure 3.3.3b: Grading of ground under suspended floors



Section

Explanatory Information

The appropriate slab height above finished ground level and the slope of the external finished surface surrounding the slab may vary depending on the following:

- The local plumbing requirements; in particular the height of the overflow relief gully relative to *drainage* fittings and ground level (to work effectively they must be a minimum of 150 mm below the lowest sanitary fixture).
- The run-off from storms, particularly in areas of high rainfall intensity, and the local topography.
- The effect of excavation on a cut and fill *site*.
- The possibility of flooding.
- Termite risk management provisions.

Clearances between wall cladding and the finished ground level are provided in 7.5.7.

3.3.4 Subsoil drainage

[2019: 3.1.3.4]

Where a subsoil drainage system is installed to divert subsurface water away from the area beneath a building, the subsoil drain must—

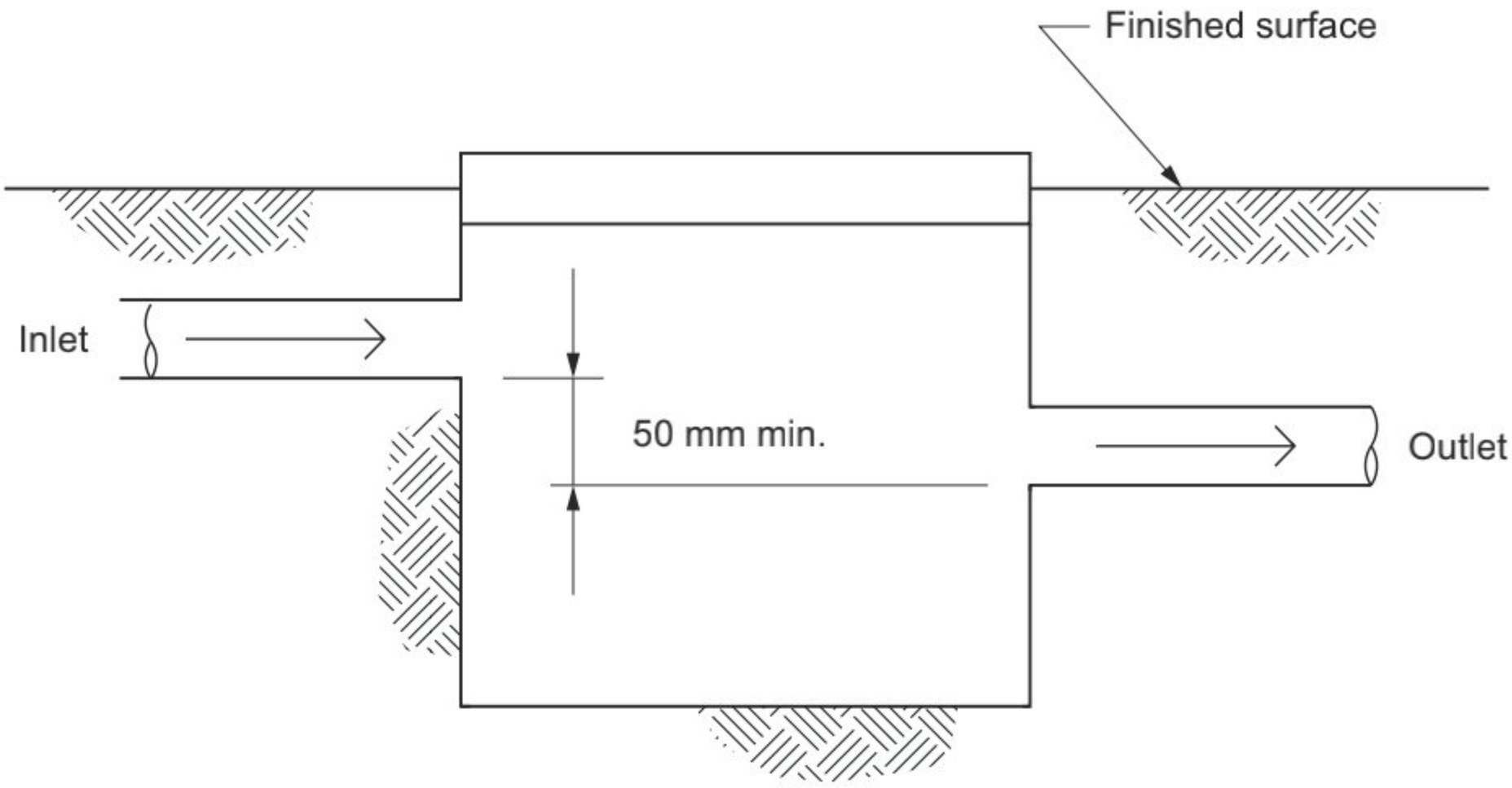
(a) be graded with a uniform fall of not less than 1:300; and

(b) discharge into an external silt pit or sump with—

(i) the level of discharge from the silt pit or sump into an impervious drainage line not less than 50 mm below the invert level of the inlet (see Figure 3.3.4); and

(ii) provision for cleaning and maintenance.

Figure 3.3.4: Construction of silt pits



Explanatory Information

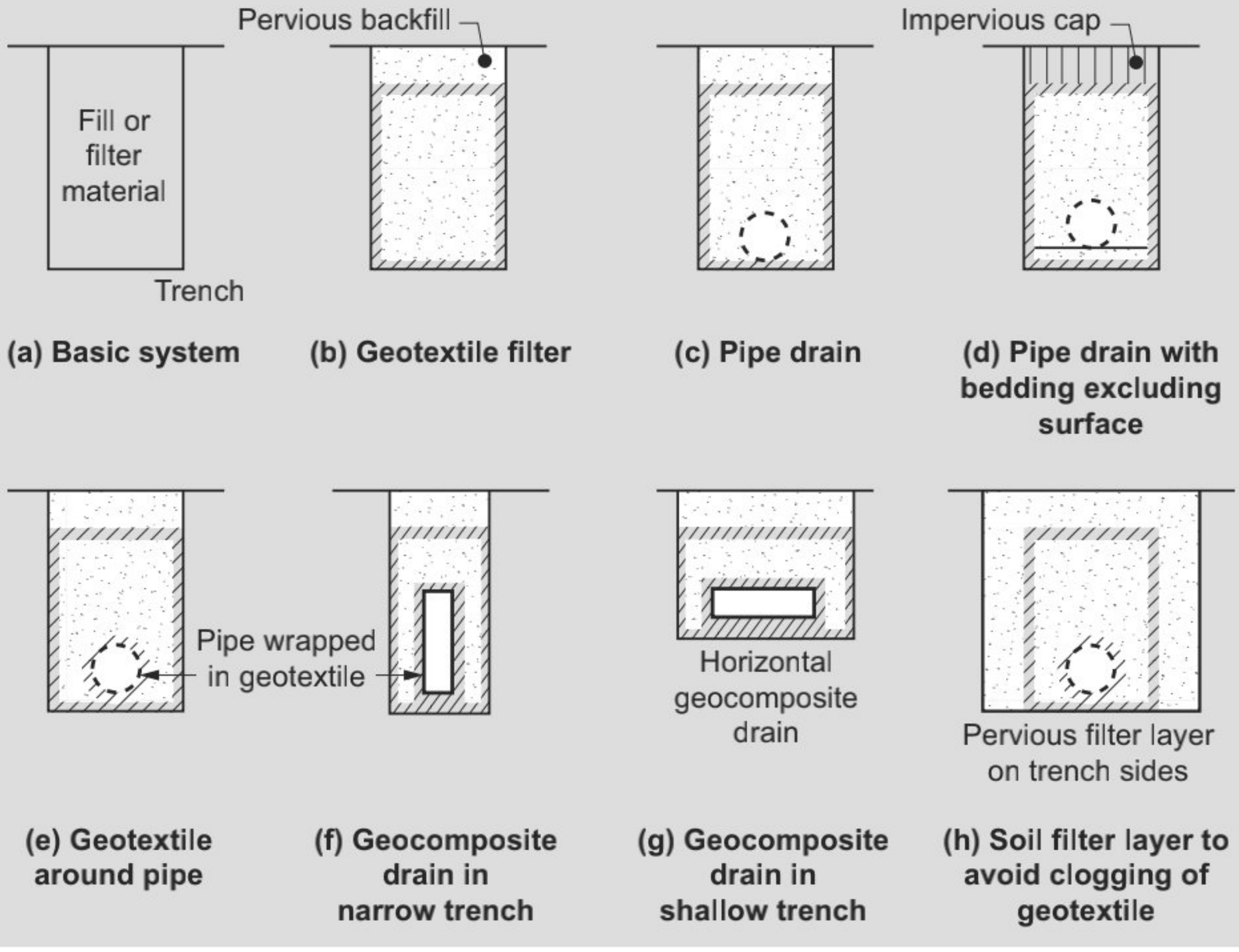
Subsoil drainage systems may need to be installed where subsurface water movement could damage buildings or cause loss of amenity through the build up of excessive moisture or lateral water pressure. Typical locations of subsoil drainage systems are on the uphill side of cut and fill sites, adjacent to deep footings, behind retaining walls and adjacent to basement walls.

The design and installation of subsoil drainage systems should take into account the nature of the soil and the anticipated water level, quantity and movement. In some cases, detailed investigations involving excavations, field observations and soil tests may be necessary to determine the appropriate solution. Typical subsoil drain configurations are shown in Figure 3.3.4 (explanatory).

In clay soil, subsoil drains can alter the long-term moisture content in the soil, adversely affecting the building *foundation* by removing or, in some cases, introducing water. In such conditions, subsoil drains should only be used where there are no other options for dealing with subsoil water.

Additional guidance on subsoil drainage systems can be found in AS/NZS 3500.3 and AS 2870.

Figure 3.3.4 (explanatory): Typical subsoil drain configurations



(a) Basic system
(b) Geotextile filter
(c) Pipe drain
(d) Pipe drain with bedding excluding surface
(e) Geotextile around pipe
(f) Geocomposite drain in narrow trench
(g) Geocomposite drain in shallow trench
(h) Soil filter layer to avoid clogging of geotextile

3.3.5 Stormwater drainage

[2019: 3.1.3.5]

Where a stormwater *drainage* system is installed, it must comply with the following:

(a) The position and manner of discharge of the stormwater *drainage* system must be to the satisfaction of the *appropriate authority*.

(b) The stormwater *drainage* system must be designed so that any overflow during heavy rain periods is prevented from flowing back into the building.

(c) Cover to stormwater drains: the cover to 90 mm Class 6 UPVC stormwater drains installed underground must be not less than—

(i) under soil — 100 mm; or

(ii) under paved or concrete areas — 50 mm; or

(iii) under areas subject to light vehicle traffic—

(A) reinforced concrete — 75 mm; or

(B) paved — 100 mm.

Explanatory Information: Discharge points

The manner of discharge of stormwater drainage systems includes consideration of discharge points. Some examples of discharge points which may be acceptable to the *appropriate authority* are—

- a legal discharge point at the allotment boundary; or
- on-site catchment systems, such as stormwater tanks; or
- on-site soil *drainage* systems, such as soaker wells.

Explanatory Information: Depth of cover

Different depths of soil cover (or no cover at all) can be achieved using other types of pipes. The cover specified is measured from the top of the pipe to either the finished ground level or, in the case of paved or concreted areas, to the underside of the paving or concrete.

Part 3.4 Termite risk management

3.4.1 Requirements for termite management systems

[2019: 3.1.4.2]

(1) The requirements of this Part apply where:

(a) a Class 1 or 10 building is constructed in an area where subterranean termites are known to present a potential risk of attack; and

(b) a *primary building element* of a Class 1 or 10 building is considered susceptible to termite attack.

NT 3.4.1(2)

(2) For the purposes of (1), a *primary building element* consisting entirely of, or a combination of, any of the following materials is considered not subject to termite attack:

(a) Steel, aluminium or other metals.

(b) Concrete.

(c) Masonry.

(d) Fibre-reinforced cement.

(e) Timber — naturally termite resistant in accordance with Appendix C of AS 3660.1.

(f) Timber — preservative treated in accordance with Appendix D of AS 3660.1.

QLD 3.4.1(3)

QLD 3.4.1(4)

QLD 3.4.1(5)

QLD 3.4.1(6)

Explanatory Information

- 3.4.1(1): Termites are not considered to be a risk in Tasmania and a lesser risk in parts of Victoria. The *appropriate authority* may have records of termite activity for each area and may be able to advise on whether termite risk management is needed.
- 3.4.1(2): Where individual *primary building elements* are susceptible to termite attack and the remainder of the *primary building elements* are constructed of termite resistant materials, only the susceptible elements need to be provided with a termite management system.
- 3.4.1(2)(c): states that masonry is not subject to termite attack, however termites may gain entry through mortar and other joints.
- Explanatory Figure 3.4.1 provides a flowchart for identifying if a termite management system is *required*.

Figure 3.4.1 (explanatory): Flow chart for identifying if a termite management system is required

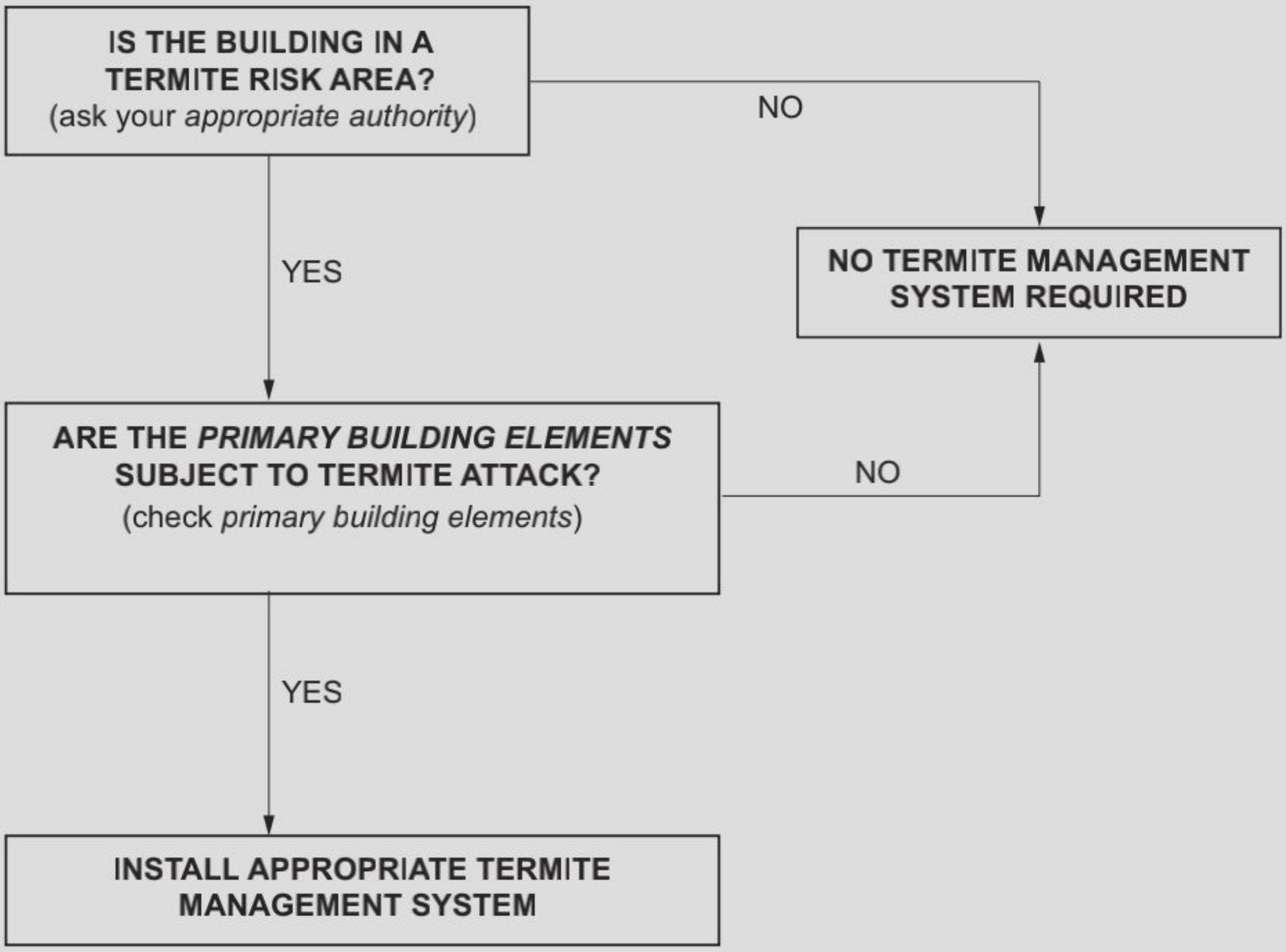


Figure Notes

To check *primary building elements*, see 3.4.1(2).

NT 3.4.2

QLD 3.4.2

3.4.2 Termite management systems

[2019: 3.1.4.3]

Where a termite management system is required it must—

(a) be selected appropriate to Table 3.4.2; and

(b) comply with—

(i) AS 3660.1; or

(ii) have been tested and passed the tests *required* by Section 5 of AS 3660.3; and

(c) have a durable notice installed in accordance with 3.4.3; and

(d) where a chemical termite management system is used, the chemical must be included on the *appropriate authority's* pesticides register.

Table 3.4.2: Acceptable termite management systems and components

Building element	Termite management system or component options
Concrete slab-on-ground: slab perimeter or *external wall* perimeter	Slab edge exposure
	Sheet material
	Granular material
	Chemical

Building element	Termite management system or component options
Concrete slab-on-ground: penetrations/control joints/area beneath the slab (see Note)	Sheet material
	Granular material
	Chemical
Suspended floors	Sheet material
	Granular material
	Chemical
Attachments to buildings	Termite management system to the attachment
	Inspection zone between attachment and building

Table Notes

The entire area beneath the slab must be treated when the slab-on-ground is not designed and constructed in accordance with AS 2870 or AS 3600.

Explanatory Information: Validity of test results

3.4.2(b)(ii) provides the option of having a chemical termite management system tested to AS 3660.3. In order for the test results to remain valid, the system would then have to be installed as tested.

Explanatory Information: Component

A component of a system as referred to in Table 3.4.2 is one that, when used in combination with other components, will form a 'full system'.

For example, if a concrete slab is used as a component of a system, it in itself will not provide a complete termite management system. Depending on the construction methods and the *site* conditions, additional requirements will be necessary for service penetrations through the concrete slab. Each of these are 'components', when integrated, will form a 'full system'.

Explanatory Information: Integrity of the termite management system

There are more than 350 species of termites in Australia, about 30 of which achieve economic importance by causing costly damage to building structures. Due to the nature of termites, it is extremely difficult to prevent them gaining access to a building.

In addition to correct installation of a termite management system, its effectiveness will rely on regular maintenance and competent inspection.

Explanatory Information: Attachments to buildings

Attachments referred to in Table 3.4.2 include downpipes, service pipes, steps, verandahs, porches, access ramps, carports, trellises, decks, *heated water* systems, air-conditioners and the like.

3.4.3 Durable notice

[2019: 3.1.4.4]

A durable notice must be permanently fixed to the building in a prominent location, such as in a meter box or the like, indicating—

(a) the termite management system used; and

(b) the date of installation of the system; and

(c) where a chemical is used, its life expectancy as listed on the *appropriate authority's* register label; and

(d) the installer's or manufacturer's recommendations for the scope and frequency of future inspections for termite activity.

Explanatory Information: Appropriate authority

For the purpose of the pesticides register, the *appropriate authority* is the government body responsible for the registration of pesticides. Currently, the Australian Pesticides and Veterinary Medicines Authority (APMVA) coordinates the registration scheme.

Explanatory Information: Durable notice

Where a durable notice is *required* by 3.4.3, it must be fixed to the building in a prominent location advising the building occupants that the system should be inspected and maintained.

The notice should be clearly written, on a material that will not deteriorate or fade over time and be located in or near the electrical meter box or similar location so that it can be easily seen and read by future owners of the building. Additional information may be included if desired by the person placing the notice.

4 Footings and slabs

Part 4.1 Scope and application of Section 4

4.1.1 Scope

[New for 2022]

This Section sets out the *Deemed-to-Satisfy Provisions* for footings and slabs.

Explanatory Information

This Section specifies the requirements for the excavation and filling for the footing or slab together with the construction of various alternative concrete slab and footing configurations. The slab and footing configurations detailed in this Section are only suitable for the specified soil classifications. The requirements contained in the remainder of this Section are more general and may be applied to all slab and footing construction.

The requirements of this Section are to be read in conjunction with Part 6.2. The Part 6.2 subfloor ventilation requirements apply to the subfloor space of all suspended floors of a building or deck, including but not limited to, timber and steel-framed subfloors and suspended concrete slabs.

4.1.2 Application

[New for 2022]

The application of this Section is subject to the following:

(a) The Governing Requirements of NCC 2022 Volume Two.

(b) Any conditions set out within the following *Deemed-to-Satisfy Provisions* of NCC Volume Two: H1D4(2), for footings and slabs.

(c) 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 4 of the ABCB Housing Provisions (other than content added in NCC 2022 or later) was contained in the acceptable construction practices for Part 3.2 of NCC 2019 Volume Two.

4.1.3 Explanation of terms

[New for 2022]

Figures 4.1.3a, 4.1.3b and 4.1.3c depict footing and slab members and associated terminology used to describe them in Part 4.2 of the ABCB Housing Provisions.

Figure 4.1.3a: Footing and slab members and associated terminology: diagram 1

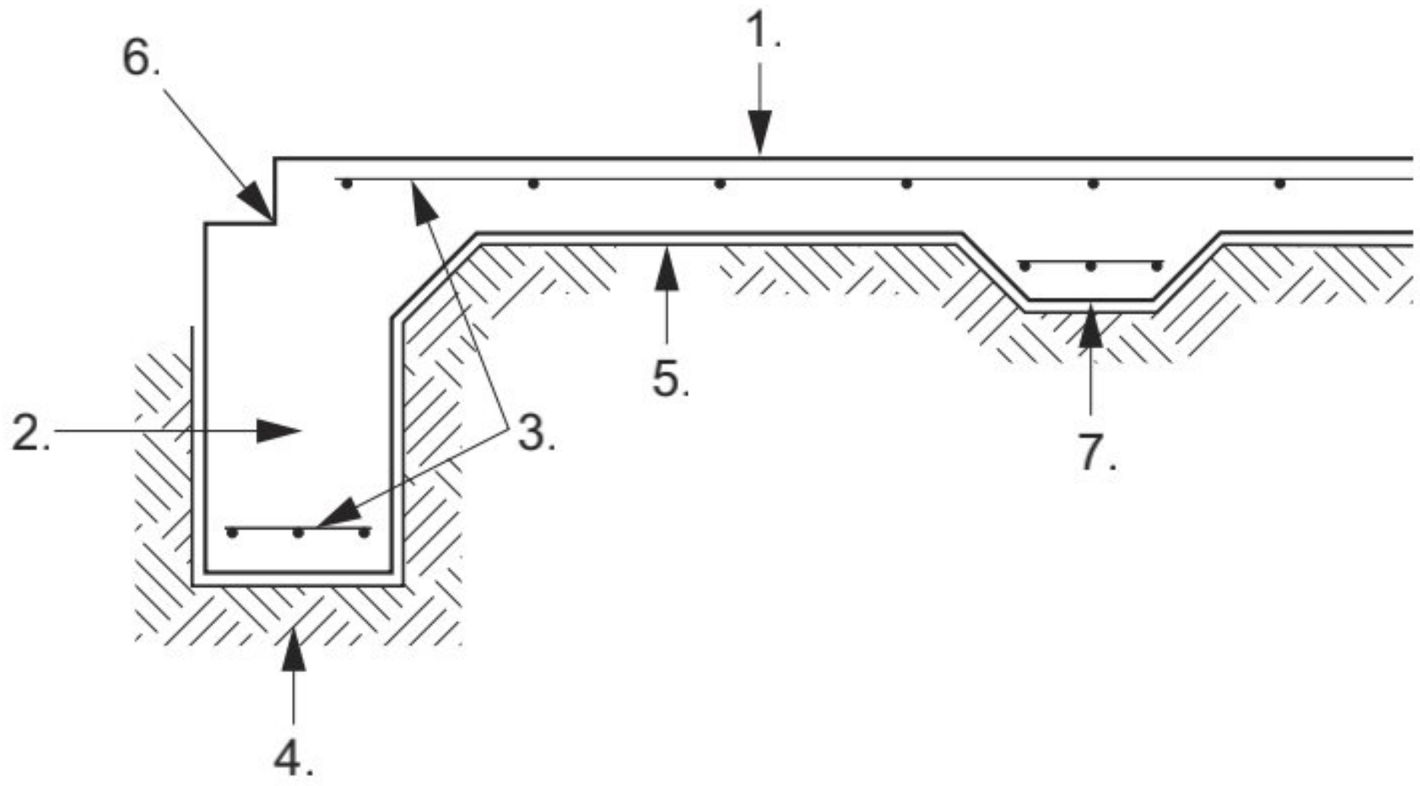


Figure Notes

(1) Slab (monolithic).

(2) Deepened edge beam.

(3) Reinforcement.

(4) *Foundation*.

(5) Vapour barrier/damp-proofing *membrane*.

(6) Edge rebate.

(7) Internal beam (thickening).

Figure 4.1.3b: Footing and slab members and associated terminology: diagram 2

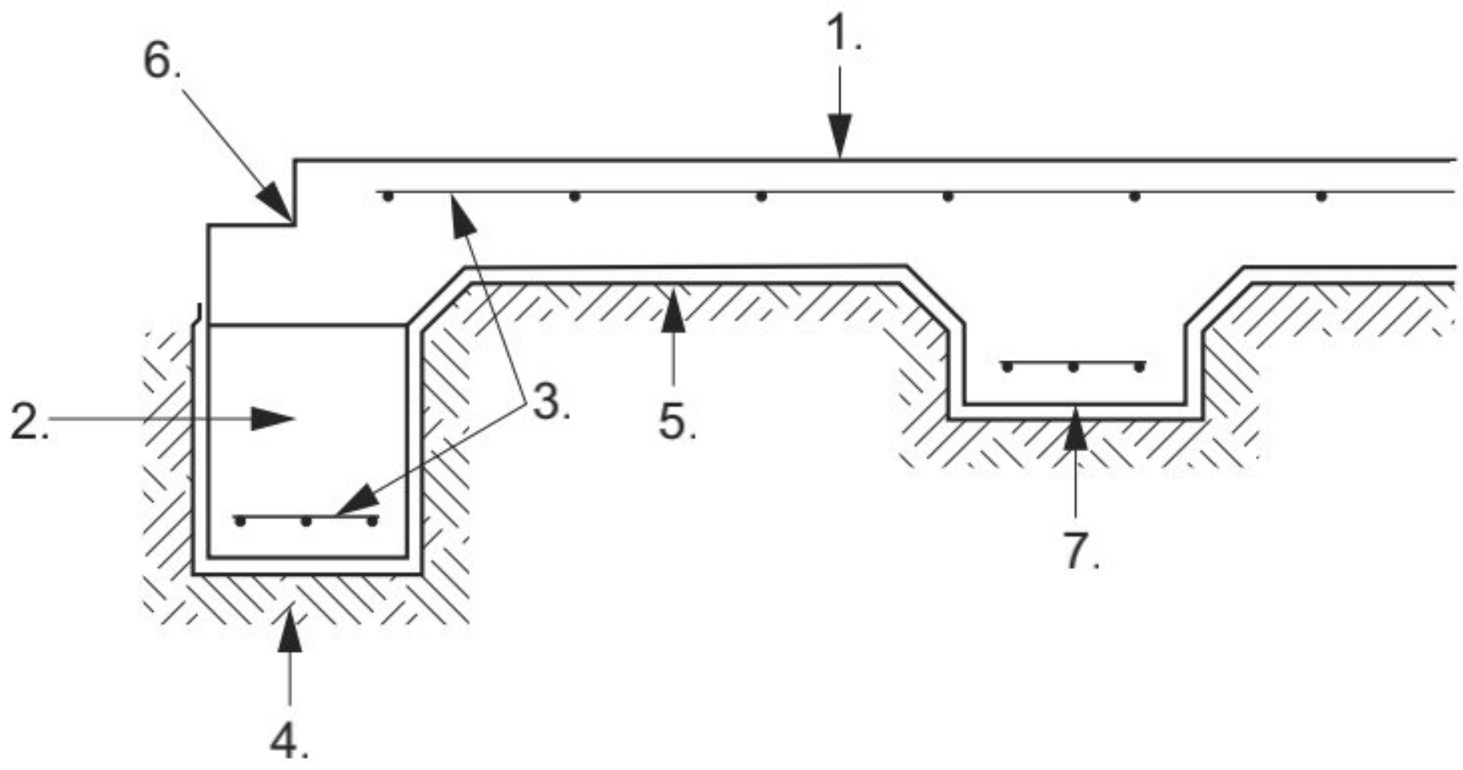


Figure Notes

(1) Slab.

(2) Deepened edge beam and slab.

(3) Reinforcement.

(4) *Foundation*.

(5) Vapour barrier/damp-proofing *membrane*.

(6) Edge rebate.

(7) Internal beam (thickening).

Figure 4.1.3c: Footing and slab members and associated terminology: diagram 3

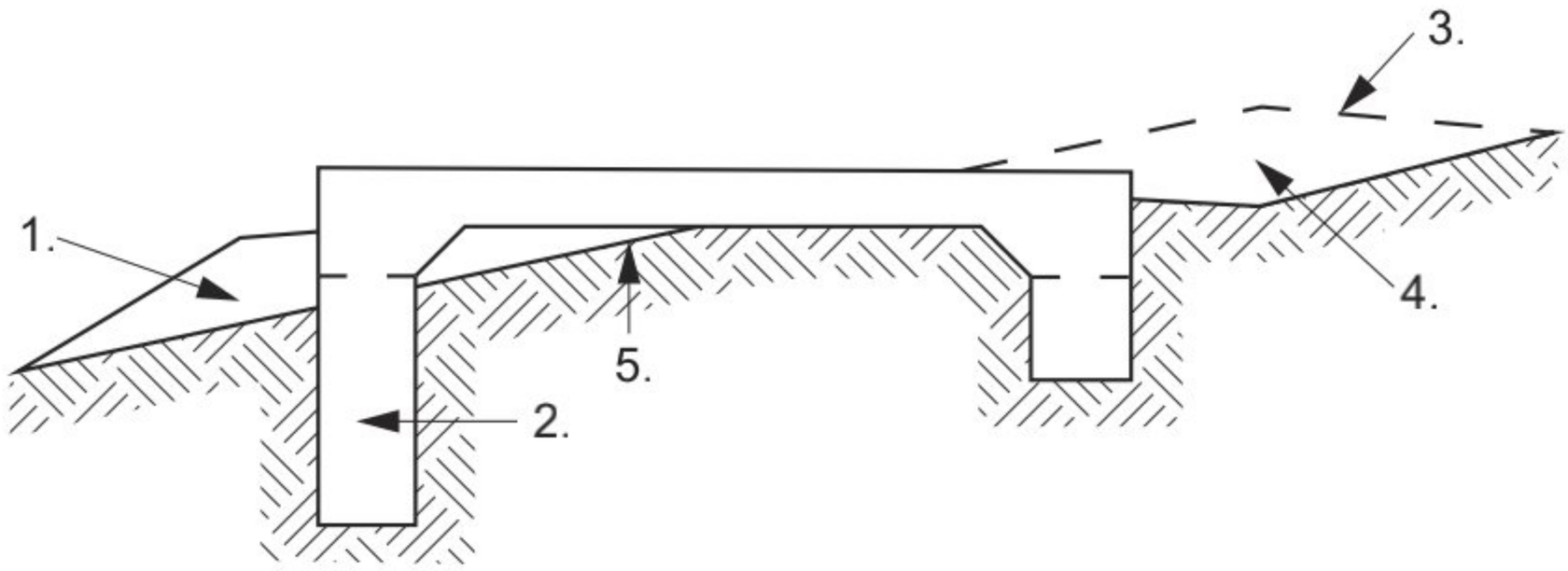


Figure Notes

(1) *Controlled fill*.

(2) Deepened edge beam and slab.

(3) Natural ground line above cut.

(4) Cut.

(5) *Foundation* (natural ground below fill).

Part 4.2 Footings, slabs and associated elements

4.2.1 Application

[New for 2022]

Part 4.2 is subject to the limitations set out in H1D4(2).

4.2.2 Site classification

[2019: 3.2.4.1]

The *foundations* where footings and slabs are to be located must be classified in accordance with AS 2870.

Explanatory Information

Explanatory Table 4.2.2 provides a general description of *foundation* soil types that will assist in the classification of a *site*. More detailed information, including differentiation between classifications, can be found in AS 2870 or alternatively contact the *appropriate authority*.

Due to the limitations of this Part, if a *site* is classified H, E or P then reference must be made to AS 2870 for design and construction information.

Table 4.2.2 (explanatory): General definition of site classes

Class	*Foundation*
A	Most sand and rock *sites* with little or no ground movement from moisture changes
S	Slightly reactive clay *sites* with only slight ground movement from moisture changes
M	Moderately reactive clay or silt *sites* which can experience moderate ground movement from moisture changes
H	Highly reactive clay *sites* which can experience high ground movement from moisture changes
E	Extremely reactive clay *sites* which can experience extreme ground movement from moisture changes
A to P	Filled *sites* — see AS 2870
P	*Sites* which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive *sites* subject to abnormal moisture conditions or *sites* which cannot be classified otherwise.

Table Notes

(1) For Class M, further division based on the depth of expected movement is *required*.

(2) For deep-seated movement, characteristic of dry climates and corresponding to a design depth of suction change H_S, equal to or greater than 3 m, the classification must be M-D.

(3) If classification M-D is established due to further division, design of footings and slabs is beyond the scope of the ABCB Housing Provisions and reference must be made to AS 2870 for design and construction information.

NSW 4.2.3

4.2.3 Excavation for footings

[2019: 3.2.2.1]

(1) Excavation for footings, including thickenings for slabs and pads must be clean cut with vertical sides, wherever possible.

(2) The base of the excavation must be—

(a) for flat *sites*, generally level but may slope not more than 1:40 to allow excavations to drain; and

(b) for sloping *sites* at an angle of not more than 1:10; and

(c) for stepped footings in accordance with 4.2.7.

(3) Footing excavations must be free of loose earth, tree roots, mud or debris.

(4) Topsoil containing grass roots must be removed from the *site* of the *foundation*.

(5) Excavation depths and soil cuts must comply with Part 3.2.

(6) On loose sand *sites* or *sites* subject to wind or water erosion, the depth below *finished ground level* to the bottom of footings must be not less than 300 mm.

(7) The height of a finished slab-on-ground must be in accordance with 3.3.3(b).

4.2.4 Filling under concrete slabs

[2019: 3.2.2.2]

Filling placed under a slab (except where the slab is suspended) must comply with the following:

(a) Filling must be either *controlled fill* or *rolled fill* as follows:

(i) Sand used in *controlled fill* or *rolled fill* must not contain any gravel size material and achieve a blow count of 7 or more per 300 mm using the test method described in AS 1289.6.3.3.

(ii) Clay used in *controlled fill* or *rolled fill* must be moist during compaction.

(iii) *Controlled fill*:

(A) Sand fill up to 800 mm deep — well compacted in layers not more than 300 mm deep by vibrating plate or vibrating roller.

(B) Clay fill up to 400 mm deep — well compacted in layers of not more than 150 mm by a mechanical roller.

(iv) *Rolled fill*:

(A) Sand fill up to 600 mm deep — compacted in layers of not more than 300 mm by repeated rolling by an excavator or other suitable mechanical equipment.

(B) Clay fill up to 300 mm deep — compacted in layers of not more than 150 mm by repeated rolling by an excavator or similar machine.

(b) A level layer of clean quarry sand must be placed on top of the fill, with a depth of not less than 20 mm.

(c) A graded stone termite management system complying with Part 3.4 may be substituted for the sand *required* in (b).

4.2.5 Foundations for footings and slabs

[2019: 3.2.2.3]

Footings and slabs, including internal and edge beams, must be founded on soil with an allowable bearing pressure as follows:

(a) Slab panels, load support panels and internal beams — natural soil with an allowable bearing pressure of not less than 50 kPa or *controlled fill* or *rolled fill* compacted in accordance with 4.2.4.

(b) Edge beams connected to the slab — natural soil with an allowable bearing pressure of not less than 50 kPa or *controlled fill* compacted in accordance with 4.2.4(a)(iii) and extending past the perimeter of the building 1 m

with a slope ratio not steeper than 2 horizontal to 1 vertical (see Figure 4.2.5).

(c) Pad footings, strip footings and edge beams not connected to the slab, must be—

(i) founded in natural soil with an allowable bearing pressure of not less than 100 kPa; or

(ii) for Class A and S sites they may be founded on controlled sand fill in accordance with 4.2.4(a).

Figure 4.2.5: Foundations for footings and slabs

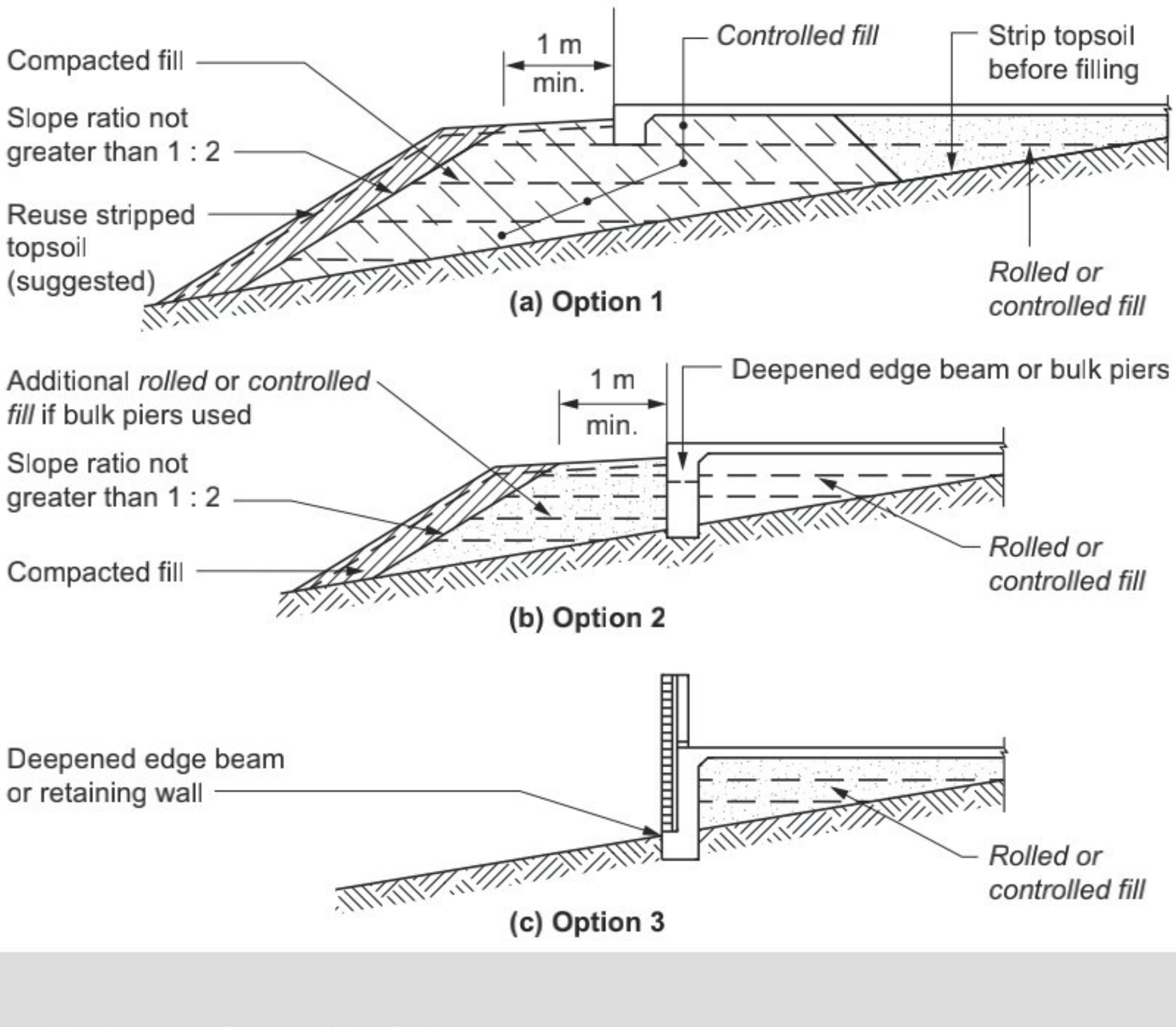


Figure Notes

Compacted fill must be in accordance with 4.2.4.

Explanatory Information

The *foundations* of a building are critical to its successful performance. As such, the soil must have the strength or bearing capacity to carry the building load with minimum movement.

The bearing capacity of a soil varies considerably and needs to be determined on a *site* by *site* basis. For this to occur, the appropriate people need to be consulted. These people may include a qualified engineer or experienced engineering geologist, or it may be determined by a person with appropriate local knowledge. The minimum bearing capacity (soil strength rating) may depend on the *site* conditions. The soil may be naturally undisturbed or be disturbed by building work or the like. Where soil is disturbed by building work and the like, the bearing capacity can be dramatically altered. This is typically the case for sloping *sites* where cut and fill procedures are used. In these situations the soil needs to be consolidated, generally via compaction, to achieve the *required* bearing capacity.

There are a number of alternatives for working on cut and filled *sites*. These are described in Figure 4.2.5.

Option 1 of Figure 4.2.5 refers to the *controlled fill* process which involves the compaction of fill in layers to achieve the bearing capacity described in 4.2.5. The depth of fill for each layer is specified to ensure effective compaction. Fill beyond these depths will need to be installed in accordance with H1D4(1).

Option 2 and 3 of Figure 4.2.5 refer to edge beams that extend through the fill into undisturbed soil which provides the 4.2.5 *required* bearing capacity. In this situation the fill is essentially only taking the internal slab loads.

4.2.6 Slab edge support on sloping sites

[2019: 3.2.2.4]

Footings and slabs installed on the low side of sloping *sites* must be as follows:

(a) Slab panels — in accordance with 4.2.5(a).

(b) Edge beams—

(i) supported by *controlled fill* in accordance with 4.2.5(b) (see Figure 4.2.5, Option 1); or

(ii) supported by deepened edge beams or bulk piers designed in accordance with AS 3600 (see Figure 4.2.5, Option 2); or

(iii) deepened (as per AS 2870) to extend into the natural soil level with a bearing capacity in accordance with 4.2.5(b) (see Figure 4.2.5, Option 3); or

(iv) stepped in accordance with AS 2870.

(c) Edge beams not connected to the slab, pad footings and strip footings — founded in accordance with 4.2.5(c).

(d) Where an excavation (cut) of the natural ground is used it must be in accordance with Part 3.2.

4.2.7 Stepped footings

[2019: 3.2.2.5]

Stepped strip footings must—

(a) have a base that is horizontal or be sloped at not more than 1:10; or

(b) be stepped in accordance with one of the methods shown in Figure 4.2.7.

Figure 4.2.7: Stepped strip footings

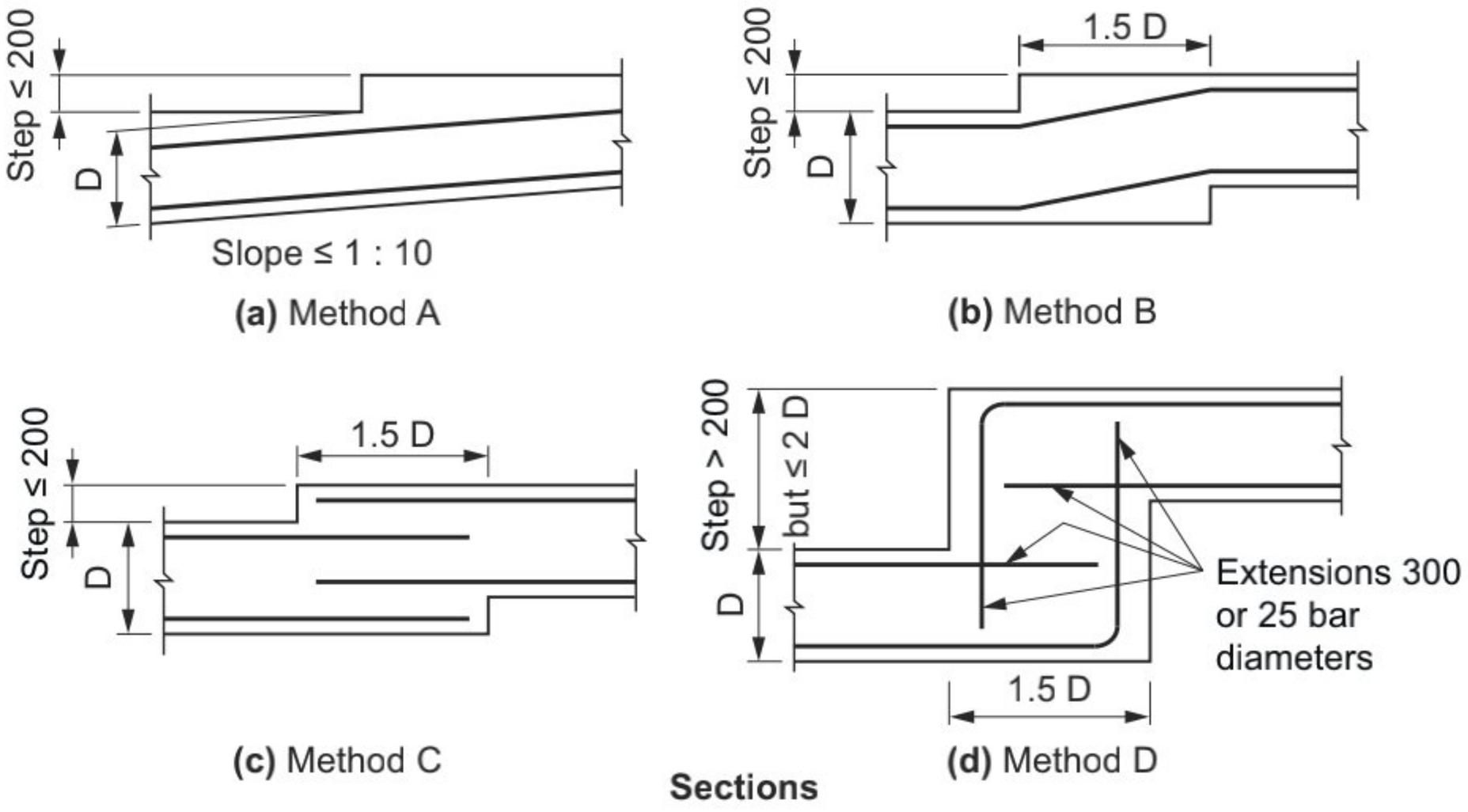


Figure Notes

All dimensions in millimetres.

NSW 4.2.8

SA 4.2.8

4.2.8 Vapour barriers

[2019: 3.2.2.6]

(1) A vapour barrier must be installed under slab-on-ground construction for a Class 1 building and for a Class 10 building where the slab is continuous with the slab of a Class 1 building in accordance with (2), (3), (4) and (5).

(2) Materials: A vapour barrier must be—

(a) 0.2 mm nominal thickness polyethylene film; and

(b) medium impact resistant,

determined in accordance with criteria specified in clause 5.3.3.3 of AS 2870.

(3) A vapour barrier must be branded continuously "AS 2870 Concrete underlay, 0.2 mm Medium impact resistance".

(4) Installation: A vapour barrier must be installed as follows:

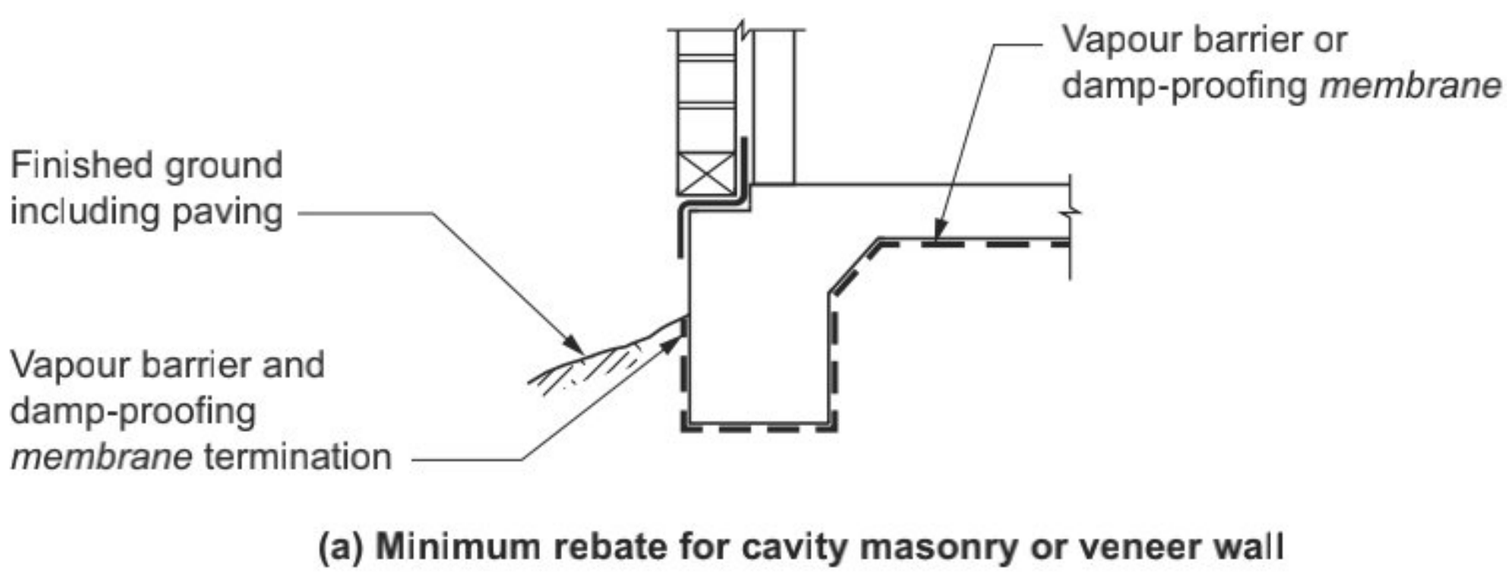
(a) Lap not less than 200 mm at all joints.

(b) Tape or seal with a close-fitting sleeve around all service penetrations.

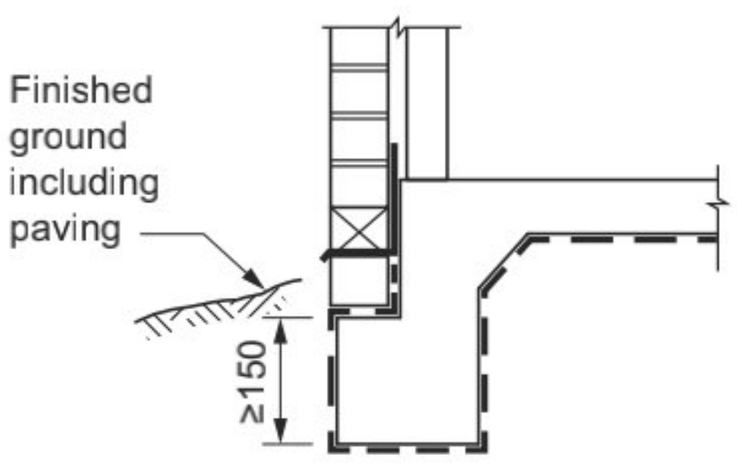
(c) Fully seal where punctured (unless for service penetrations) with additional polyethylene film and tape.

(5) The vapour barrier must be placed beneath the slab so that the bottom surface of the slab is entirely underlaid and must extend under internal and edge beams to finish at ground level in accordance with Figure 4.2.8.

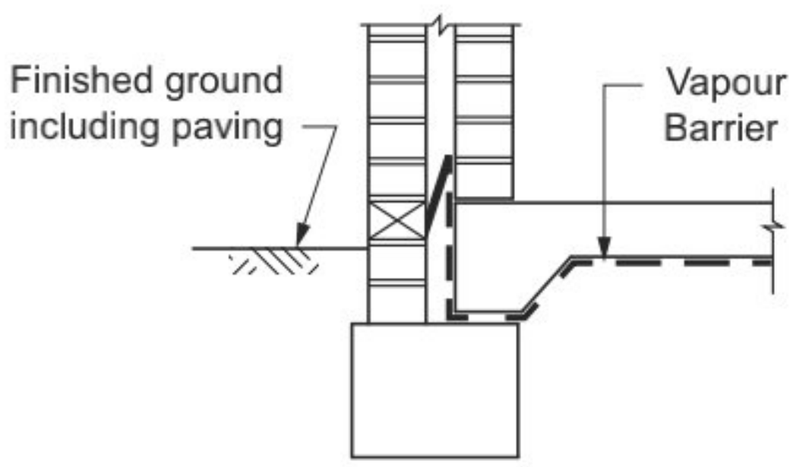
Figure 4.2.8: Acceptable vapour barrier and damp-proofing membrane location



(a) Minimum rebate for cavity masonry or veneer wall



(b) Deep edge rebate alternative



(c) Masonry alternative

Figure Notes

All dimensions in millimetres.

4.2.9 Edge rebates

[2019: 3.2.2.7]

Edge rebates for slab-on-ground and stiffened raft with masonry *cavity* or veneer construction must comply with the following:

(a) The rebate must not be less than 20 mm.

(b) The edge rebate must be flashed and drained in accordance with H2D4 and where it cannot be flashed, it must be filled with mortar.

Explanatory Information

See 4.2.21 for minimum edge beam details. For single skin or framed walls with external cladding, rebates are not required.

SA 4.2.10

4.2.10 Concrete

[2019: 3.2.3.1]

Concrete must comply with the following:

(a) Concrete must comply with AS 3600; and—

(i) have a strength at 28 days of not less than 20 MPa (denoted as N20 grade); and

(ii) have a 20 mm maximum nominal aggregate size; and

(iii) have a nominal 100 mm slump.

(b) Water must not be added to the mix to increase the slump to a value in excess of that specified.

(c) Concrete must be placed, compacted and cured in accordance with good building practice.

Explanatory Information

- Complete discharge of the concrete from the truck should be made within one and a half hours of initial mixing with water unless a suitable retarder has been specified.
- Compacting concrete by vibration removes air pockets and works the concrete thoroughly around reinforcement, service penetrations etc. and into corners of formwork to increase durability and resistance to termite infestation and salt damp attack. Care should be taken not to over-vibrate. The finishing and curing of slab edges provides an improved edge finish which is resistant to edge dampness.
- Care should be taken when using chemical curing methods, because some products may not be compatible with adhesives used to fix surface finishes to the slab.

4.2.11 Steel reinforcement

[2019: 3.2.3.2]

(1) Materials used for reinforcing steel must comply with AS 2870 and be—

(a) welded wire reinforcing fabric; or

(b) trench mesh; or

(c) steel reinforcing bars.

(2) Steel reinforcing bars may be substituted for trench mesh in accordance with Table 4.2.11a.

(3) Minimum laps for reinforcement as shown in Table 4.2.11b and Figure 4.2.11a must be provided where reinforcing is used.

(4) Any slab in H1D4 with a re-entrant corner must have—

(a) two strips of 3-L8TM; or

(b) one strip of 3-L11TM; or

(c) 3-N12 bars,

not less than 2 m in length and placed at an angle of 45° across the corner such that the centre of the 2 m length is at the location of the internal angle of the slab in accordance with Figure 4.2.11b.

(5) Footings and slabs-on-ground must have concrete cover between the outermost edge of the reinforcement (including ligatures, tie wire etc.) and the surface of the concrete of not less than—

(a) 40 mm to unprotected ground; and

(b) 30 mm to a membrane in contact with the ground; and

(c) 20 mm to an internal surface; and

(d) 40 mm to external exposure.

(6) Reinforcement must be free of loose rust, mud, paints and oils.

(7) Reinforcement must be placed as follows:

(a) All reinforcement must be firmly fixed in place to prevent it moving during concreting operations.

(b) Reinforcement must be supported off the ground or the forms by bar chairs made from wire, concrete or plastic.

(c) When using wire chairs, the minimum concrete cover (see (5)) to the uncoated portion of the chair must be obtained.

(d) Wire chairs on soft ground or plastic membrane must be placed on flat bases.

(e) Bar chairs must be spaced at not more than 800 mm centres for steel fabric.

Table 4.2.11a: Alternative mesh/reinforcing bar sizes

Trench mesh (TM)	Area — mm^2	Reinforcing bar alternative	Trench mesh alternative
2-L8TM	91	2-N10 or 1-N12	Not applicable
3-L8TM	136	2-N10 or 2-N12	Not applicable
4-L8TM	182	2-N12	2-L11TM
5-L8TM	227	2-N12	3-L11TM
2-L11TM	180	1-N16 or 2-N12	2x2-L8TM
3-L11TM	270	3-N12	2x3-L8TM
4-L11TM	360	2-N16	2x4-L8TM
2-L12TM	222	2-N12	3-L11TM
3-L12TM	333	3-N12	4-L11TM
4-L12TM	444	4-N12	5-L11TM

Table Notes

(1) Where necessary, 2 layers of mesh may be used.

(2) L11TM and L12TM may be replaced by RL1118 and RL1218 mesh respectively.

(3) L11TM may be replaced by two layers of L8TM.

Table 4.2.11b: Minimum lap for reinforcement

Reinforcement	Minimum splice	Minimum lap at "T" intersections	Minimum lap at "L" intersections
Steel reinforcing bars ≤12 mm diameter	500 mm	Full width across the junction	One outer bar must be bent and continue 500 mm (min) around corner
Steel reinforcing bars >12 mm to ≤16 mm diameter	700 mm	Full width across the junction	One outer bar must be bent and continue 500 mm (min) around corner
Trench mesh	500 mm	Full width across the junction	Full width across the junction
Square and rectangular mesh	The two outermost transverse wires of one sheet must overlap the two outermost transverse wires of the other	Not applicable	Not applicable

Figure 4.2.11a: Splice, L and T intersections

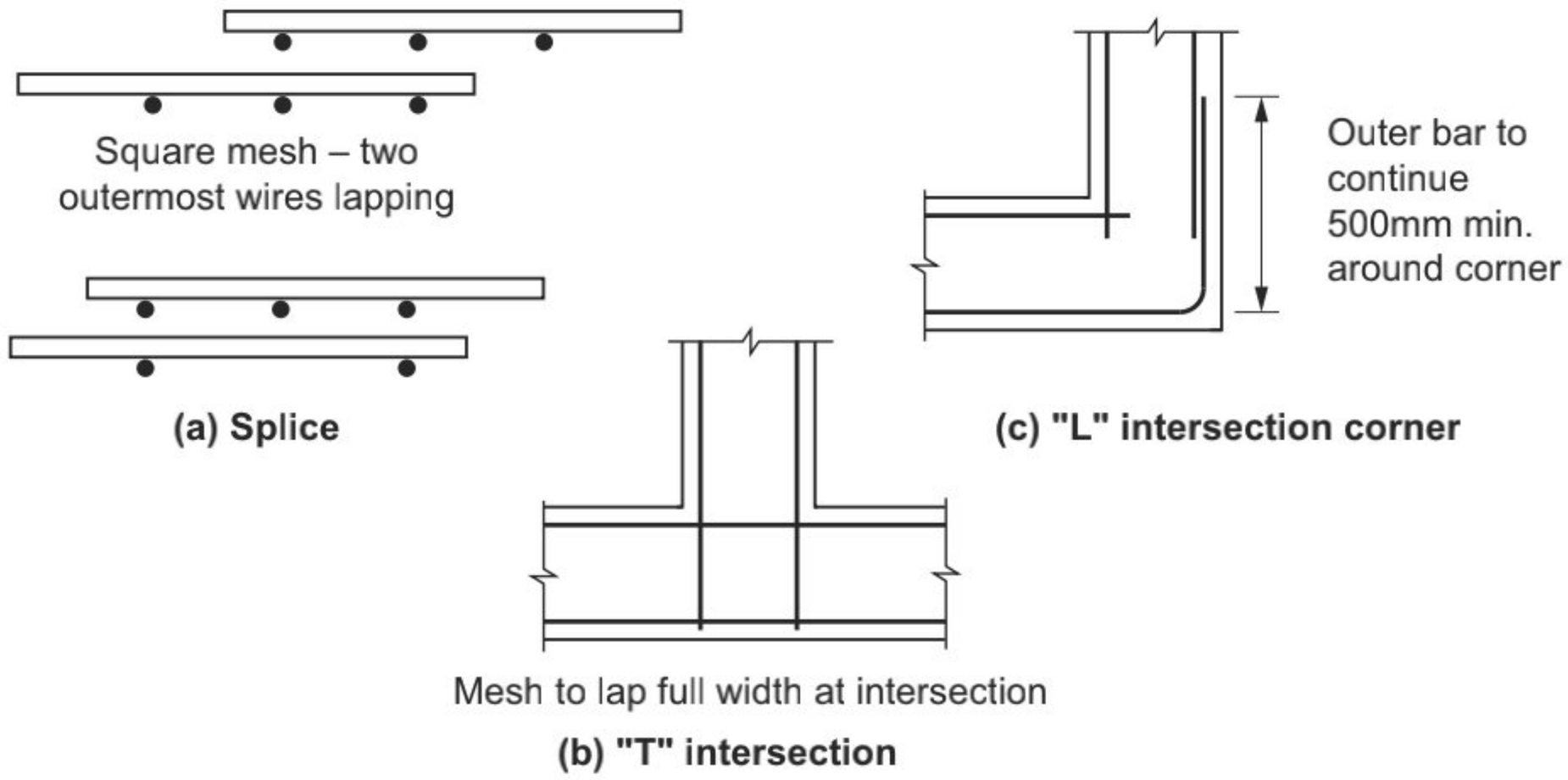
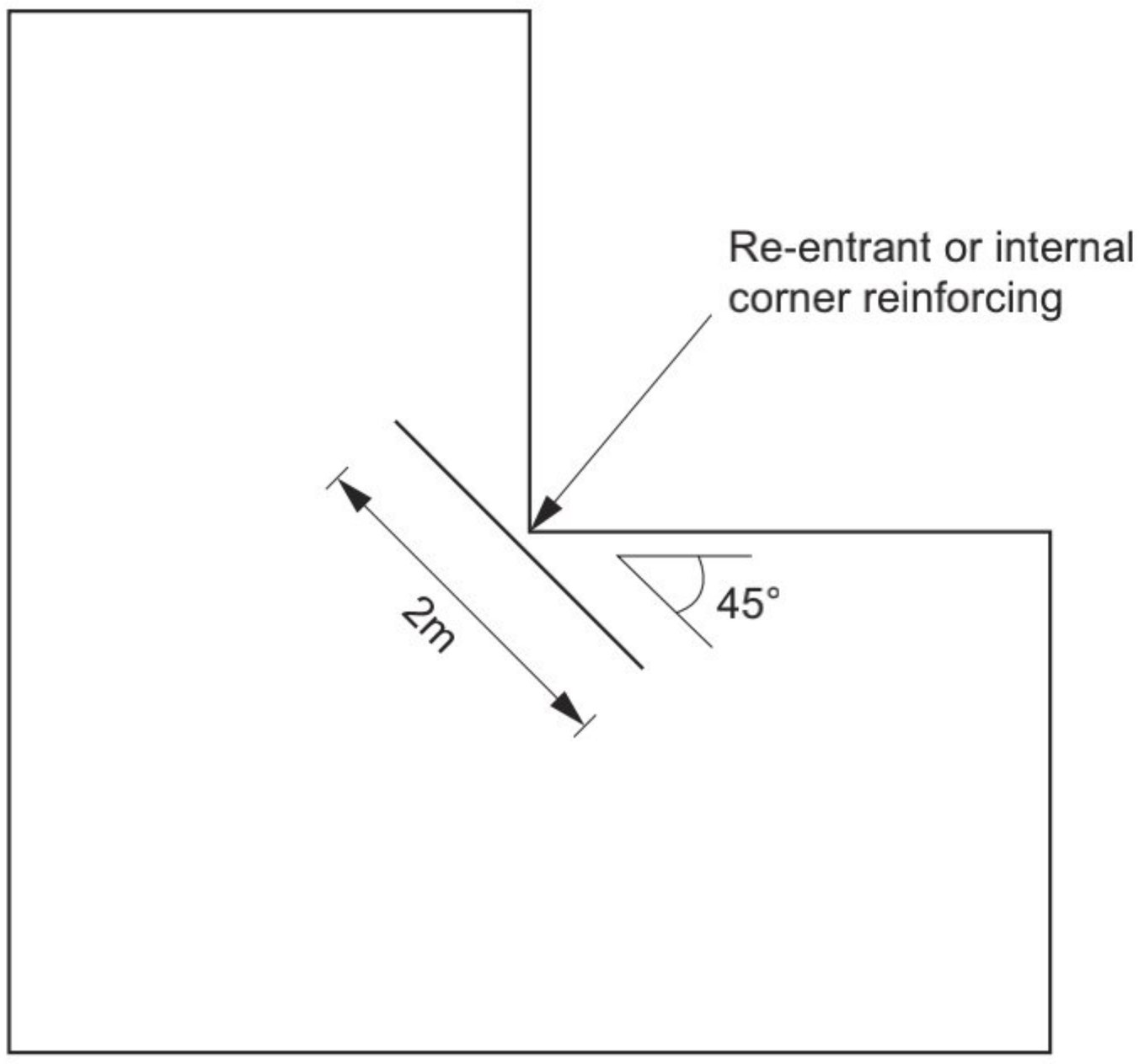


Figure 4.2.11b: Reinforcing for re-entrant corners



Explanatory Information: Reinforcement types

Reinforcement types referenced in this clause are described as follows:

- Square mesh is designated in terms of the diameter of each bar and the spacing of consecutive bars. For example, SL62 consists of 6 mm bar at 200 mm spacings.
- Trench mesh is designated in terms of the number of longitudinal bars and the diameter of each bar. For example, 3-L11TM consists of 3 longitudinal bars each of which are 11 mm in diameter.
- Reinforcing bars are designated in terms of the number of bars and the diameter of each bar. For example, 6-N12 consists of 6 bars each of which are 12 mm in diameter.

Explanatory Information: Cleaning and placement of reinforcing

In order to obtain a good bond between concrete and reinforcement, the reinforcement should be free of contamination by mud, paint, oils, etc. It is not necessary for the reinforcement to be completely free of rust. Some rusting is beneficial in promoting a good bond as it roughens the surface of the steel. Loose rust, however, must be removed from the reinforcement.

Reinforcement is designed to be in a particular place so as to add strength or to control cracking of the concrete. A displacement from its intended location could make a significant difference to the life or serviceability of the structure.

Supports for fabric reinforcement are provided to prevent the fabric distorting when workers walk on top of it to place the concrete and maintain the correct concrete cover to the fabric.

4.2.12 Footing and slab construction

[2019: 3.2.5.1]

Footing and slab construction, including size and placement of reinforcement, must be in accordance with the relevant provisions of—

(a) 4.2.13 for footings for stumps; and

(b) 4.2.14 for stiffened rafts on Class A, S and M *sites*; and

(c) 4.2.15 for strip footing systems on Class A, S and M *sites*; and

(d) 4.2.16 for footing slabs on Class A *sites*; and

(e) 4.2.17 for footings for *single leaf masonry*, *mixed construction* and earth retaining walls; and

(f) 4.2.18 for footings for fireplaces on Class A and S *sites*; and

(g) 4.2.19 for shrinkage control; and

(h) 4.2.20 for concentrated loads; and

(i) 4.2.21 for minimum edge beam dimensions; and

(j) 4.2.22 for recessed areas of slabs.

4.2.13 Stump footing details

[2019: 3.2.5.6]

(1) Footings for stumps must comply with—

(a) the provisions of Tables 4.2.13a, 4.2.13b or 4.2.13c for Class A and Class S *sites*; or

(b) the appropriate referenced document listed in—

(i) H1D6(3); or

(ii) H1D4.

(2) Concrete stumps must—

(a) be designed in accordance with—

(i) AS 3600; or

(ii) Tables 4.2.13d, 4.2.13e or 4.2.13f; and

(b) use a minimum 20 MPa concrete as defined in AS 3600.

(3) Steel stumps must be—

(a) designed in accordance with—

(i) AS 4100; or

(ii) Tables 4.2.13d, 4.2.13e or 4.2.13f; and

(b) fully enclosed and sealed with a welded top plate; and

(c) encased in concrete sloping away from the stump and finishing not less than 100 mm above *finished ground level*; and

(d) corrosion protected in accordance with Part 6.3.

(4) Timber stumps must be designed in accordance with—

(a) AS 1684.2, AS 1684.3, AS 1684.4 or AS 1720.1; or

(b) Tables 4.2.13d, 4.2.13e or 4.2.13f.

(5) Stumps must be braced—

(a) by a full perimeter masonry base; or

(b) for concrete stumps — in accordance with AS 3600; or

(c) for steel stumps — in accordance with AS 4100; or

(d) for timber stumps — in accordance with AS 1684.2, AS 1684.3, AS 1684.4 or AS 1720.1.

(6) Stumps must be embedded into the foundation material not less than 30% of their height above ground level or 450 mm, whichever is the greater.

(7) Pad footings for clad frame, Class A and Class S *sites*, must be in accordance with Table 4.2.13g and Figure 4.2.13.

Table 4.2.13a: Stumps supporting single storey timber floor and metal roof

Floor load area (m^2)	Dimension (mm)	Roof load area (m^2)		
		0	6	12
3	Square pad footing size	250 x 250	300 x 300	350 x 350
8	Square pad footing size	400 x 400	400 x 400	450 x 450
12	Square pad footing size	450 x 450	500 x 500	500 x 500
3	Circular pad footing diameter	300	400	400
8	Circular pad footing diameter	450	450	600
12	Circular pad footing diameter	600	600	600
3	Pad footing depth	250	250	250
8	Pad footing depth	250	250	250
12	Pad footing depth	250	250	250

Table Notes

(1) Load accounted for includes 0.53 kPa permanent floor, 0.92 kN/m permanent wall, 0.4 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) For pad footings founded on rock, the width or diameter may be reduced by half but not less than 250 mm x 250 mm or 300 mm diameter.

(5) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(6) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(7) A roof load area of “0” must be used for stumps not supporting roof loads.

(8) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13b: Stumps supporting single storey tiled floor and tiled roof

Floor load area (m^2)	Dimension (mm)	Roof load area (m^2)		
		0	6	12
3	Square pad footing size	300 x 300	400 x 400	450 x 450
8	Square pad footing size	450 x 450	500 x 500	550 x 500
12	Square pad footing size	500 x 500	550 x 550	600 x 600
3	Circular pad footing diameter	400	450	600
8	Circular pad footing diameter	600	600	650
12	Circular pad footing diameter	650	650	700
3	Pad footing depth	250	250	250
8	Pad footing depth	250	250	250
12	Pad footing depth	250	300	300

Table Notes

(1) Load accounted for includes 0.98 kPa permanent floor, 0.92 kN/m permanent wall, 0.85 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) For pad footings founded on rock, the width or diameter may be reduced by half but not less than 250 mm x 250 mm or 300 mm diameter.

(5) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(6) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(7) A roof load area of "0" must be used for stumps not supporting roof loads.

(8) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13c: Stumps supporting double storey timber floor and metal roof

Floor load area (m^2)	Dimension (mm)	Roof load area (m^2)		
		0	6	12
3	Square pad footing size	350 x 350	400 x 400	450 x 450
8	Square pad footing size	550 x 550	550 x 550	600 x 600
12	Square pad footing size	650 x 650	650 x 650	700 x 700
3	Circular pad footing diameter	400	450	600
8	Circular pad footing diameter	650	650	700
12	Circular pad footing diameter	750	750	800
3	Pad footing depth	250	250	250
8	Pad footing depth	300	300	350

Floor load area (m^2)	Dimension (mm)	Roof load area (m^2)		
		0	6	12
12	Pad footing depth	350	350	350

Table Notes

(1) Load accounted for includes 0.53 kPa permanent floor, 0.92 kN/m permanent wall, 0.4 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) For pad footings founded on rock, the width or diameter may be reduced by half but not less than 250 mm x 250 mm or 300 mm diameter.

(5) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(6) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(7) A roof load area of "0" must be used for stumps not supporting roof loads.

(8) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13d: Maximum stump height (mm): stump supporting single storey timber floor and metal roof

Stump material	Section size (mm)	Floor load area (m^2)	Roof load area (m^2)		
			0	6	12
Concrete f'_c= 20 MPa	100 x 100	3	2500	2000	1750
Concrete f'_c = 20 MPa	100 x 100	8	1500	1500	1500
Concrete f'_c = 20 MPa	100 x 100	12	1250	1250	1250
Steel f_y = 350 MPa	100 x 100 x 2.0	3	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	8	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	12	3000	3000	3000
Timber F17	100 x 100	3	3000	3000	3000
Timber F17	100 x 100	8	2500	2500	2250
Timber F17	100 x 100	12	2250	2000	2000
Timber F14	100 x 100	3	3000	3000	2500
Timber F14	100 x 100	8	2250	2000	1750
Timber F14	100 x 100	12	1750	1500	1500
Timber F11	100 x 100	3	3000	2500	2250
Timber F11	100 x 100	8	2000	1750	1750
Timber F11	100 x 100	12	1500	1500	1250
Timber F8	100 x 100	3	3000	2500	2000
Timber F8	100 x 100	8	1750	1500	1250
Timber F8	100 x 100	12	1250	1000	750
Timber F7	100 x 100	3	2500	2250	1750
Timber F7	100 x 100	8	1500	1250	750
Timber F7	100 x 100	12	750	–	–
Timber F5	100 x 100	3	2500	2000	1500

Stump material	Section size (mm)	Floor load area (m^2)	Roof load area (m^2)		
			0	6	12
Timber F5	100 x 100	8	1250	750	–
Timber F5	100 x 100	12	–	–	–

Table Notes

(1) Load accounted for includes 0.53 kPa permanent floor, 0.92 kN/m permanent wall, 0.4 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(5) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(6) A roof load area of "0" must be used for stumps not supporting roof loads.

(7) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13e: Maximum stump height: stump supporting single storey tiled floor and tiled roof

Stump material	Section size (mm)	Floor load area (m^2)	Roof load area (m^2)		
			0	6	12
Concrete f'_c = 20 MPa	100 x 100	3	2250	1750	1500
Concrete f'_c = 20 MPa	100 x 100	8	1500	1250	1250
Concrete f'_c = 20 MPa	100 x 100	12	1250	1250	750
Steel f_y = 350 MPa	100 x 100 x 2.0	3	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	8	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	12	3000	3000	3000
Timber F17	100 x 100	3	3000	3000	2500
Timber F17	100 x 100	8	2500	2250	2000
Timber F17	100 x 100	12	2000	2000	1750
Timber F14	100 x 100	3	3000	2500	2000
Timber F14	100 x 100	8	2000	1750	1500
Timber F14	100 x 100	12	1500	1250	1000
Timber F11	100 x 100	3	3000	2250	2000
Timber F11	100 x 100	8	1750	1500	1250
Timber F11	100 x 100	12	1250	1000	750
Timber F8	100 x 100	3	2500	2000	1750
Timber F8	100 x 100	8	1500	1250	1000
Timber F8	100 x 100	12	1000	500	–
Timber F7	100 x 100	3	2500	1750	1250
Timber F7	100 x 100	8	1250	750	–
Timber F7	100 x 100	12	–	–	–
Timber F5	100 x 100	3	2250	1500	1000
Timber F5	100 x 100	8	750	–	–

Stump material	Section size (mm)	Floor load area (m^2)	Roof load area (m^2)		
			0	6	12
Timber F5	100 x 100	12	–	–	–

Table Notes

(1) Load accounted for includes 0.98 kPa permanent floor, 0.92 kN/m permanent wall, 0.85 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(5) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(6) A roof load area of "0" must be used for stumps not supporting roof loads.

(7) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13f: Maximum stump height: stump supporting double storey timber floor and metal roof

Stump material	Section size (mm)	Floor load area (m^2)	Roof load area (m^2)		
			0	6	12
Concrete f'_c = 20 MPa	100 x 100	3	1750	1500	1500
Concrete f'_c = 20 MPa	100 x 100	8	1250	1000	750
Concrete f'_c = 20 MPa	100 x 100	12	–	–	–
Steel f_y = 350 MPa	100 x 100 x 2.0	3	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	8	3000	3000	3000
Steel f_y = 350 MPa	100 x 100 x 2.0	12	3000	2750	2500
Timber F17	100 x 100	3	3000	2500	2500
Timber F17	100 x 100	8	1750	1750	1500
Timber F17	100 x 100	12	1250	1250	1250
Timber F14	100 x 100	3	2500	2250	2000
Timber F14	100 x 100	8	1250	1250	1000
Timber F14	100 x 100	12	750	500	500
Timber F11	100 x 100	3	2250	2000	1750
Timber F11	100 x 100	8	1000	1000	750
Timber F11	100 x 100	12	–	–	–
Timber F8	100 x 100	3	2000	1750	1500
Timber F8	100 x 100	8	500	500	–
Timber F8	100 x 100	12	–	–	–
Timber F7	100 x 100	3	1750	1500	1250
Timber F7	100 x 100	8	–	–	–
Timber F7	100 x 100	12	–	–	–
Timber F5	100 x 100	3	1500	1000	750
Timber F5	100 x 100	8	–	–	–
Timber F5	100 x 100	12	–	–	–

Table Notes

(1) Load accounted for includes 0.53 kPa permanent floor, 0.92 kN/m permanent wall, 0.4 kPa permanent roof, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations for ULS included are 1.35G and 1.2G + 1.5Q for stumps and G + 0.5Q for pad footings.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) Stumps are assumed to be braced and simply-supported at both ends with an effective length factor of 1.

(5) A maximum load eccentricity of length/100 has been accounted for in the stumps.

(6) A roof load area of "0" must be used for stumps not supporting roof loads.

(7) The length of wall load allowed for is equal to the square root of the floor area.

Table 4.2.13g: Minimum dimensions of circular and square pad footings for clad frame, Class A and S sites

Effective supported areas (m^2)	Width of square pad (mm)	Width of circular pad (mm)	Thickness (t) (mm)	Depth (mm)
10	400	500	200	400
20	500	600	200	400
30	600	750	250	400

Table Notes

(1) The effective area supported by a pad footing is the sum of—

(a) the supported floor area; and

(b) the supported roof area (if applicable); and

(c) half the supported wall area in elevation (if applicable).

(2) The width or diameter can be reduced to one half the above footings on rock.

(3) The pad footings must be constructed in concrete.

(4) Pad footing sizes must also apply to footings supporting roof and floor loads only.

(5) The *foundation* must provide an allowable bearing pressure of not less than 100 kPa.

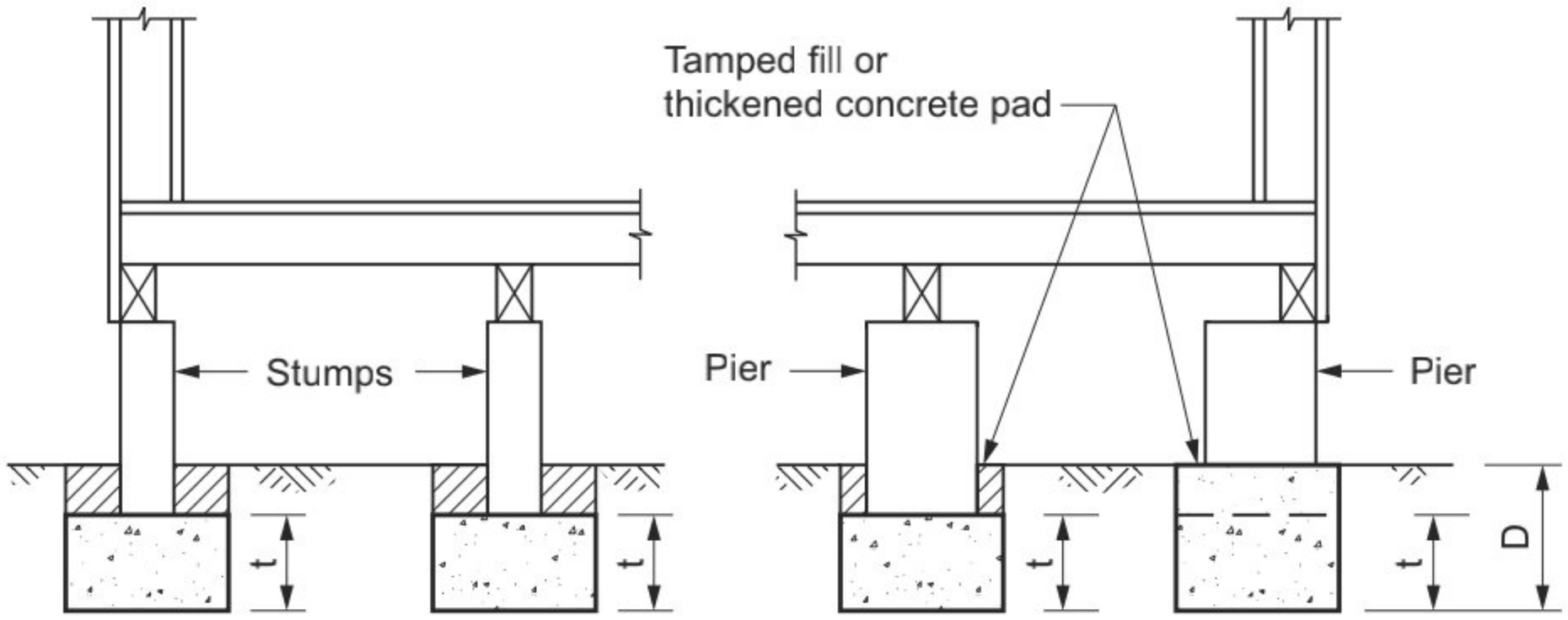
(6) The excavation must be backfilled with manually rodded tamped soil, or the footing thickness shall be increased by 50 mm.

(7) Where stump pad footings provide resistance to horizontal or uplift forces, the minimum size of the footing must comply with AS 2870.

(8) Braced stumps must comply with 4.2.13(5).

(9) For masonry piers, strip footings complying with 4.2.15 for masonry can be used in lieu of pad footings.

Figure 4.2.13: Pad footings for clad frame, Class A and S sites



(a) Stumps **(b) Piers**

Figure Notes

(1) For minimum pad footing dimensions t and D, see Table 4.2.13g.

(2) For tamped fill or thickened concrete pads, see Note 6 to Table 4.2.13g.

4.2.14 Stiffened rafts Class A, S and M sites

[New for 2022]

Footing and stiffened raft slabs must comply with—

(a) For Class A and S *sites* — Tables 4.2.14a, 4.2.14b and Figure 4.2.14a; and

(b) For Class M *sites* — Table 4.2.14c and Figure 4.2.14b.

Table 4.2.14a: Reinforcement for stiffened raft footings for Class A sites

Type of construction	Depth (D) (mm)	Bottom reinf.	Max. spacing c/l to c/l	Slab fabric
Clad frame	300	3-L8TM	N/A	SL72
Articulated masonry veneer	300	3-L8TM	N/A	SL72
Masonry veneer	300	3-L8TM	N/A	SL72
Articulated full masonry	400	3-L8TM	N/A	SL72
Full masonry	400	3-L8TM	N/A	SL72

Table Notes

(1) Internal and external edge beams must be arranged to form an integral structural grid (see clauses 5.3.8 and 5.3.9 of AS 2870).

(2) A 10% increase in spacings is permitted where the spacing in the other direction is 20% less than that specified.

(3) Where external beams are wider than 300 mm, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width.

(4) Where a reinforced *single leaf masonry* wall is constructed directly above and structurally connected to a concrete edge beam, the beam may be reduced to 300 mm wide by 300 mm deep and reinforced with 3–L8TM reinforcement.

(5) Alternative reinforcement sizes must comply with AS 2870.

(6) Internal beam details and spacings must comply with Figure 4.2.14a or Figure 4.2.14b.

Table 4.2.14b: Reinforcement for stiffened raft footings for Class S sites

Type of construction	Depth (D) (mm)	Bottom reinf.	Max. spacing c/l to c/l	Slab fabric
Clad frame	300	3-L8TM	N/A	SL72
Articulated masonry veneer	300	3-L8TM	N/A	SL72
Masonry veneer	300	3-L11TM	N/A	SL72
Articulated full masonry	450	3-L11TM	N/A	SL72
Full masonry	450	3-N16	5.0 (m) Note 2	SL82

Table Notes

(1) Internal and external edge beams must be arranged to form an integral structural grid (see clauses 5.3.8 and 5.3.9 of AS 2870).

(2) A 10% increase in spacings is permitted where the spacing in the other direction is 20% less than that specified.

(3) Where external beams are wider than 300 mm, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width.

(4) Where a reinforced *single leaf masonry* wall is constructed directly above and structurally connected to a concrete edge beam, the beam may be reduced to 300 mm wide by 300 mm deep and reinforced with 3–L8TM reinforcement.

(5) Alternative reinforcement sizes must comply with AS 2870.

(6) Internal beam details and spacings must comply with Figure 4.2.14a or Figure 4.2.14b.

Table 4.2.14c: Reinforcement for stiffened raft footings for Class M sites

Type of construction	Depth (D) (mm)	Bottom reinf.	Max. spacing c/l to c/l	Slab mesh
Clad frame	300	3-L11TM	6.0Note 2	SL72
Articulated masonry veneer	400	3-L11TM	6.0Note 2	SL72
Masonry veneer	400	3-L11TM	5.0Note 2	SL72
Articulated full masonry	500	3-L12TM	4.0	SL82
Full masonry	850	3-N16	4.0	SL92

Table Notes

(1) Internal and external edge beams must be arranged to form an integral structural grid (see clauses 5.3.8 and 5.3.9 of AS 2870).

(2) A 10% increase in spacings is permitted where the spacing in the other direction is 20% less than that specified.

(3) Where external beams are wider than 300 mm, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width.

(4) Where a reinforced *single leaf masonry* wall is constructed directly above and structurally connected to a concrete edge beam, the beam may be reduced to 300 mm wide by 300 mm deep and reinforced with 3–L8TM reinforcement.

(5) Alternative reinforcement sizes must comply with AS 2870.

(6) Internal beam details and spacings must comply with Figure 4.2.14b.

Figure 4.2.14a: Footing slab and stiffened raft slab details for Class A and S sites

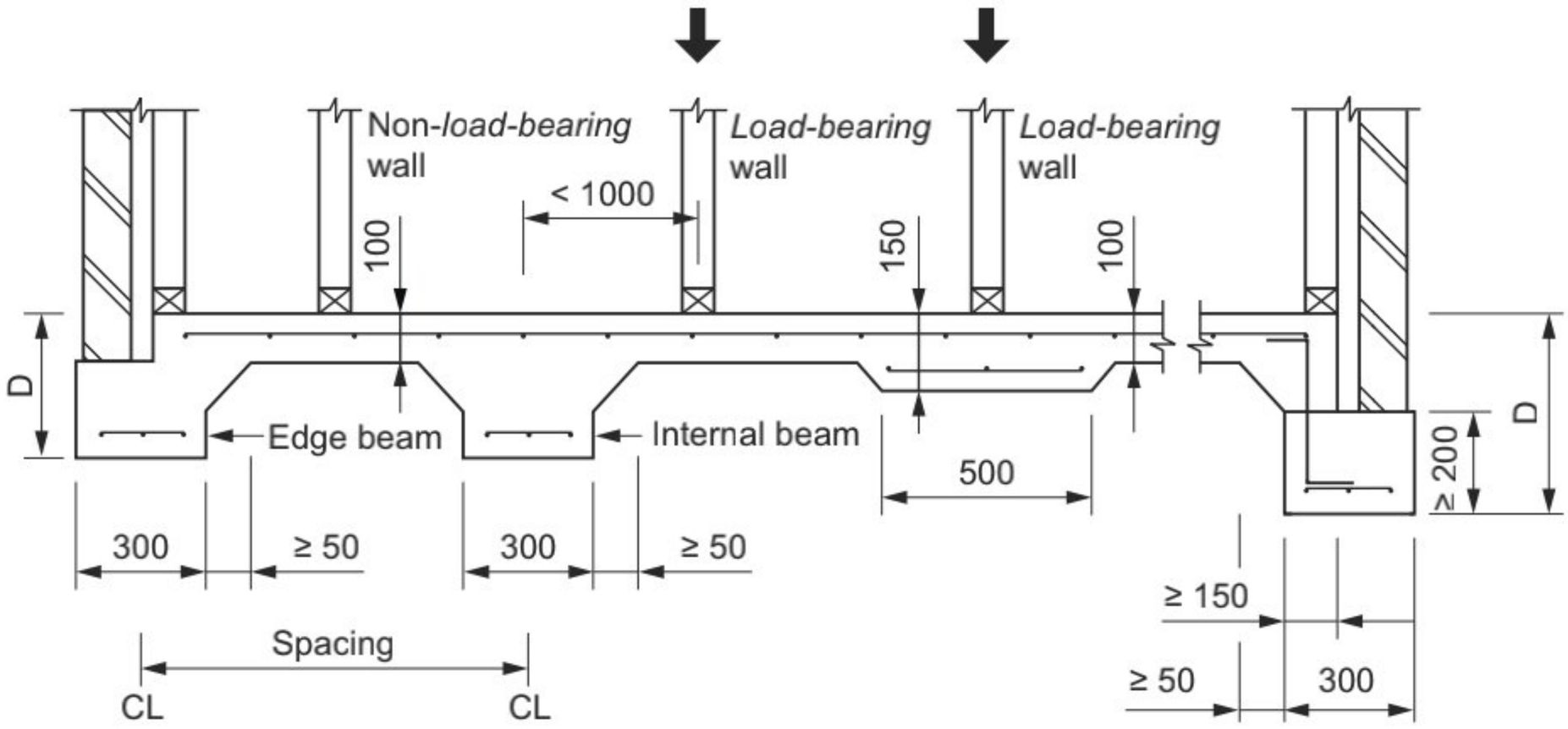
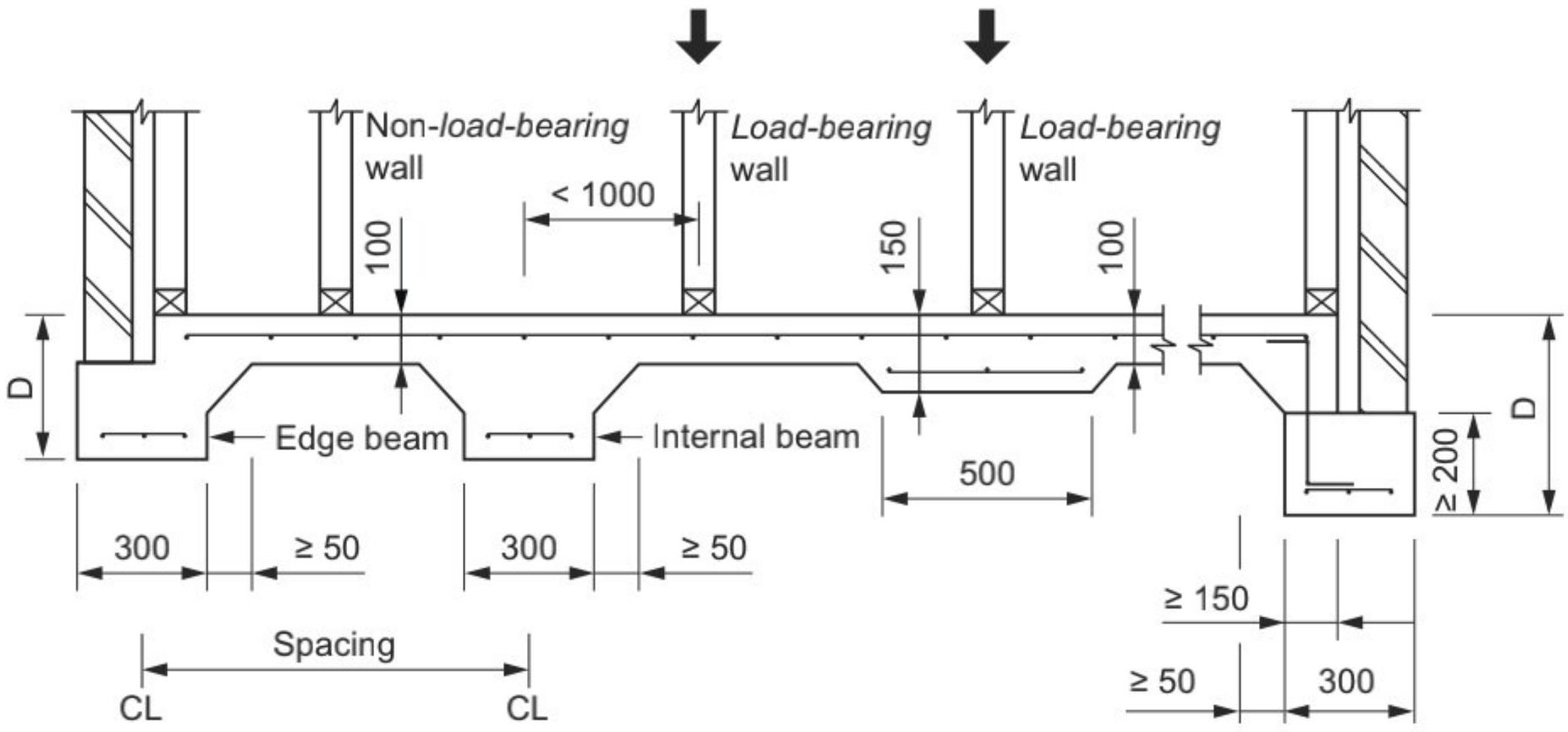


Figure 4.2.14b: Footing slab and stiffened raft slab details for Class M sites



4.2.15 Strip footings Class A, S and M sites

[New for 2022]

Strip footings for Class A, S and M *sites* must comply with—

(a) for Class A and S *sites* — Tables 4.2.15a, 4.2.15b and Figure 4.2.15a; and

(b) for Class M *sites* — Table 4.2.15c and Figure 4.2.15b.

Table 4.2.15a: Dimensions and reinforcement for strip footing systems for Class A sites

Type of construction	D (mm)	B (mm)	Reinforcement (top and bottom)
Clad frame	300	300	3–L8TM
Articulated masonry veneer	300	300	3–L8TM
Masonry veneer	300	300	3–L8TM
Articulated full masonry	300	400	4–L8TM
Full masonry	300	400	4–L8TM

Table Notes

(1) All masonry walls must be supported on strip footings.

(2) Internal strip footings must be of the same proportions as the external footings and run from external footing to external footing. 'Side slip joints' consisting of a double layer of polyethylene must be provided at the sides of the footing only.

(3) Infill floors may be concrete slabs, brick paving, stone flags or compacted and stabilised earth. For concrete slab infill panels, mesh may be required to control shrinkage in slab panels and around openings or restrained regions. Concrete infill slabs must use a minimum of SL62 mesh to control shrinkage (see also 4.2.19).

(4) Where footings are wider than the specified width, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width. If strip footings deeper than those *required* are used, the reinforcement must be increased to match that specified for the deepened proportions.

(5) The measurement of D_f is greater or equal to D plus 75 mm.

(6) Alternative reinforcing sizes must comply with AS 2870.

Table 4.2.15b: Dimensions and reinforcement for strip footing systems for Class S sites

Type of construction	D (mm)	B (mm)	Reinforcement (top and bottom)
Clad frame	400	300	3–L8TM
Articulated masonry veneer	400	300	3–L8TM
Masonry veneer	400	300	3–L8TM
Articulated full masonry	400	400	4–L11TM
Full masonry	500	400	4–L11TM

Table Notes

(1) All masonry walls must be supported on strip footings.

(2) Internal strip footings must be of the same proportions as the external footings and run from external footing to external footing. 'Side slip joints' consisting of a double layer of polyethylene must be provided at the sides of the footing only.

(3) Infill floors may be concrete slabs, brick paving, stone flags or compacted and stabilised earth. For concrete slab infill panels, mesh may be *required* to control shrinkage in slab panels and around openings or restrained regions. Concrete infill slabs must use a minimum of SL62 mesh to control shrinkage (see also 4.2.19).

(4) Where footings are wider than the specified width, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width. If strip footings deeper than those *required* are used, the reinforcement must be increased to match that specified for the deepened proportions.

(5) The measurement of D_f is greater or equal to D plus 75 mm.

(6) Alternative reinforcing sizes must comply with AS 2870.

Table 4.2.15c: Dimensions and reinforcement for strip footing systems for Class M sites

Type of construction	D (mm)	B (mm)	Reinforcement (top and bottom)
Clad frame	400	300	3-L11TM
Articulated masonry veneer	450	300	3-L11TM
Masonry veneer	500	300	3-L12TM
Articulated full masonry	600	400	4-L12TM
Full masonry	900 Note 2	400	4-L12TM

Table Notes

(1) All masonry walls must be supported on strip footings.

(2) For beams 700 mm or deeper, as specified in the table above, internal footings must be provided at no more than

6 m centres and at re-entrant corners to continue footings to the opposite external footing. Internal strip footings must be of the same proportions as the external footings and run from external footing to external footing. 'Side slip joints' consisting of a double layer of polyethylene must be provided at the sides of the footing only.

(3) Infill floors must only be used for Class A and S sites.

(4) Where footings are wider than the specified width, an extra bottom bar or equivalent of the same bar size is *required* for each 100 mm additional width. If strip footings deeper than those *required* are used, the reinforcement must be increased to match that specified for the deepened proportions.

(5) The measurement of D_f is greater or equal to D plus 75 mm.

(6) Alternative reinforcing sizes must comply with AS 2870.

(7) For Class M articulated full masonry and full masonry, internal strip footings must be of the same proportions as the external footing and run from external footing to external footing.

Figure 4.2.15a: Strip footing systems for Class A and S sites

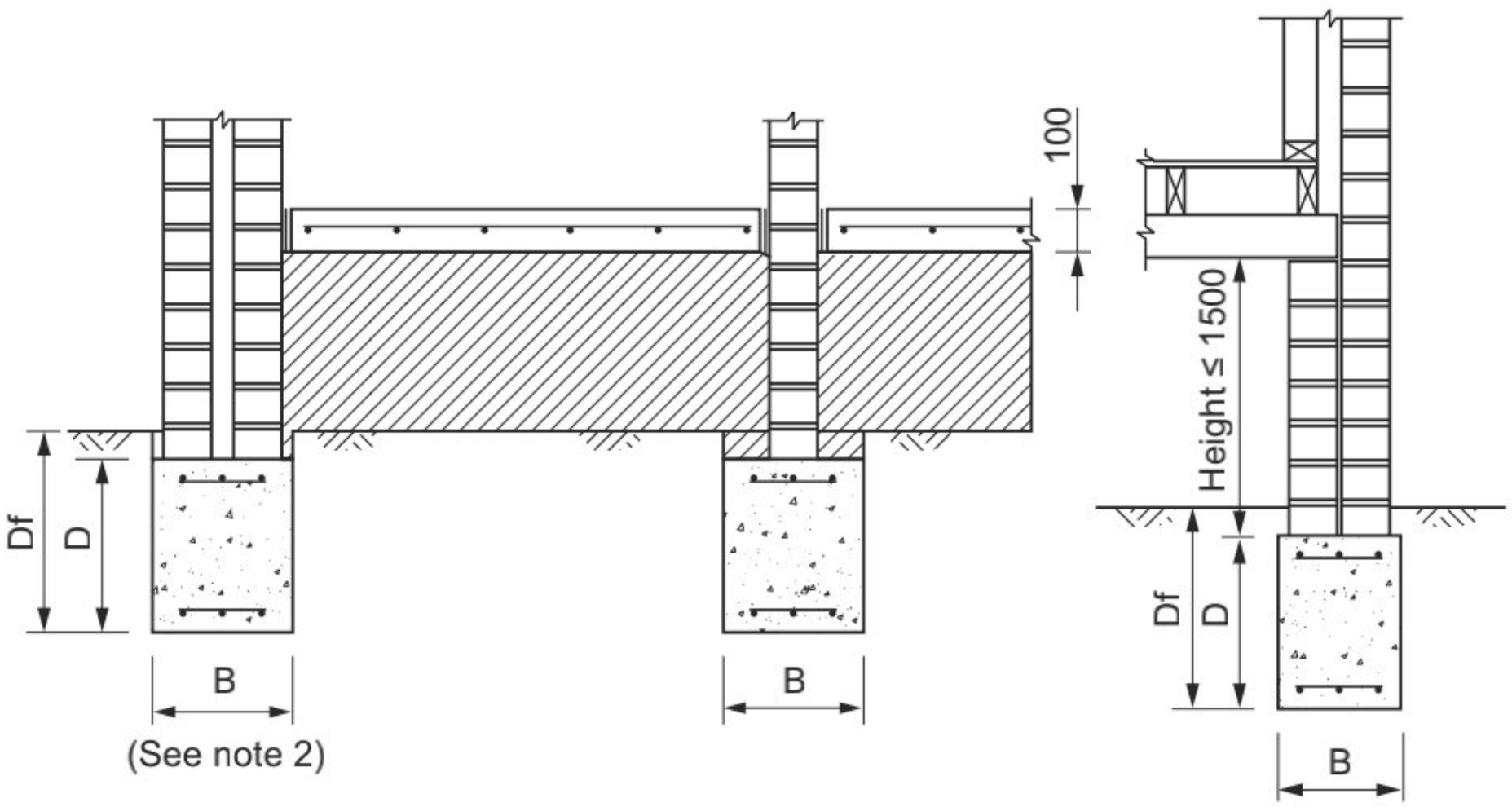


Figure Notes

See Notes to Tables 4.2.15a and 4.2.15b.

Figure 4.2.15b: Strip footing system for Class M sites

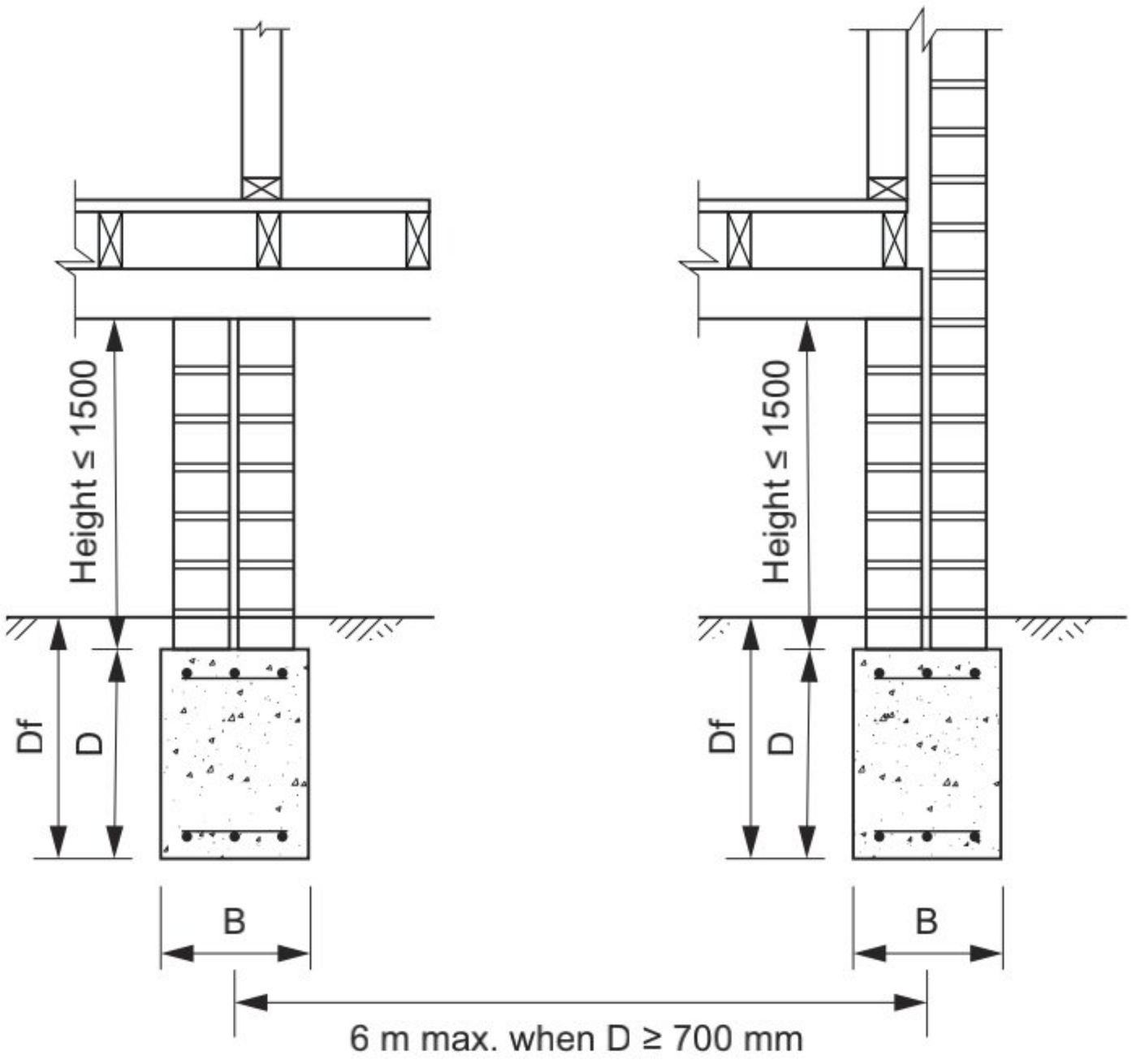


Figure Notes

See Notes Tables 4.2.15a, 4.2.15b and 4.2.15c.

4.2.16 Footing slabs for Class A sites

[New for 2022]

Footing slabs for Class A *sites* supporting the following *external wall* types must comply with Figure 4.2.16:

(a) *Clad frame*.

(b) *Articulated masonry*.

(c) Masonry veneer.

(d) Articulated full masonry.

(e) Full masonry.

Figure 4.2.16: Footing slabs for Class A sites suitable for clad frame, articulated masonry veneer, masonry veneer, articulated full masonry and full masonry

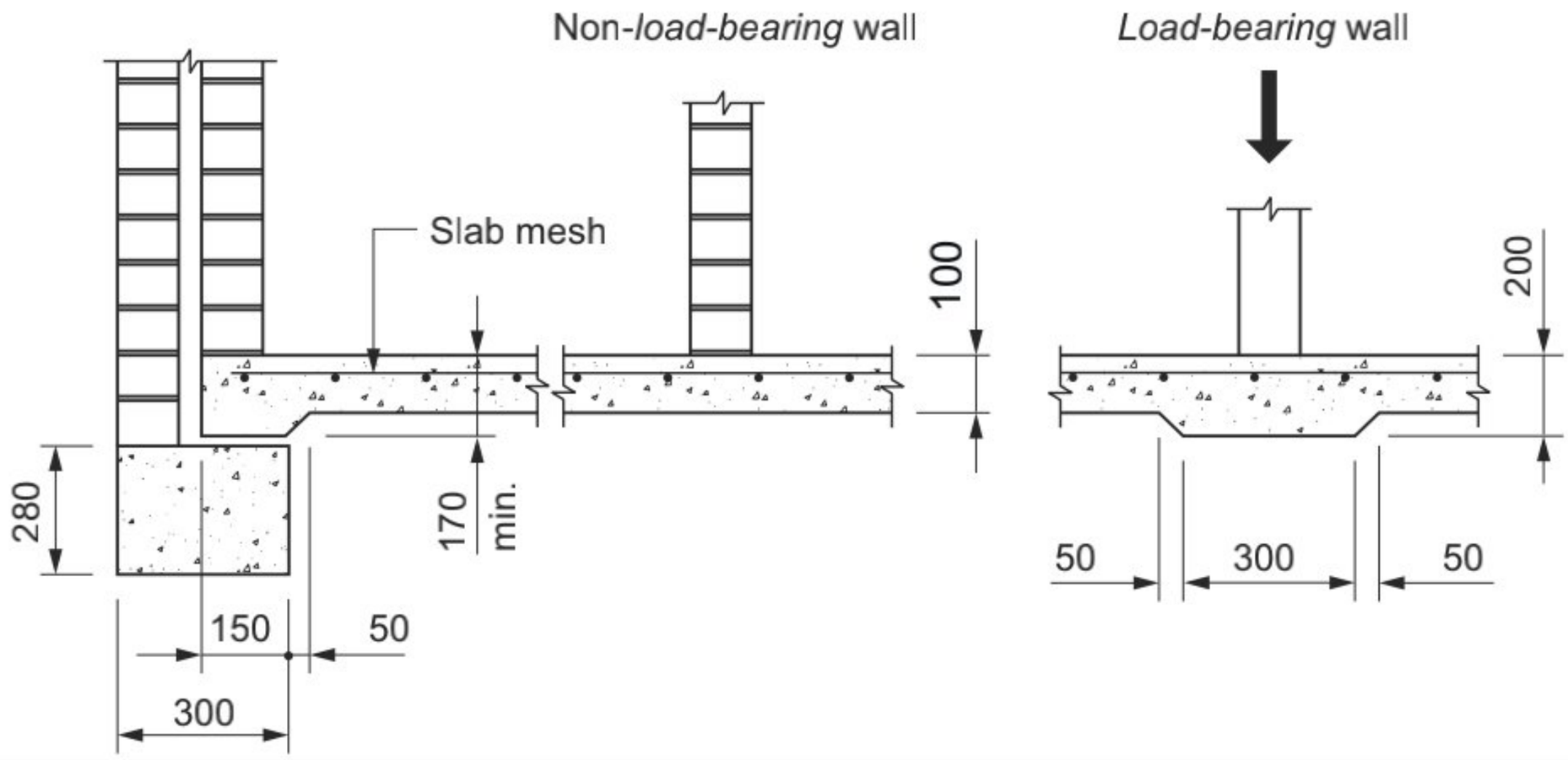


Figure Notes

(1) Use SL63 when slab length is less than 12 m.

(2) Use SL62 when slab length is less than 18 m.

(3) In parts of Western Australia (around Perth) and other locations where the *site* consists of extremely stable sands, and where specified by a *professional engineer*, the slab thickness may be reduced to 85 mm and reinforced as follows:

(a) Use SL53 when slab length is less than or equal to 12 m.

(4) Dune sands may require compaction.

4.2.17 Footings for single leaf masonry, mixed construction and earth wall construction

[2019: 3.2.5.2]

Footings supporting the following *external wall* types must comply with the equivalent wall construction set out in Tables 4.2.17a, 4.2.17b and 4.2.17c:

(a) *Single leaf masonry*.

(b) *Mixed construction*.

(c) Earth wall structures.

Table 4.2.17a: Equivalent wall construction: single leaf masonry

Actual construction: *external walls*	Actual construction: *internal walls*	Equivalent wall construction
Reinforced *single leaf masonry*	*Articulated masonry* on Class A and Class S *sites*, or framed	*Articulated masonry* veneer
Reinforced *single leaf masonry*	*Articulated masonry* or reinforced *single leaf masonry*	Masonry veneer
Articulated *single leaf masonry*	*Articulated masonry*	Articulated full masonry

Table 4.2.17b: Equivalent wall construction: mixed construction

Actual construction: *external walls*	Actual construction: *internal walls*	Equivalent wall construction
Full masonry	Framed	Articulated full masonry

Actual construction: *external walls*	Actual construction: *internal walls*	Equivalent wall construction
Articulated full masonry	Framed	Masonry veneer

Table 4.2.17c: Equivalent wall construction: earth wall construction

Actual construction: *external walls*	Actual construction: *internal walls*	Equivalent wall construction
Infill panels of earth wall construction	Framed earth wall construction	*Articulated masonry* veneer
Loadbearing earth wall construction	*Loadbearing* earth wall construction	Articulated full masonry

Explanatory Information

Tables 4.2.17a, 4.2.17b and 4.2.17c provide solutions for footings that are equivalent to those supporting a wall type that may be different to the actual type included in design documentation. The equivalent wall construction in the right-hand column of each of these tables recognises the types of footing systems suitable to support the actual *external wall* and *internal wall* types that may not have a specific solution for supporting footings.

4.2.18 Footings for fireplaces on Class A and S sites

[2019: 3.2.5.5]

(1) Fireplaces on Class A and S *sites* must be supported on a pad footing—

(a) 150 mm thick for single storey (one trafficable floor and a wall height not more than 4.2 m) construction; and

(b) 200 mm thick for 2 storey (two trafficable floors and a wall height not more than 8 m) construction; and

(c) reinforced top and bottom with SL72 mesh; and

(d) extending 300 mm past the edges of the masonry except for any edge flush with the outer wall.

(2) The pad footing must form an integral part of the slab.

4.2.19 Shrinkage control

[2019: 3.2.5.3]

Where brittle floor coverings, such as ceramic tiles, are to be used over an area greater than 16 m^2, one of the following additional measures must be taken to control the effect of shrinkage cracking—

(a) the amount of shrinkage reinforcement (steel reinforcement mesh in the slab panel) must be—

(i) increased to SL92 or equivalent throughout the affected slab area; or

(ii) reinforced top and bottom with sheets of slab mesh throughout the affected slab area; or

(b) the bedding system for brittle coverings must be selected on the basis of the expected slab movement and the characteristics of the floor covering (including the use of expansion joints etc.); or

(c) the placement of floor covering must be delayed for not less than 3 months after the concrete has been poured.

4.2.20 Concentrated loads

[New for 2022]

Where a footing or slab supports a concentrated load from a structural steel column, localised thickening must—

(a) be provided in accordance with—

(i) for tiled floor and tiled roof, Tables 4.2.20a, 4.2.20b or 4.2.20c; or

(ii) for timber floor and metal roof, Tables 4.2.20d, 4.2.20e or 4.2.20f; and

(b) be centred under the structural steel column; and

(c) have SL72 reinforcement with a minimum 50 mm of concrete cover (see Figure 4.2.20).

Table 4.2.20a: Localised thickening under concentrated load — tiled floor and tiled roof — roof load area = 0 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	450 x 450	650 x 650	850 x 850
Thickening depth (mm)	250	350	400

Table Notes

(1) Load accounted for includes 0.98 kPa permanent tiled floor, 0.85 kPa permanent tiled roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 100 kPa for pad footings.

(4) A roof load area of "0" must be used for footings not supporting roof loads.

(5) The length of wall allowed for is equal to the square root of the floor area.

Table 4.2.20b: Localised thickening under concentrated load — tiled floor and tiled roof — roof load area = maximum 9 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	650 x 650	800 x 800	950 x 950
Thickening depth (mm)	350	400	450

Table Notes

(1) Load accounted for includes 0.98 kPa permanent tiled floor, 0.85 kPa permanent tiled roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 1000 kPa for pad footings.

(4) The length of wall allowed for is equal to the square root of the floor area.

Table 4.2.20c: Localised thickening under concentrated load — tiled floor and tiled roof — roof load area = maximum 18 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	750 x 750	900 x 900	1000 x 1000
Thickening depth (mm)	400	450	500

Table Notes

(1) Load accounted for includes 0.98 kPa permanent tiled floor, 0.85 kPa permanent tiled roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 1000 kPa for pad footings.

(4) The length of wall allowed for is equal to the square root of the floor area.

Table 4.2.20d: Localised thickening under concentrated load — timber floor and metal roof — roof load area = 0 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	400 x 400	600 x 600	750 x 750
Thickening depth (mm)	250	300	350

Table Notes

(1) Load accounted for includes 0.53 kPa permanent timber floor, 0.4 kPa permanent metal roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 1000 kPa for pad footings.

(4) A roof load area of "0" must be used for footings not supporting roof loads.

(5) The length of wall allowed for is equal to the square root of the floor area.

Table 4.2.20e: Localised thickening under concentrated load — timber floor and metal roof — roof load area = maximum 9 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	500 x 500	700 x 700	800 x 800
Thickening depth (mm)	300	350	400

Table Notes

(1) Load accounted for includes 0.53 kPa permanent timber floor, 0.4 kPa permanent metal roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 1000 kPa for pad footings.

(4) The length of wall allowed for is equal to the square root of the floor area.

Table 4.2.20f: Localised thickening under concentrated load — timber floor and metal roof — roof load area = maximum 18 m²

Localised thickening	Maximum floor load area (m²)		
	4	10	16
Square thickening size (mm)	600 x 600	750 x 750	850 x 850
Thickening depth (mm)	300	400	450

Table Notes

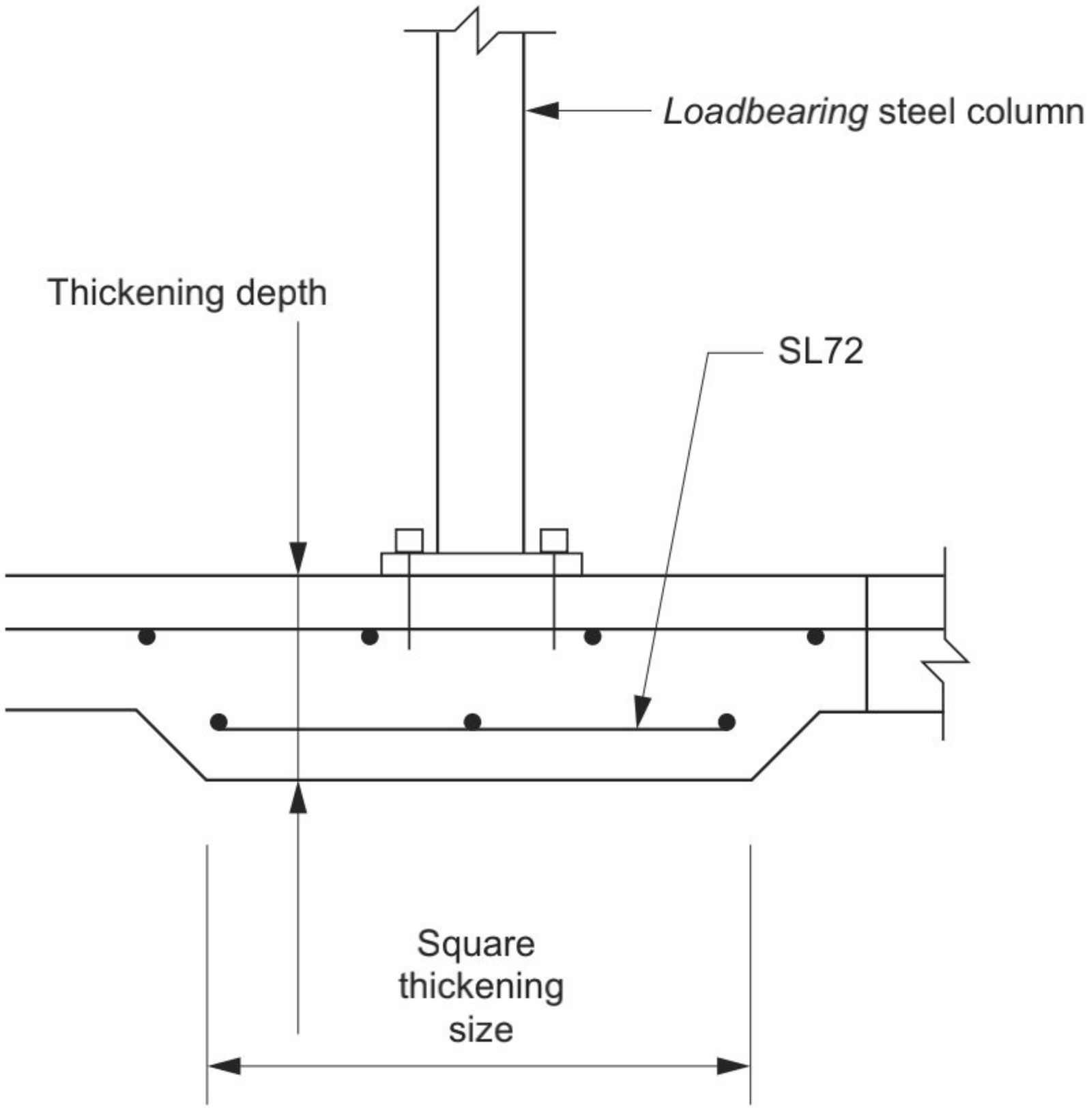
(1) Load accounted for includes 0.53 kPa permanent timber floor, 0.4 kPa permanent metal roof, 1.16 kN/m permanent wall, permanent member self-weight, 1.5 kPa or 1.1 kN imposed floor and 0.25 kPa imposed roof.

(2) Load combinations included are G + 0.5Q for ULS.

(3) Minimum bearing pressure is 1000 kPa for pad footings.

(4) The length of wall allowed for is equal to the square root of the floor area.

Figure 4.2.20: Localised thickening for concentrated loads



4.2.21 Minimum edge beam dimensions

[2019: 3.2.5.4]

For footing slabs, the width of the edge beam at the base of the rebate must not be less than 200 mm, except that if R10 or N10 ties at 900 mm spacing (or equivalent) are provided to resist vertical forces, the width of the edge beam at the base of the rebate can be reduced to 150 mm.

4.2.22 Recessed areas of slabs

[New for 2022]

(1) Where a recess in a slab is provided, it must comply with one of the following:

(a) For recess depths less than or equal to half the nominal slab thickness, the reinforcing mesh must have a minimum lap length of 400 mm measured from the inside face of the recess (see Figure 4.2.22a).

(b) For recess depths greater than half the nominal slab thickness (see Figure 4.2.22b)—

(i) top reinforcing mesh must overlap the bottom reinforcing mesh by not less than 400 mm; and

(ii) bottom reinforcing mesh must be two layers of SL72.

(2) Concrete cover to reinforcing in (1)(a) and (b) must comply with 4.2.11(5).

Figure 4.2.22a: Recess depths (d) less than or equal to nominal slab thickness

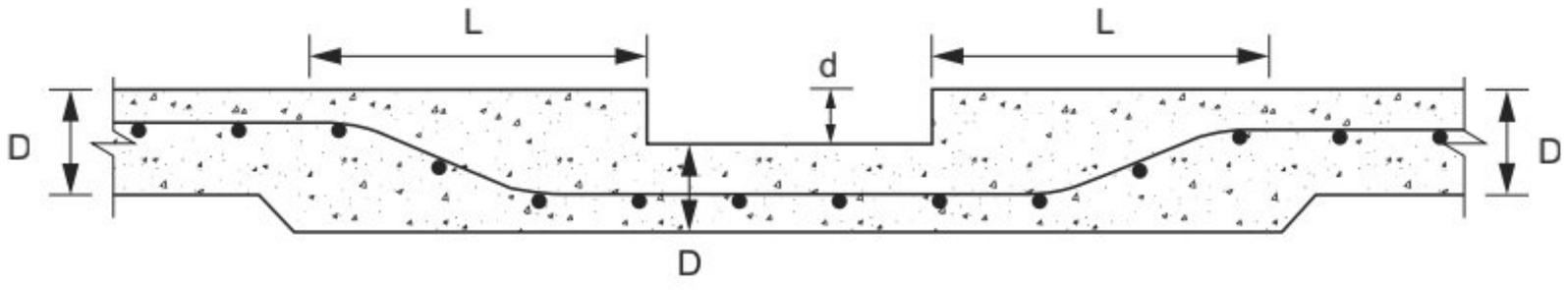
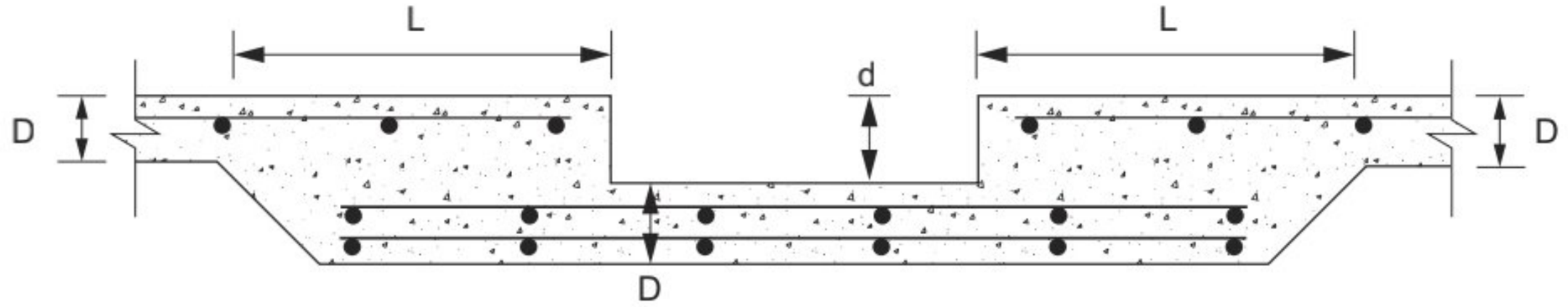


Figure 4.2.22b: Recess depths (d) greater than nominal slab thickness



5 Masonry

Part 5.7 Weatherproofing of masonry

Part 5.1 Scope and application of Section 5

5.1.1 Scope

[New for 2022]

(1) This Section sets out the *Deemed-to-Satisfy Provisions* for—

(a) masonry veneer — see Part 5.2; and

(b) *cavity* masonry — see Part 5.3; and

(c) single leaf *unreinforced masonry* — see Part 5.4; and

(d) isolated masonry piers — see Part 5.5; and

(e) masonry components and accessories — see Part 5.6; and

(f) weatherproofing of masonry — see Part 5.7.

(2) For other masonry provisions not included in this Section, refer to NCC Volume Two: H1D5(4) *Reinforced masonry*.

5.1.2 Application

[New for 2022]

The application of this Section is subject to the following:

(a) The Governing Requirements of NCC 2022 Volume Two.

(b) Any conditions set out within the following *Deemed-to-Satisfy Provisions* of NCC Volume Two:

(i) H1D5(1), for masonry veneer.

(ii) H1D5(2), for *cavity* masonry.

(iii) H1D5(3), for *unreinforced masonry*.

(iv) H1D5(5), for isolated masonry piers.

(v) H1D5(6), for masonry accessories.

(vi) H2D4(2)(c), for weatherproofing of masonry.

(c) 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 5 of the ABCB Housing Provisions (other than content added in NCC 2022 or later) was contained in the acceptable construction practices for Parts 3.3.5 and 3.3.6 of NCC 2019 Volume Two.

NCC 2019 Volume Two did not include an acceptable construction practice for Parts 3.3.1, 3.3.2, 3.3.3 or 3.3.4.

Part 5.2 Masonry veneer

5.2.1 Application

[New for 2022]

(1) Part 5.2 is subject to the limitations set out in H1D5(1)(c).

(2) Part 5.2 need not be complied with if H1D5(1)(a) or (b) are complied with.

5.2.2 Height of wall limitation

[2019: 3.3.5.2]

Masonry veneer walls must not be greater than 8.5 m in height when measured above the adjacent finished ground level.

5.2.3 Openings in masonry veneer

[2019: 3.3.5.11]

(1) Except where excluded by (2), openings in masonry veneer must be spanned by steel lintels.

(2) Openings in masonry veneer not more than 500 mm wide need not be provided with a steel lintel provided the opening is adequately supported.

5.2.4 Damp-proof courses and flashing materials

[New for 2022]

Damp-proof courses and *flashing* materials must be in accordance with 5.7.3 and 5.7.4.

5.2.5 Vertical articulation joints

[New for 2022]

Vertical articulation joints are to be installed in accordance with 5.6.8.

5.2.6 Engaged piers

[2019: 3.3.5.14]

Where *engaged piers* are installed to support subfloor framing, they must comply with the provisions of this Part and be constructed as follows:

(a) Footings for piers must comply with Section 4.

(b) *Engaged piers* must not support more than a single storey with a roof framing span of not more than 12 m.

(c) Piers must be spaced at not more than 3 m centres with floor framing complying with—

  (i) H1D6(3) for steel framing; and

  (ii) H1D6(4) for timber framing; and

  (iii) H1D6(5) for structural steel framing.

(d) Piers must be—

  (i) not more than 1.2 m high; and

  (ii) a minimum thickness of 100 mm inclusive of mortar; and

  (iii) a width greater than the depth of the timber or steel section which it is supporting (see Figure 5.2.6).

(e) Notwithstanding (c), *engaged piers* must be located beneath—

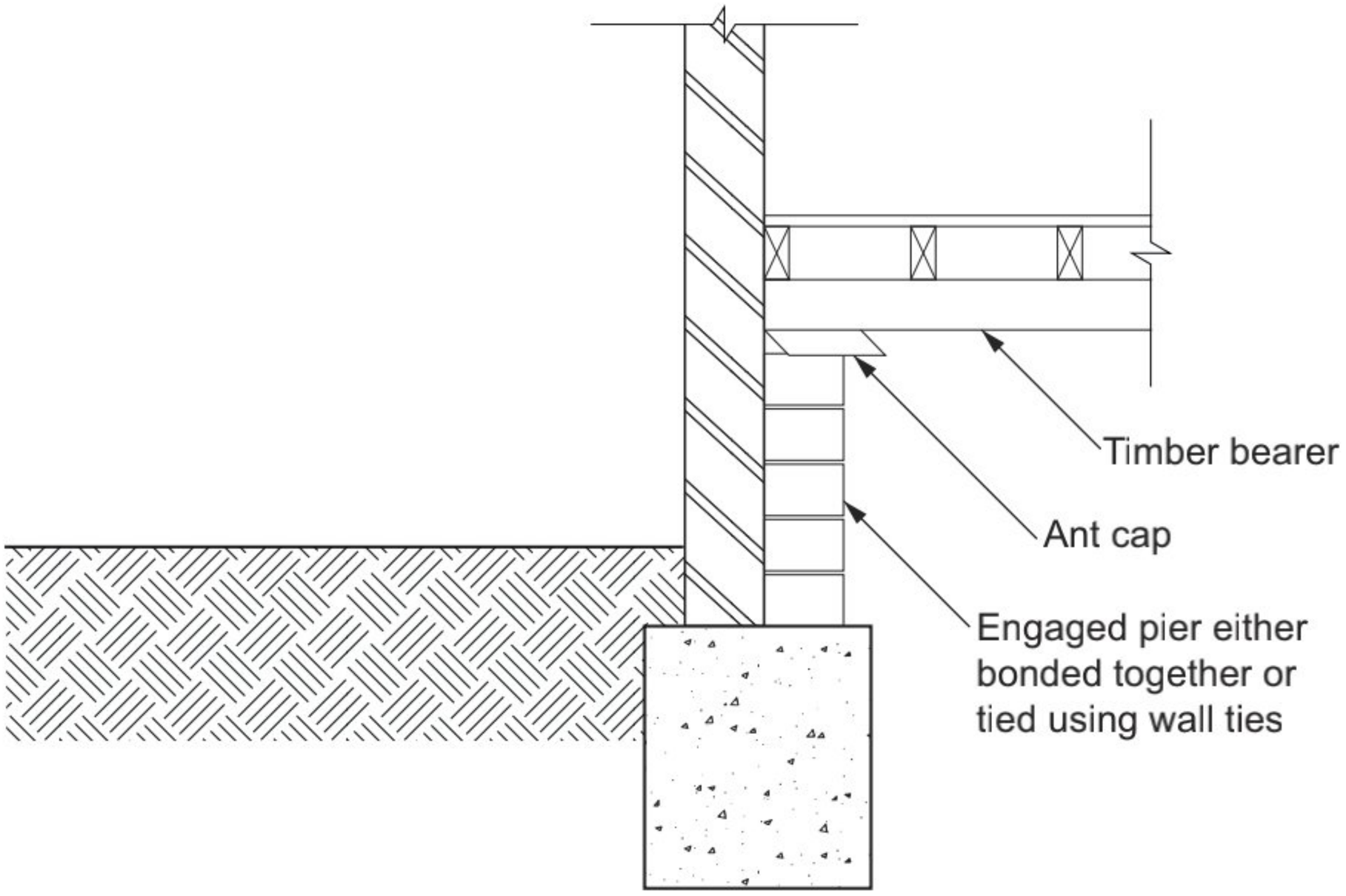
(i) each side of *window* and door openings; and

(ii) concentrated roof loads, inclusive of any roof beams and girder trusses.

(f) Piers must be tied or bonded to the external masonry wall, and where ties are used they must comply with 5.6.5.

(g) Piers formed from hollow-core masonry units must be filled with grout.

Figure 5.2.6: Engaged pier



Part 5.3 Cavity masonry

5.3.1 Application

[New for 2022]

(1) Part 5.3 applies subject to the limitations set out in H1D5(2)(c).

(2) Part 5.3 need not be complied with if H1D5(2)(a) or (b) are complied with.

5.3.2 Height of wall limitation

[New for 2022]

Cavity masonry walls must not be greater than 8.5 m in height when measured above the adjacent *finished ground level*.

5.3.3 External walls

[New for 2022]

(1) *Cavity* masonry walls must comply with the relevant provisions of this Part and Parts 5.6 and 5.7, and be constructed as follows:

(a) The height of the wall between *lateral supports* (floor or ceiling or roof diaphragm) must be not more than 3 m.

(b) *Cavity* masonry walls subject to wind loads must be supported by masonry cross walls or by steel mullions complying with (3).

(c) Masonry cross walls must be—

(i) not less than 2 m in length; and

(ii) at not more than 5.1 m centres where the length of the *cavity* wall being supported does not contain any opening or control joint; and

(iii) not more than 2.5 m from the edge of a control joint in the length of the *cavity* wall being supported; and

(iv) not more than a distance from the edge of an opening in the length of the *cavity* wall being supported as stated in Table 5.3.3; and

(v) located at both edges of openings of width greater than 2.7 m; and

(vi) directly connected to the internal leaf of the *cavity* wall being supported using—

(A) properly bonded units with at least 90 mm engagement on each side of the interface with the selected bond pattern but not less than every fourth course of masonry; or

(B) medium duty Type A *cavity* wall ties in aligning mortar bed joints at a vertical spacing of not more than 300 mm; and

(vii) connected by a floor or ceiling diaphragm to the wall being supported where floor or ceiling connections are designed in accordance with AS/NZS 4600, AS 1720.1 or AS 3600, as appropriate.

(2) *Cavity* masonry walls must be constructed of two leaves, with each leaf not less than 90 mm wide.

(3) In *cavity* masonry construction, a *cavity* must be provided between the inner and outer masonry leaves as follows:

(a) The *cavity* must be not less than 35 mm and not more than 75 mm in width, in accordance with 5.7.2.

(b) Except for steel mullions, the minimum *cavity* width specified in (a) is to be maintained between the outer masonry leaf and any insulation or services located in the *cavity*.

(c) Where steel mullions are located in a *cavity* as permitted by (b), a vertical *damp-proof course* must be placed between the outer masonry leaf and the mullion to prevent moisture penetration.

Table 5.3.3: Spacing of return walls for cavity walls with openings — distance from the edge of an opening (mm)

Wind class	Opening width (mm)			
	900	1500	2100	2700
N3	2100	1800	800	400
N2	3200	2900	2600	2300
N1	2500(Note)	2200(Note)	1900(Note)	800(Note)

Table Notes

The spacing in wind class N1 is smaller than for N2 because 5.6.5 states that for *cavity* walls in wind class N1, light duty *cavity* ties are to be used. This results in only relying on one leaf to resist the load instead of sharing it equally as per clause 7.7.3 of AS 3700.

Explanatory Information

Steel mullions complying with AS 4773.1 and 4773.2 used to support wind loads may be placed within a *cavity*. Flat ceiling capable of performing diaphragm action may act as *lateral support* to walls provided the structure has been specifically designed.

5.3.4 Internal walls

[New for 2022]

(1) Where internal masonry walls intersect with other internal or external walls they must comply with the relevant provisions of this Part and be—

(a) not less than 75 mm thick; and

(b) either—

(i) bonded at the junctions of the intersecting walls; or

(ii) provided with an articulation joint in accordance with 5.6.8.

(2) Where a vertical articulation joint is provided in an internal masonry wall it must be formed in accordance with 5.6.8.

5.3.5 Openings in cavity masonry

[New for 2022]

(1) Except where excluded by (2), openings in *cavity* masonry must be spanned by steel lintels in accordance with 5.6.7.

(2) Openings in *cavity* masonry not more than 500 mm wide need not be provided with a steel lintel provided the opening is adequately supported.

Explanatory Information

An opening of not more than 500 mm is considered to be adequately supported if the masonry bears directly on a timber window head or steel frame.

5.3.6 Damp-proof courses and flashing materials

[New for 2022]

Damp-proof courses and *flashing* must be provided in accordance with 5.7.3 and 5.7.4.

5.3.7 Vertical articulation joints

[New for 2022]

Vertical articulation joints are to be installed in accordance with 5.6.8.

Part 5.4 Unreinforced single leaf masonry

5.4.1 Application of Part 5.4

[New for 2022]

(1) Part 5.4 applies subject to the limitations set out in H1D5(3)(c).

(2) Part 5.4 need not be complied with if H1D5(3)(a) or (b) are complied with.

5.4.2 External walls

[New for 2022]

(1) Single leaf *unreinforced masonry* walls with *engaged piers* and return walls must comply with the relevant provisions of this Part and be constructed in accordance with the following:

(a) The roof frame must be connected continuously to the top of the wall (see Figure 5.4.2a).

(b) *Stack bonded piers* must have wall ties at every fourth course.

(c) Pier and return supports size limitations for—

(i) single leaf *unreinforced masonry* walls with *engaged piers*, must comply with Table 5.4.2a and Figure 5.4.2b; and

(ii) single leaf *unreinforced masonry* walls with return supports, must comply with Table 5.4.2b and Figure 5.4.2c.

(d) An *engaged pier* or return wall must be provided at both sides of an opening.

(e) The width of an opening must be not more than the spacing between the *engaged piers* unless the *engaged piers* either side of the opening are designed in accordance with AS 3700.

(f) Articulation joints must be located within 300 mm of vertical supports in accordance with 5.6.8.

(2) A Class 10a building containing not more than 1 storey may be enclosed with single leaf masonry *external walls* not less than 90 mm in thickness, provided that—

(a) the building measured in the direction of the span of the roof is not more than 9 m and the height is not more than 2.7m; and

(b) *engaged piers* are provided that are in accordance with Tables 5.4.2c and 5.4.2d; and

(c) the roof does not place any spreading thrust onto the *external walls*; and

(d) the Class 10a building is located in an area with a wind class of not more than N2.

Table 5.4.2a: Engaged piers in external single leaf masonry walls to AS 3700

Element	Symbol used in Figure 5.4.2b	Thickness of wall (T)	
		90	110
Pier size (minimum) (not more than N2)	A x B	290 x 190 (800 spacing)	350 x 230 (1150 spacing)
Pier size (minimum) (not more than N3)	A x B	290 x 290 (700 spacing)	350 x 350 (1050 spacing)
Spacing of returns (maximum)	S	700	1050
Height (maximum)	H	2400	2700

Table Notes

(1) Dimensions are in mm.

(2) Return supports are not *required* for 140 mm and 190 mm thick walls.

Table 5.4.2b: Return support limitations for external single leaf masonry walls to AS 3700

Element	Symbol used in Figure 5.4.2c	Thickness of wall (T)			
		90	110	140	190
Return length (minimum)	R	450	450	–	–
Spacing of returns (maximum) (N2)	S	1050	1300	–	–
Spacing of returns (maximum) (N3)	S	600	750	–	–
Height (maximum)	H	2400	2400	1700 (N2)	2300 (N2)

Table Notes

(1) Dimensions are in mm.

(2) Return supports are not *required* for 140 mm and 190 mm thick walls.

Table 5.4.2c: Engaged piers in external walls of Class 10a buildings — wall height: 2.4 m

Wall thickness (mm)	Pier thickness (mm)	Pier width (mm)	Spacing (mm) for wind class	
			N1	N2
90	190	290	1000	600
90	290	190	1700	1200
90	290	290	2600	1800
110	230	230	1320	840
110	230	350	2040	1320
110	350	230	3240	2160
110	350	350	4920	3360

Table 5.4.2d: Engaged piers in external walls of Class 10a building — wall height: 2.7 m

Wall thickness (mm)	Pier thickness (mm)	Pier width (mm)	Spacing (mm) for wind class	
			N1	N2
90	190	290	700	500
90	290	190	1300	900
90	290	290	2000	1400
110	230	230	960	600
110	230	350	1440	960
110	350	230	2520	1680
110	350	350	3840	2520

Figure 5.4.2a: Top lateral restraint detail for unreinforced single leaf masonry walls

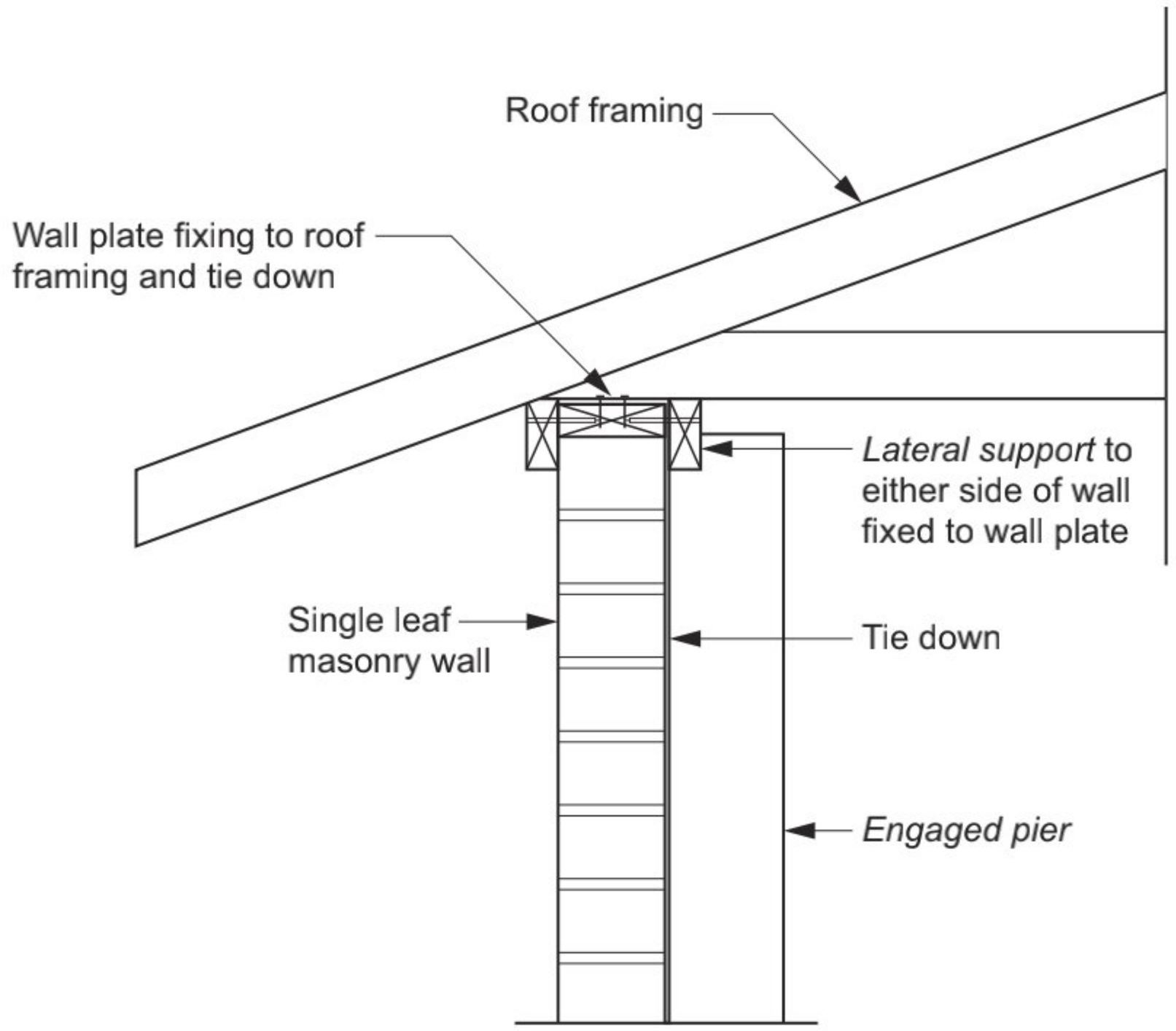


Figure Notes

Tie down of wall must comply with 5.6.6.

Figure 5.4.2b: Engaged piers in external single leaf masonry walls to AS 3700

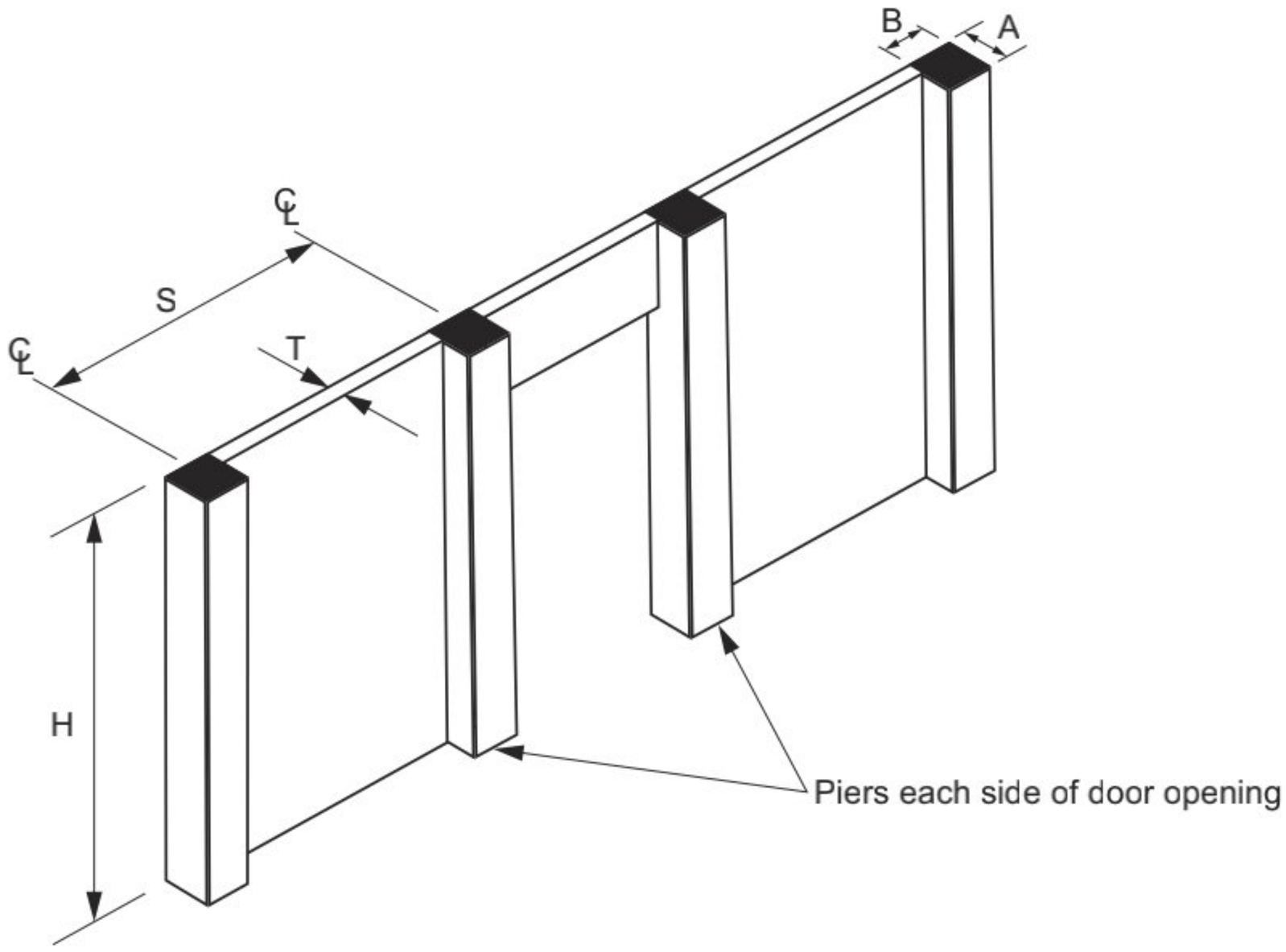
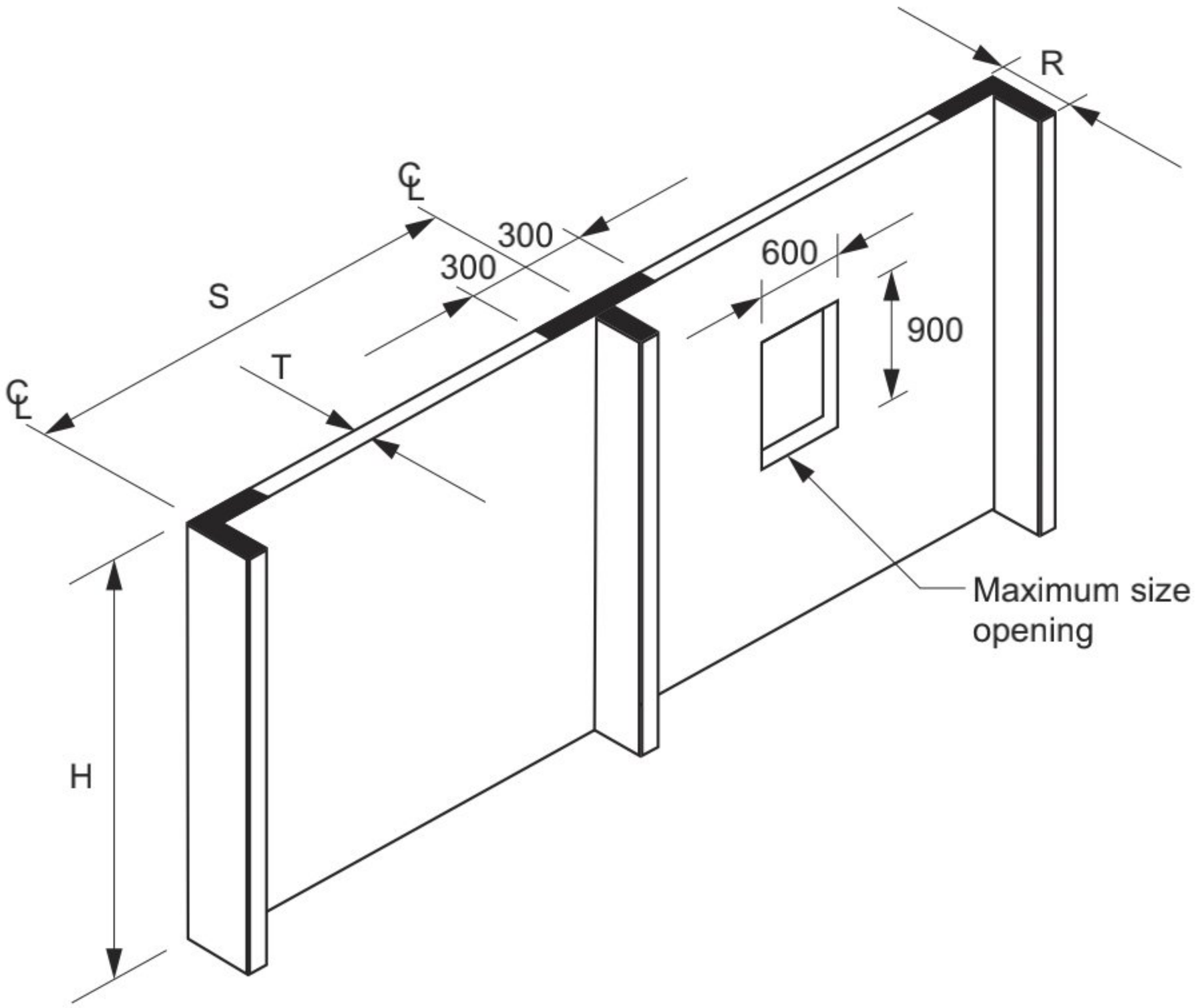


Figure 5.4.2c: Return support limitations for external single leaf masonry walls to AS 3700



5.4.3 Internal walls

[New for 2022]

Internal masonry walls must be engaged with other walls, must comply with the relevant provisions of this Part and must be—

(a) not less than 75 mm thick; and

(b) supported by either—

(i) the ceiling structure in accordance with Figure 5.4.3a; or

(ii) return walls in accordance with Figure 5.4.3b.

Figure 5.4.3a: Support for internal walls—supported by ceiling structure

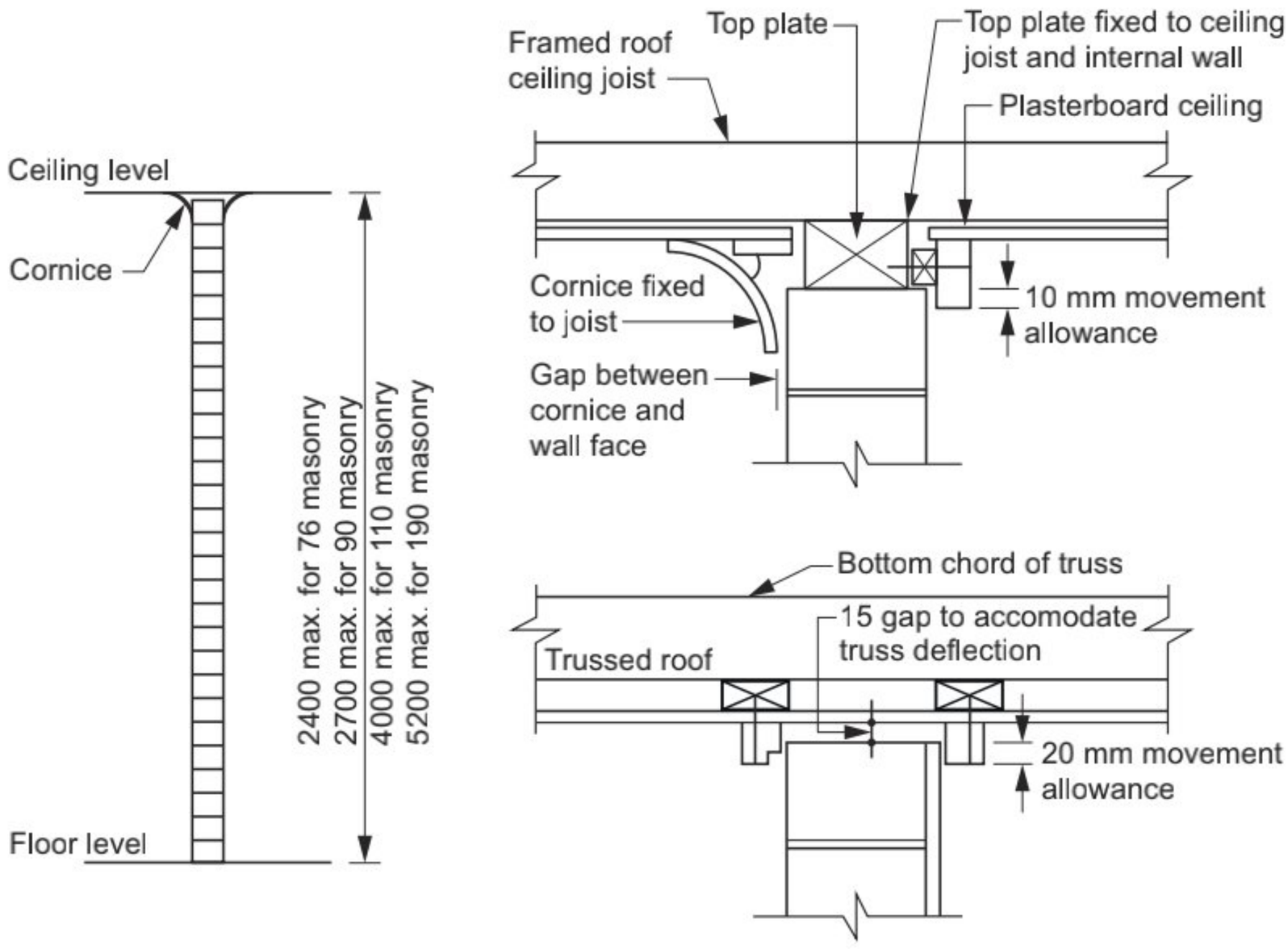


Figure Notes

(1) Timber joist must be fixed to top plate in accordance with H1D6(4).

(2) Fixing of top plate to masonry wall must be in accordance with 5.6.6.

Figure 5.4.3b: Support for internal walls—supported by return walls

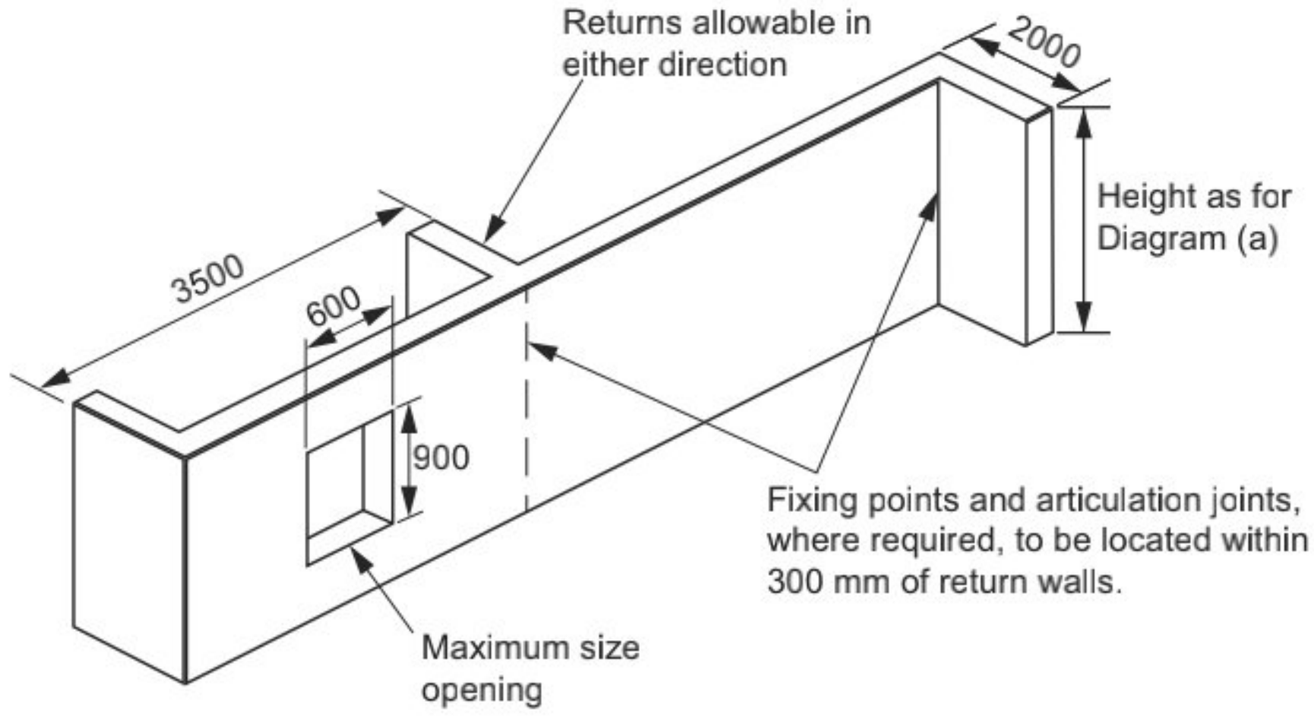


Figure Notes

(1) An opening of not more than 600 mm x 900 mm is allowed to internal walls without additional support.

(2) Openings larger than as described in Note 1 and door openings must be supported.

(3) The maximum allowable height for the wall is described in Figure 5.4.3a.

(4) Articulation joints must be in accordance with 5.6.8.

Explanatory Information

A full height door frame or stud fastened at the roof framing and tied to the wall at 300 mm centres can be considered equivalent to a return wall.

5.4.4 Vertical articulation joints

[New for 2022]

Vertical articulation joints must be provided in accordance with 5.6.8.

5.4.5 Damp-proof courses and flashing materials

[New for 2022]

Where required, *damp-proof courses* and *flashing* must be provided in accordance with 5.7.3 and 5.7.4.

Part 5.5 Isolated piers

5.5.1 Application

[New for 2022]

(1) Part 5.5 is subject to the limitations set out in H1D5(5)(c).

(2) Part 5.5 need not be complied with if H1D5(5)(a) or (b) are complied with.

5.5.2 Isolated piers supporting carports, verandahs, porches and similar roof structures

[2019: 3.3.6.2]

Isolated piers supporting carports, verandahs, porches and similar roof structures, or vehicle access door openings, which form part of the main roof, or are attached to a wall of a Class 1 building must—

(a) be not less than 290 x 290 mm in section; and

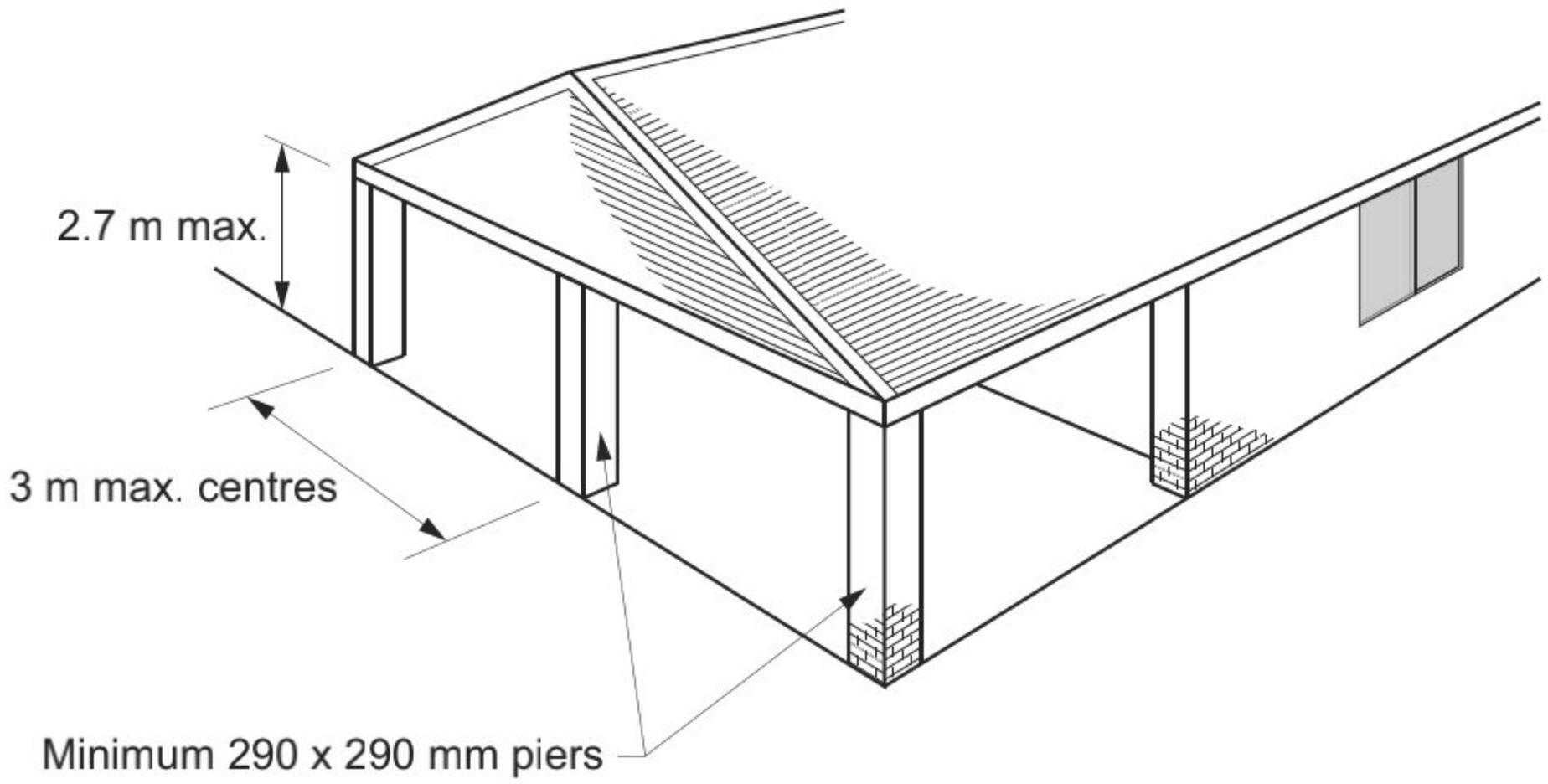
(b) be not more than 2.7 m high (see Figure 5.5.2); and

(c) be spaced at not more than 3 m centres (see Figure 5.5.2); and

(d) provide a bearing length of not less than 150 mm for any supported members; and

(e) comply with the relevant provisions of this Part.

Figure 5.5.2: Piers under main roof



5.5.3 Isolated piers supporting tiled roofs

[2019: 3.3.6.3]

Isolated piers supporting tiled roofs must have—

(a) a built-in 30 x 0.8 mm galvanised steel strap fixed to the roof structure that extends the full height of the pier; and

(b) a 4.6 grade M12 galvanised steel rod which is cast into the footing when poured and looped and fixed around the galvanised steel strap *required* by (a).

5.5.4 Isolated piers supporting sheet roofs

[2019: 3.3.6.4]

Isolated piers supporting sheet roofs must have—

(a) a built-in 30 x 0.8 mm galvanised steel strap fixed to the roof structure extending the full height of the pier which is looped and fixed around a 4.6 grade 16 mm diameter galvanised steel rod cast into the footing when poured; or

(b) a 4.6 grade M16 galvanised steel rod cast into the footing, threaded at the top and extending the full height of the pier to connect to the roof structure.

5.5.5 Isolated piers for freestanding carports

[2019: 3.3.6.5]

Piers for freestanding carports must—

(a) be not less than 290 x 290 mm in section with the central core filled with 20 MPa concrete, or an exposure class mortar (see Table 5.6.3) complying with 5.6.3; and

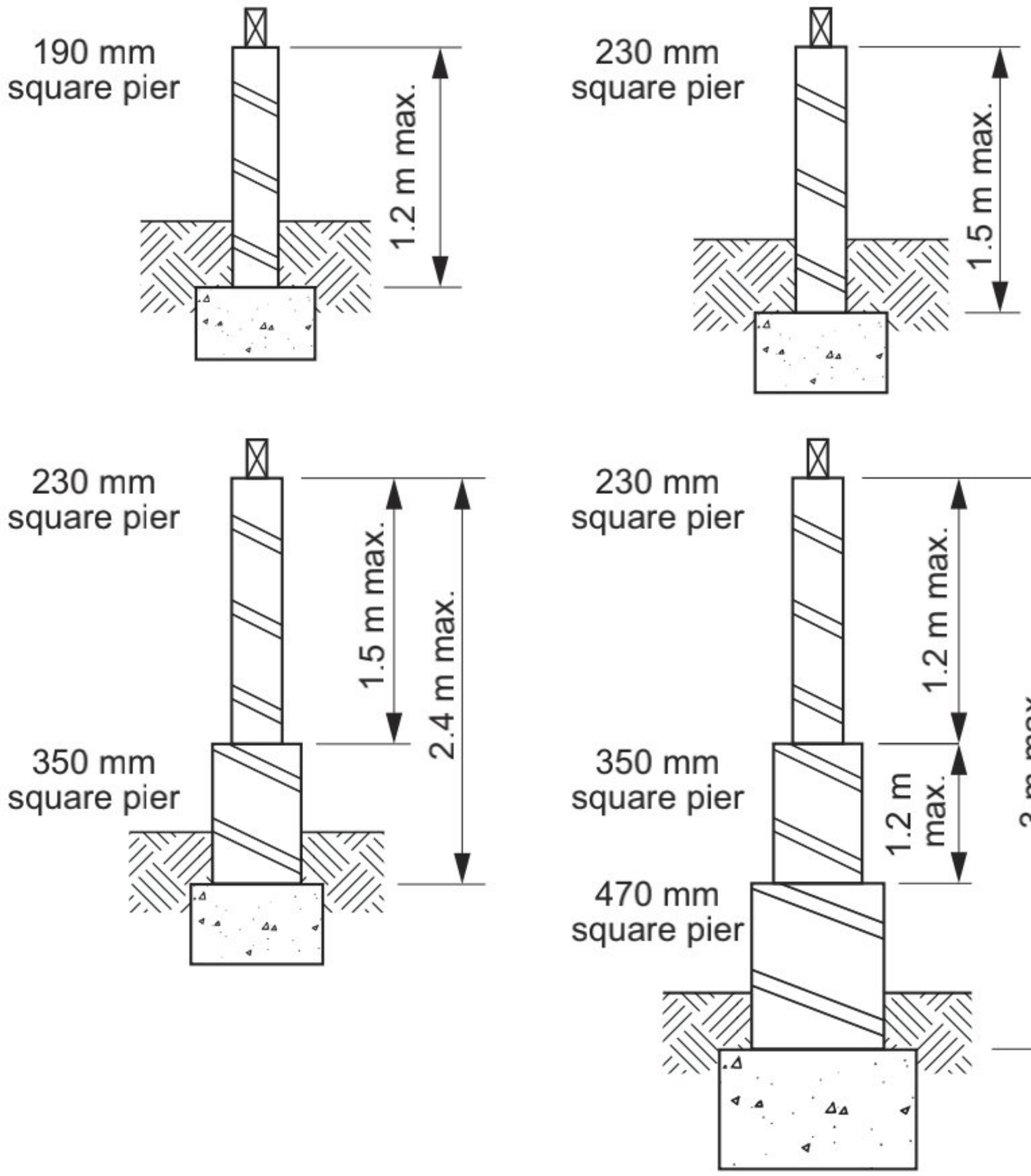
(b) have the core reinforced with one Y16 steel reinforcing rod cast into the footing and extending the full height of the pier to connect to the roof structure.

5.5.6 Subfloor isolated piers

[2019: 3.3.6.6]

Subfloor isolated piers must be not less than 190 x 190 mm in section and comply with Figure 5.5.6 for height requirements.

Figure 5.5.6: Sub-floor isolated piers — maximum height and sectional details



Part 5.6 Masonry components and accessories

5.6.1 Application

[New for 2022]

(1) Part 5.6 is subject to the limitations set out in H1D5(6)(c)(i), (ii) and (iii).

(2) Part 5.6 need not be complied with if H1D5(6)(a) or (b) are complied with.

5.6.2 Masonry units

[2019: 3.3.5.3]

(1) Masonry veneer masonry units must have a minimum compressive strength of—

(a) 3 MPa for solid or cored units; or

(b) 10 MPa for hollow units.

(2) *Cavity* masonry and single skin masonry units must have a minimum compressive strength of—

(a) 5 MPa for solid or cored units; or

(b) 10 MPa for hollow units.

(3) Masonry *cavity* walls must have a minimum leaf thickness of 90 mm.

(4) Subject to (5), masonry units must be—

(a) either clay or calcium silicate brick or concrete brick or block; and

(b) classified and used in the exposure conditions appropriate to their classification as described in (6).

(5) Mixing of panels consisting of clay masonry units with panels consisting of concrete or calcium silicate masonry units is not permitted unless—

(a) at vertical junctions, a control joint is installed; and

(b) at horizontal junctions between panels of different materials, a slip joint using a membrane similar to that used for *damp-proof courses* is installed.

(6) Masonry unit exposure classifications and corresponding masonry unit applications are as follows:

(a) Protected (P) masonry units are suitable for use in locations such as—

(i) internal walls; and

(ii) *external walls* that are coated or rendered; and

(iii) walls above *damp-proof courses* provided the wall is protected at the top by a roof, eaves, coping, topping or the like.

(b) General Purpose (GP) masonry units are suitable for use in all locations except those where 'Exposure class' (Exp) is *required*.

(c) Exposure class (Exp) masonry units are suitable for use in all locations including severe local conditions such as—

(i) below the *damp-proof course* in areas where walls are expected to be attacked by salts in the ground water or masonry itself (salt attack or salt damp); and

(ii) on sea fronts where walls are exposed to attack from salt spray; and

(iii) in heavily polluted areas subject to deposition of atmospheric pollution; and

(iv) under regular cyclic freeze and thaw conditions.

Explanatory Information

The exposure classification or durability of a masonry unit is a measure of its resistance to attack by soluble salts, either

in the ground or in the atmosphere. All masonry products manufactured are classified by their durability. The majority of uses will require either an Exposure class (Exp) product or a General Purpose (GP) product.

5.6.3 Mortar mixes

[2019: 3.3.5.4]

Mortar used for masonry construction must comply with AS 3700 or AS 4773 except that the mortar may be mixed by volume in the proportions stated in Table 5.6.3.

Table 5.6.3: Acceptable mortar mixes

Masonry unit exposure classification	Mortar mix by volume Note 1 Cement: lime: sand	
	General use	Suitable for concrete masonry Note 2
Protected	1:2:9	1:0:5
General purpose	1:1:6	1:0:5
Exposure class	1:0.5:4.5	1:0:4.2

Table Notes

(1) Additives may be used provided they comply with the appropriate specified rate.

(2) Mortar mixes for masonry require the use of methyl cellulose water thickener.

5.6.4 Mortar joints

[2019: 3.3.5.5]

(1) Unless otherwise specified, masonry bed and perpend joints must have a nominal thickness of 10 mm.

(2) Raked joints are not to be used in saline environments or areas subject to heavy industrial airborne pollution.

(3) Where raked joints are used the depth of raking must not be—

  (a) closer than 5 mm to any perforation in cored unit masonry or 20 mm in hollow unit masonry; or

  (b) more than 5 mm for masonry units at least 90 mm wide; or

  (c) more than 10 mm for masonry units at least 110 mm wide.

5.6.5 Wall ties

[2019: 3.3.5.10]

Masonry wall ties must—

(a) comply with AS 2699.1 and—

  (i) for masonry veneer walls be—

    (A) a minimum of light duty veneer ties in areas where the *design wind speed* is not more than N2; and

    (B) a minimum of medium duty veneer ties in areas where the *design wind speed* is more than N2; and

  (ii) for *cavity* masonry walls be—

    (A) a minimum of light duty *cavity* ties in areas where the *design wind speed* is N1; and

    (B) a minimum of medium duty *cavity* ties in areas where the *design wind speed* is more than N1; and

  (iii) where non-*engaged piers* are provided, piers must be tied to walls using medium duty ties; and

  (iv) for monolithic or solid masonry construction be a minimum of medium duty ties; and

(b) be spaced and fixed in accordance with Tables 5.6.5a, 5.6.5b and 5.6.5c (see also Figures 5.6.5a and 5.6.5b); and

(c) be protected against corrosion in accordance with Table 5.6.5d.

Table 5.6.5a: Wall tie spacings in masonry veneer

Direction	Wall tie spacing	
	450 mm wall stud spacing	600 mm wall stud spacing
Horizontal	Maximum 450 mm	Maximum 600 mm
Vertical	Maximum 600 mm	Maximum 400 mm

Table Notes

Wall ties that are suitable for higher duties are also suitable for use in lower duty conditions.

Table 5.6.5b: Wall tie spacing in cavity and solid masonry

Direction	Wall tie spacing (maximum)	
	Cavity masonry	Solid or monolithic masonry
Horizontal	600 mm	400 mm
Vertical	600 mm	400 mm

Table Notes

Wall ties that are suitable for higher duties are also suitable for use in lower duty conditions.

Table 5.6.5c: Placement of wall ties

Location	Placement of wall ties
Unsupported panel sides and edges of openings	Within 300 mm of panel side or edge
Top of veneer panels and top of panels under openings	Within 300 mm or two courses (whichever is the lesser) of the top of veneer
Bottom of veneer panel in masonry rebate sealed with liquid applied *damp-proof course*	Within 300 mm or two courses (whichever is the lesser) from the bottom of the veneer
Bottom of veneer panel supported on steel lintel	
Bottom of veneer panel in masonry rebate with membrane *damp-proof course*	In each of the first two courses
Intersection of *internal walls* and *external walls*	350 mm vertically or 3-4 courses
Where articulation joints occur	At both sides of the articulation joint within 300 mm from the joint
Engaged piers	Within 200 mm of the top of the pier

Table Notes

(1) Ties to be embedded a minimum of 50 mm into each masonry leaf.

(2) Masonry wall ties must be installed in such a manner as to prevent moisture travelling along the tie to the inner leaf of masonry or the frame.

Table 5.6.5d: Corrosion protection for wall ties

Exposure condition	Tie specification (minimum corrosion protection)
Areas less than 1km from *breaking surf*; or less than 100 m from salt water not subject to *breaking surf*; or within heavy industrial areas.	Grade 316L stainless steel; or engineered polymer complying with the requirements of AS 2699.1.
Areas 1km or more but less than 10km from *breaking surf*; or 100m or more but less than 1km from salt water not subject to *breaking surf*.	Sheet steel and bar ties galvanised after manufacture - 470 g/m^2 on each side; or galvanised wire ties - 470 g/m^2 coating mass; or Grade 304L stainless steel.
All other areas	Galvanised sheet steel - 300 g/m^2 coating on each side; or sheet steel ties galvanised after manufacture - 300 g/m^2 on each side.

Figure 5.6.5a: Wall tie details (lowset)

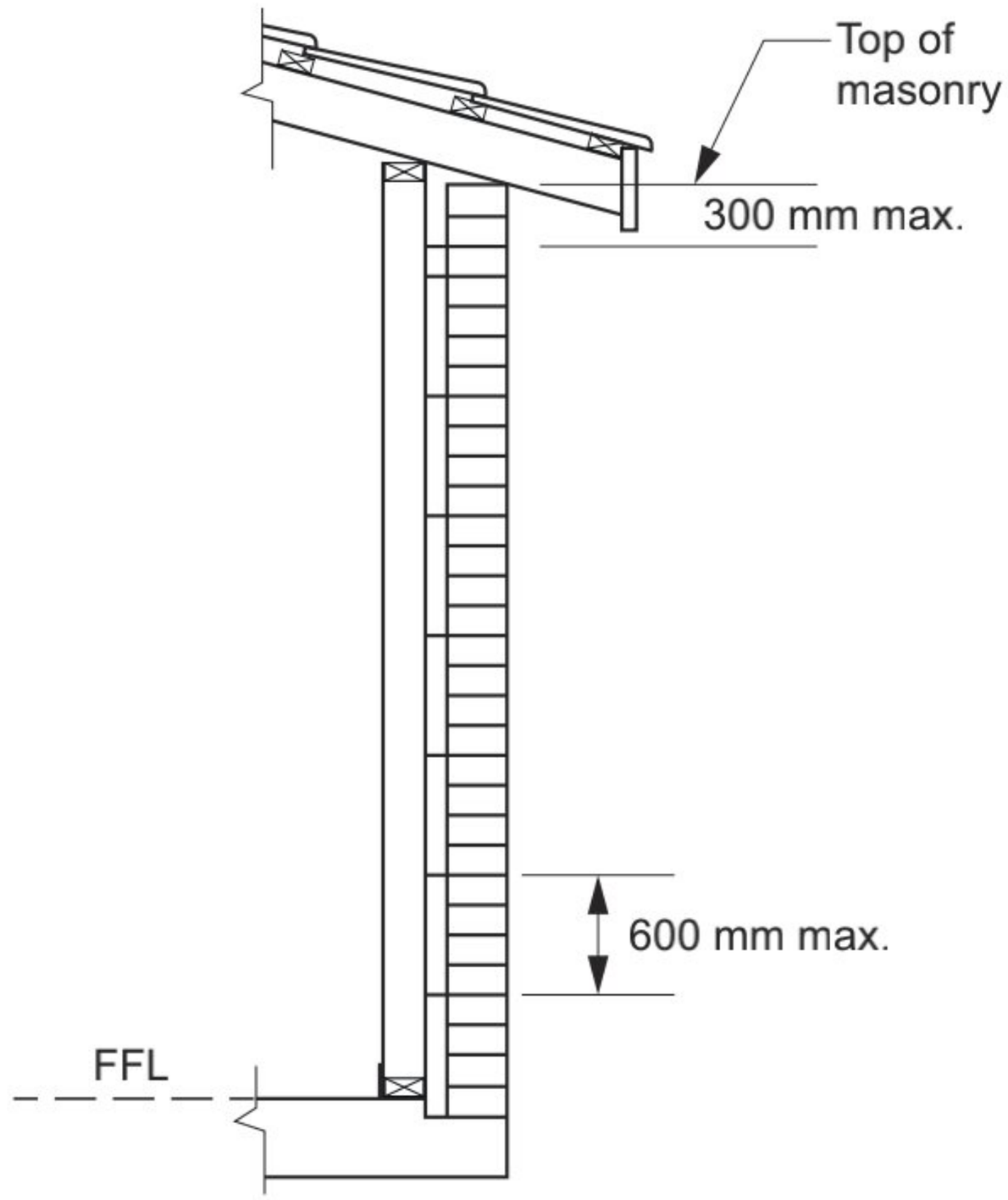


Figure 5.6.5b: Wall tie details (highset)

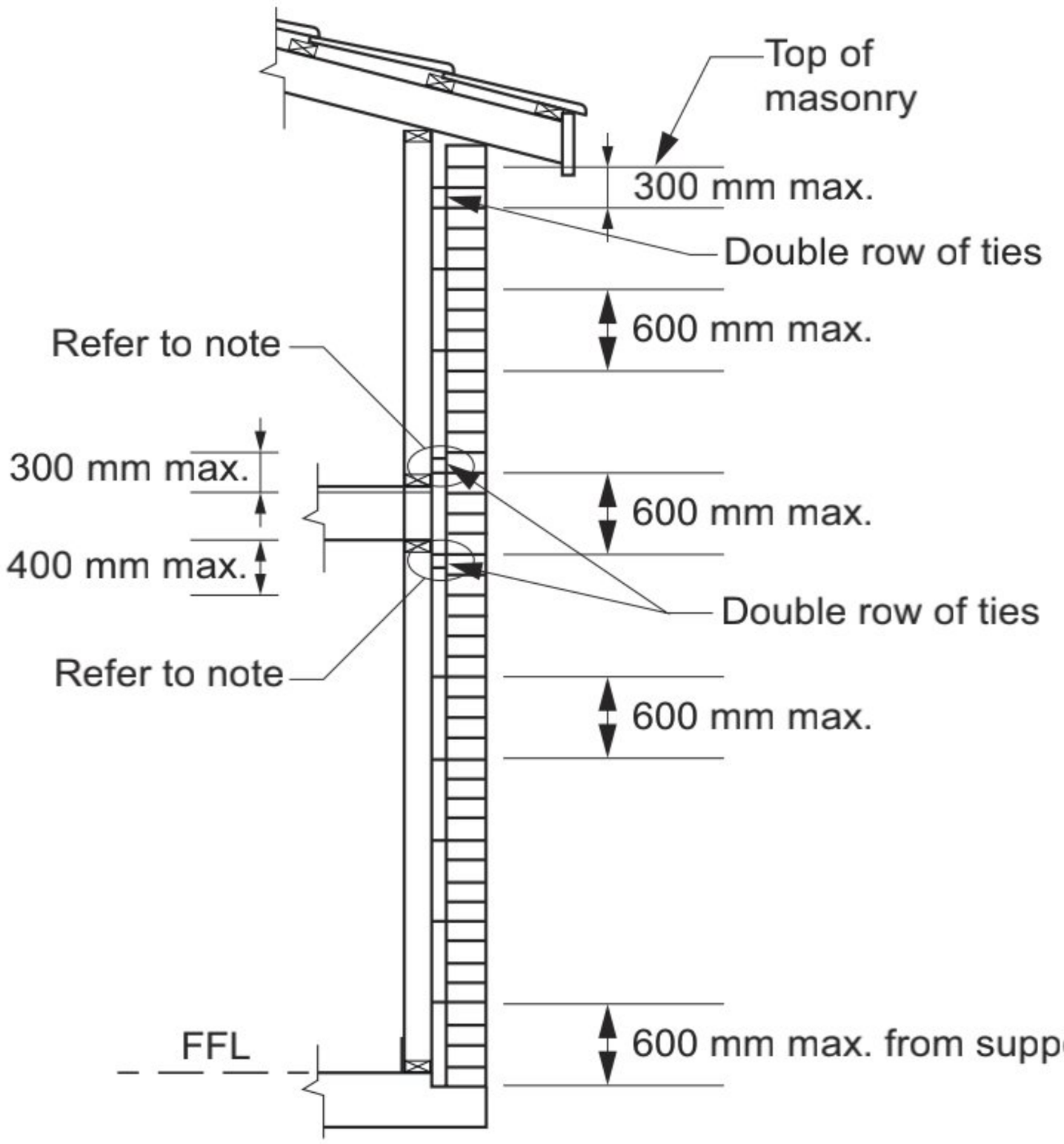


Figure Notes

Where wall ties are *required*, they must be placed in adjacent courses (as shown) or must be placed in the same course on each side of the stud.

Explanatory Information

Wall ties that are suitable for use in a more severe exposure condition are also suitable for use in less severe exposure conditions, i.e. stainless steel and engineered polymer ties are suitable for use in all conditions and 470g/m^2 galvanised ties can be used in all exposure conditions except the most severe.

5.6.6 Fixing straps and tie-down systems

[New for 2022]

(1) Timber door and *window* frames abutting *cavity* masonry must be fixed with 300 mm long 30 mm x 0.8 mm kinked galvanised steel straps—

(a) fixed to the back of frames; and

(b) set into courses not less than 150 mm at not more than 400 mm intervals.

(2) For areas with a wind class of N1 or N2 and a building width from outside wall to outside wall of not more than 10 m in the direction of the roof span (see Figure 5.6.6a), sheet metal and tiled roofs must be tied down using one of the following methods:

(a) 30 mm x 0.8 mm galvanised steel straps at not more than 1.2 m centres and corresponding with truss or rafter positions, looped around 10 mm diameter galvanised mild steel rods—

(i) built-in across the *cavity* at a course not less than 900 mm below the top of the wall; and

(ii) embedded not less than 50 mm into each leaf.

(b) 30 mm x 1 mm galvanised steel straps at not more than 1.2 m centres and corresponding with truss or rafter positions, built-in to masonry inner leaf not less than 50 mm and at a course not less than 900 mm below the top of the wall (see Figure 5.6.6b).

(3) Roof framing supporting tiled roofs on single leaf *unreinforced masonry* walls with *engaged piers* or return walls must have—

(a) a built-in 30 mm x 0.8 mm galvanised steel strap fixed to the roof structure that extends the full height of the *engaged pier* or return wall; and

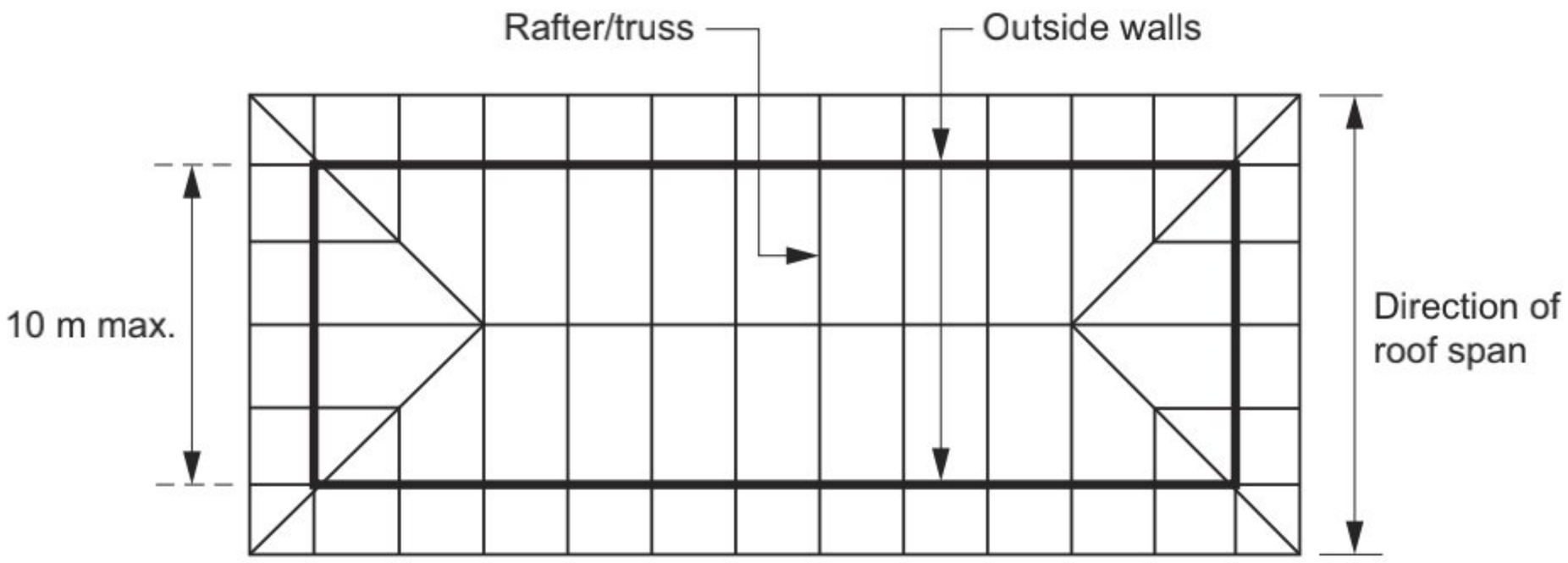
(b) a 4.6 grade M12 galvanised steel rod which is cast into the footing when poured and looped and fixed around the galvanised steel strap *required* by (a) (see Figure 5.6.6c).

(4) Roof framing supporting sheet roofs on single leaf *unreinforced masonry* with *engaged piers* or return walls must have—

(a) a built-in 30 mm x 0.8 mm galvanised steel strap fixed to the roof structure extending the full height of the *engaged pier* or return wall which is looped and fixed around a 4.6 grade 16 mm diameter galvanised steel rod cast into the footing when poured; or

(b) a 4.6 grade M16 galvanised steel rod cast into the footing, threaded at the top and extending the full height of the pier or return wall to connect to the roof structure.

Figure 5.6.6a: Building width



Plan view

Figure 5.6.6b: Suitable tie-down strap details for cavity masonry

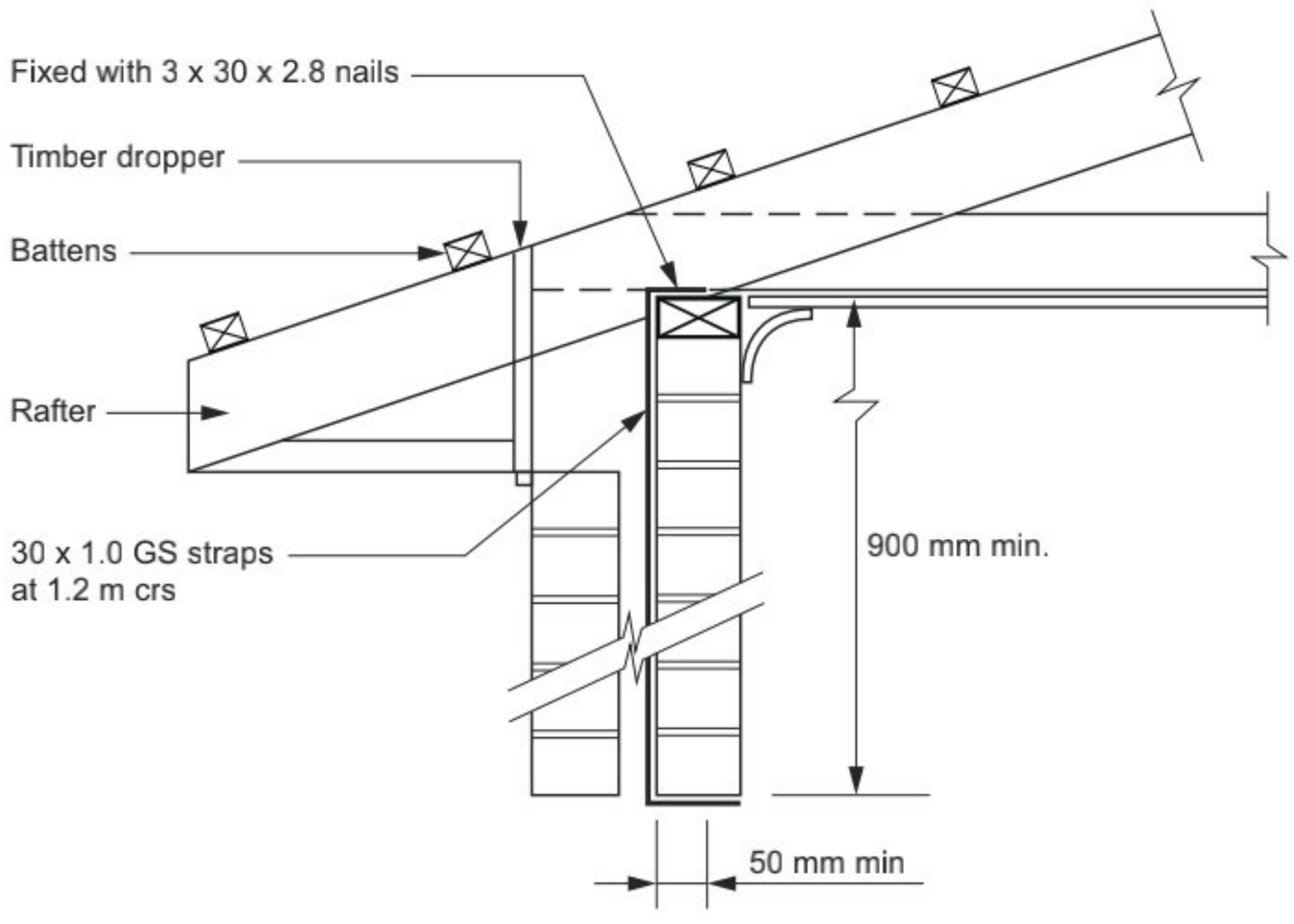
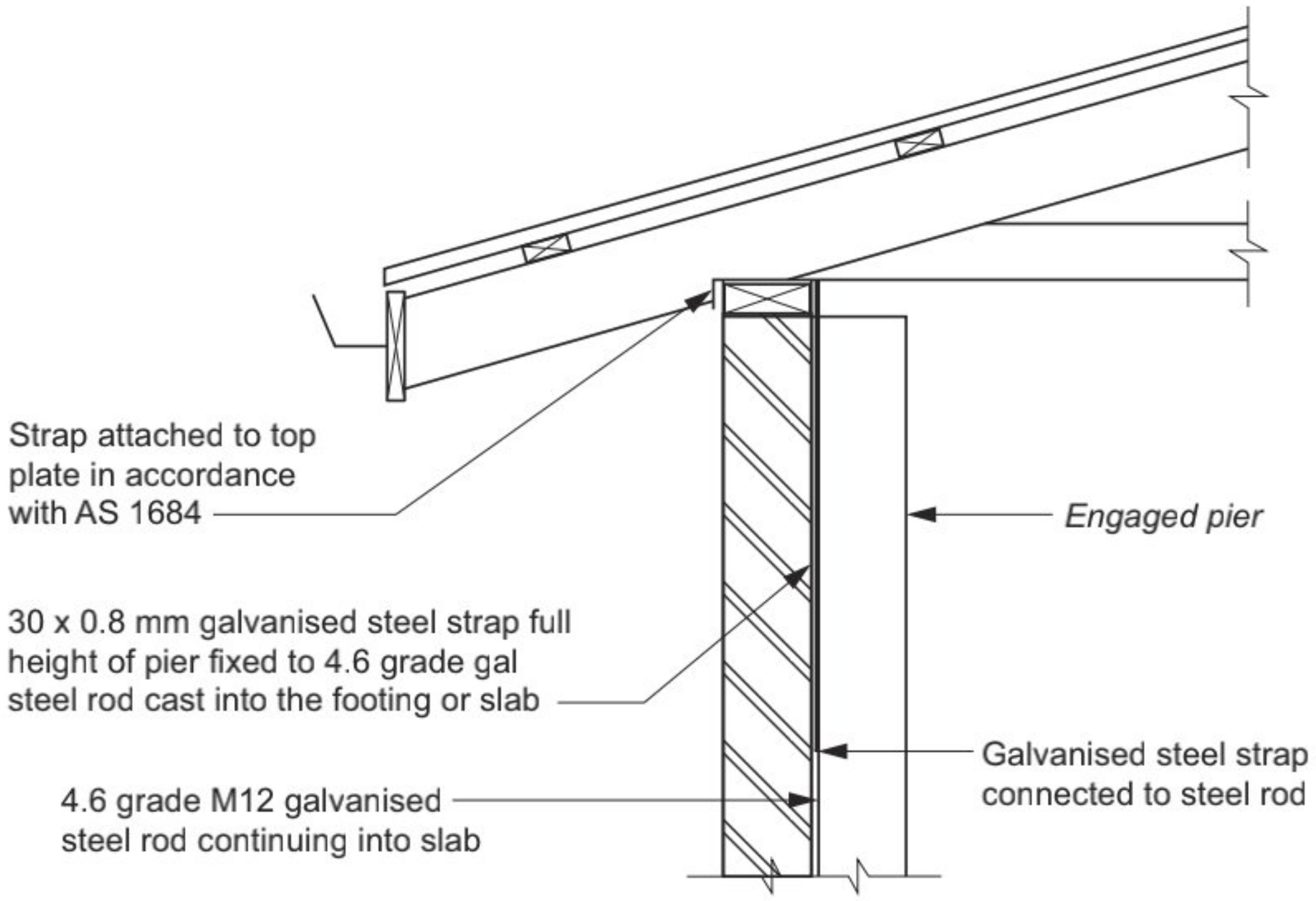


Figure 5.6.6c: Typical tie-down to single leaf unreinforced masonry



Explanatory Information

Roof tie-down over openings more than 1200 mm wide in masonry construction must be specifically designed in accordance with relevant material and structural design standards.

5.6.7 Lintels

[2019: 3.3.5.12]

Where a lintel is *required* it must comply with the following:

(a) Steel lintels must comply with this Part or H1D6(3).

(b) Steel lintels must—

(i) be sized in accordance with Table 5.6.7a; and

(ii) be installed with the long leg of lintel angle vertical; and

(iii) be wide enough so that the masonry does not overhang the horizontal leg of the lintel by more than 25 mm; and

(iv) not support masonry more than 3 m in height when measured above the opening; and

(v) have a minimum bearing length at each end of the lintel of—

(A) for clear spans not more than 1 m - 100 mm; or

(B) for clear spans more than 1 m - 150 mm (See Figure 5.6.7); and

(vi) have a minimum of three courses of masonry over openings; and

(vii) comply with the corrosion protection requirements of Table 5.6.7b.

Table 5.6.7a: Masonry lintel sizes

Lintel	Maximum clear span of lintel (mm): ≤ 600 mm of masonry over opening	Maximum clear span of lintel (mm): > 600 mm of masonry over opening
Flat 75 x 8	700	700
Flat 100 x 10	900	900
Angle 90 x 90 x 6EA	3000	2650
Angle 90 x 90 x 8EA	3200	2800
Angle 100 x 100 x 6EA	3350	2900
Angle 100 x 100 x 8EA	3600	3040
Angle 150 x 90 x 8UA	4200	3850

Table Notes

The lintels described in this Table must be not less than grade 300 MPa in accordance with AS 4100.

Table 5.6.7b: Corrosion protection – Lintels

Durability class of lintel in accordance with AS 2699.3 Note 1	Material or protective requirements in accordance with AS 2699.3 Note 1
R1, R2	Hot dip galvanised with a minimum average coating thickness of 300 g/m^2; or stainless steel 316L
R3	Hot dip galvanised with a minimum average coating thickness of 600 g/m^2; or stainless steel 316L
R4	Stainless steel 316L

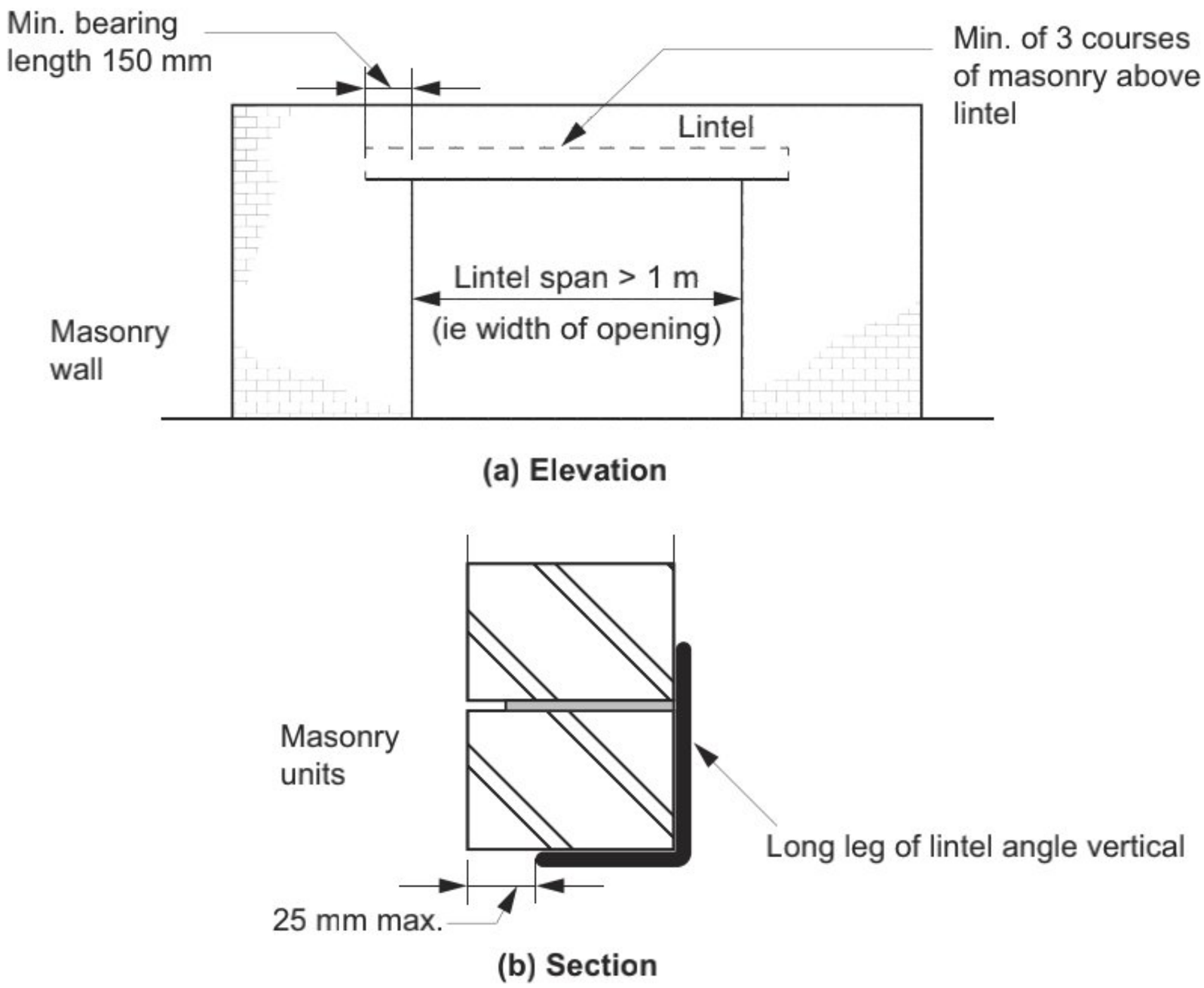
Table Notes

(1) AS 2699.3 contains information on the corrosivity category locations in Australia and provides a method for determining coating thickness for lintels.

(2) Additional decorative coatings can be applied, but must not be considered for the purpose of satisfying the requirements of this Table.

(3) Any lintel with a coating that is modified, i.e. by cutting, welding, or where damaged, must have the coating restored to provide an equivalent level of protection provided by the original coating.

Figure 5.6.7: Lintel installation



5.6.8 Vertical articulation joints

[2019: 3.3.5.13]

(1) Vertical articulation joints must be provided in masonry walls in accordance with (2), except in walls constructed on *sites* where the soil classification is A or S (see 4.2.2).

(2) Articulation joints between masonry elements must have a width of not less than 10 mm and be provided (see Figures 5.6.8a and 5.6.8b)—

(a) in straight, continuous walls with openings less than 900 mm x 900 mm or walls without openings — at not more than 6 m centres and within 4.5 m, but not closer than 470 mm of all corners; and

(b) in straight, continuous walls with openings more than 900 mm x 900 mm — at not more than 5 m centres and located so that they are not more than 1.2 m away from openings; and

(c) where the height of the wall changes by more than 20% — at the position of change in height; and

(d) where a wall changes in thickness; and

(e) at control or construction joints in footings or slabs; and

(f) at junctions of walls constructed of different masonry materials.

(3) Articulation joints must not be located adjacent to arched openings.

(4) Articulation joints must be filled with flexible sealant that is supported during installation by—

(a) a compressible foam or polystyrene filler (see Figures 5.6.8d and 5.6.8e); or

(b) a purpose made backer rod (see Figures 5.6.8c, 5.6.8d, 5.6.8e and 5.6.8f).