# Building Code of Australia

## Volume Two

## Class 1 and Class 10 Buildings
## Housing Provisions

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Australian Building Codes Board

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The BCA is published in this loose-leaf service by CCH Australia Limited on behalf of the ABCB.

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The Australian Building Codes Board (ABCB) is established by agreement between the Commonwealth Government and each State and Territory Government. It is a co-operative arrangement between the signatories, Local Government and the building industry.

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# HOW TO USE

## GENERAL INFORMATION

The Building Code of Australia (BCA) is in two loose-leaf volumes. It is written and maintained by the Australian Building Codes Board (see "Introduction") and is published in conjunction with CCH Australia Limited.

## COLOURED TABS

This publication contains a number of basic divisions, each marked distinctively by a coloured "tab card" — see, for example, the yellow tab card in Volume Two "2 — Performance Requirements". The tabs provide a "bird's-eye-view" of the contents of each division. Each tab division has its own table of contents indicating the various matters treated in that tab.

## COLOUR HIGHLIGHTING

To assist in the use of the BCA, red shading is used to highlight "Section", "Part" and similar headings and "Application" and "Limitation" clauses associated with "Objectives", "Functional Statements" and "Performance Requirements".

Also, red shading identifies "Explanatory information", "State/Territory variations" and "Associated Performance Requirements".

## PAGE NUMBERS

Page numbers, located at the top of each page, are used primarily for the purpose of filing new updates.

You may notice gaps in the page numbering sequence. These are necessary in a loose-leaf publication so that new material can be easily inserted. Where such a gap occurs, there is a reference to what the next page number will be, for example:

**[Next page is 3,601]**

## CLAUSE NUMBERS

Within each Section, there are a number of Parts and clauses.

The number of the relevant clause (or specification) appears at the bottom of each page within a tab division.

## INDEX

There is a separate Index under the red tab card marked "Index • Abbreviations and Symbols". It covers the deemed-to-satisfy provisions in the Code. References in the Index are to clauses or specifications.

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## ABBREVIATIONS AND SYMBOLS

Abbreviations and symbols used in the BCA are conveniently located in the red tab division "Index • Abbreviations and Symbols".

## HISTORY OF AMENDMENTS

See under the blue tab division "History of Amendments" for an ongoing record of all amendments to the BCA.

## LOOSE-LEAF UPDATES

A loose-leaf update contains pages that need to be filed (as a result of amendments to the BCA) into the volume. Each loose-leaf update is accompanied by a Filing Record sheet which tells you which pages to remove from the volume and which new ones to insert.



### UPDATE NUMBER

Each odd-numbered page of a loose-leaf update includes an update number located at the top left corner. For example:

2-12-96

This update number indicates that the page was inserted by Update No 2 issued in December of 1996.

### AMENDMENT NUMBER AND DATE OF ADOPTION

The amendment number, its date of adoption and a summary of changes are provided with the loose-leaf update. It is important to check the date of adoption as it may not be the same for all States and Territories.

Amendments to clauses of the BCA are indicated on the relevant pages.

## HOW TO FILE

### LOOSE-LEAF UPDATES

As amendments to the BCA occur, CCH mails to subscribers an update consisting of new loose-leaf pages. A loose-leaf update is always accompanied by filing instructions telling which pages to remove and which new pages to insert. Once the new pages have been inserted, the Filing Record sheet itself should be filed under the pink tab marked "Filing Record".

### FILING NEW UPDATES

Each new update is accompanied by a numbered Filing Record sheet with filing instructions for new pages. Once the new pages have been inserted, the Filing Record sheet itself should be filed under the pink tab card marked "Filing Record".

Before inserting the pages of a new update, always check the number of the last update. This will ensure that no updates are unfiled. (See "Update number".)

## HELP IN FILING

The Filing Record sheet which lies on the top of the loose-leaf pages of each update gives specific instructions for filing the loose-leaf pages of that update in the binder. More general instructions on report filing are set out below:

**Opening the 5-ring binder**. To file the sheets you are, of course, required to open the rings of the binder. If the binder is new, first remove the small cardboard wedge that was inserted near the base of the binder for shipment purposes only. To open the binder, lay it flat on the desk and pull the lever towards you. To close the binder, push the lever back to ensure that it "clicks" and so is properly locked. During filing, there is no need to "click" it every time – only when the filing has been completed.

**Before you file any update**. Always check under the pink "Filing Record" tab to ensure that your BCA is filed right up to date. The number of the last update filed in your BCA appears on the last Filing Record sheet filed in that tab division. This ensures that no update remains unfiled.

**Filing.** The filing instructions are on the Filing Record sheet. Put this filing sheet to one side for easy reference and file the remaining loose-leaf pages in accordance with the instructions given. The instructions require you to remove certain pages from the binder and insert certain pages.

**Page numbering.** Sometimes more pages are inserted than are removed; sometimes the opposite happens. There are often gaps in the page numbering sequence. This allows for "growth". Where a page gap occurs, there is a statement of the number of the next page underneath the page number on the preceding page. The page number is the number in bold type at the top corner of each page.

**Old pages.** The pages removed from the BCA no longer form part of the Code. In some instances it may be appropriate to retain these pages for future reference associated with buildings constructed while they were current. **Where removed pages are retained they should be kept in a separate folder to prevent confusion with replacement pages.**

**Final step.** The final step in filing is always to take the Filing Record sheet and use it to replace the previous Filing Record sheet in the "Filing Record" tab. This enables you to check that your filing is up to date. There should only be one Filing Record sheet in this tab division at any given time.

**Comparing old and new pages.** "New" and "old" pages can be identified by the update number. (See "Update number".) New pages will bear the latest update number.

**Do you need more help?** For customer service support, please don't hesitate to contact CCH. *Telephone:* Sydney 1 300 300 224. *Facsimile:* 1 300 306 224.

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# INTRODUCTION

## THE BUILDING CODE OF AUSTRALIA

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Commonwealth Government and each State and Territory Government.

The BCA is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia. It allows for variations in climate and geological or geographic conditions.



## THE AUSTRALIAN BUILDING CODES BOARD

The ABCB is established by agreement between the Commonwealth Government and each State and Territory Government. It is a co-operative arrangement between the signatories, Local Government and the building industry.

It is responsible to the Planning, Housing and Local Government Ministerial Council, and has a mission to achieve nationally consistent performance based building regulatory systems that are efficient, cost effective and meet community and industry needs.

The Board comprises:

(a) the principal officer of each State and Territory administration responsible for building regulatory matters;

(b) a representative of the Commonwealth;

(c) a representative of the Australian Local Government Association (ALGA); and

(d) industry representatives.

The Building Codes Committee (BCC) is the peak technical advisory body to the ABCB, with responsibility for technical matters associated with the BCA.

The BCC comprises:

(a) the Executive Director of the ABCB;

(b) one nominee each of the Commonwealth, State, Territory and ALGA members of the ABCB; and

(c) industry members appointed by the ABCB.

### HOUSING ADVISORY COMMITTEE

A Housing Advisory Committee has been appointed to advise the BCC on the development of the Housing Code. Members have a wide range of practical and regulatory experience in the housing industry.

This committee is an important link between end users and regulators providing direct advice to the BCC when preparing future changes to the Housing Code and associated documents, such as Australian Standards.

## THE BCA - CONTENT

### GOALS

The goals of the BCA are to enable the achievement and maintenance of acceptable standards of structural sufficiency, safety (including safety from fire), health and amenity for the benefit of the community now and in the future.

These goals are applied so that the BCA extends no further than is necessary in the public interest, is cost effective, easily understood, and is not needlessly onerous in its application.



### 1996 EDITION

The 1996 edition of the BCA is published in two volumes:

| | |
|---|---|
| **Volume One** | pertains primarily to Class 2 to 9 buildings |
| **Volume Two** | pertains primarily to Class 1 and 10 buildings (houses, sheds, carports, etc) |

Both volumes are drafted in a performance format to provide greater flexibility for the use of new and innovative building products, systems and designs.

A user may choose to comply with the Deemed-to-Satisfy Provisions (described as acceptable construction practice in Volume Two) or may use an Alternative Solution that satisfies the Performance Requirements.

The Deemed-to-Satisfy provisions in this edition generally are the same as those contained in the 1990 edition of the BCA for Class 1 and 10 buildings, including amendments one to nine and other changes resulting from the ongoing technical improvement program.

**Note:** Class 1 buildings are typically single dwelling houses (not located one above the other); Class 10 buildings include carports, sheds, fences, swimming pools etc which may be associated with Class 1 buildings as well as Class 2-9 buildings. (see Part 1.3 for further information).

### STATE AND TERRITORY VARIATIONS AND ADDITIONS

Each State's and Territory's legislation adopts the BCA subject to the variation or deletion of some of its provisions, or the addition of extra provisions. In Volume Two of the BCA these are divided into 2 types as follows:

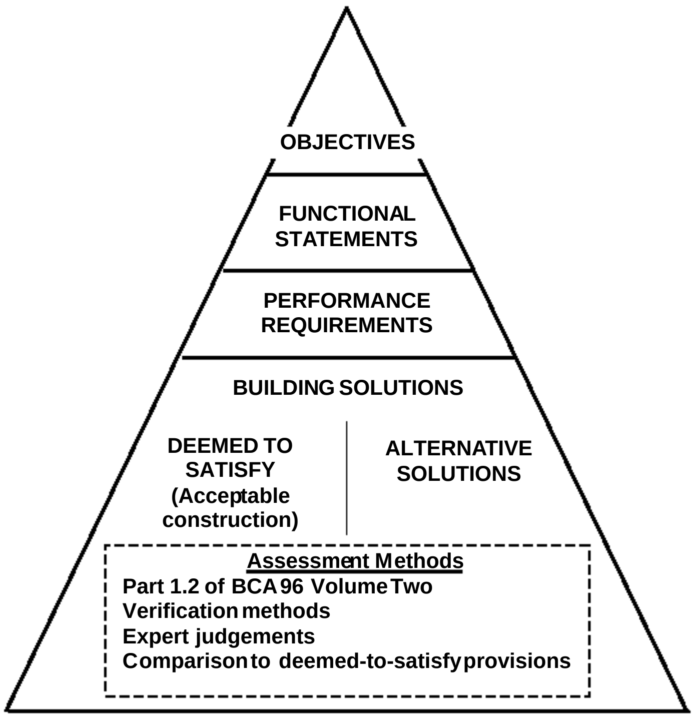
a. A variation to the Housing Provisions - these are identified adjacent the clause that is being varied.

b. Additional requirements - these are contained in Appendix A.

### THE BCA PERFORMANCE HIERARCHY

The 'performance hierarchy' is outlined in the following diagram:

**Figure 1 - BCA Hierarchy**




### THE HIERARCHY EXPLAINED

<u>Objectives</u>

The Objectives set out community expectations. The Objectives are contained in Section 2.

<u>Functional Statements</u>

The Functional Statements describe how buildings achieve the Objectives. One or more Functional Statements follow the Objectives.

<u>Performance Requirements</u>

The Performance Requirements outline the levels of performance which must be met in order for a building to meet the Objectives and the Functional Statements. One or more Performance Requirements follow the Functional Statements.

Applications and Limitations

Applications or Limitations are applied to Objectives, Functional Statements and Performance Requirements as appropriate to prescribe the circumstances in which provisions do or do not apply. The Applications or Limitations are shown in shaded boxes following the appropriate clause in Section 2 of the Housing Provisions.

Building Solutions

The means of achieving the Performance Requirements are called Building Solutions. The BCA provides for two process pathways which can be followed to develop Building Solutions.

These are:

Deemed-to-Satisfy Provisions

The Deemed-to-Satisfy Provisions contained in the BCA include examples of materials, components, design factors and construction methods which, if complied with, are conclusive proof that the Performance Requirements have been satisfied.

Alternative Solutions

Alternative Solutions are proposals that differ in whole or in part from the Deemed-to-Satisfy Provisions and include materials, components, systems, design factors and construction methods that can be demonstrated to-

(a) comply with the relevant Performance Requirements; or
(b) at least perform in an equivalent manner to the Deemed-to-Satisfy Provisions.

In either case, the relevant authority, as determined by the building regulatory legislation in each State and Territory, must be satisfied that the proposal-

(a) complies with the Deemed-to-Satisfy Provisions; or

(b) where an Alternative Solution is used-

(i) complies with the Performance Requirements; or

(ii) at least performs in an equivalent manner to the Deemed-to-Satisfy Provisions.

## A FLEXIBLE APPROACH

People may use a combination of deemed-to-satisfy (acceptable construction) and performance design (alternative solutions) to comply with the performance requirements of the Housing Provisions. An example of such an approach would be as follows:

- Use the performance (alternative solution) path to prove the acceptability of an innovative fire rated wall system;
- Design the footings from first principles using AS 3600, an acceptable design manual, listed in Part 3.11;
- Follow the acceptable construction practice in Part 3.4 to build the timber frame.

Assessment Methods

There are a number of Assessment Methods that can be used to determine whether a proposal complies with the Deemed-to-Satisfy Provisions or, where Alternative Solutions are used, complies with the relevant Performance Requirements.

These Assessment Methods may include one or any combination of the following:

- Documentary evidence as described in 1.2.2.
- Verification Methods

  Verification methods may include the following:

  (a) Calculations - using analytical methods or mathematical models.

  (b) Tests - using a technical procedure either on site or in a laboratory to directly measure compliance with one or more performance criteria.

  (c) Other methods accepted by the relevant authority.
- Comparison with Deemed-to-Satisfy Provisions

  Where Alternative Solutions are used, comparison with the relevant Deemed-to-Satisfy Provisions to determine that they at least perform in an equivalent manner.
- Expert Judgements

  The opinions of suitably qualified and experienced technical experts.

### DEFINITIONS

Words with special meanings are printed in italics and are defined in A1.1.

## LEGISLATIVE ARRANGEMENTS

### GENERAL

The BCA is given legal effect by building regulatory legislation in each State and Territory. This legislation consists of an Act of Parliament and subordinate legislation which empowers the regulation of certain aspects of buildings and structures, and contains the administrative provisions necessary to give effect to the legislation.

Any provision of the BCA may be overridden by, or subject to, State or Territory legislation. The BCA must therefore be read in conjunction with that legislation. Any queries on such matters should be referred to the State or Territory authority responsible for building regulatory matters.

#### ADMINISTRATIVE PROVISIONS

Administrative provisions covered in the building regulatory legislation may include-

- Plan submission and approval procedures.
- Issue of approvals or permits.
- Inspections during and after construction.
- Provision of evidentiary certificates.
- Issue of certificates of occupancy or compliance.
- Accreditation or approval of materials or components.
- Review and enforcement of standards.
- Fees and charges.



#### BCA ADOPTION

The adoption of the 1996 edition of the BCA is addressed in Part 1.0 of Volume Two.

## PERFORMANCE IN PRACTICE

In drafting this edition of the BCA, the ABCB intends that each level in the hierarchy is superior to that below it. This means that in meeting the Performance Requirements the relevant Functional Statements and Objectives are also met.

For the assessment process of a building proposal associated with the issuing of a building license, building approval, building permit or the like, it is intended that the Objectives and Functional Statements are only used where necessary to assist in the interpretation of the Performance Requirements. For this process it is not intended that a building proposal be assessed against either the Objectives or Functional Statements.

For any appeal assessment process, it is not intended that the above restrictions apply.

## FURTHER DEVELOPMENT OF THE BCA

Regular amendments are planned to the BCA to improve clarity of provisions, upgrade referenced documents and to reflect the results of research and improved technology.

## COMMENTS

Comments in writing on any matter concerning the text, presentation or further development of the BCA are invited from building and other authorities, industry organisations, professional operatives and the public generally. These comments should be addressed to:

Executive Director
Australian Building Codes Board
GPO Box 9839
CANBERRA ACT 2601

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# SECTION 1

# GENERAL PROVISIONS

# SECTION 1 CONTENTS



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# PART 1.0 APPLICATION



### 1.0.1 Adoption

The date of adoption of the 1996 edition of the Building Code of Australia (Volume One and Volume Two) is-

(a) the 1st of July 1997 for the Commonwealth and in the Australian Capital Territory, Queensland, Tasmania, Victoria and Western Australia; and

(b) to be determined by New South Wales, Northern Territory and South Australia.

### 1.0.2 BCA Volumes

(a) This is Volume Two of the Building Code of Australia 1996 which contains the requirements for-

   (i) Class 1 and 10 buildings (other than access requirements for people with disabilities in Class 10 buildings); and

   (ii) certain Class 10 structures.

(b) Volume One contains the requirements for-

   (i) all Class 2 to 9 buildings; and

   (ii) access requirements for people with disabilities in Class 10 buildings; and

   (iii) certain Class 10 structures.

# PART 1.1 INTERPRETATION

## 1.1.1 Definitions

**1.1.1.1** In the *Housing Provisions*, definitions are containedas follows:

(a) In Part 1.1.1 for definitions that apply to all of Volume Two.

(b) In each Part (as applicable) for definitions that apply to that Part only.

**1.1.1.2** In the *Housing Provisions*, unless the contrary appears:

**Alpine area** means land-

(a) likely to be subject to significant snowfalls;

(b) in New South Wales, ACT or Victoria more than 1200 m above the Australian Height Datum; and

(c) in Tasmania more than 900m above the Australian Height Datum.

> **Explanatory Information:**
>
> See Part 3.7.4 for map of alpine areas.

**Alteration**, in relation to a building, includes an addition or extension to a building.

**Automatic**, applied to a fire door, smoke door, solid core door, fire shutter, fire *window*, smoke-and-heat vent, sprinkler system, alarm system or the like, means designed to operate when activated by a heat, smoke or fire sensing device.

**Average recurrence interval** applied to rainfall, means the average or expected interval between exceedances of a given rainfall intensity.

**Certificate of Accreditation** means a certificate issued by ABCB or a State or Territory accreditation authority stating that the properties and performance of a building material or method of construction or design fulfil specific requirements of the Housing Provisions.

**Combustible** -

(a) applied to a material - means *combustible* under AS 1530.1; or

(b) applied to construction or part of a building -means constructed wholly or in part of *combustible* materials.

**Common wall** means a wall that is common to adjoining buildings other than a Class 1 buildings.

**Designated bushfire prone area** means land which has been declared by appropriate legislation to be likely to be subject to bushfires.

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**Design wind speed** means the design gust wind speed for the area where the building is located calculated in accordance with AS 1170.2 or AS 4055 (see Table 1.1.1 for Housing Provisions design wind speed descriptions and equivalent values).

**Table 1.1.1**

**DESIGN WIND SPEED - EQUIVALENT VALUES**

**Note:**

1. Wind classification map identifying cyclonic areas (as per AS 4055) is contained in Section 3, Part 10.1.
2. Information on wind speeds for particular areas may be obtained from the relevant approval authority.
3. [shaded] = design wind speed areas covered by Part 11.1, *high wind areas*.

| Housing Provisions description | EQUIVALENT VALUES | | | |
|---|---|---|---|---|
| | Wind Class - AS 4055 | | | Design gust wind speed (m/sec) - AS 1170.2 |
| | KPH | For non-cyclonic regions A and B | For cyclonic regions C and D | Permissible stress method only |
| W28 | 101 | N1 | - | 28 |
| W33 | 119 | N2 | - | 33 |
| W41 | 148 | N3 | C1 | 41 |
| W50 | 180 | N4 | C2 | 50 |
| W60 | 216 | N5 | C3 | 60 |
| W70 | 252 | N6 | C4 | 70 |

**External wall** means an outer wall of a building which is not a separating wall.

**Fire-resistance level (FRL)** means the grading periods in minutes determined in accordance with Specification A2.3 of Volume One of the BCA, for-

(a) structural adequacy; and

(b) *integrity*; and

(c) insulation,

and expressed in that order.

A dash, for examples 90/-/- or -/-/-, means there is no requirement for an FRL for that criterion.

**Fire-resisting**, applied to a structural member or other part of a building, means having the FRL required for that structural member or other part.

**Flammability Index** means the index number determined under AS 1530.2.

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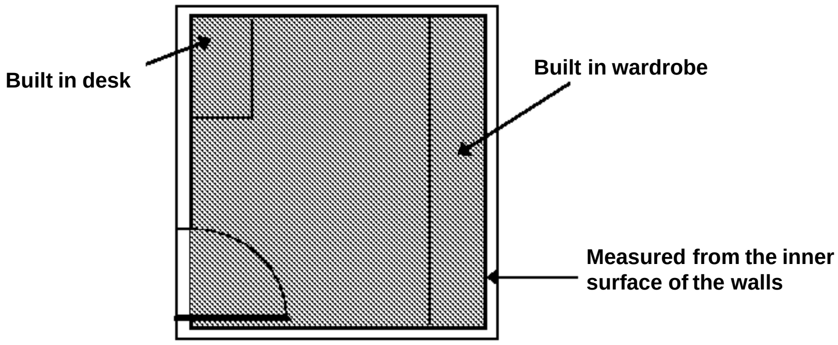
**Floor area** means in relation to a room - the area of the room measured within the finished surfaces of the walls, and includes the area occupied by any cupboard or other built-in furniture, fixture or fitting, see Figure 1.1.1.

**Figure 1.1.1**

**IDENTIFICATION OF FLOOR AREA OF A ROOM**

**Legend:**

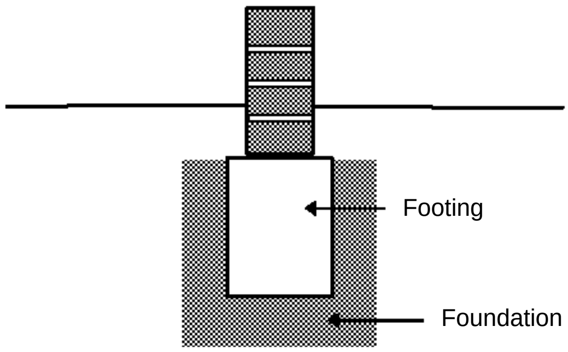
= Floor area to measured.




**Foundation** means the ground which supports the building, see Figure 1.1.2.

**Figure 1.1.2**

**IDENTIFICATION OF FOUNDATION - Section**




**Habitable room** means a room used for normal domestic activities, and-

(a) includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom; but





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(b) excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes-drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.

**High wind area** means a region that is subject to *design wind speeds* more than W41 and cyclonic winds of W41 or more. (see Table 1.1.1)

**Housing Provisions** means the requirements for Class 1 and 10 buildings contained in the Volume Two of the Building Code of Australia 1996 as published by the Australian Building Codes Board.

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**Illuminance** means the luminous flux falling onto a unit area of surface.

**Insulation**, in relation to an FRL, means the ability to maintain a temperature on the surface not exposed to the furnace below the limits specified in AS 1530.4.

**Integrity**, in relation to an FRL, means the ability to resist the passage of flames and hot gases specified in AS 1530.4.

**Internal wall** excludes a *separating wall*, *common wall* or party wall.

**Lightweight construction** means construction which incorporates or comprises-

(a) sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by impact, pressure or abrasion; or

(b) concrete and concrete products containing pumice, perlite, vermiculite, or other soft material similarly susceptible to damage by impact, pressure or abrasion; or

(c) masonry having a thickness less than 70 mm.

**Loadbearing** means intended to resist vertical forces additional to those due to its own weight.

**Non-combustible** -

(a) applied to a material - means not deemed *combustible* under AS 1530.1 - Combustibility Tests for Materials; and

(b) applied to construction or part of a building - means constructed wholly of materials that are not deemed *combustible.*

**Other property** means all or any of the following-

(a) any building, whether or not on the same or an adjoining allotment; and

(b) any land on an adjoining allotment of land; and

(c) a road.

**Outdoor air** means air outside the building.

**Outfall** means that part of the disposal system receiving *surface water* from the drainage system and may include a natural water course, kerb and channel, or soakage system.

**Private garage** means-

(a) any garage associated with a Class 1 building; or

(b) any separate single storey garage associated with another building where such garage is capable of accommodating not more than 3 vehicles.

**Professional engineer** means a person who is-

(a) if legislation is applicable - a registered *professional engineer* in the relevant discipline who has appropriate experience and competence in the relevant field; or

(b) if legislation is not applicable-

(i) a Corporate Member of the Institution of Engineers, Australia; or

(ii) eligible to become a Corporate Member of the Institution of Engineers, Australia, and has appropriate experience and competence in the relevant field.

**Registered Testing Authority** means -

(a) the National Building Technology Centre (NBTC);

(b) the CSIRO Division of Building, Construction and Engineering (CSIRO-DBC&E);

(c) an authority registered by the National Association of Testing Authorities (NATA) to test in the relevant field; or

(d) an organisation outside Australia recognised by NATA through a mutual recognition agreement.

**Relevant approval authority** means the relevant authority as determined by the building regulatory legislation in each State and Territory.

**Required** means required to satisfy a performance requirement or a deemed-to-satisfy provision of the *Housing Provisions* as appropriate.

**Sanitary compartment** means a room or space containing a toilet fixture, closet pan, soil pan, chemical toilet, or the like.

**Sarking-type material** means a material such as a reflective foil or other flexible membrane of a type normally used for a purpose such as waterproofing, vapour proofing or thermal reflectance.

**Self-closing,** applied to a door or window means equipped with a device which returns the door or window to the fully closed and latched position immediately after each manual opening.

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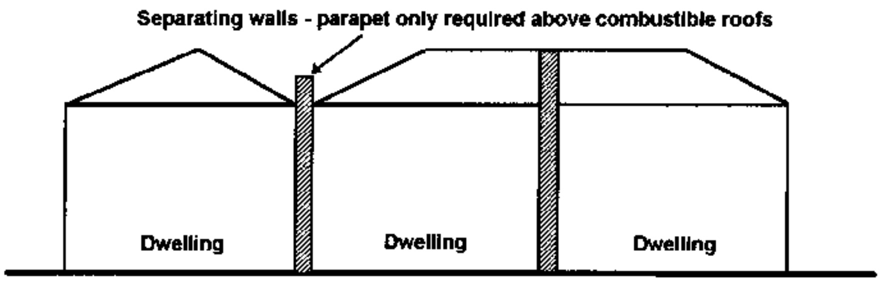
**Separating wall** means a wall that is common to adjoining Class 1 buildings (see Figure 1.1.3).

**Figure 1.1.3**

**SEPARATING WALL - (elevation view)**

**Note:** May also be known as a party wall and typically is *required* to be *fire resisting* construction (see Part 3.7.1).




**Site** means the part of the allotment of land on which a building stands or is to be erected.

**Sitework** means work on or around a *site*, including earthworks, preparatory to or associated with the construction, *alteration*, demolition or removal of a building.

**Smoke-Developed Index** means the index number for smoke developed under AS 1530 .3

**Spread-of-Flame Index** means the index number for spread of flame under AS 1530.3

**Standard Fire Test** means the Fire-resistance Test of Elements of Building Construction as described in AS 1530.4.

**Structural adequacy,** in relation to an FRL means the ability to maintain stability and adequate loadbearing capacity under AS 1530.4.

**Structural member** means a component or part of an assembly which provides vertical or lateral support to a building or structure.

**Surface water** means all naturally occurring water, other than sub-surface water, which results from rainfall on the *site* or water flowing onto the *site*, including that flowing from a drain, stream, river, lake or sea.

**Swimming pool** means any excavation or structure containing water and used principally for swimming, wading, paddling, or the like, including a bathing or wading pool, or spa.

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**STATE AND TERRITORY VARIATIONS**

In 1.1.1 the definition for swimming pool is substituted in Queensland as follows:

**Swimming pool** has the same meaning as in the Queensland Building Act.



**Window** includes a roof light, glass panel, glass block or brick, glass louvre, glazed sash, glazed door, or other device which transmits natural light directly from outside a building to the room concerned when in the closed position.

### 1.1.2 Adoption of referenced documents

Where a deemed-to-satisfy provision adopts a Standard, rule, specification or provision included in any document issued by Standards Australia or other body, that adoption does not include a provision-

(a) specifying or defining the respective rights, responsibilities or obligations as between themselves of any manufacturer, supplier or purchaser; or

(b) specifying the responsibilities of any trades person or other building operative, architect, engineer, authority, or other person or body; or

(c) requiring the submission for approval of any material, building component, form or method of construction, to any person, authority or body other than a person or body empowered under State or Territory legislation to give that approval; or

(d) specifying that a material, building component, form or method of construction must be submitted to Standards Australia or a committee of Standards Australia for expression of opinion; or

(e) permitting a departure from the code, rule, specification or provision at the sole discretion of the manufacturer or purchaser, or by arrangement or agreement between the manufacturer and purchaser.

### 1.1.3 Context of reference

A reference in a deemed-to-satisfy provision to a document under 1.1.2 refers to the edition or issue, together with any amendment, listed in Part 1.4 and only so much as is relevant in the context in which the document is quoted.

### 1.1.4 Differences between referenced documents and the Housing Provisions

The *Housing Provisions* overrule in any difference arising between it and any Standard, rule, specification or provision in a document listed in Part 1.4.

### 1.1.5 Compliance with all Sections of Housing Provisions

Subject to 1.1.6, Class 1 and 10 buildings must be so designed and constructed that they comply with the relevant provisions of Sections 1 to 3 (inclusive) of Volume Two of the BCA.

### 1.1.6 Application of the Housing Provisions to a particular State or Territory

For application within a particular State or Territory, Volume 2 of the BCA comprises-

(a) Sections 1 to 3 (inclusive); and

(b) the variations, deletions and additions to Sections 1 to 3 applicable to that State or Territory specified in the relevant Appendix.



### 1.1.7 Language

A reference to a building in the Housing Provisions is a reference to an entire building or part of a building, as the case requires.

### 1.1.8 Interpretation of diagrams

Diagrams in the *Housing Provisions* are used to describe specific issues reference in the associated text. They are not to be construed as containing all design information that is *required* for that particular building element or situation.

**Explanatory Information:**

Diagrams are used to explain the requirements of a particular clause. To ensure the context of the requirement is clearly understood, adjacent construction elements of the building that would normally be required in that particular situation are not always shown.

ie. Diagrams to show the installation of damp proof courses will only depict the damp proof course and associated masonry. It will not necessarily show non-related items such as wall ties, adjacent timber flooring, reinforcing for any footing etc.

Accordingly, aspects of a diagram that are not shown should not be interpreted as meaning these construction details are not required.”

### 1.1.9 Explanatory information

These elements of the Housing Provisions are non-mandatory. They are used to provide additional guidance on theapplication of the particular clauses and do not need to be followed to meet the requirements of this code.

# PART 1.2 ACCEPTANCE OF DESIGN AND CONSTRUCTION



### 1.2.1 Suitability of materials

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the *Housing Provisions*, using materials that are fit for the purpose for which they are intended.

### 1.2.2 Evidence of suitability

(a) Subject to 1.2.3 and 1.2.4, evidence to support that the use of a material, form of construction or design meets a Performance Requirement or a deemed-to-satisfy provision may be in the form of one or a combination of the following:

(i) A report issued by a *Registered Testing Authority*, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building.

(ii) A current *Certificate of Accreditation*.

(iii) A certificate from a *professional engineer* or other appropriately qualified person which-

(A) certifies that a material, design or form of construction complies with the requirements of the *Housing Provisions*; and

(B) sets out the basis on which it is given and the extent to which relevant specifications, rules, codes of practice or other publications have been relied upon.

(iv) A Standards Mark Certificate issued by Standards Australia.

(v) A current SSL Product Listing Data Sheet and listing in the latest issue of the Scientific Services Laboratory Register of Accredited Products - Fire Protection Equipment.

(vi) Any other form of documentary evidence that correctly describes the properties and performance of the material or form of construction and adequately demonstrates its suitability for use in the building.

(b) Any copy of documentary evidence submitted, must be a complete copy of the original report or document.

### 1.2.3 Fire resistance of building elements

Where a deemed-to-satisfy provision requires a building element to have an FRL, it must comply with the acceptable construction method or be determined in accordance with Specification A2.3 of Volume One - BCA 1996.

### 1.2.4 Early Fire Hazard Indices

Where a deemed-to-satisfy provision requires a building component or assembly to have an Early Fire Hazard Index, it must be determined in accordance with Specification A2.4 of Volume One - BCA 1996.

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**Explanatory information:**

The provisions of 1.2 list acceptable methods to enable verification and acceptance of both the performance (listed in Section 2) and deemed-to-satisfy options (listed in Section 3) of the Housing Provisions.

# PART 1.3 CLASSIFICATION

### 1.3.1 Principles of classification

The classification of a building or part of a building is determined by the purpose for which it is designed, constructed or adapted to be used.

**Explanatory Information:**

1. Class 1 and 10 buildings are classified in accordance with this Part; and
2. Class 2 to 9 buildings are classified in accordance with Section A of the BCA, Volume One.



### 1.3.2 Classification

Class 1 and 10 buildings are classified as follows:

**Class 1 -** one or more buildings, which in association constitute-

(a) **Class 1a -** a single dwelling being-

(i) a detached house; or

(ii) one or more attached dwellings, each being a building, separated by a *fire-resisting wall*, including a row house, terrace house, town house or villa unit; or

which are not located above or below another dwelling or another Class of building other than a *private garage* (see Figure 1.3.1 and 1.3.2 and 1.3.3

(b) **Class 1b -** a boarding house, guest house, hostel or the like with a total floor area not exceeding 300 $m^2$ and in which not more than 12 persons would ordinarily be resident.

**Class 10 -** a non-habitable building or structure (see Figure 1.3.3) -

(a) **Class 10a** - a non-habitable building being a *private garage*, carport, shed, or the like; or

(b) **Class 10b** - a structure being a fence, mast, antenna, retaining or free-standing wall, *swimming pool*, or the like.

**Figure 1.3.1**

**IDENTIFICATION OF CLASS 1 AND 2 BUILDINGS - (elevation)**

**Note:** For *fire resisting* construction between Class 1 buildings see Part 3.7.1.1.

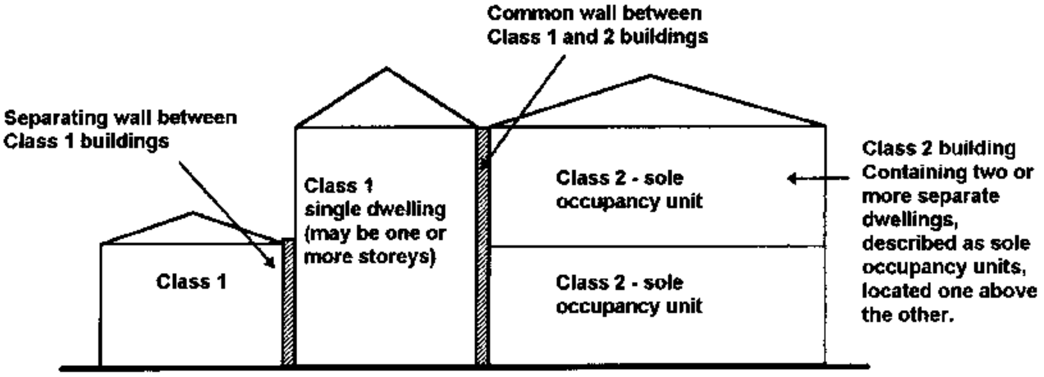



**Figure 1.3.2**

**TYPICAL CLASS 1 CONFIGURATIONS (plan view)**

**Note:** Legend = Separating wall

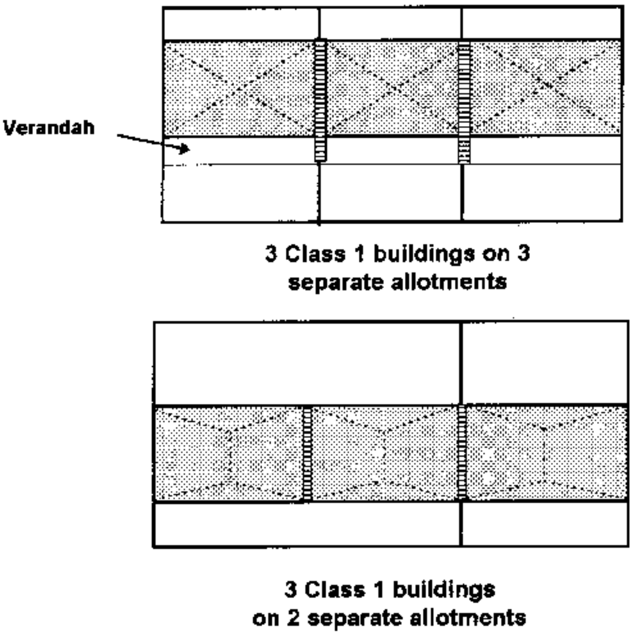
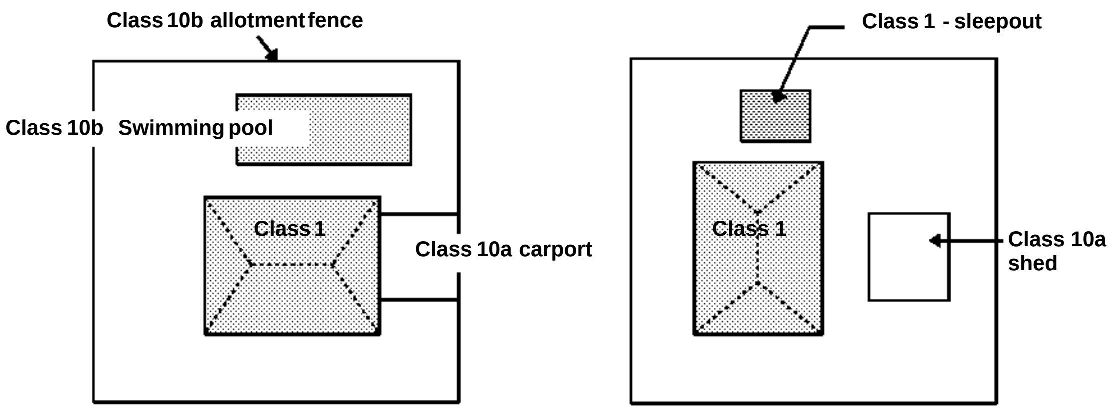


**Figure 1.3.3**

**DOMESTIC ALLOTMENT - CLASSIFICATION OF BUILDINGS AND STRUCTURES (Plan view)**

**Note:**
1. A Class 10 building may be attached to a Class 1 building.
2. A Class 1 may consist of one or more buildings (eg detached bedrooms).






### 1.3.3 Multiple classifications

Each part of a building must be classified separately, and -

(a) Classes 1a, 1b, 10a and 10b are separate classifications; and

(b) a reference to -

(i) Class 1 - is to Class 1a and 1b; and

(ii) Class 10 - is to Class 10a and 10b.

# PART 1.4 STANDARDS ADOPTED BY REFERENCE

## 1.4.1 Schedule of referenced documents

The Standards and other documents listed in Table 1.4.1 are referred to in the Housing Provisions.



**Table 1.4.1:**
**SCHEDULE OF REFERENCED DOCUMENTS**

| No. | Date | Title |
|---|---|---|
| **AS 1038** | | Coal and coke-Analysis and testing |
| Part 15 | 1995 | Fusibility of higher rank coal ash and coke ash |
| **AS 1170** | | Minimum design loads on structures<br>(SAA Loading Code) |
| Part 1 | 1989 | Dead and live loads and load combinations<br>Amdt 1, Jan 1993 |
| Part 2 | 1989 | Wind loads<br>Amdt 1, Jan. 1991<br>Amdt 2, Jan 1993<br>Amdt 3, Dec 1993 |
| Part 3 | 1990 | Snow loads |
| Part 4 | 1993 | Earthquake loads<br>Amdt 1, Sept 1994 |
| **AS 1191** | 1985 | Acoustics- Method for laboratory measurement of airborne sound transmission loss of building partitions<br>Amdt 1, Jan 1987 |
| **AS/NZS 1200** | 1994 | Pressure equipment |
| **AS. 1214** | 1983 | Hot-dip galvanised coatings on threaded fastners |
| **AS 1250** | 1981 | The use of steel in structures<br>(SAA Steel Structures Code)<br>Amdt 2, Oct. 1984 |
| **AS 1273** | 1991 | Unplasticized PVC (UPVC) downpipe and fittings for rainwater |
| **AS 1276** | 1979 | Methods for determination of Sound Transmission Class and Noise Isolation Class of building partitions |
| **AS 1288** | 1994 | Glass in buildings - Selection and Installation |
| **AS 1289** | 1984 | Methods of testing soils for engineering purposes |
| **AS 1302** | 1991 | Steel reinforcing bars for concrete |
| **AS 1304** | 1991 | Welded wire reinforcing fabric |
| **AS 1379** | 1991 | The specification and manufacture of concrete |
| **AS 1397** | 1993 | Steel sheet and strip - Hot-dipped zinc coated or aluminium/zinc coated |

**Table 1.4.1 continued**

| | | |
|---|---|---|
| **AS 1492** | 1973 | Flooring milled from radiata pine |
| **AS 1526** | 1974 | One-part polysulphide based sealing compounds for the building industry |
| **AS 1527** | 1974 | Two-part polysulphide based sealing compounds for the building industry |
| **AS 1530** | | Methods for fire tests on building materials components and structures |
| Part 1 | 1994 | Combustibility test for materials |
| Part 2 | 1993 | Test for flammability of materials<br>Amdt 1, July 1993 |
| Part 3 | 1989 | Simultaneous determination of ignitability, flame propagation, heat release and smoke release<br>Amdt 1, April 1992 |
| Part 4 | 1990 | Fire-resistance tests on elements of building construction |
| | | [Note: Subject to the note to AS 4072.1, reports relating to tests carried out under earlier editions of AS 1530 Parts 1 to 4 remain valid. Reports relating to tests carried out after the date of an amendment to a Standard must relate to the amended Standard] |
| **AS 1538** | 1988 | Cold-formed Steel Structures Code |
| **AS 1562** | | Design and installation of sheet roof and wall cladding |
| Part 1 | 1992 | Metal<br>Amdt 1, July 1993<br>Amdt 2, Sept 1995 |
| **AS 1604** | 1993 | Timber-preservative-treated-sawn and round |
| **AS 1627** | 1990 | Metal finishing-preparation and pretreatment of surfaces |
| **AS 1639** | 1990 | The design and installation of corrugated fibre-reinforced cement roofing and wall cladding<br>Amdt 1, May 1991 |
| **AS 1650** | 1989 | Hot-dipped galvanised on ferrous articles |
| **AS 1657** | 1992 | Fixed platforms, walkways, stairways and ladders - Design, construction and installation<br>(SAA Code for Fixed Platforms, Walkways, Stairways and Ladders) |
| **AS 1664** | 1979 | Rules for the use of aluminium in structures<br>(SAA Aluminium Structures Code) |
| **AS 1668** | | The use of mechanical ventilation and air-conditioning in buildings |
| Part 2 | 1991 | Mechanical ventilation for acceptable indoor-air quality |
| **AS 1670** | 1995 | Automatic fire detection and alarm systems - system design, installation and commissioning |

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**Table 1.4.1 continued**

| | | |
|---|---|---|
| **AS 1680** | | Interior lighting |
| Part 1 | 1990 | General principles and recommendations<br>Amdt 1, June 1993 |
| Part 2.0 | 1990 | Recommendations for specific tasks and interiors<br>Amdt 1, Dec 1992 |
| Part 2.1 | 1993 | Circulation space and other general areas |
| **AS 1684** | 1992 | National Timber Framing Code<br>Amdt 1, Sept 1993<br>Amdt 2, June 1994<br>Amdt 3, Dec 1995 |
| **AS 1691** | 1985 | Domestic oil-fired appliances - Installation<br>Amdt 1, Sept 1985 |
| **AS 1720** | | Timber structures<br>(SAA Timber Structures Code) |
| Part 1 | 1988 | Design methods<br>Amdt 1, March 1993 |
| Part 4 | 1990 | Fire resistance of structural timber |
| **AS 1782** | 1975 | Flooring milled from Australian grown conifers (softwoods)(excluding radiata pine and cypress pine) |
| **AS 1810** | 1975 | Flooring milled from cypress pine |
| **AS 1859** | 1980 | Flat pressed particleboard |
| **AS 1860** | 1975 | Installation of particleboard flooring |
| **AS 1926** | | Swimming pool safety |
| Part 1 | 1993 | Fencing for swimming pools |
| Part 2 | 1995 | Location of fencing for private swimming pools |
| **AS 2049** | 1992 | Roof tiles |
| **AS 2050** | 1995 | Fixing of roofing tiles<br>Amdt 1, Sept 1995 |
| **AS 2159** | 1995 | Rules for the design and installation of piles (SAA Piling Code)<br>Amdt 1, April 1996 |
| **AS/NZ 2179** | 1994 | Specification for rainwater goods, accessories and fasteners |
| **AS 2180** | 1986 | Metal rainwater goods-selection and installation Amdt 1 Aug 1986<br>Amdt 2 June 1990<br>Amdt 3 Aug 1994 |
| **AS 2185** | 1991 | Fibrous plaster products |
| **AS/NZ 2269** | 1994 | Plywood-structural |

**Table 1.4.1 continued**

| | | |
|---|---|---|
| **AS 2327** | | Composite construction in structural steel and concrete (SAA Composite Construction Code) |
| Part 1 | 1980 | Simply supported beams |
| **AS 2424** | 1991 | Plastics building sheets- General installation requirements and design of roofing systems |
| **AS 2699** | 1984 | Wall ties for masonary construction incorporating Amdt 1 1986<br>Amdt 2 Dec 1986 |
| **AS 2733** | 1984 | Concrete masonary units<br>Amdt 1 Oct 1988 |
| **AS 2796** | 1985 | Timber-seasoned hardwood-milled products<br>Amdt 1 Nov 1985 |
| **AS 2867** | 1986 | Farm structures - General requirements for structural design |
| **AS 2870** | | Residential slabs and footings |
| Part 1 | 1996 | Construction<br>Amdt 1, Dec 1996 |
| **AS/NZS 2904** | 1995 | Damp-proof courses and flashings |
| **AS 2908** | | Cellulose cement products |
| Part 1 | 1992 | Corrugated sheets |
| Part 2 | 1992 | Flat sheets |
| **AS 2918** | 1990 | Domestic solid-fuel burning appliances-Installation |
| **AS/NZS 3013** | 1995 | Electrical installations - Wiring systems for specific applications |
| **AS 3500.3** | 1990 | Stormwater drainage |
| **AS 3566.3** | 1988 | Screws - Self-drilling-for the building and construction industries<br>Amdt 1 July 1990 |
| **AS 3600** | 1994 | Concrete structures |
| **AS 3660** | | Protection of buildings from subterranean termites |
| Part 1 | 1995 | New buildings |
| **AS 3623** | 1993 | Domestic metal framing |
| **AS 3700** | 1988 | Masonry in Buildings (SAA Masonry Code)<br>Amdt 1, Jan 1989<br>Amdt 2, March 1991<br>Amdt 3, April 1992<br>Amdt 4, July 1994 |
| **AS 3740** | 1994 | Waterproofing of wet areas in residential buildings<br>Amdt 1, Sept 1995 |

**Table 1.4.1 continued**

| | | |
|---|---|---|
| **AS 3786** | 1993 | Smoke alarms<br>Amdt 1, April 1994<br>Amdt 2, Dec 1995 |
| **AS 3798** | 1990 | Guidelines on earthworks for commercial and residential developments |
| **AS 3958** | 1991 | Ceramic tiles |
| **AS 3958.1** | 1991 | Guide to the installation of ceramic tiles |
| **AS 3959** | 1991 | Construction of buildings in bushfire prone areas |
| **AS 4055** | 1992 | Wind loads for housing |
| **AS 4100** | 1990 | Steel Structures<br>Amdt 1, Aug 1992<br>Amdt 2, June 1993<br>Amdt 3, Dec 1995 |
| **AS/NZS 4200** | | Pliable building membranes and underlays |
| Part 1 | 1994 | Materials<br>Amdt 1, Dec 1994 |
| Part 2 | 1994 | Installation requirements |
| **AS/NZS 4256** | | Plastic roof and wall cladding material |
| Part 1 | 1994 | General requirements |
| Part 2 | 1994 | Unplasticized polyvinyl chloride (uPVC) building sheets |
| Part 3 | 1994 | Glass fibre reinforced polyester (GRP) |
| Part 5 | 1996 | Polycarbonate |
| **AISC** | | Guidelines for assessment of fire resistance of structural steel members |
| **ASTM D3018-90** | | Class A asphalt shingles surfaced with mineral granules |
| **ASTM E72-80** | | Standard method of conducting strength tests of panels for building construction |
| **ASTM E695-79** | 1985 | Standard method of measuring relative resistance of wall, floor and roof construction to impact loading |
| **CSIRO- DBC&E** | | Special report-low rise domestic and similar framed structures<br>Part 4- Supplementary domestic buildings for built-up areas sections I to V |
| **CSIRO-NBTC** | 1987 | Bulletin 5- Earth-wall Construction 4th edition |
| **ISO 140** | | Acoustics- Measurement of sound insulation in buildings and of building elements |
| Part VI | 1978E | Laboratory measurements of impact sound insulation of floors |
| **Northern Territory** | | **Deemed to comply Standards manual** |

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**Table 1.4.1 continued**

| | |
|---|---|
| **SA G5 101** | South Australian Ministers Specification |
| **SA G5** | South Australian Ministers Specification |
| **SSL** | Register of Accredited Products - Fire Protection Equipment |
| **TN 61** | Cement and concrete association of Australia |
| **Timber framing manual - 1994** | Timber promotion council - Victoria |
| **Timber framing manual Supplementary tables - 1995** | Timber promotion council - Victoria |
| **NSW Timber framing manual - 1994** | State forest of NSW |
| **Timber framing manual W33N-W41N - 1994** | Timber research and development advisory council - Queensland |
| **Timber framing manual W41C 1993** | Timber research and development advisory council - Queensland |
| **Timber framing manual W50C 1994** | Timber research and development advisory council - Queensland |
| **Timber framing manual W60C - 1992** | Timber research and development advisory council - Queensland |

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## STATE AND TERRITORY VARIATIONS - SCHEDULE OF REFERENCE DOCUMENTS

### AUSTRALIAN CAPITAL TERRITORY REFERENCED DOCUMENTS

| No. | Date | Title |
|---|---|---|
| **AS 1691** | 1985 | Domestic oil-fired appliances-Installation Amdt 1, Sept 1985 |
| **AS 3000** | 1991 | SAA Wiring Rules |
| | | Worksafe Australia Asbestos Code of Practice and Guidance Notes, August 1988 |

### SOUTH AUSTRALIAN REFERENCED DOCUMENTS

| No. | Date | Title |
|---|---|---|
| **AS 1428** | 1993 | Design for access and mobility |
| | | Part 1: General requirements for access - buildings. |

### VICTORIAN REFERENCED DOCUMENTS

| No. | Date | Title | | |
|---|---|---|---|---|
| **AS/NZS 4200** | 1993 | Pliable building materials and underlays | | |
| | | Part 1 | 1994 | Materials |
| | | Part 2 | 1994 | Installation requirements |
| **House energy rating** | | Energy Victoria June 1994 | | |

SECTION 2

Amdt 0

# PERFORMANCE PROVISIONS

# SECTION 2 CONTENTS



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# PART 2.0 APPLICATION



## 2.0 Application

(a) This Section contains the Objectives, Functional Statements and Performance Requirements for Class 1 and 10 buildings (other than access requirements for people with disabilities in Class 10 buildings); and

(b) For the purposes of this Section a reference to the word building includes a reference to both Class 1 and 10 buildings unless otherwise specified.

**Note:** Access requirements for people with disabilities in Class 10 buildings are contained in Volume One of the Building Code of Australia 1996.

# PART 2.1 STRUCTURE

**2.1** The structural performance provisions for Volume 2 of BCA 1996 are:



## OBJECTIVE

**O2.1** The objective is to-

(a) safeguard people from injury caused by structural failure; and

(b) safeguard people from loss of amenity caused by structural behaviour; and

(c) protect *other property* from physical damage caused by structural failure.

## FUNCTIONAL STATEMENT

**F2.1** A building or structure is to withstand the combination of loads and other actions to which it may be reasonably subjected.

## PERFORMANCE REQUIREMENT

**P2.1** A building or structure including its materials and components must be capable of sustaining at an acceptable level of safety and serviceability-

(a) the most adverse combination of loads (including combinations of loads that might result in a potential for progressive collapse); and

(b) other actions

to which it may reasonably be subjected.

# PART 2.2 DAMP AND WEATHERPROOFING

**2.2** The damp and weatherproofing performance provisions for Volume 2 of BCA 1996 are:

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## OBJECTIVE

**O2.2** The objective is to-

(a) safeguard occupants from illness or injury and protect the building from damage caused by-

(i) *surface water*, and

(ii) external moisture entering a building; and

(iii) the accumulation of internal moisture in a building; and

(iv) the discharge of *swimming pool* waste water; and

(b) protect *other property* from damage caused by -

(i) redirected *surface water;* and

(ii) the discharge of *swimming pool* waste water.

**STATE AND TERRITORY VARIATIONS**

**02.2(a)(iv) does not apply in the Northern Territory.**

## FUNCTIONAL STATEMENT

### F2.2.1 Surface water

A building including any associated *sitework* is to be constructed in a way that protects people and *other property* from the adverse effects of redirected *surface water*.

### F2.2.2 Weatherproofing and Dampness

A building is to be constructed to provide resistance to moisture from the outside and moisture rising from the ground.

**Limitation:**

F2.2.2 does not apply to a Class 10 building where in the particular case there is no necessity for compliance.

### F2.2.3 Drainage from swimming pools

Adequate means for the disposal of *swimming pool* water and drainage is to be provided to a *swimming pool*.

> **Note:**
>
> The BCA does not contain any deemed-to-satisfy provisions for this performance requirement.

**STATE AND TERRITORY VARIATIONS**

**F2.2.3 does not apply in the Northern Territory.**



## PERFORMANCE REQUIREMENT

### P2.2.1 Surface water

(a) *Surface water*, resulting from a storm having an *average recurrence interval* of 10 years and which is collected or concentrated by a building or *sitework*, must be disposed of in a way that avoids the likelihood of damage or nuisance to any *other property*.

(b) *Surface water*, resulting from a storm having an *average recurrence interval* of 5 years must not enter the building.

> **Limitation:**
>
> P2.2.1(b) does not apply to a Class 10 building where in the particular case there is no necessity for compliance.

(c) A drainage system for the disposal of *surface water* must-

(i) convey *surface water* to an appropriate *outfall*; and

(ii) avoid the entry of water into a building; and

(iii) avoid water damaging the building.

### P2.2.2 Weatherproofing

A roof and *external wall* (including openings around *windows* and doors) must prevent the penetration of water that could cause -

(a) unhealthy or dangerous conditions, or loss of amenity for occupants; and

(b) undue dampness or deterioration of building elements.

**Limitation:**

P2.2.2 (a) does not apply to a Class 10 building where in the particular case there is no necessity for compliance..



### P2.2.3 Dampness

A building element must be protected against deterioration caused by undue dampness or other conditions on the allotment.

**STATE AND TERRITORY VARIATIONS**

**P2.2.3 has been replaced in South Australia as follows.**

**P2.2.3** A building element must be protected against deterioration caused by undue dampness or other conditions as appropriate to its geographical environment.

### P2.2.4 Drainage from swimming pools

A *swimming pool* must have adequate means of draining the pool in a manner which will not-

(a) cause illness to people; or

(b) affect *other property*.

**Note:**

The BCA does not contain any deemed-to-satisfy provisions for this performance requirement.

**STATE AND TERRITORY VARIATIONS**

**P2.2.4 does not apply in the Northern Territory.**

# PART 2.3 FIRE SAFETY

**2.3** The fire safety performance provisions for Volume 2 of BCA 1996 are:

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## OBJECTIVE

**O2.3** The objective is to:

(a) Safeguard the occupants from illness or injury -

(i) by alerting them of a fire in the building so that they may safely evacuate; and

(ii) caused by fire from combustion appliances installed within a building; and

(iii) in *alpine areas,* from an emergency while evacuating a building; and

(b) prevent the spread of fire; and

(c) protect the Class 1 building from the effects of a bushfire.

## FUNCTIONAL STATEMENT

**F2.3.1 Protection from the spread of fire**

A Class 1 building is to be protected from the spread of fire.

**F2.3.2 Fire detection and early warning**

A Class 1 building is to be provided with safeguards so that occupants are warned of a fire in the building so that they may safely evacuate.

**F2.3.3 Combustion appliances**

Combustion appliances using controlled combustion located in a building are to be installed in a way which reduces the likelihood of fire spreading beyond the appliance.

**F2.3.4 Bushfire areas**

A Class 1 building constructed in a *designated bushfire prone area* is to provide resistance to bushfires in order to reduce the danger to life and reduce the risk of the loss of the building .

**F2.3.5 Alpine areas**

A Class 1 building in an *alpine area* is to be provided with additional measures in view of the increased difficulties in fighting fire and maintaining access and means of egress in snow conditions.

**PERFORMANCE REQUIREMENT**

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**P2.3.1 Protection from the spread of fire**

(a) A Class 1 building must be protected from the spread of fire from -

(i) another building other than an associated Class 10 building; and

(ii) the allotment boundary, other than a boundary adjoining a road or public space.

(see Figure 2.3.1)

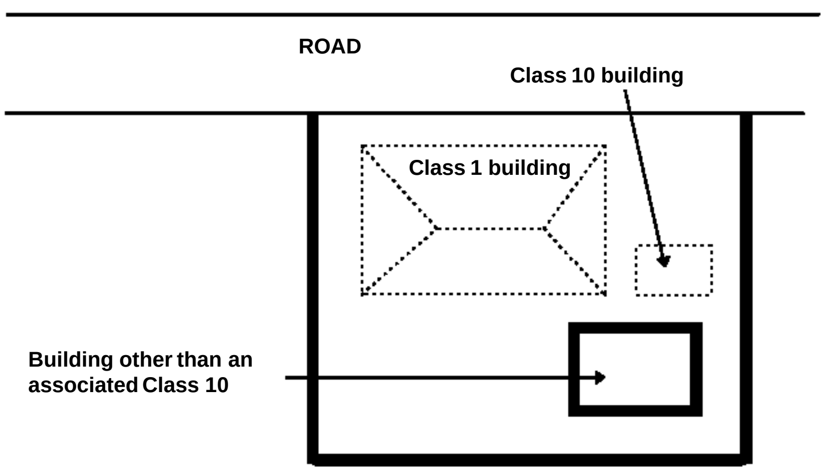
(b) A Class 10 building must not significantly increase the risk of fire spread between buildings.

**Figure 2.3.1**

**TYPICAL AREAS OF POTENTIAL FIRE SPREAD**

**Note:** The following diagram indicates areas of potential fire spread. This situation will differ for corner allotments etc.

**Legend:** ▬ = areas of potential fire spread.



**P2.3.2 Fire detection and early warning**

In a Class 1 building providing sleeping accommodation, occupants must be provided with *automatic* warning on the detection of smoke so that they may evacuate in the event of a fire to a safe place.

**P2.3.3 Combustion appliances**

A combustion appliance and its associated components within a building including an open fire-place, chimney, or the like must be installed-

(a) to withstand the temperatures likely to be generated by the appliance; and

(b) so that it does not raise the temperature of any building element to a level that would adversely affect the element's physical or mechanical properties or function; and

(c) so that hot products of combustion will not-

(i) escape through the walls of associated components; and

(ii) discharge in a position that will cause fire to spread to nearby *combustible* materials or allow smoke to penetrate through nearby *windows*, ventilation inlets, or the like.

**P2.3.4 Bushfire areas**

A Class 1 building that is constructed in a *designated bushfire prone area* must be provided with protection to reduce the risk of ignition in the event of a bushfire by embers until the fire front passes.

**P2.3.5 Alpine areas**

(a) An external doorway from a Class 1 building in an *alpine area* must be installed so that opening the door is not obstructed by snow or ice.

(b) A building in an *alpine area* containing external trafficable structures forming part of the means of egress must be constructed so that they remain, as far as practicable, useable under snow conditions.

(c) A building in an *alpine area* must be constructed so that snow or ice is not shed from the building onto the allotment, any adjoining allotment, road or public space in a location or manner that will-

(i) obstruct a means of egress from any building to a road or *open space;* or

(ii) otherwise endanger people.

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# PART 2.4 HEALTH AND AMENITY

**2.4** The health and amenity performance provisions for Volume 2 of BCA 1996 are:



## OBJECTIVE

### O2.4.1 Wet areas

The objective is to safeguard the occupants from illness or injury and protect the building from damage caused by the accumulation of internal moisture arising from the use of wet areas in a building.

### O2.4.2 Room heights

The objective is to safeguard the occupants from injury or loss of amenity caused by inadequate height of a room or space.

### O2.4.3 Facilities

The objective is to -

(a) safeguard occupants from illness caused by infection; and

(b) safeguard occupants from loss of amenity arising from the absence of adequate personal hygiene facilities; and

(c) enable occupants to carry out laundering; and

(d) provide for facilities to enable food preparation.

### O2.4.4 Light

The objective is to safeguard occupants from injury, illness or loss of amenity due to-

(a) isolation from natural light; and

(b) lack of adequate artificial lighting.

### O2.4.5 Ventilation

The objective is to safeguard occupants from illness or loss of amenity due to lack of air freshness.

### O2.4.6 Sound insulation

The objective is to safeguard occupants from illness or loss of amenity as a result of undue sound being transmitted between adjoining dwellings.

**FUNCTIONAL STATEMENT**

**F2.4.1 Wet areas**

A building is to be constructed to avoid the likelihood of -

(a) the creation of any unhealthy or dangerous conditions; or

(b) damage to building elements,

caused by dampness or water overflow from bathrooms, laundries and the like.

**F2.4.2 Room heights**

A building is to be constructed to provide height in a room or space suitable for the intended use.

**F2.4.3 Facilities**

A Class 1 building is to be provided with suitable -

(a) space and facilities for personal hygiene; and

(b) space and facilities for laundering; and

(c) space and facilities for the preparation and cooking of food.

**F2.4.4 Light**

(a) A habitable space within a building used by occupants is to be provided with openings to admit natural light; and

(b) a space within a building used by occupants is to be provided with artificial lighting consistent with its function or use which, when activated in the absence of suitable natural light, will enable safe use and movement.

**F2.4.5 Ventilation**

A space used by occupants within a building is to be provided with adequate ventilation consistent with its function or use.

**F2.4.6 Sound insulation**

A building element which separates dwellings is to be constructed to prevent undue sound transmission between adjoining dwellings.

**PERFORMANCE REQUIREMENT**

**P2.4.1 Wet areas**

To protect the structure of the building and to maintain the amenity of the occupants, water must be prevented from penetrating-

(a) behind fittings and linings; or

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(b) into concealed spaces,

of sanitary facilities, bathrooms, laundries and the like.

**P2.4.2 Room heights**

A *habitable room* or space must have sufficient height that does not unduly interfere with its intended function.

**P2.4.3 Facilities**

(a) Suitable sanitary facilities for personal hygiene must be provided in a convenient location within or outside the Class 1 building appropriate to the function or use of the building.

(b) Any sanitary and facilities for personal hygiene must be-

(i) within the building; or

(ii) grouped elsewhere in a convenient and *accessible* location.

(c) Laundering facilities or space for laundering facilities must be provided in a convenient location within or outside the Class 1 building appropriate to the function or use of the building.

(d) A food preparation facility must be provided which includes -

(i) a means for food rinsing, utensil washing and waste water disposal; and

(ii) a means for cooking food; and

(iii) a space for food preparation.

**P2.4.4 Light**

(a) Sufficient openings must be provided and distributed in a building so that natural light, when available, provides a level of *illuminance* appropriate to the function or use of that part of the building.

**Application:**

P2.4.4(a) only applies to habital rooms.

(b) Artificial lighting must be installed to provide a level of illuminance appropriate to the function or use of the building to enable safe use and movement by occupants.

**Application:**

P2.4.4 only applies if natural lighting of a suitable standard is not available to *sanitary compartments*, bathrooms, shower rooms, airlocks and laundries.

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**P2.4.5 Ventilation**

(a) A space within a building used by occupants must be provided with means of ventilation with *outdoor air* which will maintain adequate air quality.

(b) A mechanical air-handling system installed in a building must control -

(i) the circulation of objectionable odours; and

(ii) the accumulation of harmful contamination by micro-organisms, pathogens and toxins.

(c) Contaminated air must be disposed of in a manner which does not unduly create a nuisance or hazard to people in the building or *other property*.

**P2.4.6 Sound insulation**

(a) Walls separating dwellings must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants.

(b) The *required* sound insulation of walls must not be compromised by the incorporation or penetration of a pipe or other service element.

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SUPERSEDED

# PART 2.5 SAFE MOVEMENT AND ACCESS

**2.5** The safe movement and access performance provisions for Volume 2 of BCA 1996 are:



## OBJECTIVE

**O2.5** The objective is to:

(a) Provide people with safe access to and within a building.

(b) Safeguard young children from drowning or injury in a *swimming pool.*

**Application:**

O2.5 only applies to a *swimming pool* with a depth of water more than 300 mm.

**STATE AND TERRITORY VARIATIONS**

1. **02.5(b) does not apply in New South Wales.**

   **Note:** Restriction of access to swimming pools in New South Wales is regulated under the Swimming Pools Act 1992.

2. **02.5(b) does not apply in the Northern Territory.**

3. **02.5(b) does not apply in Queensland.**

   **Note:** Restriction of access to swimming pools in Queensland is regulated under the Building Act 1975.

## FUNCTIONAL STATEMENT

**F2.5.1 Safety from falling**

A building is to provide safe access for people to the services and facilities within.

**F2.5.2 Swimming pool access**

Access by young children to *swimming pools* is to be restricted.

**Application:**

F2.5.2 only applies to a *swimming pool* with a depth of water more than 300 mm.

STATE AND TERRITORY VARIATIONS

1. **F2.5.2 does not apply in New South Wales.**

   **Note:** Restriction of access to swimming pools in New South Wales is regulated under the Swimming Pools Act 1992.

2. **F2.5.2 does not apply in the Northern Territory.**

3. **F2.5.2 does not apply in Queensland.**

   **Note:** Restriction of access to swimming pools in Queensland is regulated under the Building Act 1975.



## PERFORMANCE REQUIREMENT

### P2.5.1 Stairways and ramps

So that people can move safely to and within a building, it must have-

(a) walking surfaces with safe gradients; and

(b) any stairway or ramp with -

  (i) suitable handrails where necessary to assist and provide stability to people using a stairway or ramp; and

  (ii) suitable landings to avoid undue fatigue; and

  (iii) in the case of a stairway, be suitable for safe passage in relation to the nature, volume and frequency of likely usage.

### P2.5.2 Barriers

Where people could fall 1 metre or more from a floor or roof of a building or an opening in the external envelope, or due to a sudden change of level within or associated with a building, a barrier must be provided which must be-

(a) continuous and extend for the full extent of the hazard; and

(b) of a height to protect people from accidentally falling from the floor or roof; and

(c) constructed to prevent people from falling through the barrier; and

(d) capable of restricting the passage of children; and

(e) of strength and rigidity to withstand-

  (i) the foreseeable impact of people; and

  (ii) where appropriate, the static pressure of people pressing against it.

### P2.5.3 Swimming pool access

A barrier must be provided to a *swimming pool* and must-

(a) be continuous for the full extent of the hazard; and

(b) be of a strength and rigidity to withstand the foreseeable impact of people; and

(c) restrict the access of young children to the pool and the immediate pool surrounds; and

(d) have any gates and doors fitted with latching devices not readily operated by young children, and constructed to automatically close and latch.

**Application:**

P2.5.3 only applies to a *swimming pool* with a depth of water more than 300 mm.



**STATE AND TERRITORY VARIATIONS**

1. **P2.5.3 does not apply in New South Wales.**

   **Note:** Restriction of access to swimming pools in New South Wales is regulated under the Swimming Pools Act 1992.

2. **P2.5.3 does not apply in the Northern Territory.**

3. **P2.5.3 does not apply in Queensland.**

   **Note:** Restriction of access to swimming pools in Queensland is regulated under the Building Act 1975.



SUPERSEDED

SECTION **3**

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# ACCEPTABLE CONSTRUCTION

**Introduction**

**The scope of these provisions**

**Suitability of alternative solutions**

**The use of maps**

**Consultation with relevant approval authorities**

**Layout of Parts 3.1 - 3.11**

**How to use the requirements of each Part**



SUPERSEDED

# HOW TO USE SECTION 3



**3.0** This is a non mandatory explanatory introduction on how to use Section 3 of the *Housing Provisions*.

## 3.1 Introduction

Section 3, Parts 3.1- 3.11 are deemed-to-satisfy options that are considered to be acceptable forms of construction that meet the legislative requirements for complying with the *Housing Provisions* (ie they comply with the performance requirements listed in Section 2 of the *Housing Provisions*).

**There is no obligation to adopt any particular option contained in Section 3 of the *Housing Provisions*, if you prefer to meet the performance requirement in some other way.**

However, If you do not comply with one of the options described in Section 3, then it will be up to you to prove that you have satisfied the performance requirements.

## 3.2 The scope of these provisions

The deemed-to-satisfy options (described as “acceptable construction practice” or “acceptable construction manual”) are indicative of some of the most common forms of national construction practice.

However, it should be noted that some of these options described as “acceptable construction practice” may have very specific limitations and accordingly will not be suitable for all applications. Generally these limitations relate to climatic (*design wind speed*), geographical and topographical conditions and building geometry.

If the acceptable construction practice option is not suitable for the proposed construction or site conditions, an alternative approach may be found in one of the acceptable construction manuals listed at the start of each Part.

## 3.3 Suitability of alternative solutions

The options described in Section 3 are typical examples. They are certainly not the only means available of complying with the *Housing Provisions*. The performance nature of this document provides flexibility and allows the use of alternative construction methods even though they may not be specifically described in an acceptable construction manual or as acceptable construction practice.

Alternative solutions may be used provided they comply with the performance provisions listed in Section 2 (for further explanation see the Introduction).

## 3.4 The use of maps

Maps have been used throughout Section 3 to indicate areas where particular requirements apply. These maps are indicative and some variation in conditions will apply, especially on the border of marked areas.

It is recommended that the *relevant approval authority* be consulted and in most cases they will be able to identify what conditions apply in such areas at the early stage of building design.

## 3.5 Consultation with relevant approval authorities

When building in certain locations there may be local conditions that may limit the type of construction that can be used. This is particularly important with *design wind speed* classifications and soil types.

*Relevant approval authorities* have a wide range of experience and information on the geographical and topographical conditions found in their area of responsibility, accordingly it is a worthwhile step during the initial design stage to consult with these people to ensure you are applying the *Housing Provisions* correctly.

## 3.6 Layout of Parts 3.1- 3.11

Parts 3.1- 3.11 of the *Housing Provisions* are organised in a manner that follows the logical construction sequence of a building. When considering the initial design of a building people may need to refer to different elements of the *Housing Provisions* to obtain the relevant information. This will obviously vary depending on the nature of work being undertaken. The following chart outlines some of the more frequently used details and where it is located in this document.

**INFORMATION GUIDE**

| | Relevant Part | Part reference |
|---|---|---|
| INITIAL CONCEPT CONSIDERATIONS → | Earthworks | 3.1.1 |
| | Location of buildings (fire safety) | 3.7.1 |
| | Facilities required | 3.8.3 |
| | Room heights | 3.8.2 |
| | Light and ventilation | 3.8.4 and 3.8.5 |
| CONSTRUCTION ISSUES → | Site preparation | 3.1.2 and 3.1.3 |
| | Footings and slabs | 3.2 |
| | Masonry | 3.3 |
| | Framing | 3.4 |
| | Roof and wall cladding | 3.5 |
| | Glazing | 3.6 |
| | Barriers | 3.9.2 |
| | Wet area waterproofing | 3.8.1 |
| | Sound insulation | 3.8.6 |
| | Swimming pool access | 3.9.3 |
| SPECIAL REQUIREMENTS → | Termite risk management | 3.1.3 |
| | Earthwall construction | 3.3.5 |
| | Smoke alarms | 3.7.2 |
| | Heating appliances | 3.7.3 |
| | High wind areas | 3.10.1 |
| | Bushfire areas | 3.7.4 |
| | Alpine areas | 3.7.5 |
| | Earthquake areas | 3.10.2 |

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## 3.7 How to use the requirements of each Part

The following is an example page layout from Part 3.2. This diagram explains the concepts behind typical clauses contained throughout Parts 3.1 - 3.11.

**Acceptable construction manuals**

**This clause lists reference manuals that can be used to meet the relevant performance requirement of the Housing Provisions. These reference manuals may also be used in conjunction with the acceptable construction practice described for that part. Either approach fully meets the requirements of the Housing Provisions**

**The performance requirement, contained in Section 2, is also nominated in this clause. It is not necessary to read the performance requirement, unless you are planning part of your design to meet the performance requirement. This would occur when you plan to use a method of construction not specifically covered by the Housing Provisions or one of its acceptable construction or design manuals.**

> Appropriate performance requirements:
>
> Where an alternative footing system is proposed to that described in Part 3.2, that proposal must comply with:
>
> a. the structural performance requirement P2.1; and
>
> b. the dampness performance requirement P2.2.2(b) in Section 2.

A. Acceptable construction manuals

**3.2.0** Performance requirements P2.1 and P2.2.2(b) are satisfied if a footing or slab is installed in accordance with one of the following manuals:

(a) The footings and slab are constructed in accordance with AS 2870.

(b) Piled foundations are designed in accordance with AS 2159.

**Appropriate performance requirement**

**This clause is an explanatory note indicating the peformance requirements that need to be complied with if an alternative design to that described in this Part is proposed.**

> Explanatory information:
>
> Composite construction - design requirements for other materials that may be used in combination with the above footing systems, including the use of heavy steel support beams etc. are described in Part 3.11 - structural design codes.

B. Acceptable construction practice

**3.2.1 Application**

Compliance with the acceptable construction practice provisions of Part 3.2 for footing systems satisfies performance requirements P2.1 and P2.2.2(b), provided -

(a) the footing is on a Class A, S or M *site* (classified in accordance with AS 2870) with a uniform bearing capacity; and

**Application**

**Indicate the limitations that apply to the acceptable construction practice described in that Part. Construction must meet all the relevant requirements of this clause for it to comply with the Housing Provisions.**

**Explanatory information**

**These elements in the Housing Provisions are not mandatory (ie they do not need to be followed).**

**They have been included to explain the application of particular clauses or provide additional guidance on the intent of a requirement.**

**Acceptable construction practice**

**These requirements are acceptable methods of construction and therefore comply with the Housing Provisions.**

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# PART 3.1

# SITE PREPARATION

# PART 3.1 CONTENTS



**Explanatory Information:**

These provisions relate to general site preparation for footings, services, drainage and installation of termite barriers to assist in termite management.

It should be noted that other construction methods may be used to achieve the same results as specified in this part provided they comply with the appropriate performance requirement.

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# PART 3.1.1 EARTHWORKS

**Appropriate performance requirements:**
Where an alternative approach to earthworks is proposed to that described in Part 3.1.1, that proposal must comply with the structural performance requirement P2.1 in Section 2.

STATE AND TERRITORY VARIATIONS

**3.1.1 does not apply in New South Wales.**

**Note:** In New South Wales the Local Government Act 1993 and the Local Government (Approvals) Regulation 1993 regulate matters relating to siteworks associated with the erection of a building including, the safeguarding of excavations and backfilling, provision of retaining walls to prevent soil movement, and support for neighbouring buildings.



## Acceptable construction practice

### 3.1.1.0 Application

Compliance with the acceptable construction practice provisions of Part 3.1.1 for earthworks associated with building work satisfies performance requirement P2.1 provided:

(a) The work is undertaken in normal site conditions.

(b) For the purposes of this Part, normal site conditions is defined by the following parameters -

(i) a *site* that is classified as A, S, M, H or E in accordance with Part 3.2; and

(ii) moisture conditions on site are as a result of seasonal and climatic changes; and

(iii) the *site* is not subject to unusual moisture conditions caused by drains, dams, channels, ponds or tanks which are maintained or removed from the *site*; and

(iv) no large trees have been recently removed from the *site* prior to construction; and

(v) there have been no buildings or other structures removed that are likely to have significantly modified the soil moisture conditions; and

(vi) drainage on the allotment is maintained.

(c) Any administrative obligations to adjoining owners have been observed.

**Explanatory Information:**

The provisions described in Part 3.1.1 will enable earthworks to be carried out safely and avoid potential damage to adjoining structures and property through the soil collapsing or subsiding during building works. Exceptional site conditions (including the effects of torrential rain) may need special consideration and additional advice from appropriately qualified people should be considered.

State and Territory legislation may also have requirements that affect the excavation, especially in relation to adjoining property and notification to owners of that property. Advice should be obtained from the *relevant approval authority* before commencement of works.



### 3.1.1.1 Earthworks

Excavation and fill utilising unprotected embankments can be undertaken in accordance with -

(a) Table 3.1.1.1 for general earthwork; or

(b) 3.1.1.2 for excavation adjacent to vacant *adjoining property*; or

(c) 3.1.1.3 for excavation adjacent to existing buildings; or

(d) 3.1.1.4 for fill adjacent to *adjoining property*.

### 3.1.1.2 Excavation adjacent to vacant adjoining property

Excavation work, using unprotected embankments, adjacent another allotment can be undertaken provided -

(a) there are no buildings or structures on the adjoining allotment within 3m of the property line adjacent to the excavation; and

(b) the excavation commences at the allotment boundary and is within the area defined as being suitable for excavation in Figure 3.1.1.1; and

(c) the slope of the unprotected embankment of the excavation complies with the appropriate soil classification slope described in Table 3.1.1.1.

### 3.1.1.3 Excavation adjacent to existing buildings

Excavation work for footings, drainage trenches or other similar works, adjacent to existing buildings can be undertaken provided -

(a) the angle to determine the safe area for excavation is taken from the bottom of the shallowest point of the existing footing as per Figure 3.1.1.2; and

(b) the excavation is within the area defined as being suitable for excavation in Figure 3.1.1.2; and

(c) the slope of the unprotected embankment of the excavation complies with the appropriate soil classification described in Table 3.1.11.1; and

(d) for footing excavation adjacent existing footings -

(i) the footing is poured as soon as practicable after exposing the existing footing; and

(ii) the existing footing, where on an adjoining property, is completely isolated from the new footing by means of a flexible bond breaker at least 10 mm thick; and

(e) the adjoining footing is not left exposed at the completion of works.



**Figure 3.1.1.1**

**EXCAVATION AFFECTING ADJOINING PROPERTY - SIDE ELEVATION**

**Note:** For the purposes of this Figure the angle for line A-A is defined in Table 3.1.1.1.

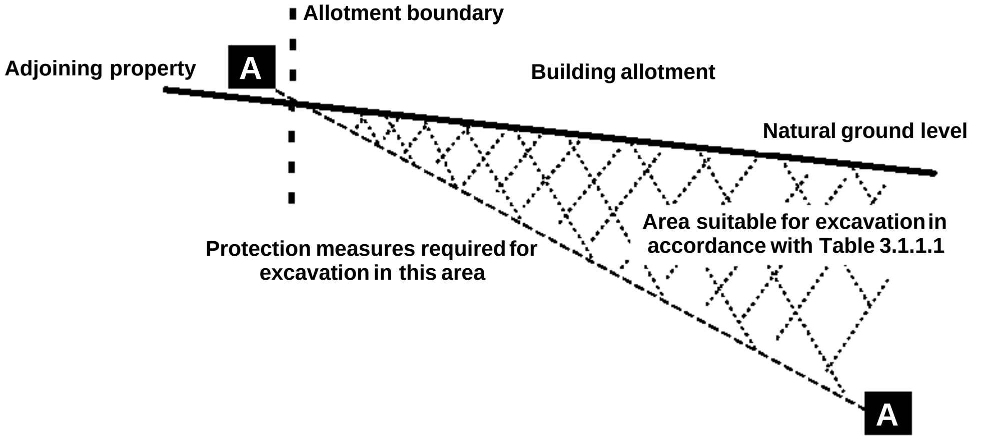
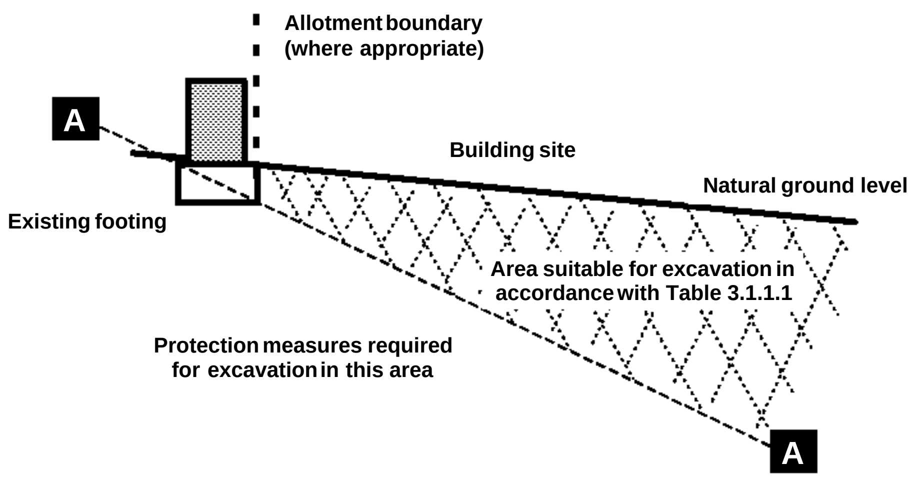



**Figure 3.1.1.2**

**EXCAVATION ADJACENT TO EXISTING BUILDINGS - SIDE ELEVATION**

**Note:** For the purposes of this Figure, line A - A is defined in Table 3.1.1.1 and taken from the bottom of the shallowest point of the existing footing.



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### 3.1.1.4 Fill

Filling works may be carried out provided -

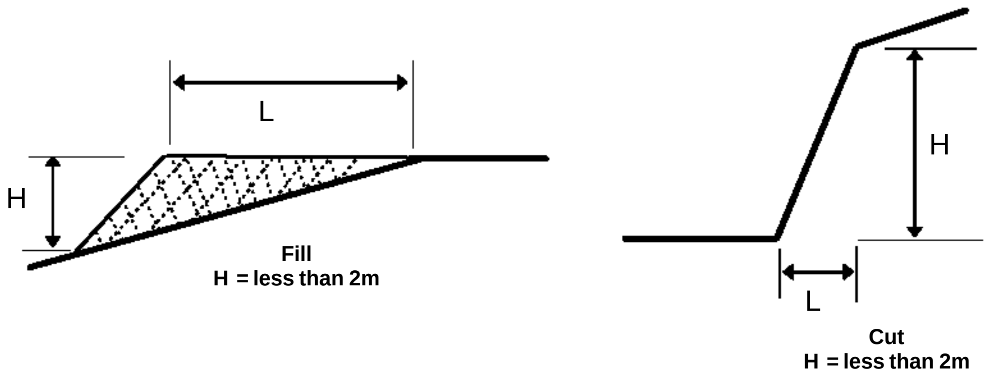
(a) where the fill is deeper than existing soil level the gradient of the fill complies with Table 3.1.1.1; and

(b) where the fill is to be used to support footings or slabs it is placed and compacted in accordance with Part 3.2.1.

**Table 3.1.1.1**
**UNPROTECTED EMBANKMENTS**

**Notes:** For the purposes of this Table:

1. Retaining walls or other types of soil retaining methods must be installed where -
   a. the slope ratio is less than that described in Table 3.1.1.1; or
   b. the soil type is not described in this Table.
2. Embankments that are to be left exposed at the end of the construction works must be stabilised by vegetation or similar works to prevent soil erosion.




| SOIL TYPE (*see 3.2.4 for material description) | | EMBANKMENT SLOPES H:L | |
|---|---|---|---|
| | | Compacted fill (see 3.2.4) | Cut |
| Stable rock (A*) | | 2:3 | 8:1 |
| Sand (A*) | | 1:2 | 2:3 |
| Silt (P*) | | 1:4 | 1:4 |
| Clay | Firm clay | 1:2 | 1:1 |
| | Soft clay | Not suitable | 2:3 |
| Soft soils (P*) | | Not suitable | Not suitable |

# PART 3.1.2 DRAINAGE

**Appropriate performance requirements:**
Where an alternative drainage system is proposed to that described in Part 3.1.2, that proposal must comply with the surface water performance requirement P2.2.1 in Section 2.



## A. Acceptable construction manual

**3.1.2.0** Performance requirement P2.2.1 is satisfied if gutters and downpipes are designed and constructed in accordance with the following manual:

(a) AS 3500.3 - Stormwater drainage installations.

**STATE AND TERRITORY VARIATIONS**

**3.1.2.0 is deleted in New South Wales.**

## B. Acceptable construction practice

### 3.1.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.1.2 satisfies performance requirement P2.2.1 for drainage of -

(a) roofs in areas subject to rainfall intensities of not more than 255 mm/per hour over an average rainfall recurrence interval over 20 years (as per Table 3.5.2.1) where a drainage system is *required*; and

(b) sub-soil areas where excessive soil moisture problems may occur; and

(c) land adjoining and under buildings.

**Explanatory Information:**

1. The BCA does not require the installation of drainage systems. Accordingly these requirements need only be applied when these systems are used.
2. Information on drainage requirements outside the allotment may be obtained from the *relevant approval authority*.
3. The legal discharge point from a building site is generally determined by local government authorities.
4. No stormwater from any source should be discharged into a sewer drainage system.

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### 3.1.2.2 Drainage requirements

Drainage systems must be installed as follows -

(a) areas adjoining and under buildings - *surface water* drainage in accordance with 3.1.2.3; 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 3.1.2.4; and

(c) where sealed underground drainage from roof areas is required or permitted - underground stormwater drainage in accordance with 3.1.2.5; and

**Explanatory Information:**

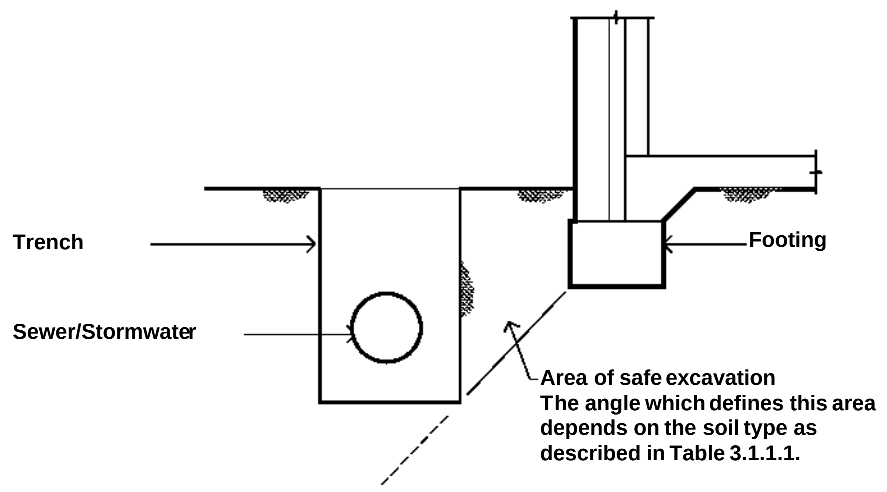
Due to problems with mosquito breeding habits, the use of sealed underground systems is not permitted in areas where Ross River fever exists (typically in Queensland in areas North of Brisbane) unless the system is sealed or able to be totally drained to prevent mosquito access and breeding.

(d) excavation for drains adjacent to existing footings must be within the area described in Figure 3.1.2.1 as being safe for excavation.

**Figure 3.1.2.1**

**EXCAVATION FOR DRAINS ADJACENT TO FOOTINGS**

**Note:** For the purposes of this Figure any excavation below the area defined as being safe for excavation will need additional protection measures to be determined by appropriately qualified persons.



### 3.1.2.3 Surface water drainage

*Surface water* must be diverted away from Class 1 buildings as follows:

(a) Slab-on-ground - finished ground level adjacent to buildings
The external finished surface surrounding the slab must be drained to move *surface water* away from the building and graded to give a minimum slope of 50mm over the first 1m away from the building (see Figure 3.1.2.2).

(b) Slab-on-ground - finished slab heights
The minimum height of the slab-on-ground (measured at the slab edge) above external finished surfaces must be -

(i) 150mm above finished ground level; or

(ii) 100mm above sandy, well-drained areas; or

(iii) 50mm above paved or concreted areas that slope away from the building.

**Explanatory Information:**

The appropriate slab height above finished ground level may vary depending on:

1. 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 150mm below the finished slab level).
2. The run-off from storms and the local topography.
3. The effect of excavation on a cut and fill site.
4. The possibility of flooding.
5. Termite barrier provisions.

(c) The ground beneath suspended floors must be graded so that the area beneath the building is above the adjacent external finished ground level (see Figure 3.1.2.3) and *surface water* is prevented from ponding under the building.

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Figure 3.1.2.2
SITE SURFACE DRAINAGE

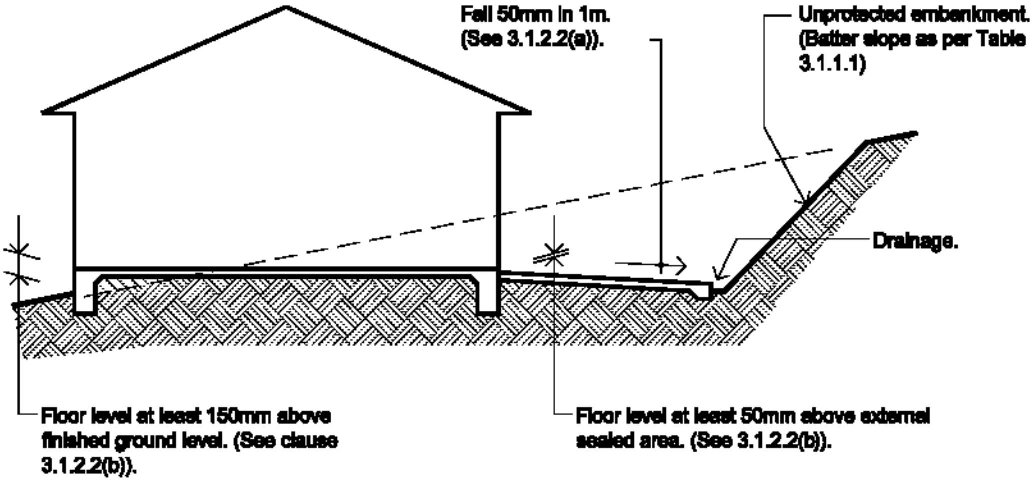
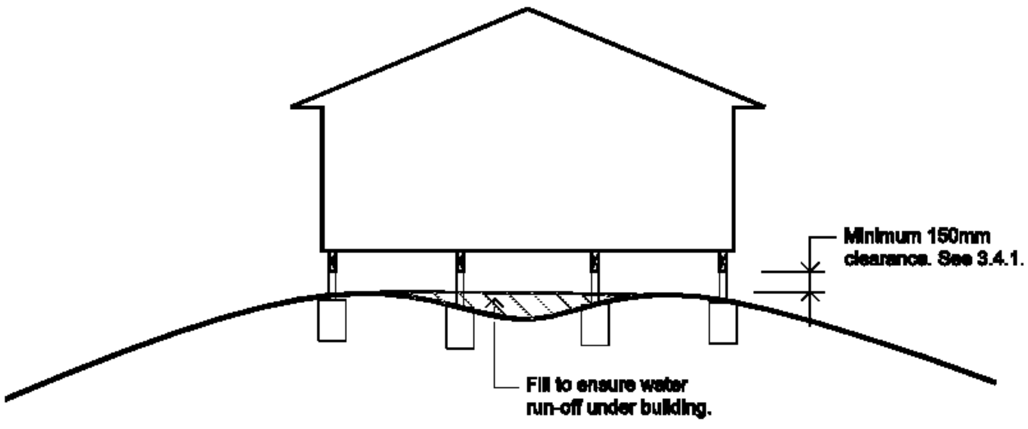



Figure 3.1.2.3
GRADING OF GROUND UNDER SUSPENDED FLOORS



### 3.1.2.4 Subsoil drainage

Where a subsoil drainage system is installed to divert sub-surface water away from the area beneath the building it must comply with the following:

> **Explanatory Information:**
>
> Subsoil drainage may need to be installed where subsoil water movement could damage foundations through the build up of excessive moisture or lateral water pressure on footings.
>
> The use of the subsoil drain described in 3.1.2.3 is optional and other systems may be used if there is a need to control ground water (see explanatory information at the end of this clause).



(a) The minimum depth to the top of the drain must be at least 400mm into the soil; and at least 100mm below any adjacent -

(i) pavement level; and

(ii) structural footing level.

(b) Trench bases (as appropriate) must be graded to a uniform fall to suit the following-

(i) parallel with pavement grade; and

(ii) parallel with overall grade of footings; and

(iii) not less than 1:300.

(c) The bottom of the trench must be well compacted and evenly graded.

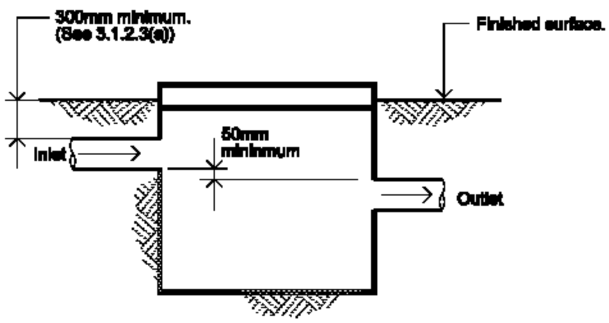
(d) The drain must be laid true to line and gradient on the bottom of the trench or where rock is encountered on compacted bedding.

(e) Silt pits of a suitable size for expected water flow, must be provided at the outlet end of each subsoil drain before it discharges into the stormwater system.

> **Explanatory Information:**
>
> Silt pits designed to control the amount of silt entering the drainage system are usually installed where the excavation on a site exceeds 1m and there is a need to drain subsoil water movement.
>
> Silt pits are typically prefabricated and designed to suit a range of conditions. Heavy duty silt pits are not commonly used in domestic applications except in areas subject to traffic (such as where a driveway runs down towards a garage located under a dwelling).
>
> To be effective the silt pit must be maintained by regular cleaning.

(f) Outlets must be installed through walls of silt pits a minimum of 50mm below the lowest point of the inlet (see Figure 3.1.2.4).

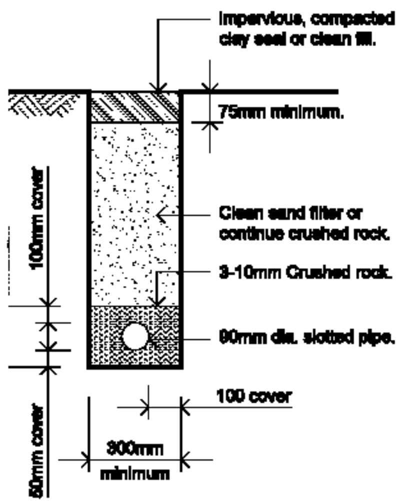
**Figure 3.1.2.4**
**CONSTRUCTION OF SILT PITS**




(g) Drainage trenches in clay soils using sand filters may be constructed in accordance with either of the options in Figure 3.1.2.5.

**Figure 3.1.2.5**
**BACKFILLING OF SUBSOIL DRAINS**

**Note:** The impervious fill may be omitted if the drain is also designed to collect surface water.

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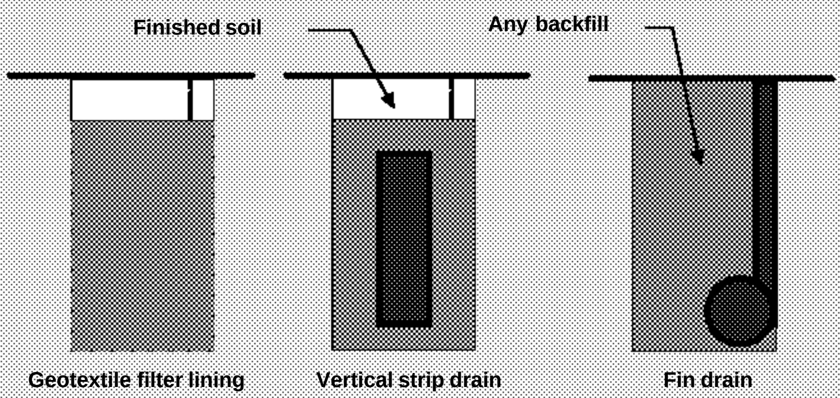
**Explanatory Information:**

The design of alternative subsoil drains will need to consider the nature of the soil and the anticipated water level and movement. One of the main concerns with subsoil drains is to keep fine soil particles from clogging the soil filters and accordingly preventing free water movement.

The following are various configurations for subsoil drains using geotextile filters and different pipe configurations. Drainage may be achieved by trenches filled with filter material or enhanced using pipes such as slotted UPVC or geotextile wrapped PVC.

Subsoil drains may also be required on the uphill side of cut and fill sites; adjacent deep strip footings, behind retaining walls, adjacent basement walls etc in soil with poor drainage qualities or excessive sub-water movement.




TYPICAL SUBSOIL DRAINS

### 3.1.2.5 Stormwater drainage

Where a sealed stormwater drainage system is installed to remove roof water run-off, it must comply with the following:

(a) Stormwater must discharge into-

(i) a legal discharge point at the allotment boundary; or

(ii) on-site catchment systems, such as stormwater tanks; or

(iii) on-site soil drainage systems, such as soaker wells.

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

**Explanatory Information:**

Stormwater drainage systems specified in the *Housing Provisions* are not designed to remove all of the water during exceptionally heavy rain, especially in tropical areas. Accordingly, it is necessary to design and install the system so that when overflowing occurs any water is directed away from the inside of the building and away from the building *foundations*.

To ensure that roof gutters do not overflow into the building consideration should be given to using slotted gutters, locating the gutter so that it is below the top edge of the facia, the installation of rainwater heads with overflow slots etc.

To enable the drainage system to achieve optimum capacity it should be cleaned and maintained on a regular basis, especially in areas where trees overhang roof drainage systems.

Special attention needs to be given to box gutters, valley gutters etc located above the internal areas of a building. In these situations if adequate overflow controls cannot be implemented there may be a need to increase the size and capacity of drainage components to remove all water anticipated during heavy rain periods. The design for such systems can be taken from AS 3500.3.



(c) Pipes must be -

(i) adequately jointed or continuous; and

(ii) where access to pipes is not available, inspection openings must be provided within the allotment at -

(A) 1.2m from the downpipe; and

(B) at each change of direction, and

(C) intervals not exceeding 9m.

(d) The pipe size and grade must comply with Table 3.1.2.

**Table 3.1.2**
**MAXIMUM ALLOWABLE AREAS FOR uPVC PIPES WITH VARYING GRADES**

| Pipe size (diameter in millimetres) | Grade | Maximum roof catchment area ($m^2$) |
|---|---|---|
| 90 | 1 in 100 | 360 |
| 90 | 1 in 50 | 440 |
| 90 | sealed system | 360 |

**STATE AND TERRITORY VARIATIONS**

**Table 3.1.2 does not apply in the Australian Capital Territory.**

(e) Cover to stormwater drains

The minimum cover to 90mm Class 6 uPVC stormwater drains installed underground must be -

(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:**

Different depths of soil cover (or no cover at all) can be achieved using other types of pipes.

(f) Sealed systems

Sealed systems in accordance with Figure 3.1.2.6, may be used -

(i) for supply of water to rainwater tanks provided the rainwater downpipe drainage system is in uPVC; or

(ii) where the lower level of the downpipe is below the level of the allotment rainwater drainage outlet, provided -

(A) the sealed stormwater pipe at the inlet end extends a minimum of 600mm above the outlet or the highest permanent water point in the pipe, whichever is the greater; and

(B) uPVC is used for all pipes required to be sealed.

**Explanatory Information:**

Due to problems with mosquito breeding habits, the use of sealed underground systems is not permitted in areas where Ross River fever exists (typically in Queensland in areas North of Brisbane) unless the system is sealed or able to be totally drained to prevent mosquito access and breeding.

(g) On-site drainage

In sandy soils downpipes may discharge into soak wells provided -

(i) grates are installed between the underground pipe network leading to the soak well and downpipes; and

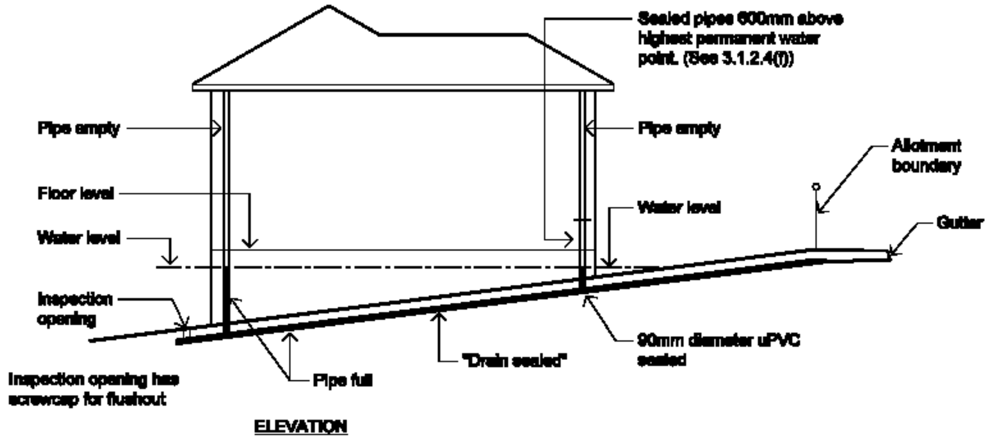
(ii) the size of the soak well is designed so that the roof area (metres squared) is multiplied by 0.012 to determine the size in cubic metres of the soak well.

eg Roof area of 50m²

50 x 0.012 = 0.600

Therefore a soak well of 0.60m³ capacity is required.

**Figure 3.1.2.6**
**SEALED DRAINAGE SYSTEMS**



# PART 3.1.3 TERMITE RISK MANAGEMENT

## 3.1.3 Application of this Part

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(a) The requirements of this Part apply when the primary building element of a Class 1 building are considered as being susceptible to termite attack.

(b) This Part does not apply to Class 1 buildings as follows (see also Figure 3.1.3.1):

(i) Buildings built in an area where subterranean termites are not known to present a potential risk of attack to the structural members of the building.

**Explanatory Information:**

Termites are not considered to be a risk in Tasmania and a lesser risk in parts of Victoria and the Australian Capital Territory. The *relevant approval authority* may have records of termite activity for each area and should be able to advise you on whether protection is needed.

(ii) Building that have all their primary structural members constructed of one, or a combination of, the following materials:

(A) Steel.

(B) Concrete.

(C) Masonry.

(D) Fibre-reinforced cement.

(E) Timber-naturally termite resistant in accordance with Appendix A of AS 3660.1.

(F) Timber-preservative treated in accordance with Appendix B of AS 3660.1.

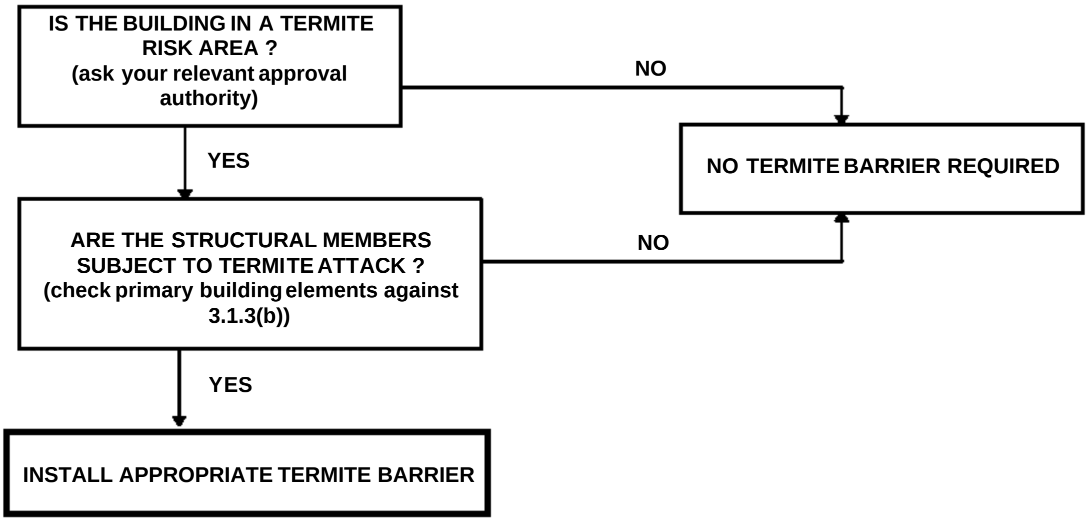
(iii) Buildings built in Tasmania.

(c) For the purposes of this Part, primary building element means a member of a building designed specifically to take part of the building load and includes roof, ceiling, floor and wall framing members including any bracing members designed for the specific purpose of acting as a brace to those members.

**Figure 3.1.3.1**

**FLOW CHART FOR IDENTIFYING IF A TERMITE BARRIER IS REQUIRED**

**Note:** Some relevant approval authorities may not be able to give you this advice.

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## STATE AND TERRITORY VARIATIONS

**3.1.3 is replaced by the following clause in New South Wales.**

### NSW 3.1.3 General requirements

(a) The requirements of this Part apply when the *structural members* of a building are considered as being susceptible to termite attack.

(b) For the purposes of (a) a *structural member* consisting entirely of, or a combination of any of the following materials is considered not subject to termite attack:

- (I) Steel
- (ii) Concrete
- (iii) Masonry
- (iv) Fibre-reinforced cement
- (v) Timber-naturally termite resistant in accordance with Appendix A of AS 3660.1
- (vi) Timber - preservative treated in accordance with Appendix B of AS 3660.1

**Appropriate performance requirements:**
Where an alternative termite barrier or system is proposed to that described in Part 3.1.3, that proposal must comply with the structural performance requirement P2.1 in Section 2.

## A. Acceptable construction manual

**3.1.3.0** Performance requirement P2.1 is satisfied if:

(a) a termite barrier is installed in a Class 1 building to protect the primary building element in accordance with AS 3660.1 - Protection of buildings from subterranean termites - New buildings; and

(b) a termite inspection notice is installed in accordance with 3.1.3.2(b).

**STATE AND TERRITORY VARIATIONS**

1. **3.1.3.0(a) and (b) are replaced by the following clauses in the Northern Territory.**
   (a) In areas North of the Tropic of Capricorn:
      (i) AS 1694 - 1974 Code of practice for physical barriers used in the protection of buildings against subterranean termites; or
      (ii) AS 2057 - 1986 Protection of buildings from subterranean termites - chemical treatment of soil for buildings under construction.
   (b) In areas South of the Tropic of Capricorn:
      (i) AS 3660.1 Protection of buildings against subterranean termites - New buildings; or
      (ii) AS 2057 - 1986 Protection of buildings from subterranean termites - chemical treatment of soil for buildings under construction.
2. **3.1.3.0(a) is replaced by the following clause in New South Wales.**
   (a) a termite barrier is installed in accordance with AS 3660.1 - Protection of buildings from subterranean termites - New buildings; and

## B. Acceptable construction practice

### 3.1.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.1.3 for the installation of a barrier to assist with termite risk management satisfies performance requirement P2.1.

**STATE AND TERRITORY VARIATIONS**

**3.1.3.1 is replaced by the following clause in the Northern Territory.**
Compliance with the acceptable construction practice provisions of Part 3.1.3 for the installation of a barrier to assist with termite risk management satisfies performance requirement P2.1 provided the building is located in an area South of the Tropic of Capricorn.

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**Explanatory Information:**

The intent of these requirements is to provide for a termite barrier that will assist with inspection of the building for termite ingress. It should be noted that the installation of termite barriers will not stop termite activity from occurring.

### 3.1.3.2 Installation of termite barriers

(a) A termite barrier or combination of barriers is installed in accordance with -

(i) AS 3660.1; or

(ii) 3.1.3.3 for concrete slabs on ground; or

(iii) 3.1.3.4 for suspended floors.

(For barrier options see Table 3.1.3.1).

(b) Durable notice
Where a barrier is installed in accordance with AS 3660.1 a durable notice must be permanently fixed to the building in a prominent location, such as in a meter box or the like, indicating -

(i) the method of protection; and

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

(iii) where a chemical barrier is used, its situation life expectancy as listed on the National Registration Authority label; and

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

**STATE AND TERRITORY VARIATIONS**

**3.1.3.2(b)(iv) is replaced as follows in New South Wales.**

(b)(iv) the need to maintain and inspect the system on a regular basis.

**Explanatory Information:**

Termite protection notice

When a termite protection system is installed in a building in accordance with AS 3660.1 a durable notice 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 meter box or similar location so that it can be easily seen and read by future owners of the building. It is also worth noting that the information nominated by the BCA to be placed on the notice is a minimum and additional information can be included if desired by the person placing the notice.

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**Table 3.1.3.1**

**ACCEPTABLE TERMITE BARRIERS**

**Note**: For the purposes of this Table accredited termite control systems may be used instead of the systems described in AS 3660.1 to protect the relevant areas of the building eg Termite shielding.

| PROTECTION METHOD (as per AS 3660.1) | FOOTING SYSTEM | | | | |
|---|---|---|---|---|---|
| | Concrete slab on ground complying with AS 2870 | | Concrete slab on ground not complying with AS 2870 | | Suspended floors |
| | Penetrations and control joints | Slab perimeter | Beneath slab (includes penetrations and control joints) | Slab perimeter | |
| **Slab edge exposure** | Not suitable | Suitable | Not suitable | Suitable | Not suitable |
| **Termite shielding** | Not suitable | Not suitable | Not suitable | Not suitable | Suitable |
| **Stainless steel mesh** | Partial; or Full system | Partial; or Full system | Full system | Full system | Suitable |
| **Graded stone** | Partial; or Full system | Partial; or Full system | Full system | Full system | Partial; or Full system |
| **Chemicals** | Full system beneath slab | Perimeter system | Full system beneath slab | Perimeter system | Full system |

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### 3.1.3.3 Barriers for concrete slab-on-ground

(a) Where a concrete slab-on-ground is to be used as part of a termite barrier system, the slab must be designed and constructed to comply with AS 2870; and

(i) monolithic slabs must have penetrations and the perimeter of the slab protected in accordance with Table 3.1.3.1 (see Figure 3.1.3.2); and

(ii) non-monolithic slabs must have penetrations, control joints and the perimeter of the slab protected in accordance and Table 3.1.3.1 (see Figure 3.1.3.3).

(b) Slabs not constructed in accordance with AS 2870 must have the full area beneath the slab and the perimeter protected in accordance with Table 3.1.3.1.

(c) Slab edge exposure
The edge of a slab-on-ground may be used as a perimeter barrier provided -

(i) the slab edge is left exposed, 75 mm above finished ground level; and

(ii) the face of the exposed edge is not rough, honey combed and does not contain ripples caused by folds in vapour barrier or the like that could conceal termite activity.

**Figure 3.1.3.2**
**AREAS TO BE PROTECTED FOR MONOLITHIC SLABS**

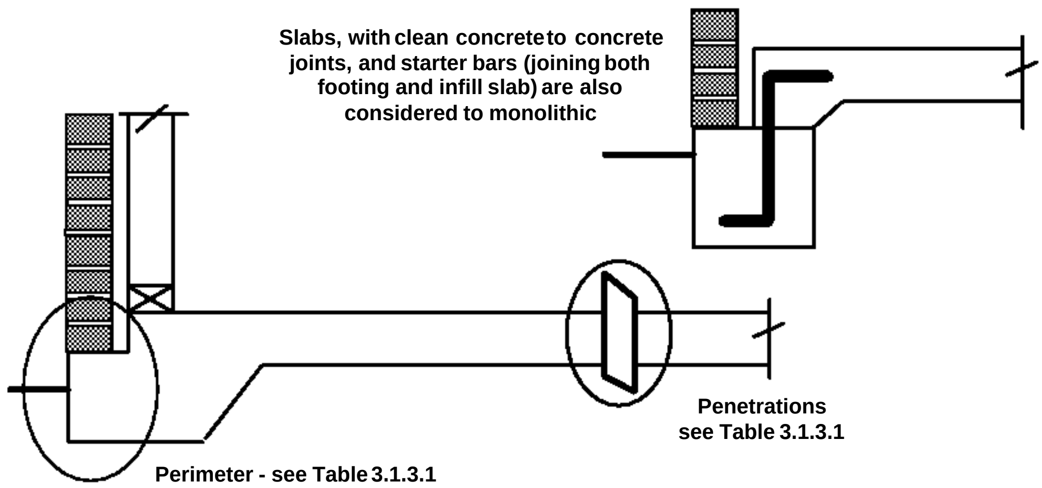
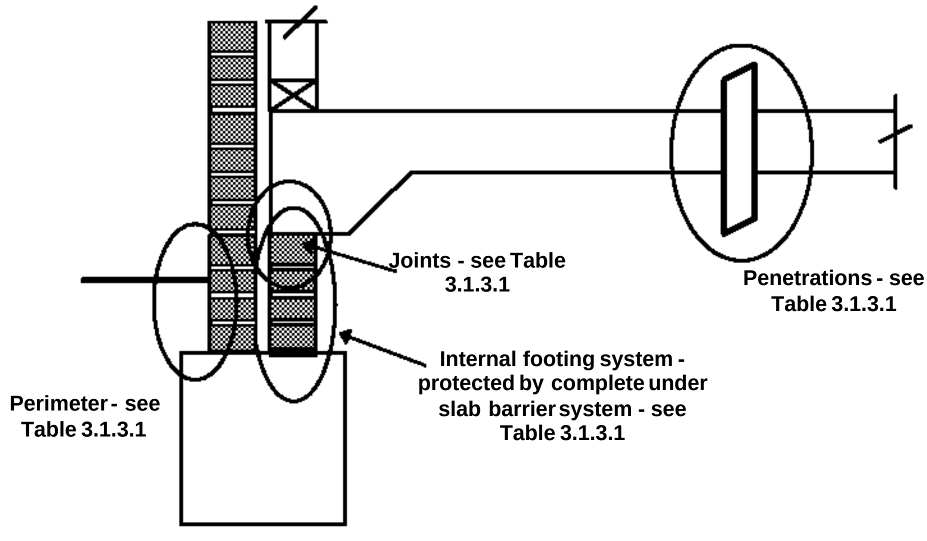



**Figure 3.1.3.3**
**AREAS TO BE PROTECTED FOR NON-MONOLITHIC SLABS**




### 3.1.3.4 Protection of suspended floors

The area beneath a suspended floor of a building must be protected as follows -

(a) install a barrier system in accordance with Table 3.1.3.1; and

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(b) provide sub-floor ventilation at a rate of 7300 $mm^2$ per lineal metre in accordance with 3.4.1.4; and

(c) where a barrier is installed that needs to be inspected, provide access to the area of the barrier that needs to be inspected in accordance with AS 3660.1.

**Explanatory information: Termites**

1. Barriers - Part of a 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. Unfortunately, due to the nature of termites, it is extremely difficult to prevent them gaining access to a building.

While understanding the difficulty of controlling termite activity, it is important to note that termite protection requirements listed in the *Housing Provisions* must be perceived as part of a system. In addition to the correct installation of a termite barrier it must be stressed that the effectiveness of all barriers will rely on regular maintenance and competent inspection.

The requirements in the BCA are the minimum requirements and owners of buildings may choose to incorporate additional termite protection systems in their buildings.

2. The slab as a barrier

A concrete slab, designed and constructed in accordance with AS 2870, can form part of an acceptable termite barrier system. The obvious concern with this approach is the impact cracking may have on the slab. Cracking, to some degree, is a common phenomena and does not necessarily indicate the failure of the termite barrier. Most cracks, including those that may appear quite wide on the surface do not necessarily extend for the full depth of the slab.

The correct placement of shrinkage reinforcement is an important element in controlling the magnitude of cracking. This will be achieved by strictly complying with AS 2870 and paying attention to the following detail:

a. Correct classification of site soil conditions.

b. Installation of adequate shrinkage reinforcement.

c. Proper placement of reinforcement.

d. Effective site supervision.

3. Slab edge exposure

This approach uses a similar philosophy to that applied to termite shielding in that termite activity is forced onto the open exposed surface of the slab where with regular inspections termite ingress via the perimeter of the building can be prevented.

To achieve this the exposed edge of the slab should be kept clean and debris such as leaves should be removed to ensure the full 75mm of the slab is always visible. Attachments to the buildings such as downpipes should be located in such a manner that visual inspection can be achieved. A clearance of 40 mm is usually adequate between such fittings and the slab.

The fixing of tiles or rendering of the exposed surface should also be avoided as it will result in the barrier being ineffective.

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**Explanatory information (continued):**

4. Protection of sub-floor areas

The area beneath a building requires special attention to detailing to ensure the effectiveness of the termite barrier. The following points should be observed.

a. Subfloor ventilation - In suspended floor areas it is important that termite activity is not encouraged by poor construction practice. In conjunction with physical or chemical barriers air flow is critical. Air flow will not only restrict the growth of fungus which attacks subfloor members (which makes them more susceptible to termite attack), but also create a climatic atmosphere less conducive to termite activity.

b. Subfloor access - Termite shielding installed below suspended floors relies totally on access for both inspection and maintenance to be effective. Accordingly, minimum clearance heights will need to be achieved between the building structure (including heating ducts) and the adjoining ground to allow easy access to all areas where physical barriers are used.

Perimeter access doors will also be needed where access is required for inspection. When installing access doors care should be taken to ensure that the opening is sufficient to allow easy entry and service pipes are located in such a manner that they do not reduce the effective opening size.

Amdt 0

# PART 3.2

# FOOTINGS AND SLABS



Amdt 0

# PART 3.2 CONTENTS



**Explanatory information:**

This Part 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 Part 2.5 are only suitable for the specified soil classifications. The requirements contained in the remainder of this Part are more general and may be applied to all slab and footing construction.

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# PART 3.2 FOOTINGS AND SLABS

**Appropriate performance requirements:**

Where an alternative footing system is proposed to that described in Part 3.2, that proposal must comply with:

a. the structural performance requirement P2.1; and

b. the dampness performance requirement P2.2 in Section 2.

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## Definitions

**3.2** The following definitions are used in this Part:

**Articulated masonry** means masonry construction in which special provisions have been made for movement by articulation, see Part 3.3.1.7.

**Clad frame** means timber or metal frame construction with exterior timber or sheet wall cladding that is not sensitive to minor movement and includes substructure masonry walls up to 1.5m high.

**Controlled fill** means material that has been placed and compacted in layers with compaction equipment (such as a vibrating plate) within a defined moisture range to a defined density requirement.

**Finished ground level** means the ground level adjacent footing systems at the completion of construction and landscaping.

**Footing** means construction that transfers the load from the building to the foundation.

**Load bearing wall** for the purposes of this part means any wall imposing on the footing a load greater than 10 kN/m.

**Mixed construction** means a building consisting of more than one form of construction, particularly in double-storey buildings.

**Rolled fill** means material placed in layers and compacted by repeated rolling by an excavator.

**Single leaf masonry** means outer walls constructed with a single thickness of masonry unit.

**Waffle raft** means a stiffened raft with closely spaced ribs constructed on the ground and with slab panels supported between ribs.

## A. Acceptable construction manuals

**3.2.0** Performance requirements P2.1 and P2.2 are satisfied if a footing or slab is installed in accordance with one of the following manuals:

(a) The footings and slab are constructed in accordance with AS 2870.

(b) Piled foundations are designed in accordance with AS 2159.

**Explanatory information:**
Composite construction - design requirements for other materials that may be used in combination with the above footing systems, including the use of heavy steel support beams etc. are described in Part 3.11 - structural design codes.

## B. Acceptable construction practice



### 3.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.2 for footing systems satisfies performance requirements P2.1 and P2.2.2(b), provided -

(a) the footing is on a Class A, S or M *site* (classified in accordance with AS 2870) with a uniform bearing capacity; and

(b) the slab is no longer than 25m; and

(c) slabs containing permanent joints (eg contraction joints) are not used; and

(d) the structure supported by the footing is not more than -

(i) two storeys where a suspended concrete floor is used at the first floor level; or

(ii) three storeys where -

(A) suspended concrete floors are not used above the ground floor level; and

(B) the wall height excluding any gable is not more than 8m; and

(e) the building does not include wing walls or masonry arches not detailed for movement in accordance with Cement and Concrete Association of Australia TN 61; and

(f) single leaf earth or stone masonry walls do not exceed 3m in height.

(g) the *site* is considered to be normal as defined in 3.1.1.

(h) the *site* is not located in an *alpine area*.

**STATE AND TERRITORY VARIATIONS**

**3.2.1(g) is deleted in New South Wales.**

# PART 3.2.2 PREPARATION



### 3.2.2.1 Excavation for footings

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

(b) The base of the excavation must be for -

(i) flat *sites*, generally level but may slope up to 1:40 to allow excavations to drain; and

(ii) sloping *sites* at an angle of not more than 1 in 10; and

(iii) stepped footings see 3.2.2.5.

(c) Footing excavations must be free of loose earth, tree roots, mud or debris immediately before pouring concrete.

(d) Topsoil containing grass roots must be removed from the area on which the footing will rest.

(e) Excavations depths and soil cuts must comply with Part 3.1.1.

(f) On loose sand *sites* or *sites* subject to wind or water erosion, the minimum depth below finished ground level for footings must be 300mm.

(g) Height of finished slab-on-ground must be in accordance with 3.1.2.3(b).

### 3.2.2.2 Filling under concrete slabs

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

(a) The maximum depth of fill must be 2.4m.

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

(i) Sand used in controlled or rolled fill must not contain any gravel size material and achieve a blow count of 7 or more per 0.3m using the penetrometer test described in AS 1289, clause F3.3.

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

(iii) Controlled fill:

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

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

(iv) Rolled fill:

(A) Sand fill up to 600mm deep - compacted in layers of not more than 300mm 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 150mm by repeated rolling by an excavator or similar machine.

(c) Fill with a greater depth than that specified in (a) must be installed in accordance with AS 3798.

(d) A level layer of clean quarry sand must be placed on top of the fill, with a minimum depth of 20mm.

(e) A graded stone termite barrier complying with 3.1.3 may be substituted for the sand required in (d).

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**3.2.2.3 Foundations for footings and slabs**

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 a minimum allowable bearing pressure of 50 kPa or controlled or rolled fill compacted in accordance with 3.2.2.2.

(b) Edge beams connected to the slab - natural soil with a minimum allowable bearing pressure of 50 kPa or controlled fill compacted in accordance with 3.2.2.2 (a) (i) and extending past the perimeter of the building 1 m with a slope ratio not steeper than 2 horizontal to 1 vertical (see Figure 3.2.2.1).

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

(i) founded in natural soil with a minimum allowable bearing pressure of 100 kPa; or

(ii) for Class A and S sites they may be founded on controlled sand fill in accordance with 3.2.2.2(b).

**3.2.2.4 Slab edge support on sloping sites**

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

(a) Slab panels - in accordance with 3.2.2.3(a).

(b) Edge beams -

(i) supported by controlled fill in accordance with 3.2.2.3(b) (see Figure 3.2.2.1, Option 1); or

(ii) supported by deepened edge beam or bulk piers designed in accordance with AS 3600 (see Figure 3.2.2.1, Option 2); or

(iii) deepened (as per AS 2870) to extend into the natural soil level with a bearing capacity in accordance with 3.2.2.3(b) (see Figure 3.2.2.1, Option 3); or

(iv) stepped in accordance with AS 2870.

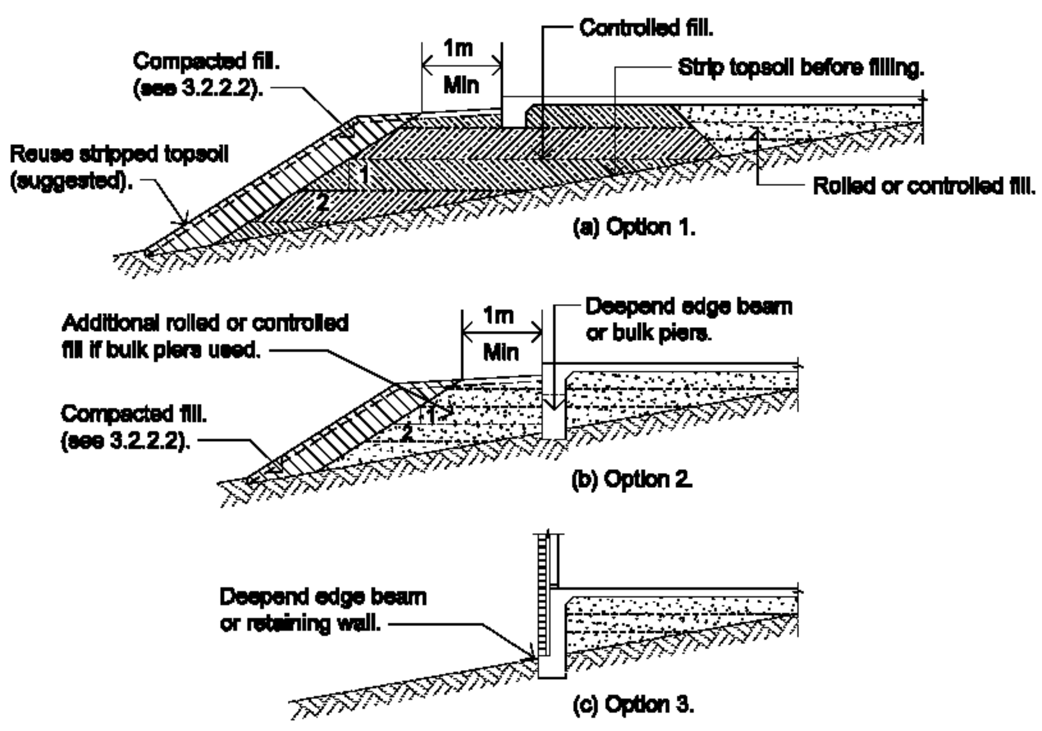
(c) Edge beams (not connected to the slab), pad footings and strip footings - founded in accordance with 3.2.2.3(c).

(d) Where an excavation (cut) of the natural ground is used it must be in accordance with Part 3.1.1.



**Figure 3.2.2.1**

**SLAB EDGE SUPPORT ON THE LOW SIDE OF SLOPING SITES**




### 3.2.2.5 Stepped footings

Stepped strip footings must be constructed as follows -

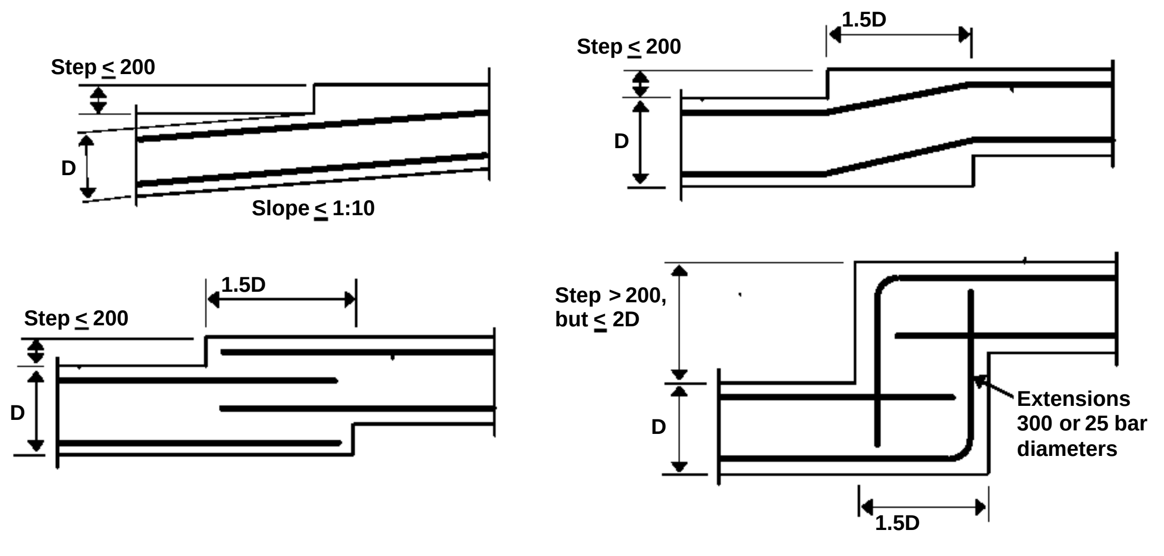
(a) the base of the footing must be horizontal or have a slope of not more than 1:10; or

(b) be stepped in accordance with one of the methods shown in Figure 3.2.2.2.

**Figure 3.2.2.2**

**STEPPED STRIP FOOTINGS**

**Note:** All measurements in millimetres.




### 3.2.2.6 Vapour barriers and damp-proofing membranes

A vapour barrier or damp-proofing membrane must be installed under slab-on-ground construction for all Class 1 buildings as follows -

(a) Damp-proofing membranes are required in areas prone to rising damp or salt attack.

**Note:** This applies to South Australia and other such areas.

(b) Materials

A vapour barrier or damp-proofing membrane must -

(i) be tested in accordance with AS 2870 clause 5.3.3.2(c); and

(ii) be 200 um (0.2mm) nominal thickness polyethylene film; and

(iii) for vapour barriers -

(A) have a medium impact resistance; and

(B) be branded continuously “AS 2870 Concrete underlay, 0.2mm Medium impact resistance.

(iv) for damp-proofing membranes -

(A) have a high impact resistance and be resistant to puncture and moisture penetration; and

(B) be branded continuously “AS 2870 Concrete underlay, 0.2mm High impact resistance.

(c) Installation

A vapour barrier or damp-proofing membrane must be laid as follows -

(i) lap 200mm minimum at all joints; and

(ii) taped or sealed with a close fitting sleeve around all service penetrations; and

(iii) where punctured (unless for service penetrations) it is sealed fully with additional polyethylene film and tape.

(d) The waterproof membrane must be placed beneath the slab so that the entire bottom surface of the slab is entirely underlaid and extend under edge beams to finish at ground level in accordance with Figure 3.2.2.3 (also see 3.3.4.8 for single skin masonry details).

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**Explanatory information:**

It is recommended that a vapour barrier also be placed beneath Class 10 areas attached to the main house slab such as garages, verandahs and the like to prevent ground moisture entering the building.

Additional attention to the moisture vapour detail may be required if the slab edge is to be exposed for termite protection.

**STATE AND TERRITORY VARIATIONS**

**3.2.2.6 does not apply in New South Wales.**

### 3.2.2.7 Edge rebates

Edge rebates for slab on ground, stiffened raft or waffle raft with masonry cavity or veneer construction must comply with following:

(a) The rebate must not be less than 20mm, except as provided for in (d).

(b) Exterior masonry must not overhang more than 15mm past the edge of the slab.

(c) The edge rebate must be flashed and drained in accordance with Part 3.3 and where it cannot be flashed it must be filled with mortar.

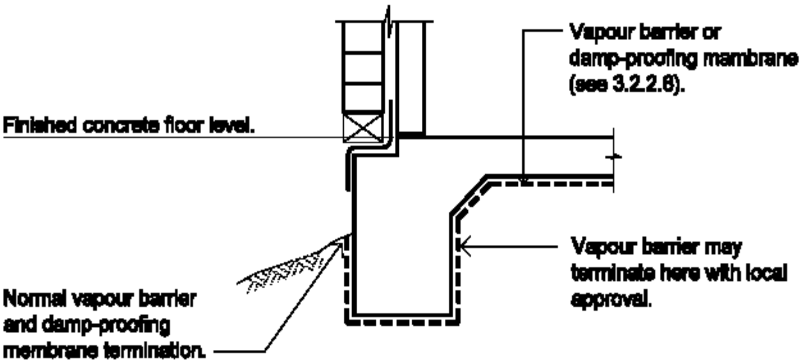
(d) Edge rebates are not required for single-leaf masonry.

**Explanatory Information:**

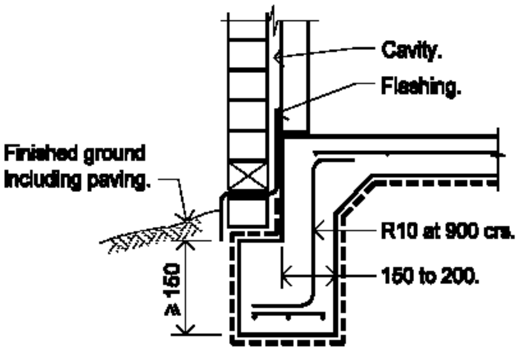
See 3.2.5.4 for minimum edge beam details.

Figure 3.2.2.3

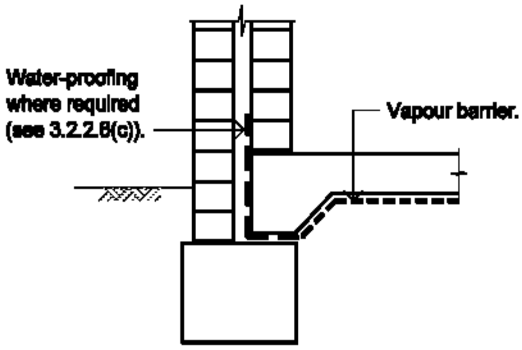
ACCEPTABLE MOISTURE BARRIER LOCATION




(a) Minimum rebate for cavity masonry or veneer wall.




(b) Deep edge rebate alternative.




(c) Masonry alternative.

# PART 3.2.3 CONCRETE AND REINFORCING



### 3.2.3.1 Concrete

Concrete must comply with the following:

(a) Concrete must be manufactured in accordance with AS 1379; and

(i) have a minimum strength at 28 days of 20 MPa (denoted as N20 grade); and

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

(iii) have a nominal 80mm 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 and compacted in accordance with good building practice.

(d) In hot (above 30 degrees Celsius) and windy conditions concrete must be cured by covering with plastic sheeting, spraying with a liquid membrane curing compound or ponding of water on the top surface.

(e) In salt-damp areas the concrete must be vibrated and then moist cured for 3 days to increase durability.

**Note:** This applies to South Australia and other such areas.

**STATE AND TERRITORY VARIATIONS**

**3.2.3.1(e) does not apply in New South Wales.**

**Explanatory information:**

1. 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.
2. 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.

### 3.2.3.2 Steel reinforcement

Steel reinforcement in the construction of footings and slabs must comply with the following:

(a) Materials used for reinforcing steel must comply with following:

(i) Square fabric - AS 1304.

(ii) Trench mesh - AS 1304.

(iii) Steel reinforcing bars - AS 1302.

**Explanatory Information:**

Reinforcement types referenced in this Part are described as follows -

1. Square fabric - F62, F72, F82, F92 or F102; and
2. Trench mesh - designated as the number and size of the longitudinal wires required, eg. 3-8TM or 4-11TM etc; and

   It should be noted that steel reinforcing bars may be substituted for trench mesh in accordance with Table 3.2.4.2.
3. Steel reinforcing bars - are designated as *x* - Y12, *x* - Y16 etc where *x* is the number of bars required.

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(b) Lapping of Reinforcement

Minimum laps as shown in Table 3.2.3.1 and Figure 3.2.3.1 must be provided where reinforcing is used.

**Table 3.2.3.1**

**MINIMUM LAP FOR REINFORCEMENT**

| Reinforcement | Minimum splice (mm) | Minimum Lap at “T” intersections | Minimum Lap at “L” intersections |
|---|---|---|---|
| **Steel reinforcing bars** | 500 | Full width across the junction | One outer bar must be bent and continue 500mm (min) around corner |
| **Trench mesh** | 500 | 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 3.2.3.1**
**LAPS IN REINFORCEMENT**

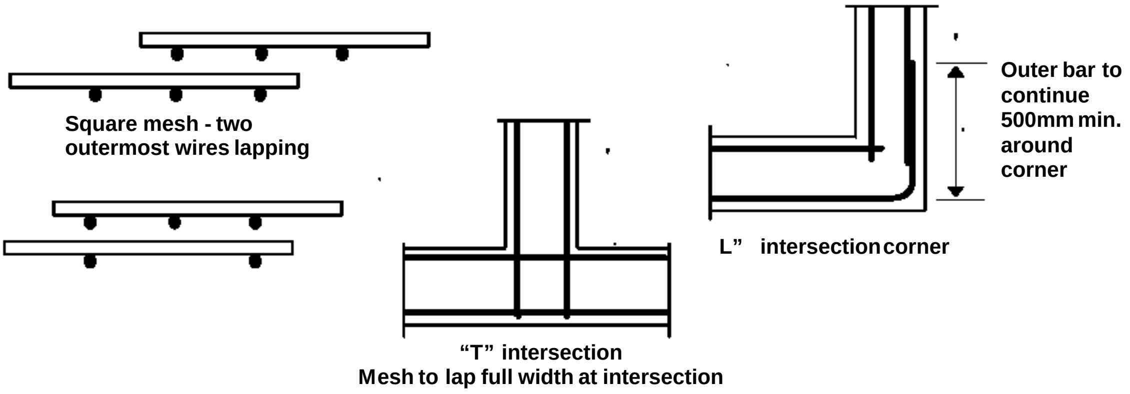




**Table 3.2.3.2**
**ALTERNATIVE MESH/REINFORCING BAR SIZES**

**Note:** For the purposes of this Table where necessary 2 layers of mesh may be used.

| Trench mesh (TM) | Area - mm$^2$ | Reinforcing bar alternative | Trench mesh alternative |
|---|---|---|---|
| **2-8TM** | 101 | 2-Y12 | not applicable |
| **3-8TM** | 151 | 2-Y12 | not applicable |
| **4-8TM** | 201 | 2-Y12 | 2-11TM |
| **5-8TM** | 252 | 3-Y12 | 3-11TM |
| **2-11TM** | 197 | 2-Y12 | 4-8TM |
| **3-11TM** | 295 | 3-Y12 | 6-8TM |
| **4-11TM** | 394 | 4-Y12 | 8-8TM |
| **2-12TM** | 245 | 2-Y16 | 3-11TM |
| **3-12TM** | 368 | 2-Y16 | 4-11TM |
| **4-12TM** | 491 | 3-Y16 | 5-11TM |

(c) Concrete cover to reinforcement

Footings and slabs on ground must have the following minimum concrete cover between the outermost edge of the reinforcement (including ligatures, tie wire etc) and the surface of the concrete:

(i) 40mm to unprotected ground.

(ii) 30mm to a membrane in contact with the ground.

(iii) 20mm to an internal surface.

(iv) 40mm to external exposure.

(d) Reinforcement preparation

Reinforcement must be cleaned of loose rust, mud, paints and oils immediately prior to the concrete pour.

**Explanatory information:**

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 prompting a good bond as it roughens the surface of the steel. Loose rust, however, must be removed from the reinforcement.

(e) Fixing of reinforcement

(i) All reinforcement must be firmly fixed in place to prevent it moving during concreting operations; and

(ii) reinforcement must be supported off the ground or the forms by bar chairs made from wire, concrete or plastic; and

(iii) when using wire chairs the minimum concrete cover (see 3.2.3.2(c)) to the uncoated portion to the chair must be obtained; and

(iv) wire chairs on soft ground or plastic membrane must be placed on flat bases; and

(v) bar chairs must be spaced at a maximum of 800mm centres for steel fabric.

**Explanatory information:**

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. Spacing of bar chairs may be increased where stiffer reinforcing is used (such as reinforcing bars instead of fabric).

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### 3.2.3.3 Stripping of formwork and loading of slabs

(a) The stripping of formwork and loading for slab-on-ground construction must not be carried out until the minimum time limits in Table 3.2.3.3 are met.

**Table 3.2.3.3**

**MINIMUM TIMES FOR STRIPPING FORMWORK FOR SLAB ON GROUND CONSTRUCTION**

| Weather conditions | Vertical surfaces |
|---|---|
| Normal (above 12°C) | 12 hours |
| Cold (below 12°C) | 18 hours |

(b) Concrete must not be severely point loaded for a minimum of seven days; and

(i) building materials (such as bricks) and plant must not be stacked on the slab during this time; and

(ii) the construction of wall frames and setting out of brick work may be undertaken during this period.

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# PART 3.2.4 SITE CLASSIFICATION

## 3.2.4.1 Site classification

The *foundation* where the footing is to be located must be classified in accordance with AS 2870.



**Explanatory information:**

Table 3.2.4.1 provides a general description of foundation soil types that will assist in the classificati onof the site. More detail ed information can be found in AS 2870 or alternativ ely contact the approval authority.

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

**Explanatory information:**

**Table 3.2.4.1**

**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 experiencehigh 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 and clause 2.4.6) |
| **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 abnormal moisture conditions or sites which cannot be classified otherwise |

# PART 3.2.5 FOOTING AND SLAB CONSTRUCTION



**Explanatory information:**

The footings included in this Part reflect the requirements of AS 2870 and apply to the most common types of soil conditions. If the soil conditions on site are not covered by this Part then additional guidance can be obtained from AS 2870 or the approval authority.

Use of traditional footing methods: The specification of these footing details is not meant to prohibit the use of alternative traditional footing methods found through experience to be suitable for local soil conditions (especially those used in stable soils). Such footings may be appropriate, provided they meet the performance requirements listed in Section 2.

Termite protection: The diagrams in this Part reflect acceptable footing designs only. They do not provide details for termite barriers such as the correct placement of ant capping and slab edge exposure.

For details on termite barriers see Part 3.1.3.

### 3.2.5.1 Footing and slab construction

(a) Footing and slab construction, including size and placement of reinforcement, must comply with the relevant provisions of this Part and the following details:

(i) Footings for stumps - the appropriate details in 3.2.5.6 and Figure 3.2.5.2.

(ii) Stiffened raft Class A, S and M sites - the appropriate details in Figure 3.2.5.3.

(iii) Strip footing systems in Class A, S and M sites - the appropriate details in Figure 3.2.5.4.

(iv) Footing slabs for Class A sites - the appropriate details in Figure 3.2.5.5.

(b) Footings for *single leaf masonry*, *mixed construction* and *earth wall masonry* must comply with the equivalent footing construction set out in Table 3.2.5.1.

### 3.2.5.2 Footings and slabs to extensions to existing buildings

(a) Footings to extensions to Class 1 or 10 buildings may be of similar proportions and details to those used with an existing same Class of building on the same allotment provided -

(i) masonry and masonry veneer walls are articulated at the junction with the existing building; and

(ii) the performance of the existing building has been satisfactory (ie there has been no significant cracking or movement - see Section 2 of AS 2870 for acceptable footing performance); and

(iii) there are no unusual moisture conditions on the site.

(b) Clad framed Class 10 buildings

Class 10 buildings of clad framed construction may use footing systems appropriate for one class of reactivety less severe than for a house.

eg Site classification M can be reduced to S.



**Table 3.2.5.1**

**EQUIVALENT FOOTING CONSTRUCTION**

| **Actual construction** | | **Equivalent footing construction (see 3.2.5.2-5)** |
|---|---|---|
| **External walls** | **Internal walls** | |
| **Single leaf masonry** | | |
| Reinforced single leaf masonry | Articulated masonry on Class A and 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 |
| **Mixed construction** | | |
| Full masonry | Framed | Articulated full masonry |
| Articulated full masonry | Framed | Masonry veneer |
| **Earth wall masonry** | | |
| Infill panels of earth masonry | Framed earth masonry | Articulated masonry veneer |
| Load bearing earth masonry | Load bearing earth masonry | Articulated full masonry |

### 3.2.5.3 Shrinkage control

(a) Where brittle floor coverings are to be used (such as ceramic tiles) one of the following additional measures must be taken to control the effect of shrinkage cracking -

(i) the amount of shrinkage reinforcement (steel reinforcement fabric in the slab panel) must be increased to F92 or equivalent throughout the affected slab panels; or

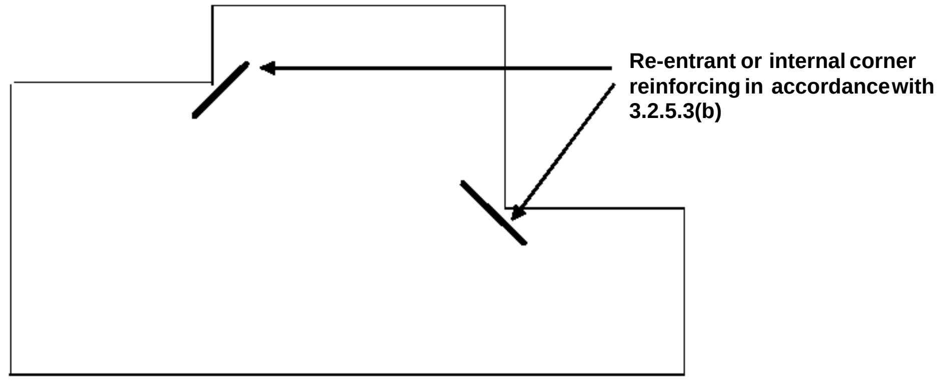
(ii) the bedding system for brittle coverings must be selected on the basis of the expected slab movement and the characteristics of the floor covering (including the use of expansion joints etc); or

(iii) the placement of floor covering must be delayed for a minimum of 3 months.

(b) At re-entrant or internal corners two strips, 2 m in length, of 3-8TM or one strip of 3-11TM (or 2-Y12 bars) must be placed diagonally across the corner as depicted in Figure 3.2.5.1.

**Figure 3.2.5.1**

**REINFORCING AT RE-ENTRANT CORNERS (plan view)**




### 3.2.5.4 Minimum edge beam dimensions

Except for waffle raft slabs, where the edge rebate exceeds 150mm in depth, the minimum width of the edge beam at the base of the rebate must not be less than 200mm, except that if R10 ties at 900mm spacing (or equivalent) are provided to resist vertical forces, this minimum can be reduced to 150mm (see Figure 3.2.2.3).

### 3.2.5.5 Footings for fireplaces on Class A and S sites

(a) Fire places must be supported on a pad footing -

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

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

(iii) reinforced top and bottom with F72 mesh; and

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

(b) The pad footing may form an integral part of the slab.

### 3.2.5.6 Stump footing details

(a) Footings for stumps must comply with -

(i) the provisions of Figure 3.2.5.2 for Class A and Class S sites; or





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(ii) the appropriate acceptable construction manual listed in -

(A) Part 3.4.3; or

(B) Part 3.2.0.

(b) Concrete stumps must -

(i) be designed in accordance with -

(A) AS 3600; or

(B) Table 3.2.5.2; and

(ii) use a minimum 20MPA concrete as defined in AS 3600; and

(c) Steel stumps must be -

(i) designed in accordance with

(A) AS 1250;or

(B) Table 3.2.5.2; and

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

(iii) encased in concrete sloping away from the stump and finishing at least 100mm above finished ground level.

(iv) corrosion protected in accordance with Part 3.4.4.

(d) Timber stumps must be a minimum of 100x100mm or 110mm diameter.

(e) Stumps which project above the ground more than 12 times the width of their smaller face or diameter must be securely braced.

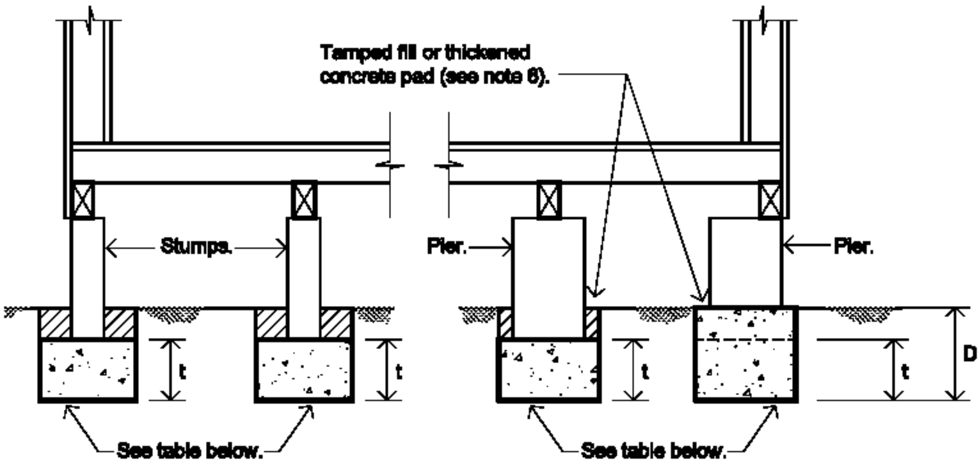


**Table 3.2.5.2**
**STUMP FOOTINGS - IN AREAS WITH A DESIGN WIND SPEED OF NOT MORE THAN W33**

| LENGTH OF STUMPS (mm) | CONCRETE | | STEEL |
|---|---|---|---|
| | Minimum size (mm) | REINFORCEMENT Number of 5mm (min.) hard drawn wires | Minimum size (mm) (SHS = square hollow section) |
| Less than 1400 | 100 x 100 or 110 diameter | 1 | 75x75x2.0 SHS |
| 1401 - 1800 | 100 x 100 or 110 diameter | 2 | 75x75x2.0 SHS |
| 1801 - 3000 | 125 x 125 or 140 diameter | 2 | 75x75x2.0 SHS |

**Figure 3.2.5.2**

**PAD FOOTINGS FOR CLAD FRAME, CLASS A AND S SITES**




**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 |
|---|---|---|---|---|
| 10 | 400 | 500 | 200 | 400 |
| 20 | 500 | 600 | 200 | 400 |
| 30 | 600 | 750 | 250 | 400 |

**Notes:** For the purposes of this Figure:

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 except that masonry footings can be used under masonry piers.
4. Pad footing sizes must also apply to footings supporting roof and floor loads only.
5. The foundation must provide a minimum bearing pressure of 100 kPa.
6. The excavation must be backfilled with manually rodded tamped soil, or the footing thickness shall be increased by 50mm.

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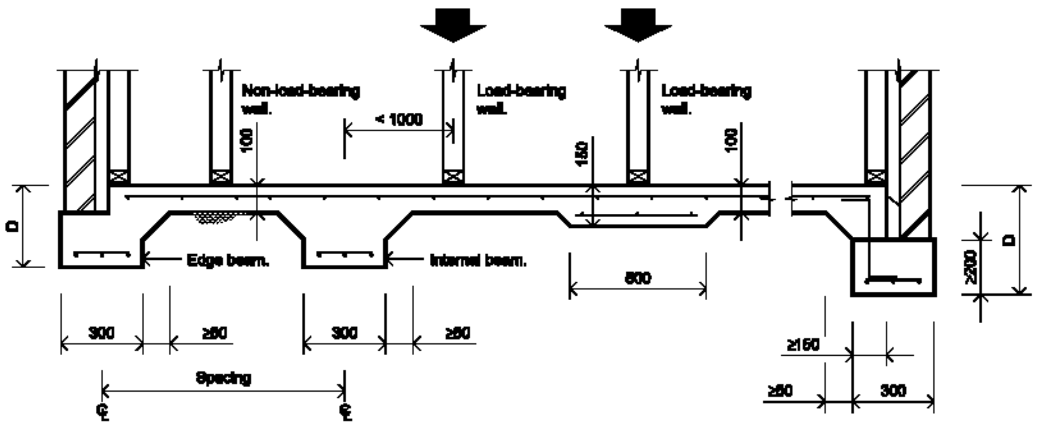
**Figure 3.2.5.3**

**FOOTING SLAB AND STIFFENED RAFT SLAB DETAILS FOR CLASS A, S AND M SITES**




**REINFORCEMENT FOR STIFFENED RAFT FOR CLASS A, S AND M SITES**

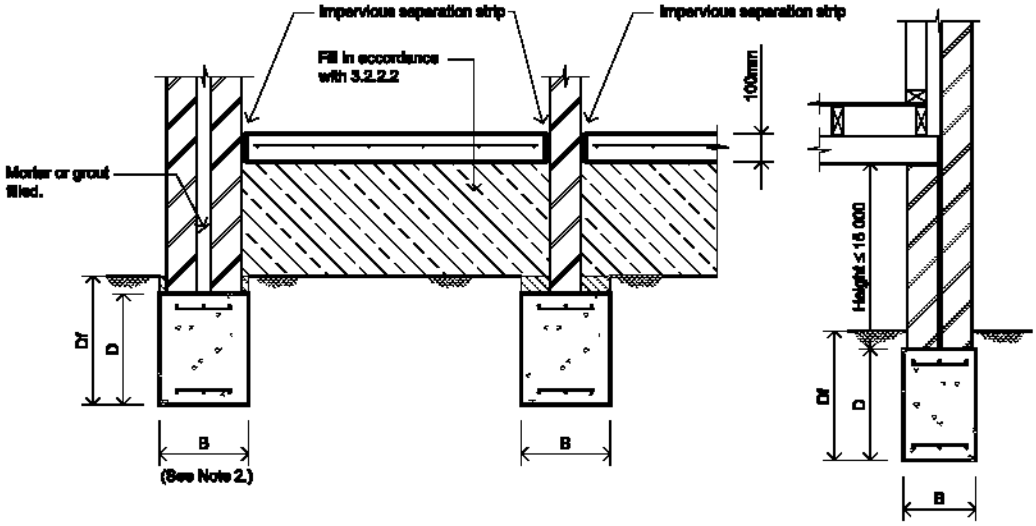
| Site Class | Type of Construction | **Edge and internal Beams** (see Note 1) | | | Slab Fabric (see Note 2) |
|---|---|---|---|---|---|
| | | **Depth (D) mm** | **Bottom Reinforcement** | **Spacing Centre to Centre (M)** | |
| **Class A** | Clad frame | 300 | 3- 8TM | - | F72 |
| | Articulated masonry veneer | 300 | 3- 8TM | - | F72 |
| | Masonry veneer | 300 | 3- 8TM | - | F72 |
| | Articulated full masonry | 400 | 3- 8TM | - | F82 |
| | Full masonry | 400 | 3- 8TM | - | F82 |
| **Class S** | Clad frame | 300 | 3- 8TM | - | F72 |
| | Articulated masonry veneer | 300 | 3- 8TM | - | F82 |
| | Masonry veneer | 300 | 3- 11TM | - | F82 |
| | Articulated full masonry | 400 | 3- 11TM | - | F82 |
| | Full masonry | 450 | 3- 11TM | 5.0 | F82 |
| **Class M** | Clad frame | 300 | 3- 11TM | 6.0 | F72 |
| | Articulated masonry veneer | 400 | 3- 11TM | 6.0 | F72 |
| | Masonry veneer | 400 | 3- 11TM | 5.0 | F72 |
| | Articulated full masonry | 500 | 3- 12TM | 4.0 | F82 |
| | Full masonry | 800 | 3- Y16 | 4.0 | F92 |

**Notes:** For the purposes of this Figure:

1. Internal and external edge beams must be arranged to form an integral structural grid (see AS 2870) to maintain continuity.
2. Slab fabric -
   a. for slabs greater than 18m in length - F82; and
   b. for Class A and S sites wherever F82 is specified the fabric can be reduced to F72.
3. A 10 % increase in spacings is permitted where the spacing in the other direction is 20% less than specified.
4. Where external beams are wider than 300mm an extra bottom bar or equivalent of the same bar size is required for each 100mm additional width.
5. 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 300mm wide by 300mm deep and reinforced with 3-8TM reinforcement.
6. Alternative reinforcing sizes must comply with AS 2870.

FIGURE 3.2.5.4

STRIP FOOTING SYSTEMS




DIMENSIONS AND REINFORCEMENT FOR STRIP FOOTING SYSTEMS

| Site Class and type of construction | D | B | Reinforcement | $D_s$ |
|---|---|---|---|---|
| **Class A** | | | | |
| Cladframe | 300 | 300 | 3- 8TM | 400 |
| Articulated masonry veneer | 300 | 300 | 3- 8TM | 400 |
| Masonry veneer | 300 | 300 | 3- 8TM | 400 |
| Articulated full masonry | 300 | 400 | 4- 8TM | 400 |
| Full masonry | 300 | 400 | 4- 8TM | 400 |
| **Class S** | | | | |
| Cladframe | 400 | 300 | 3- 8TM | 400 |
| Articulated masonry veneer | 400 | 300 | 3- 8TM | 400 |
| Masonry veneer | 400 | 300 | 3- 8TM | 400 |
| Articulated full masonry | 400 | 400 | 4- 11TM | 400 |
| Full masonry | 500 | 400 | 4- 11TM | 400 |
| **Class M** | | | | |
| Cladframe | 400 | 300 | 3- 11TM | 500 |
| Articulated masonry veneer | 450 | 300 | 3- 11TM | 500 |
| Masonry veneer | 500 | 300 | 3- 12TM | 500 |
| Articulated full masonry | 600 | 400 | 4- 12TM | 500 |
| Full masonry | 900 | 400 | 4- 12TM | 500 |

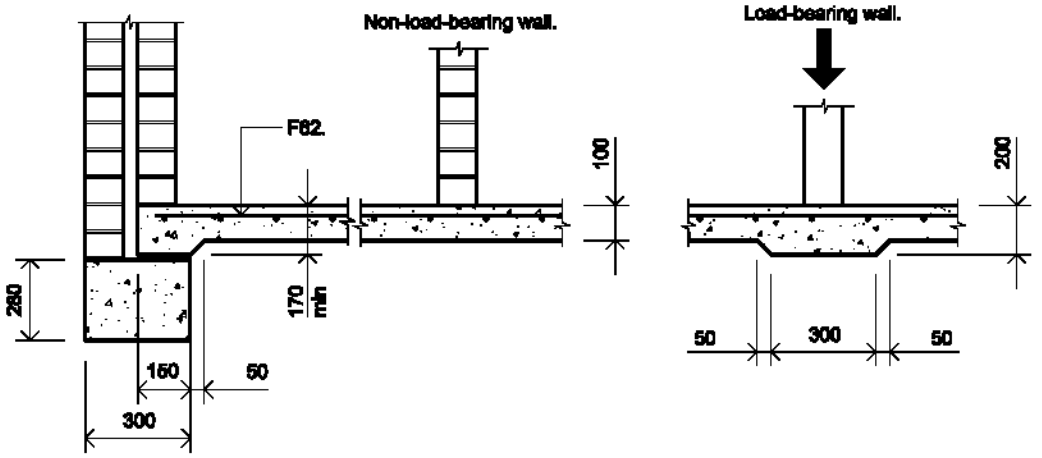
**Notes:** For the purposes of this Figure:

1. All masonry walls must be supported on strip footings.
2. For Class M articulated full masonry and full masonry internal strip footings must be of the same proportions at the external footing and run from external footing to external footing.
3. Infill floors may be concrete slabs, brick paving, stone flags or compacted and stabilised earth. Concrete infill slabs must use a minimum of F62 mesh to control shrinkage.
4. Where external beams are wider than 300mm an extra bottom bar or equivalent of the same bar size is required for each 100mm additional width.
5. The measurement $D_f$ is greater than or equal to D plus 75mm.
6. Alternative reinforcing sizes must comply with AS 2870.

**Figure 3.2.5.5**

**FOOTING SLABS FOR CLASS A SITES:**

- **a. CLAD FRAME;**
- **b. ARTICULATED MASONRY VENEER;**
- **c. MASONRY VENEER;**
- **d. ARTICULATED FULL MASONRY; and**
- **e. FULL MASONRY**




**Notes:** For the purposes of this Figure:

1. Use F63 when slab length is less than or equal to 12m.
2. Use F62 when slab length is less than or equal to 18m.
3. Use F72 when slab length is more than 18m.
4. 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 85mm and reinforced as follows:
   a. Use F53 when slab length is less than or equal to 12m.
   b. Use F63 when slab length is less than or equal to 18m.
   c. Use F62 when slab length is more than 18m.
5. Dune sands may require compaction.

**STATE AND TERRITORY VARIATIONS**

See ACT 1 for optional footing design.



SUPERSEDED

# PART 3.3

Amdt 0

# MASONRY

# PART 3.3 CONTENTS



Continued

Amdt 0

Continued



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## Definitions

**3.3** The following definitions are used in this Part:

**Bond beam** means a horizontally reinforced concrete or masonry member forming part of the masonry.

**Cavity** means a void in a masonry wall between each leaf of masonry, a leaf of masonry and/or an adjacent frame.

**Engaged pier** means a pier bonded monolithically to a masonry wall either by course bonding of masonry units or by ties.

**Lateral support** means a support (including footing, buttress, cross wall, beam, floor or braced roof structure) that effectively restrains the wall or pier at right angles to the face of the wall or pier.

**Perpend** means a vertical joint between adjacent masonry units.

**Reinforced masonry** means masonry reinforced with steel reinforcement and grouted to strengthen the masonry.

**Unreinforced masonry** means masonry that is not reinforced.

# PART 3.3.1 UNREINFORCED MASONRY

**Appropriate performance requirements:**
Where an alternative masonry walling system is proposed to that described in Part 3.3.1, that proposal must comply with the structural performance requirement P2.1 as specified in Section 2.



## A. Acceptable construction manual

**3.3.1.0** Performance requirement P2.1 is satisfied if masonry (including masonry-veneer, unreinforced masonry and reinforced masonry) is designed and constructed in accordance with the following manual:

(a) AS 3700 Masonry Code.

**Explanatory information:**
Composite construction: Design requirements for other materials that may be used in combination with masonry ie heavy steel support beams etc. are described in Part 3.11 - Structural design.

## B. Acceptable construction practice

### 3.3.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.3.1 for unreinforced masonry construction for Class 1 and 10 buildings satisfies performance requirements P2.1, provided -

(a) the unreinforced masonry is constructed on footings that comply with Part 3.2; and

(b) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**
1. Information on wind speeds for particular areas may be obtained from the *relevant approval authority*.
2. Masonry walls in an area with a design wind speed of more than W33 must be designed in accordance with AS 3700.

(c) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4.

> **Explanatory Information:**
>
> 1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5 m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
> 2. For earthquake design H3, see AS 3700.

(d) The building is not constructed in an *alpine area*.

(e) Masonry accessories, including wall ties and lintels are installed in accordance with Part 3.3.3.

### 3.3.1.2 External walls

(a) Masonry veneer

Masonry veneer must comply with the relevant provisions of this Part and be constructed as follows:

(i) Bracing requirements - masonry veneer external walls must be tied to an internal load-bearing frame constructed in accordance with Part 3.4.

(ii) Masonry veneer walls, non-load bearing, must be constructed with a minimum of 90mm wide leaf of masonry.

(b) Cavity masonry walls and solid masonry walls

Cavity masonry and solid masonry walls must comply with the relevant provisions of this Part and be constructed as follows:

(i) The maximum height of the wall between lateral supports (floor or roof) must be 3000mm with the exception of a gable where the height to the ridge may be 5000mm (refer to Figure 3.3.1.1).

(ii) Masonry cross walls must be -

(A) a minimum of 2000mm in length at not more than 9000mm centres; and

(B) connected directly or by a floor or ceiling diaphragm to the wall being supported.

(c) Cavity walls must be constructed of two leaves of not less than 90mm.

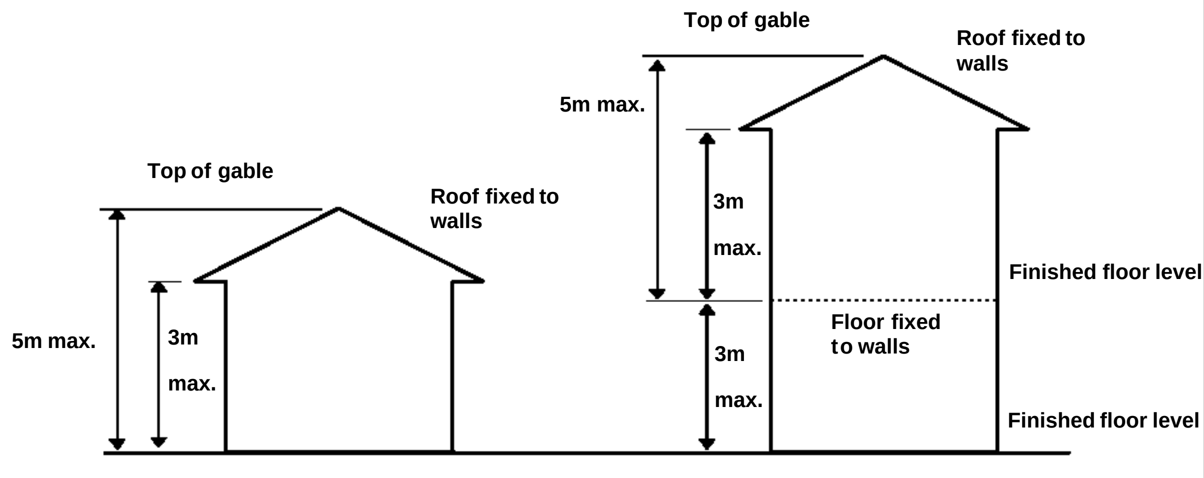
> **Explanatory Information:**
>
> For minimum cavity widths for veneer and cavity masonry see 3.3.4.1

Amdt 0

**Figure 3.3.1.1**

**HEIGHT RESTRICTIONS FOR MASONRY WALLS INCLUDING GABLE ROOF**

**Note:** Flat ceilings may act as lateral support to walls.




(d) Single leaf walls with engaged piers and return walls

Unreinforced single leaf walls with engaged piers and return walls must comply with the relevant provisions of this Part and be constructed as follows:

(i) The adjoining roof structure must be -

(A) connected to the engaged piers, see Figure 3.3.1.2; or

(B) fixed to, or within 300mm, of the return supports, see Figure 3.3.1.3.

(ii) Piers may be stack bonded with wall ties at every 4th course.

(iii) Pier and return supports size limitations:

(A) Single-leaf unreinforced masonry walls with engaged piers must comply with Figure 3.3.1.2.

(B) Single-leaf unreinforced masonry walls with return supports must comply with Figure 3.3.1.3.

(iv) There must not be more than one opening per wall panel, and any opening must not exceed 900mm high x 600mm wide, see Figure 3.3.1.3.

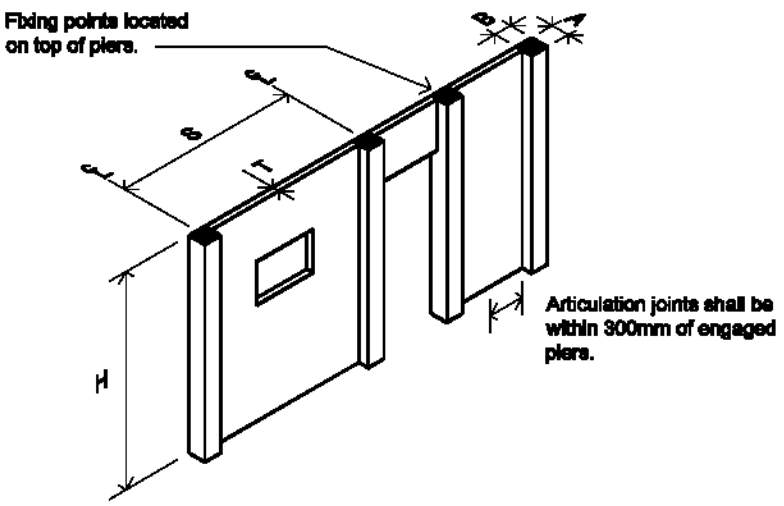
(v) An engaged pier or return wall, must be provided at both sides of a door or full height window opening, see Figure 3.3.1.2.

(vi) Articulation joints must be located within 300mm of vertical supports, see 3.3.1.8.

**Figure 3.3.1.2**

**PIERS IN EXTERNAL SINGLE LEAF WALLS**

**Note:** For the purposes of this Figure piers are not required for 140 and 190 mm walls provided the roof structure is fixed at a maximum of 3500mm centres to provide lateral support to the top of the walls.




| Table a. | | | | | |
|---|---|---|---|---|---|
| **Thickness of wall (min.)** | **T** | **90** | **110** | **140** | **190** |
| **Pier size (min.)** | AxB | 230x190 | 230x230 | - | - |
| **Spacing of piers (max.)** | S | 1650 | 1800 | - | - |
| **Height (max.)** | H | 2400 | 2700 | 2400 | 2700 |

(e) External walls for Class 10a buildings

A Class 10a building containing not more than 1 storey may be enclosed with masonry *external walls* not less than 110mm in thickness, provided that -

(i) the building measured in the direction of the span of the roof does not exceed 9m and the height does not exceed 3m; and

(ii) piers are formed that are not less than 230mm wide, project not less than 120mm and are spaced at not more than 3m centres; and

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

(iv) the *external walls* only take the distributed roof load; and

(v) cross walls are constructed at 9m centres.

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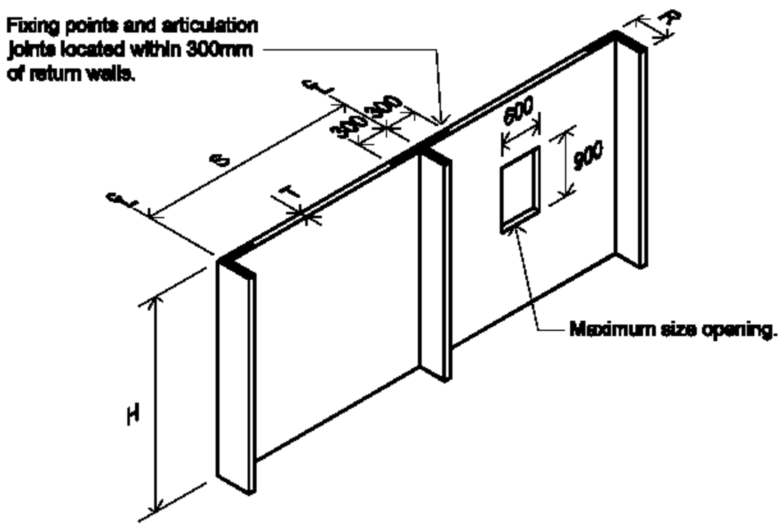
**Figure 3.3.1.3**

**RETURN SUPPORTS LIMITATIONS FOR EXTERNAL SINGLE-LEAF WALLS**

**Note:** Return supports are not required for 140mm and 190mm walls provided the roof structure is fixed at a maximum of 3500 mm centres to provide lateral support to the top of the walls.




| Table a. | | | | | |
|---|---|---|---|---|---|
| **Thickness of wall (min.)** | **T** | **90** | **110** | **140** | **190** |
| **Return length (min.)** | R | 450 | 450 | - | - |
| **Spacing of returns (max.)** | S | 3000 | 4500 | - | - |
| **Height (max.)** | H | 2400 | 2400 | 2400 | 2700 |

### 3.3.1.3 Internal walls

Internal masonry walls must comply with the relevant provisions of this Part and be constructed as follows:

(a) Internal masonry walls must be a minimum of 75mm thick.

(b) Where wall junctions occur they must be bonded or an articulation joint provided in accordance with 3.3.1.8.

(c) Single leaf internal walls must be supported by either-

(i) the ceiling structure in accordance with Figure 3.3.1.4(a); or

(ii) return walls in accordance with Figure 3.3.1.4(b).

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





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**Figure 3.3.1.4**

**SUPPORT FOR INTERNAL WALLS**

**Diagram a.** **Supported by ceiling structure**

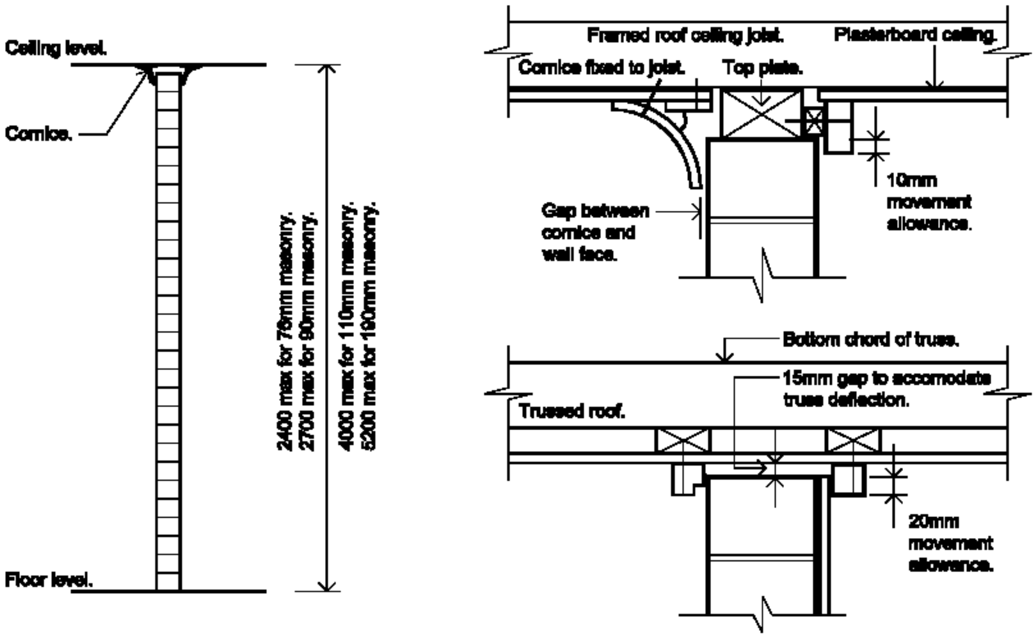
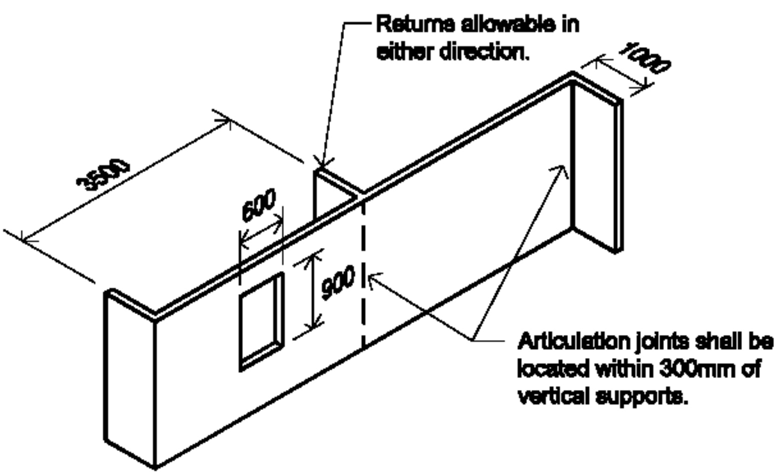



**Diagram b.** **Supported by return walls**

**Note:** For the purposes of this diagram:

1. A maximum size opening of 600x900 mm is allowed to internal walls; and
2. The maximum allowable height for the wall is described in diagram a.

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### 3.3.1.4 Isolated piers

(a) Isolated masonry piers supporting carports, verandahs, porches and similar roof structures, which form part of the main roof, or are attached to a wall of a Class 1 building must be a minimum of 290x290mm and -

(i) must comply with the relevant parts of (b), (c) or (d); and

(ii) must comply with Figure 3.3.1.5; and

(iii) may also support a roller door.

(b) Isolated piers supporting tiled roofs

Isolated piers supporting tiled roofs must have a built-in 32x0.8mm galvanised steel strap fixed to the roof structure and looped around a 10mm diameter galvanised steel rod built into the pier a minimum of six courses below the top of the pier.

(c) Isolated piers supporting sheet roofs must have -

(i) a built-in 32x0.8mm galvanised steel strap fixed to the roof structure and extending the full height of the pier which is looped around a 10mm diameter galvanised steel rod cast into the footing when poured; or

(ii) a 10mm diameter galvanised steel rod threaded at the top and extended the full height of the pier may be substituted for the galvanised steel strap.

(d) Piers for a free standing carport must -

(i) be a minimum of 290x290mm with the central core filled with 20MPa concrete, or an exposure class mortar (see Table 3.3.1.2) complying with 3.3.1.6; or

(ii) have the core reinforced with 1 Y12 steel reinforcing rod cast into the footing and extending the full height of the pier to connect to the roof structure.

(e) Sub-floor isolated piers

Sub-floor isolated piers must comply with Figure 3.3.1.6.

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Figure 3.3.1.5

ISOLATED PIERS UNDER MAIN ROOF

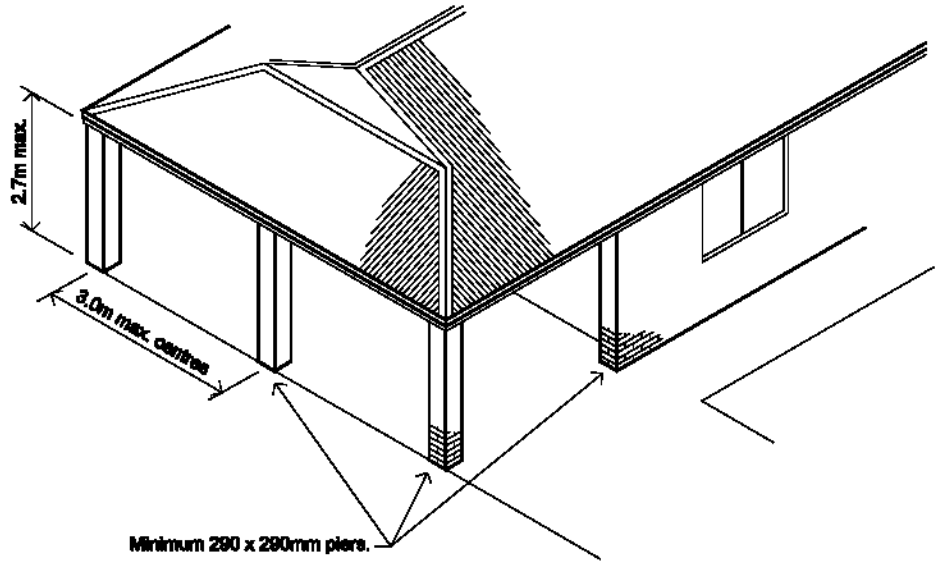
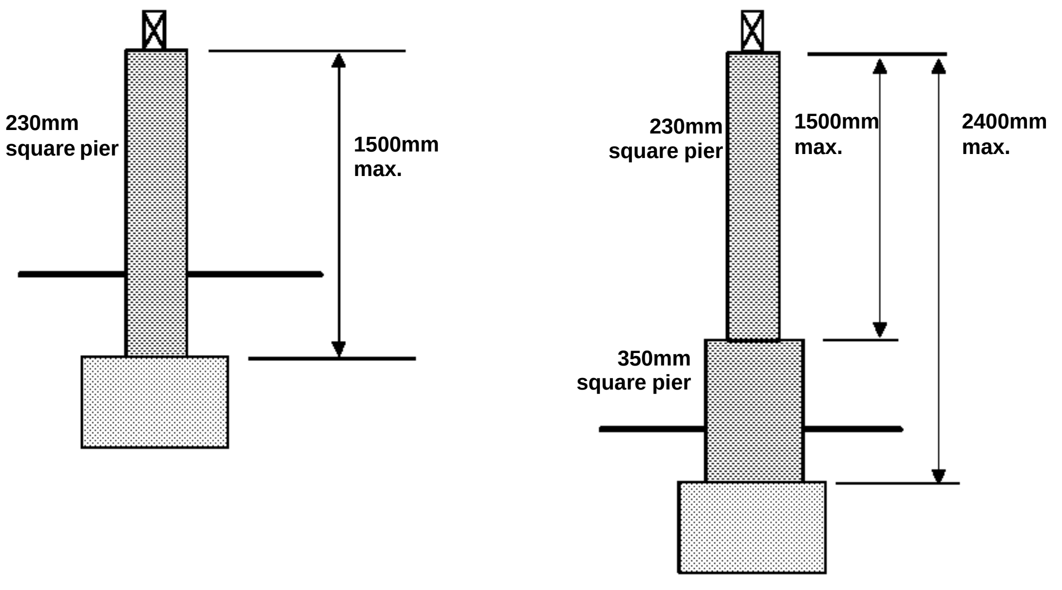



Figure 3.3.1.6

SUB-FLOOR ISOLATED PIERS - MAXIMUM HEIGHTS



### 3.3.1.5 Masonry units

(a) Masonry units

All masonry units, including autoclaved aerated concrete, calcium silicate, clay and dressed natural stone must comply with AS 2733.

(b) Uniformity

Mixing of clay with concrete or calcium silicate masonry panels of walling is not permitted; unless -

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

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

(c) Masonry units must be used in the appropriate exposure conditions described in Table 3.3.1.1.

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**Table 3.3.1.1**
**EXPOSURE CONDITIONS**

| CLASSIFICATION (as per AS 2273) | APPLICATION |
|---|---|
| **Protected (PRO)** | Suitable for use above damp-proof course provided they are protected at the top of the wall by appropriate roofs, eaves, copings or toppings in:<br>(a) Internal walls; and<br>(b) coated or rendered external walls |
| **General purpose (GP)** | Suitable for all uses except exposure class |
| **Exposure Class (EXP)** | Suitable for use in all classifications including severe local conditions such as:<br>• Below damp-proof course in areas where walls are expected to be attacked by salts in the ground water or brickwork itself (salt attack or salt damp).<br>• On sea fronts where walls are exposed to attack from wind - borne salt spray, or in heavily polluted areas subject to deposition of atmospheric pollution (most suitable; although may need further protection in some environments).<br>• In retaining walls.<br>• Under conditions of regular cyclic freezing and thawing. |

### 3.3.1.6 Mortar mixes

Mortar used for masonry construction must be mixed by volume in the proportions stated in Table 3.3.1.2; and

(a) cement in mortar mixes must comply with AS 3972; and

(b) lime in mortar mixes must comply with AS 1672; and

(c) sand in mortar mixes must be fine aggregate with low clay content and free from efflorescing salts; and

(d) water in mortar mixes must be potable (drinkable).

**Table 3.3.1.2**

**MORTAR MIXES**

**Note:** Additives may be used provided they comply with the appropriate specified rate.

| BRICK CLASSIFICATION (as per Table 3.3.1.1) | MORTAR MIXED BY VOLUME Cement: Lime: Sand | |
|---|---|---|
| | General use | Suitable for concrete masonry - requires the use of methyl cellulose water thickener |
| **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 |

### 3.3.1.7 Mortar joints

(a) Mortar joints

Unless otherwise specified masonry bed and perpend joints are to be a nominal 10mm.

(b) Mortar joint finishes

Where raked joints are used they must not be -

(i) deeper than 10mm; and

(ii) used in saline environments or areas subject to heavy industrial air-borne pollution; and

(iii) used for masonry units laid with shell bedded mortar joints.

### 3.3.1.8 Vertical articulation joints

(a) Vertical articulation joints must be provided in unreinforced masonry walls except walls built where the site soil classification is A or S (see Part 3.2).

(b) Articulation joints must have a minimum width of 10mm and be provided (see Figure 3.3.1.7) -

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(i) in straight, continuous walls having no openings, at not more than 6000mm centres and not closer than the height of the wall away from corners; and

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

(iii) where openings greater than 900x900mm occur, at not more than 5000mm centres, and positioned in line with one edge of the opening;

(iv) where walls change in thickness; and

(v) at control or construction joints in footing slabs; and

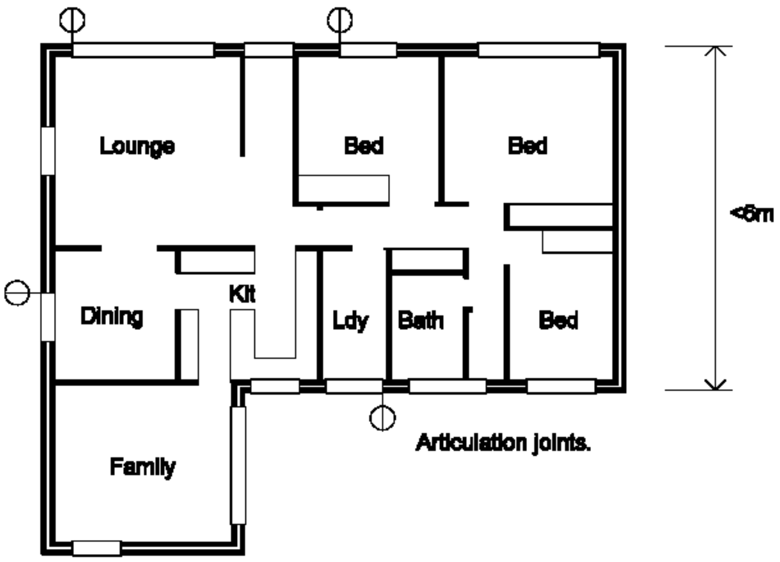
(vi) at junctions of walls constructed of different masonry materials; and

(vii) at deep chases (rebates) for service pipes.



**Figure 3.3.1.7**

**TYPICAL VERTICAL ARTICULATION JOINT LOCATIONS**




(c) For all articulation joints in cavity walls, extendable masonry anchors must be built in at every fourth course, see Figure 3.3.1.9. For veneer construction the extendable ties may be omitted.

(d) Where articulation joints are adjacent to door or window frames, a 10mm gap must be left between the edge of the frame and the masonry to allow for movement, see Figure 3.3.1.9.

(e) For single leaf masonry walls stabilised by return walls, or engaged piers, as shown in Figures 3.3.1.3, and 3.3.1.4, any articulation joints must be within 300 mm of the vertical support.

(f) All joints in single skin masonry must be sealed with a flexible, compressible material, see Figure 3.3.1.9.

(g) Articulation joints constructed adjacent to arched openings must be constructed with minimum abutments between the opening and the articulation joint, in accordance with the Cement and Concrete Association of Australia - Technical Note 61.



**Explanatory information:** Design for other masonry wall types

The above design criteria is typical for clay masonry construction. Alternative designs may be appropriate and consideration should be given to a number of important factors (including the following) to achieve an effective system-

1. expected soil movement - based on soil engineer's report;
2. expected masonry unit growth - based on manufacturer's specifications;
3. construction of wall ie openings, length of wall, height etc.

For more detailed requirements of articulation joints refer to the Cement and Concrete Association Construction Note Technical Note 61.

**Figure 3.3.1.8**

**TYPICAL LOCATIONS FOR ARTICULATION JOINTS**

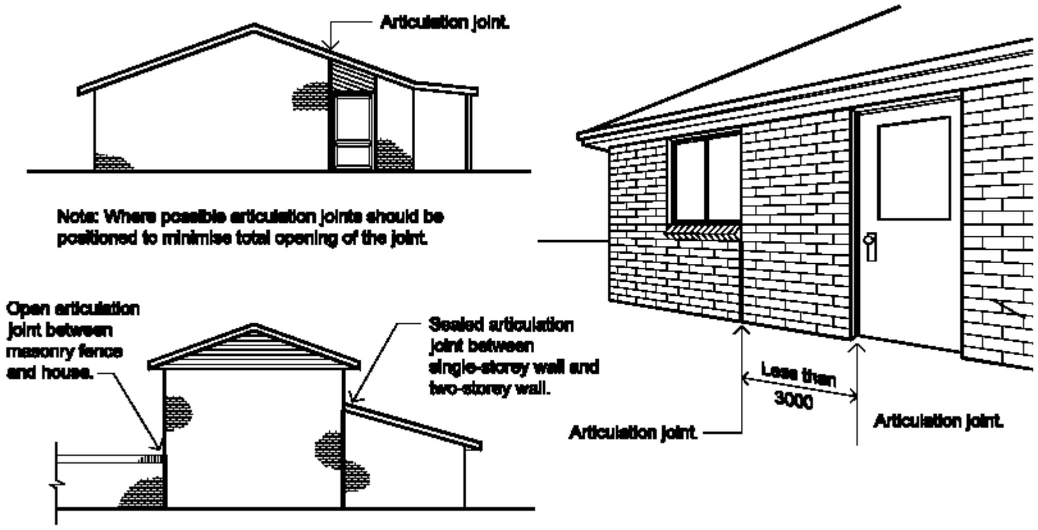
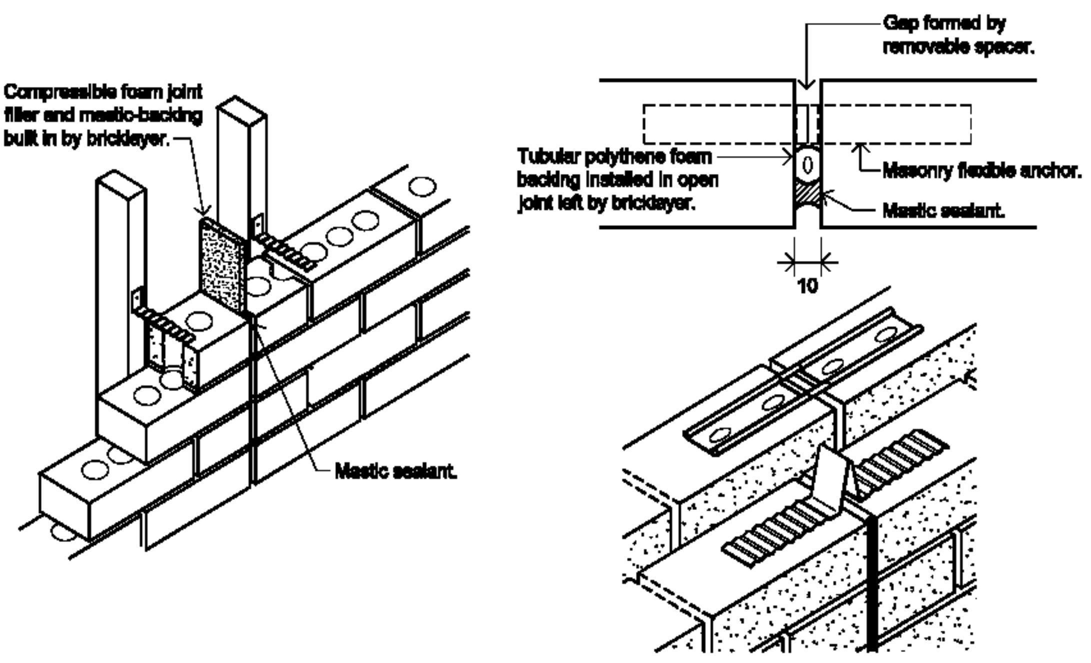


**Figure 3.3.1.9**

**VERTICAL ARTICULATION JOINT DETAILS**

**Note:** Mastic sealant is optional in cavity brick construction.




## 3.3.1.9 Sub-floor ventilation

Ventilation under suspended floors must be in accordance with Part 3.4.1; and -

(a) a clear opening width of 7300 mm$^2$/m, horizontally, in the external leaf of masonry; and

(b) the area behind a vent must be left completely clear to provide a clear flow of ventilation into the sub-floor area; and

(c) where dwarf walls are constructed, through ventilation must be maintained throughout the entire suspended floor area; and

(d) where open perpends are used for sub-floor ventilation the perpend must be left open and completely clean in the brick course immediately above the damp-proof or flashing course.





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**3.3.1.10 Shrinkage allowance for timber framing**

(a) In masonry veneer walls a gap must be left between the timber frame and the top of the masonry wall, including window sills etc, to allow for settlement of the timber framing caused by timber shrinkage. These clearances must be at least -

(i) 5 mm at sills or lower and single storey windows; and

(ii) 8 mm at roof overhangs of single storey buildings; and

(iii) 10 mm at sills of second storey windows; and

(iv) 12 mm at roof overhangs to two storey buildings.

(b) The clearances described in (a) must be doubled if the timber framing is of unseasoned hardwood.

# PART 3.3.2 REINFORCED MASONRY

**Appropriate performance requirements:**

Where an alternative reinforced masonry system is proposed to that described in Part 3.3.2, that proposal must comply with the structural performance requirement P2.1 in Section 2.



## A. Acceptable construction manual

**3.3.2.0** Performance requirements P2.1 are satisfied if reinforced masonry is designed and constructed in accordance with the following manual:

(a) AS 3700 Masonry Code.

**Explanatory information:**

Composite construction: Design requirements for other materials that may be used in combination with masonry ie heavy steel support beams etc. are described in Part 3.11 - Structural design.

## B. Acceptable construction practice

### 3.3.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.3.2 for reinforced concrete masonry construction for Class 1 and 10 buildings satisfies performance requirements P2.1, provided -

(a) the reinforced masonry is constructed on footings that comply with Part 2; and

(b) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**

1. Information on design wind speeds for particular areas may be obtained from the *relevant approval authority*.
2. Masonry walls in an area with a design wind speed of more than W41 should be designed in accordance with AS 3700 or Part 3.10.1.

(c) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4.

**Explanatory Information:**

1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
2. For earthquake design H3, see AS 3700.

(d) The building is not constructed in an *alpine area*.

### 3.3.2.2 External wall construction

External reinforced concrete walls must consist of masonry be manufactured in accordance with AS3700 and constructed as follows (see also Figure 3.3.2.1):

(a) The minimum width external wall width is 140mm.

(b) Tie down rods must -

(i) be a minimum of one Y12 steel reinforcing bar (or equivalent), and

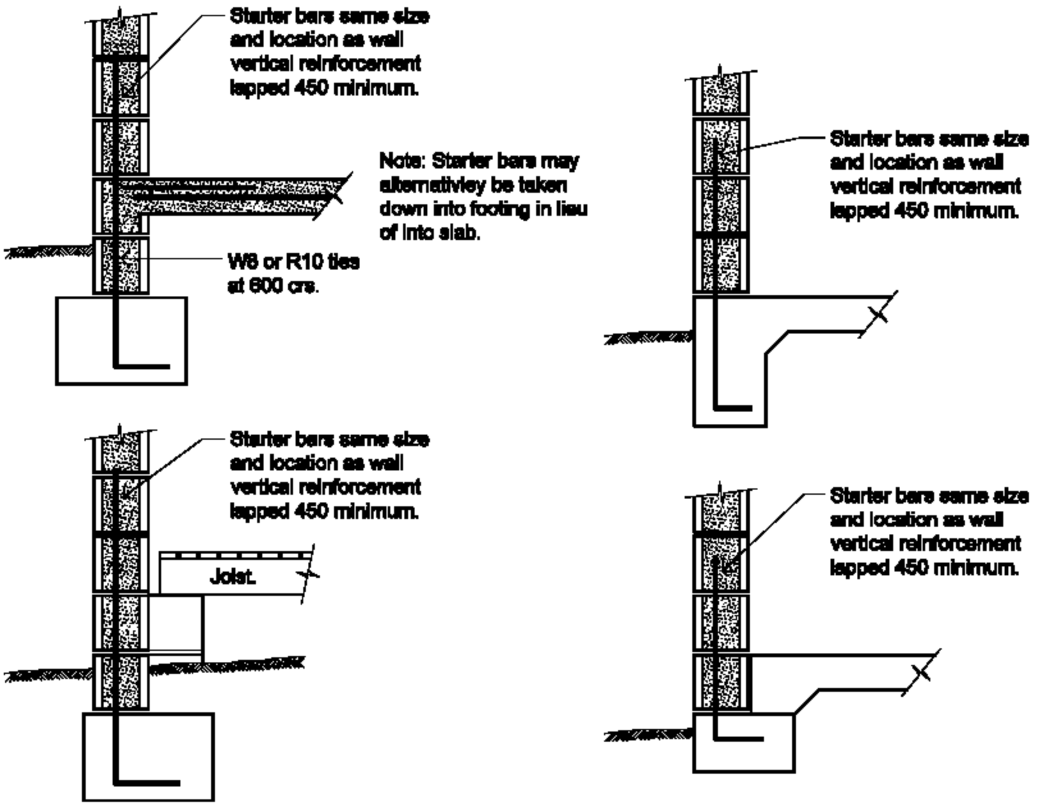
(ii) spaced at no more than 1.8m centres between openings; and

(iii) fully grouted into the block work with a grout having a characteristic compressive strength of 20 MPa; and

(iv) lapped with cogged steel starter bars of similar size set 250mm in the concrete edge beam or footing in accordance with Figure 3.3.2.1.

**Figure 3.3.2.1**

**TYPICAL FOOTING/TIE DOWN DETAILS**

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(c) Concrete bond beam

A continuous reinforced concrete bond beam must -

(i) be installed at the top of the walls in accordance with Figure 3.3.2.2 and 3.3.2.3; and

(ii) have at least two Y12 bars set in concrete grout with a characteristic compressive strength of 20 MPa; and

(iii) at door and window openings the bond beam may serve as a lintel supporting the roof trusses, provided additional reinforcement is placed in accordance with Table 3.3.2.2; and

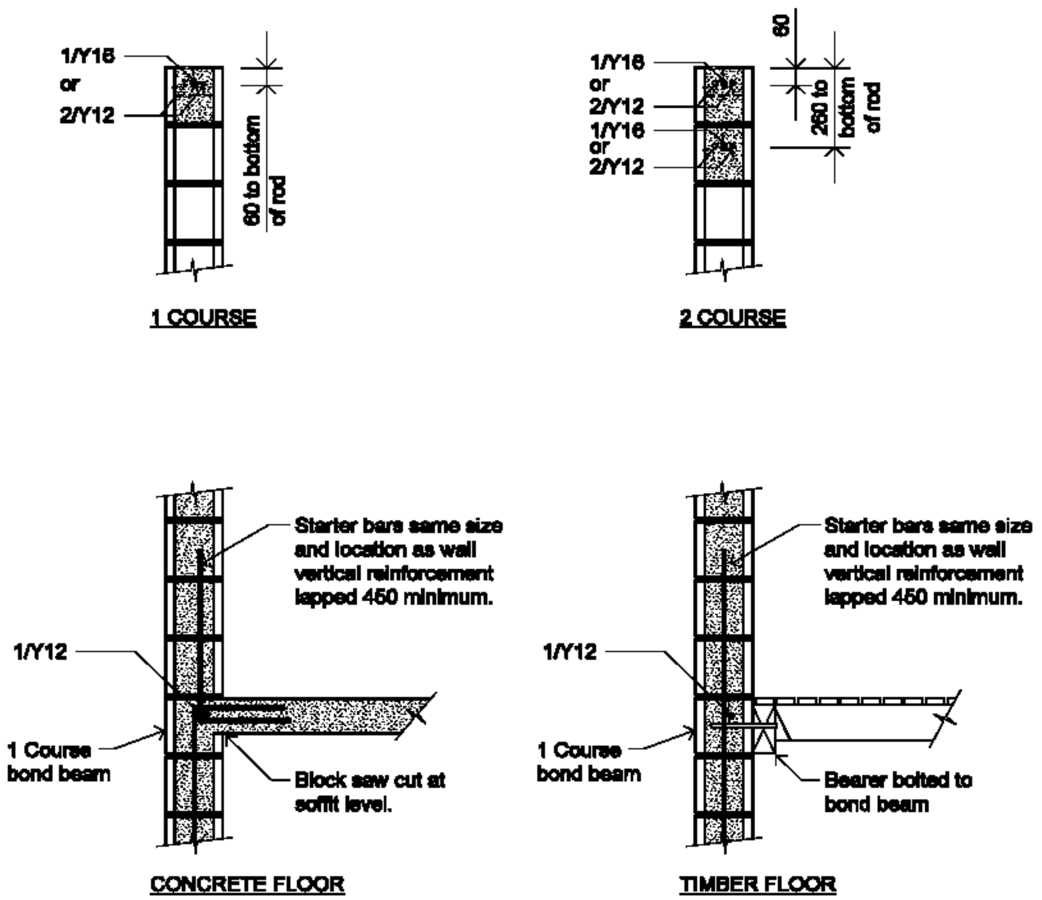
(iv) at first floor level a one course bond beam must be constructed in accordance with Figure 3.3.2.2.

(d) All cores in concrete hollow block work below ground level must be filled with concrete grout.



**Figure 3.3.2.2**

**TYPICAL BOND BEAM DETAILS**



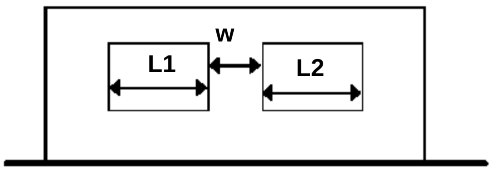
(e) Lintels must be installed as follows:

(i) Lintels must be supported on reinforced piers in accordance with Table 3.3.2.1 (where appropriate); and

(ii) lintels carrying roof loads must be constructed in accordance with the appropriate requirements of Figure 3.3.2.3 and 3.3.2.4.

**Table 3.3.2.1**

**ADDITIONAL WALL PIER REINFORCING**




| MAXIMUM SUM OF OPENINGS BESIDE PIERS "L1 + L2" | | | | |
|---|---|---|---|---|
| ALL CORES REINFORCED WITH ONE Y12 ROD | | | END CORES ONLY REINFORCED WITH Y12 ROD | |
| WIDTH OF PIER "W" (mm) | | | WIDTH OF PIER "W" (mm) | |
| 200 | 400 | 600 | 600 | 800 |
| 4000 | 6000 | 6000 | 6000 | 6000 |

**Figure 3.3.2.3**

**TYPICAL REINFORCED WALL**

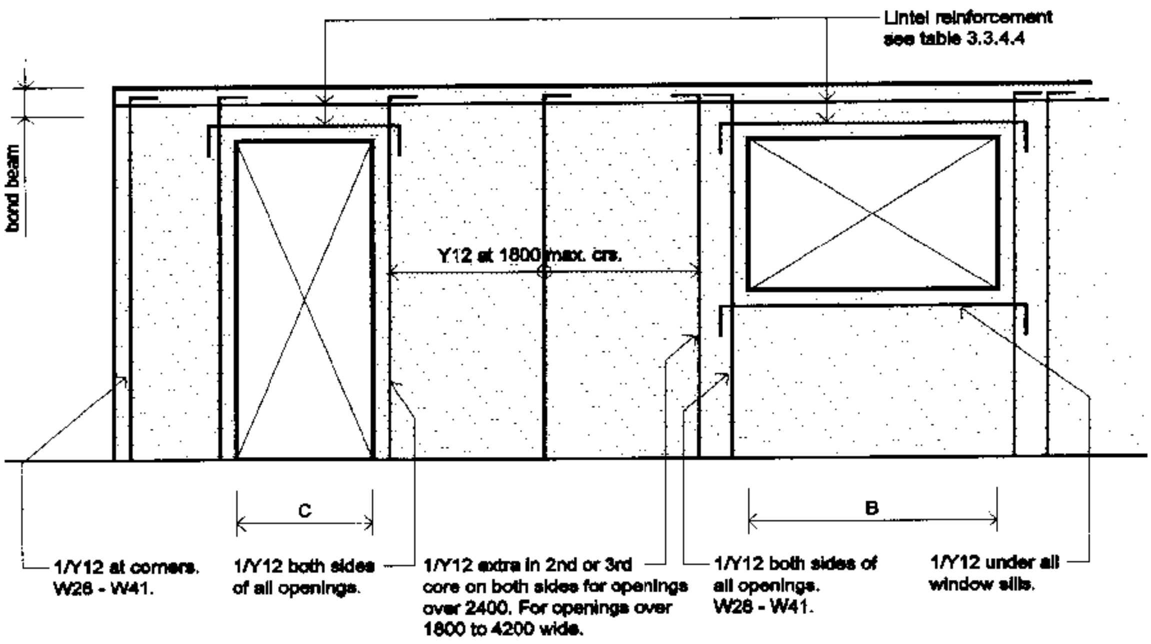
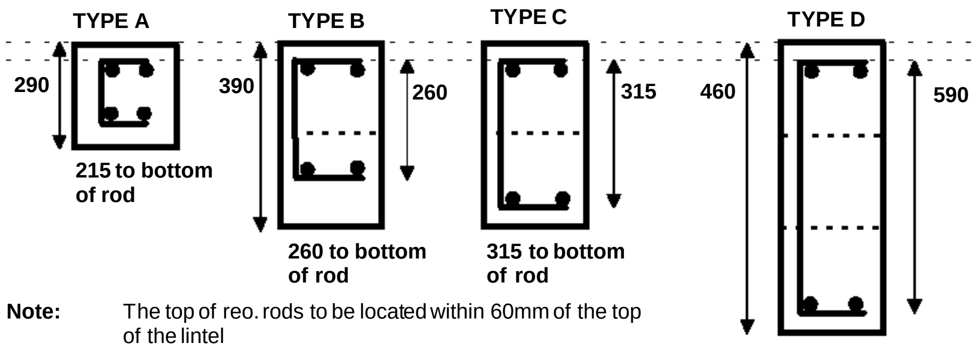


**Figure 3.3.2.4**

**REINFORCEMENT AND CONSTRUCTION OF LINTELS**

**Diagram a.** **Lintel types**




**Note:** The top of reo. rods to be located within 60mm of the top of the lintel

**Table a. Reinforcement for lintel types**

| CODE | | | | REINFORCEMENT | |
|---|---|---|---|---|---|
| A1 | B1 | C1 | D1 | 2-Y12 | Top and Bottom |
| A2 | B2 | C2 | D2 | 1-Y16 | Top and Bottom |
| A3S | B3S | C3S | D3S | 2-Y12 | Top and Bottom with W8 Stirrups @ 200 crs |
| A4S | B4S | C4S | D4S | 1-Y16 | Top and Bottom with W8 Stirrups @ 200 crs |
| A5 | B5 | C5 | D5 | 2-Y16 | Top and Bottom |
| A6S | B6S | C6S | D6S | 2-Y16 | Top and Bottom with W8 Stirrups @ 200 crs |

**Diagram b.** **Measurement of roof loads**

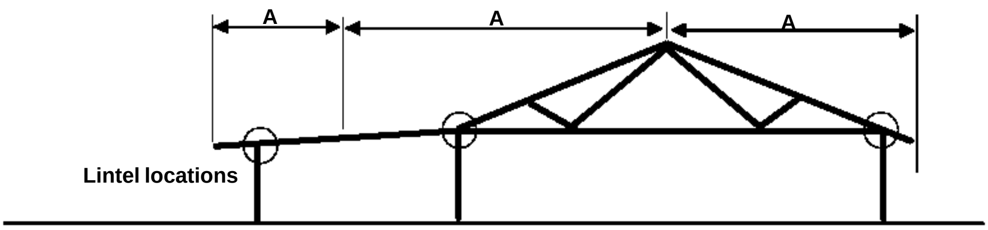



**Table b. Lintel reinforcing for standard truss loading**

**Note:** In lintels and bond beams using 2/Y12 bars, 1/Y16 bar may be used instead

| OPENING | MINIMUM LINTEL REINFORCEMENT FOR STANDARD TRUSS LOADING | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (mm) | Maximum "A" - 4.6 m | | | Maximum "A" - 5.6 m | | | Maximum "A" - 6.6 m | | |
| | LINTEL DEPTH (mm) | | | LINTEL DEPTH (mm) | | | LINTEL DEPTH (mm) | | |
| | 300 | 400 | 600 | 300 | 400 | 600 | 300 | 400 | 600 |
| **900** | A1 | B1 OR C1 | D212 | A1 | B1 OR C1 | D1 | A1 | B1 OR C1 | D1 |
| **1200** | A1 | B1 OR C1 | D212 | A1 | B1 OR C1 | D1 | A1 | B1 OR C1 | D1 |
| **1800** | A1 | B1 OR C1 | D212 | A1 | B1 OR C1 | D1 | A3S | B1 OR C1 | D1 |
| **2400** | A1 | B1 OR C1 | D212 | A3S | B1 OR C1 | D1 | A6S | B3S OR C1 | D1 |
| **3000** | A6S | B3S OR C1 | D5 | A6S | B6S OR C5 | D1 | | B6S OR C66 | D1 |
| **3600** | - | B3S OR C5 | D5 | | B6S OR C6S | D1 | | - C6S | D5 |
| **4200** | - | - C6S | D5 | | - C6S | D5 | | | D6 |
| **4800** | - | - C6S | D5 | | | D6 | | | D6 |

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(f) Bracing walls must be installed in buildings to control lateral loading as follows-

(i) the walls must be constructed in accordance with Figure 3.3.2.5; and

(ii) the permissible bracing capacity is determined in accordance with Table 3.3.2.2 after considering Figure 3.3.2.6.

**Figure 3.3.2.5**

**TYPICAL BRACING WALL DETAILS**

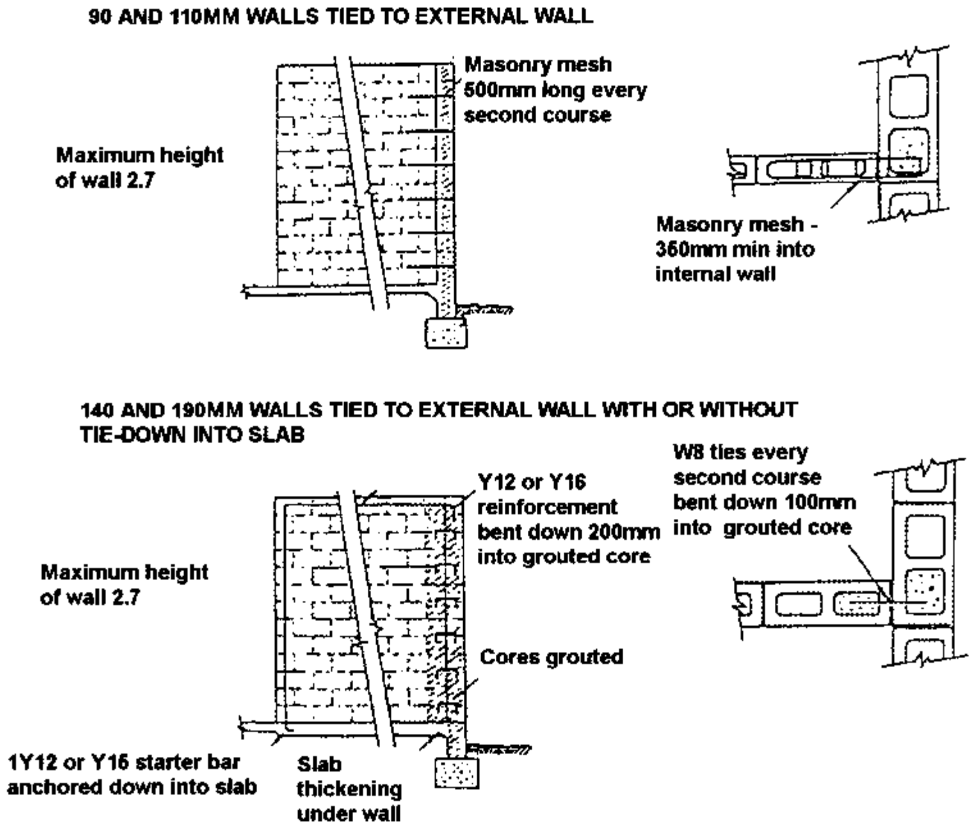


**Figure 3.3.2.6**

**IDENTIFYING WALL LENGTHS - (To be used with Table 3.3.2.2)**

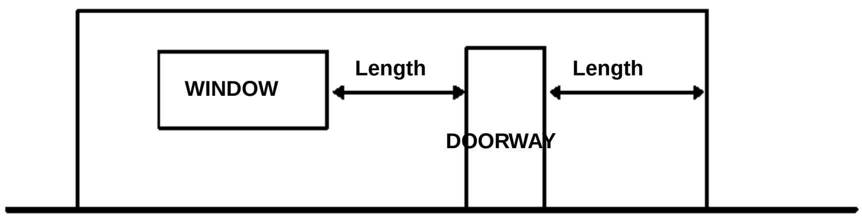






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Table 3.3.2.2

**BRACING CAPACITY OF WALLS 2.7 m HIGH**

**Note:** For the purposes of this Table where a bracing wall is connected at only one end to a wall with a single course bond beam, the bracing value is limited by shear through the bond beam to 28.8 kN. Where it is necessary to use higher values a double bond beam must be used.

| Wall Length (m) | PERMISSIBLE BRACING CAPACITY (kN) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 90 mm & 110mm Walls | 140 mm Wall | | | 190mm Wall | | |
| | | No Tie down | Tie down size | | No Tie down | Tie down size | |
| | | | Y12 | Y16 | | Y12 | Y16 |
| **0.4** | - | - | 2.4 | 4.1 | 0.1 | 2.4 | 4.2 |
| **0.6** | - | 0.1 | 4.1 | 6.7 | 0.2 | 4.1 | 7.4 |
| **0.8** | 0.2 | 0.3 | 5.8 | 7.8 | 0.3 | 6.0 | 10.0 |
| **1.0** | 0.4 | 0.5 | 7.6 | 9.0 | 0.6 | 7.8 | 11.2 |
| **1.2** | 0.5 | 0.7 | 9.5 | 10.0 | 0.8 | 9.7 | 12.4 |
| **2.4** | 2.1 | 2.8 | 16.8 | 16.8 | 3.3 | 19.6 | 19.6 |
| **3.0** | 3.3 | 4.4 | 20.2 | 20.2 | 5.2 | 23.2 | 23.2 |
| **3.6** | 4.8 | 6.3 | 23.5 | 23.5 | 7.4 | 26.8 | 26.8 |
| **4.2** | 6.6 | 8.6 | 26.9 | 26.9 | 10.2 | 30.4 | 30.4 |
| **4.8** | 8.6 | 11.2 | 30.2 | 30.2 | 13.3 | 34.0 | 34.0 |
| **5.4** | 10.5 | 14.2 | 33.6 | 33.6 | 16.8 | 37.6 | 37.6 |
| **6.0** | 10.5 | 17.6 | 37.0 | 37.0 | 20.7 | 40.4 | 40.4 |

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(g) Roof truss connections

Roof trusses must be tied to the reinforced masonry wall with a method appropriate to the design strength nominated in Figure 3.3.2.7 after taking into consideration -

(i) the uplift force as determined in accordance with Table 3.3.2.3; and

(ii) the net design uplift pressure as determined in accordance with AS 4055 or AS 1170.

**Table 3.3.2.3**

**ROOF TRUSSES - UPLIFT FORCES**

| DESIGN WIND SPEED | NET DESIGN UPLIFT PRESSURE (kPa) | | NET DESIGN UPLIFT FORCE ON STANDARD TRUSS (kN) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TRUSSES AT 600 mm SPACING | | | TRUSSES AT 900 mm SPACING | | | | | |
| | | | TILE ROOF | | | TILE ROOF | | | SHEET ROOF | | |
| | TILE ROOF | SHEET ROOF | DIMENSION "A" (m) | | | DIMENSION "A" (m) | | | DIMENSION "A" (m) | | |
| | | | 4.6 | 5.6 | 6.6 | 4.6 | 5.6 | 6.6 | 4.6 | 5.6 | 6.6 |
| W33 | 0.00 | 0.42 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 | 2.1 | 2.5 |
| W41 | 0.44 | 0.81 | 1.2 | 1.5 | 1.7 | 1.8 | 2.2 | 2.6 | 3.4 | 4.1 | 4.8 |

**Note:** For the purposes of this Table:

1. For a standard truss the uplift force at each end is equal to the pressure multiplied by dimension "A" multiplied by the truss spacing.
2. Uplift forces for other values of dimension "A" may be interpolated.
3. Sheet roof includes metal tile.
4. Dimension "A" is determined in accordance with Figure 3.3.2.4.

**Figure 3.3.2.7(a)**

**TYPICAL TRUSS TIE DOWN METHODS -USING TOP PLATE**

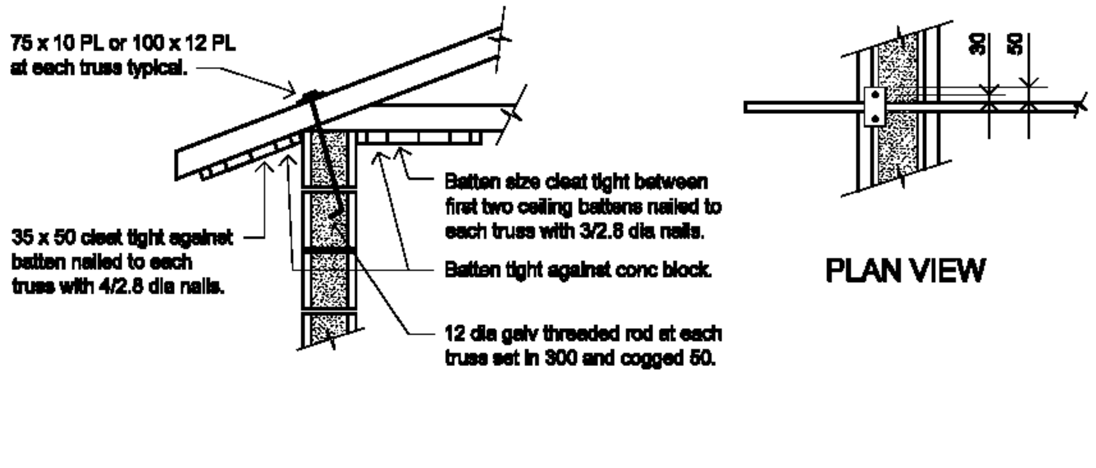
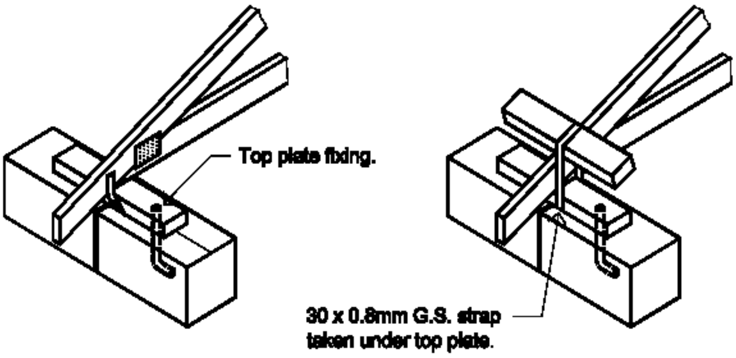


Figure 3.3.2.7(b)

TYPICAL TRUSS TIE DOWN METHODS - USING THREADED ROD






(h) Gable ends to buildings must be installed as follows -

(i) where a timber frame is used above the bond beam the gable end must be supported by a ceiling diaphragm in accordance with Figure 3.3.2.8, Diagram a, by -

(A) anchoring the end truss to the wall; or

(B) bracing the end truss back to the internal trusses; or

(ii) where block work continues above the bond beam, fix to the blockwork in accordance with Figure 3.3.2.8, Diagram b.

Figure 3.3.2.8

TYPICAL GABLE END CONSTRUCTION DETAILS

Diagram a.

Timber frame above bond

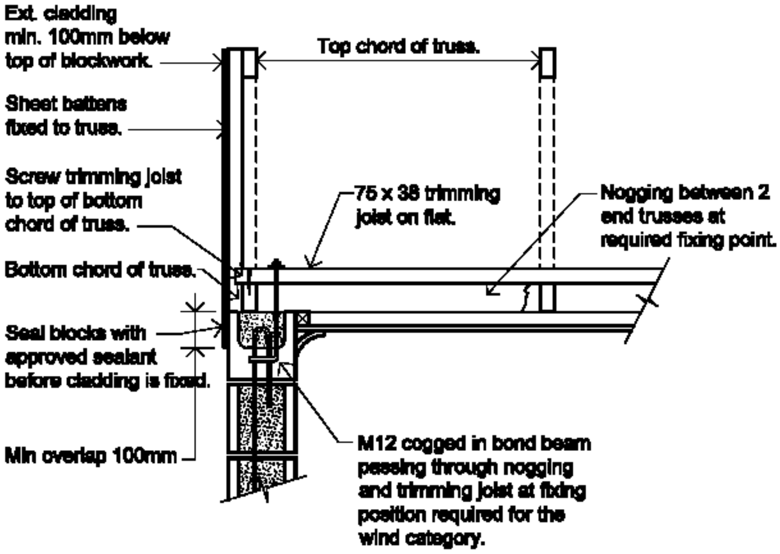
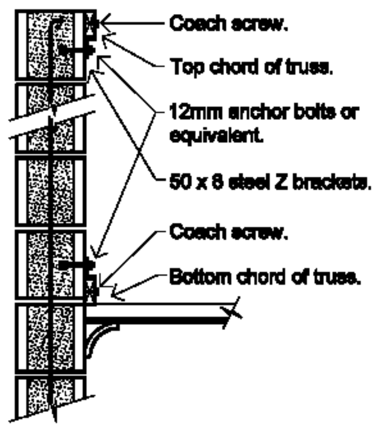



Diagram b.

Blockwork above bond beam



# PART 3.3.3 MASONRY ACCESSORIES

**Appropriate performance requirements:**
Where an alternative masonry accessory is proposed to that described in Part 3.3.3, that proposal must comply with the structural performance requirement P2.1 in Section 2.



## A. Acceptable construction manual

**3.3.3.0** Performance requirement P2.1 is satisfied if masonry wall ties and accessories are constructed and installed in accordance with the appropriate provisions of the following manuals:

(a) AS 3700 - Masonry Code.

## B. Acceptable construction practice

### 3.3.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.3.3 for masonry construction for Class 1 and 10 buildings satisfies performance requirement P2.1 provided -

(a) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**

1. Information on wind speeds for particular areas may be obtained from the *relevant approval authority*.
2. Masonry walls in an area with a design wind speed of more than W41 must be designed in accordance with AS 3700.

(b) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4.

**Explanatory Information:**

1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5 m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
2. For earthquake design H3, see AS 3700.

(c) The building is not constructed in an *alpine area*.

### 3.3.3.2 Wall ties

(a) Masonry wall ties must be used to connect -

(i) masonry veneer wall cladding to a timber or metal *load bearing* frame complying with Part 3.4; and

(ii) the two leaves of cavity masonry; and

(iii) two leaves of masonry together as a solid wall; and

(iv) intersecting masonry walls at a joint where course bonding is not employed.

(b) Masonry wall ties must be manufactured in accordance with AS 3700.

(c) Ties for articulation joints - where articulation joints occur, ties must be built in both sides of the joint, spaced not more than 300mm from the joint, see Figure 3.3.3.1.

(d) 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 frame; and

(e) Masonry veneer ties must be installed in accordance with Figure 3.3.3.2.

(f) Wall tie classification and location

Wall ties must be classified in accordance with AS 3700 as light and medium duty and installed as follows:

(i) Light duty ties must only be used in veneer clad buildings in areas where the *design wind speed* is less than W33 and spaced in accordance with Figure 3.3.3.1 as if for medium duty ties.

(ii) Medium duty ties can be used as follows -

(A) for veneer and cavity construction, spaced in accordance with Figure 3.3.3.1; and

(B) for solid or monolithic construction, see (g).

(g) Tie spacing for solid or monolithic construction

Ties must be medium duty classification spaced not more than 400 mm maximum in each direction; and

(i) the intersection of internal and external cavity or solid masonry walls must be bonded at the joint using medium duty ties at not more than 400 mm vertical spacing; and

(ii) in walls more than 200 mm in width an additional tie is required within the spacing specified in (i) for every 200 mm of the width of the masonry units making the connection.

(h) Corrosion protection

Masonry wall ties must be protected against corrosion in accordance with Table 3.3.3.1.

**Figure 3.3.3.1**

**TYPICAL BRICK TIES SPACINGS IN CAVITY AND VENEER CONSTRUCTION**

**Note:** For the purposes of this Figure:

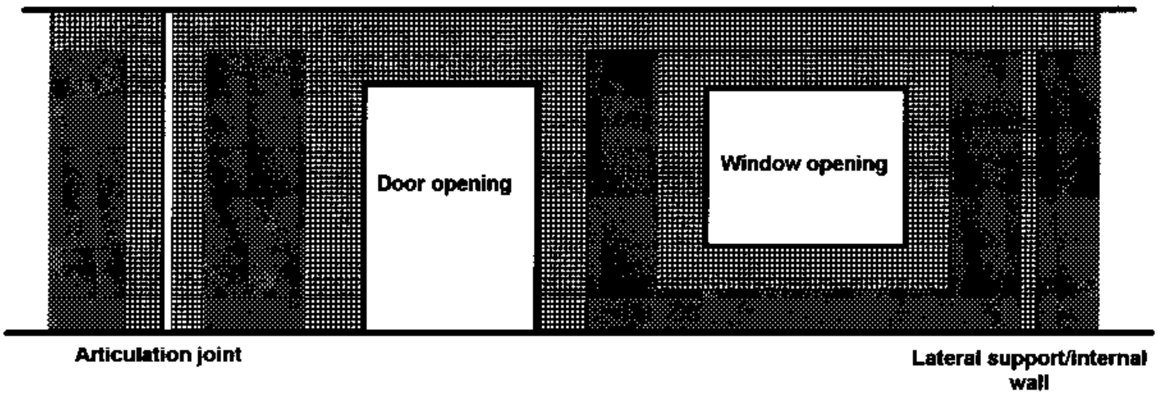
1. Solid masonry ties must be of size appropriate to the cavity width and built at least 50mm into each leaf.
2. Wall tie spacings indicated on the diagram are indicative and may be reduced according to nature of the wall.
3. Wall ties immediately adjacent ties connecting an intersecting wall may be increased to a maximum of 600mm away from the intersecting wall ties.

**Diagram a. - Spacing for medium duty wall ties - cavity and veneer construction**

**Legend:** For the purposes of this diagram:

Wall tie spacings - 300mm

Wall tie spacings - 600x600mm




| Table a. - Spacing for medium duty wall ties - cavity and veneer construction | | | |
|---|---|---|---|
| **DESIGN WIND SPEED (non-cyclonic)** | **CAVITY MASONRY** | **MASONRY VENEER CONSTRUCTION** | |
| | | **450 STUD WALLS** | **600 STUD WALLS** |
| **W28 - W41** | 600 x 600 | 600 x 450 | 600 x 600 |

**Note:** For the purposes of this Table:

1. Inner leaf masonry thickness 70-150mm for cavity walls.
2. Around openings and at control joints the vertical tie spacings are halved (ie the number of ties must be doubled).
3. In veneer construction masonry must be tied to stud wall framing at all regular stud positions, including gable ends.

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**Figure 3.3.3.2**

**TYPICAL BRICK TIES INSTALLATION IN MASONRY VENEER CONSTRUCTION**

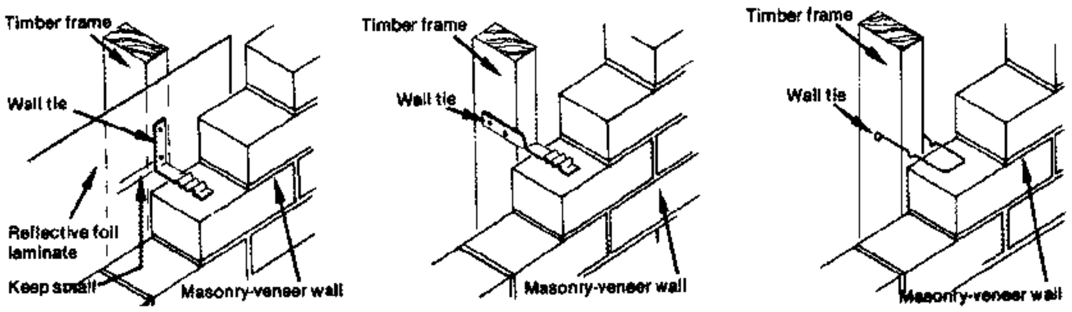


**Table 3.3.3.1**

**CORROSION PROTECTION FOR WALL TIES**

**Note:** * - For Z classification, see 3.4.2.2.

| EXPOSURE CONDITION | TIE SPECIFICATION (corrosion protection) |
|---|---|
| **Corrosive environments including: Coastal (up to 1 km from the sea) and heavy Industrial** | • Galvanised sheet steel - at least Z600*<br>• Galvanised wire - at least Z470<br>• Cadmium coated steel - at least Fe/Dc25C<br>• Grade 316 stainless steel<br>• Engineered polymer |
| **Other areas** | • Galvanised sheet steel - at least Z275<br>• Galvanised steel - coating class Type A (heavily galvanised)<br>• Cadmium coated steel - at least Fe/Dc12C<br>• Engineered polymer |

### 3.3.3.3 Fixing straps and tie down systems

(a) Door and window strap ties

Timber door and window frames abutting masonry must be -

(i) fixed with 300mm long 32x0.8mm kinked galvanised steel straps; and

(ii) fixed to back of frames; and

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(iii) set into courses a minimum of 150mm at no more than 400mm intervals.

(b) Provision for wind uplift - roof tie down in cavity masonry

(i) For areas with a *design wind speed* of W28 or W33, sheet metal and tiled roofs must be tied down using one of the following methods -

(A) use 32x0.8mm galvanised steel straps, looped around 10mm diameter galvanised mild steel rods -

(aa) built in across the cavity at a course at least 900mm below the top of the wall; and

(bb) embedded 50mm into each leaf; or

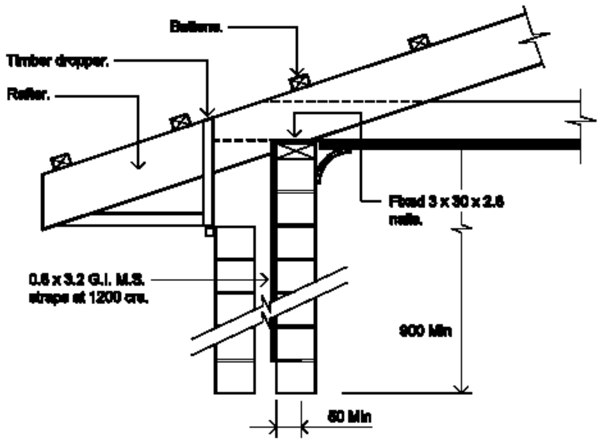
(B) use 25x1mm galvanised steel straps, built-in to the masonry inner leaf at least 50mm and 900mm below the top of the wall, see Figure 3.3.3.3.

(ii) The rods and straps are required at 1200mm maximum centres, corresponding with roof truss and rafter positions.

(iii) The span of the roof system is not more than 10m.

**Figure 3.3.3.3**

**SUITABLE TIE DOWN STRAP DETAILS**




### 3.3.3.4 Lintels

(a) Lintels in masonry may be -

(i) steel lintels complying with this Part; or

(ii) complying with AS 4100, AS1538; or

(iii) reinforced concrete beams designed in accordance with AS 3600.

> **Explanatory information:**
>
> Lintels that support structures other than masonry walls are covered in Section 3.4.4 - Structural steel members.

(b) Steel lintels must comply with Figure 3.3.3.5 and the following:

(i) The long leg of angles must be vertical, see Figure 3.3.3.4.

(ii) Each angle or flat can carry a maximum 110mm wall thickness.

(iii) For clear spans the minimum bearing length at each end of the lintel must be -

(A) for spans less than 1000mm - 100mm; and

(B) for spans more than 1000mm - 150mm, see Figure 3.3.3.4.

(iv) All lintels should be propped during brickwork construction.

(v) The maximum rafter spacing should no be greater than 600mm.

(vi) There must be at least three courses of brickwork over openings.

(vii) All loads must be uniformly distributed (point loads are not allowed).

(c ) For corrosion protection requirements refer to Part 3.4.4.

**Figure 3.3.3.4**

**LINTEL INSTALLATION**

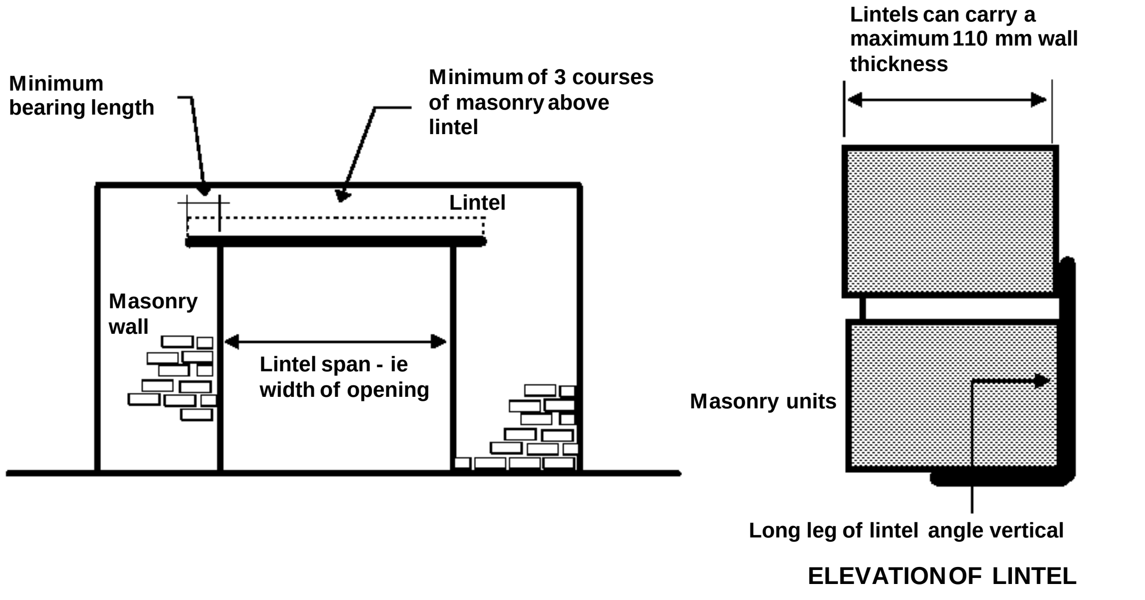







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**Figure 3.3.3.5**

**LINTELS SUPPORTING ROOFS AND MASONRY WALLS**

**Diagram a. - Lintel types as described in Table a.**

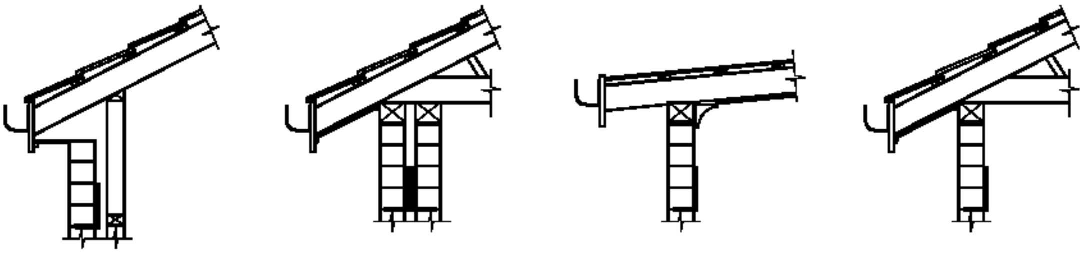


**Table a. - Lintels spans**

**Design wind speed up to W41 (non cyclonic) - Maximum roof span 10m**

| Steel Section | Mass (kg/m) | Construction Type See Diagram a. | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| **Angles** | | MAXIMUM CLEAR SPAN OF LINTEL (mm) | | | |
| 90x90x6EA | 8.22 | 3010 | 2050 | 2050 | 1570 |
| 90x90x8EA | 10.6 | 3010 | 2170 | 2170 | 1810 |
| 100x100x6E A | 9.16 | 3130 | 2290 | 2290 | 1810 |
| 100x100x8E A | 11.8 | 3370 | 2410 | 2410 | 1930 |
| 150x90x8UA | 14.3 | 4210 | 3370 | 3370 | 2770 |
| 150x100x10 UA | 18 | 4330 | 3490 | 3610 | 3010 |
| **Flats** | | | | | |
| 75x8 | 4.71 | 490 | 250 | - | - |
| 75x10 | 5.89 | 610 | 250 | 250 | 250 |

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# PART 3.3.4 WEATHERPROOFING

**Appropriate performance requirements:**
Where an alternative waterproofing system is proposed to that described in Part 3.3.4, that proposal must comply with the weatherproofing requirement P2.2.2 in Section 2.



## Definitions

**3.3.4** For the purposes of this Part:

**DPC** means damp-proof course.

## Acceptable construction practice

### 3.3.4.1 Application

Compliance with the acceptable construction practice provisions of Part 3.3.4 for weatherproofing of unreinforced masonry construction for Class 1 buildings satisfies performance requirement P2.2.2, provided the masonry wall is constructed in accordance with 3.3.1.

### 3.3.4.2 Cavity requirements

In brick veneer and cavity masonry construction a cavity must be provided between the inner and outer walls as follows:

(a) Brick veneer - 25mm minimum; and

(b) cavity masonry - 50mm (plus or minus 15mm); and

(c) the *required* minimum cavity width is to be maintained between the outer masonry leaf and any services, insulation, sheet bracing or other element located in the cavity.

### 3.3.4.3 Cavity ventilation and drainage

Open perpendicular joints (weepholes) must be created in the course immediately above any DPC or flashing as follows -

(a) at centres not exceeding 1200mm; and

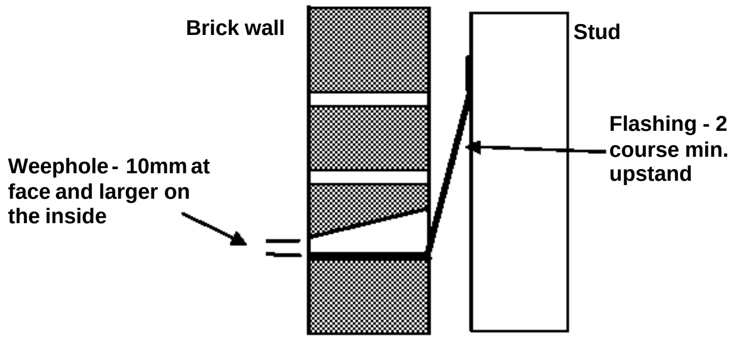
(b) must be of a minimum of 10mm diameter and larger on the inside face (see Figure 3.3.4.1); and

(c) are not *required* for head or sill openings less than 1000mm wide.

**Figure 3.3.4.1**

**WEEPHOLES FOR CAVITY CONSTRUCTION**

**Note:** For the purpose of this Figure the dimensions of the weephole is also suitable for cavity masonry construction

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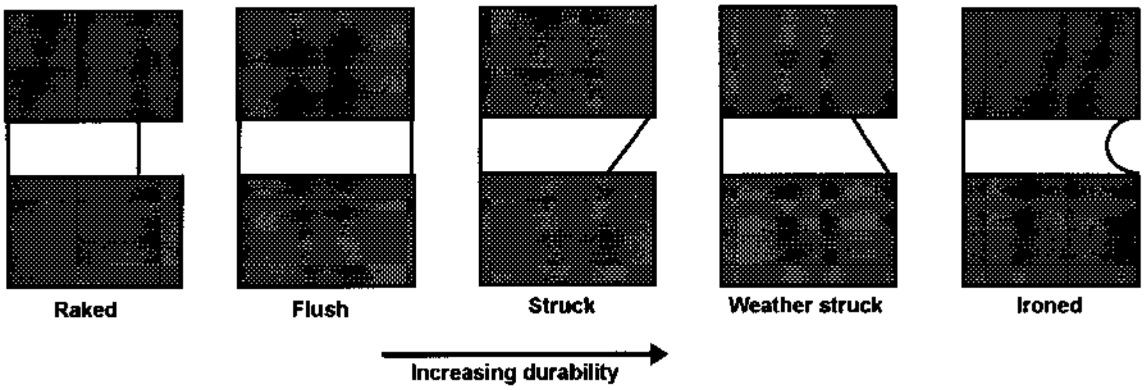
**Explanatory information:**

TYPICAL MASONRY JOINT FINISHES

The following are optional methods of increasing the water proofing capacity of masonry walls. They are not required in single leaf masonry construction.




### 3.3.4.4 Damp - proof courses - materials

Damp-proof courses must consist of the either of the following materials:

(a) In areas not subject to rising damp and salt attack -

(i) a material that complies with AS 2904; or

(ii) termite shields (with no penetrations) continuous through the wall or pier; or

(b) In all areas -

(i) embossed black polyethylene film of high impact resistance and low slip, with a nominal thickness of 0.5mm prior to embossing, and meeting the requirements of clause 7.6 of AS 2904; or

(ii) polyethylene coated metal, that has an aluminium core of not less than 0.1 mm thick, is coated both sides with bitumen adhesive enclosed in polyethylene film of not less than 0.1mm thick on each face, and has a nominal total thickness of not less than 0.5mm prior to embossing; or

(iii) bitumen impregnated materials of not less than 2.5mm thickness, that meet the requirements of clause 7.5 of AS 2904, when used in walls not higher than 7.8m above the level of the DPC.

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**3.3.4.5 Damp - proof courses - installation**

Damp-proof courses must be installed as follows:

(a) DPC's must be located as follows and as detailed in Figure 3.3.4.4-

(i) under external masonry walls on raft slab;

(A) of sufficient width to be flush with the face of the wall;

(B) located to extend across cavity and a minimum of 75mm above floor level; and

(C) the top edge of the upstand must be fixed with clouts to each timber stud or built into internal masonry wall leaf as applicable; and

(ii) in all walls in solid masonry construction; and

(iii) where the DPC is also used as a termite shield it must extend 40mm from the internal face of brick work and may be flush on the external face of brickwork; and

(iv) where required to form a continuous damp proofing barrier around the building.

(b) Flashing may be substituted for a DPC, except in areas prone to rising damp salt attack, see 3.3.4.6.

(c) Height above adjacent ground level - the DPC (or flashing) must not be less than 150mm above adjacent finished paving or ground level.

(d) Change in floor levels - DPC's must be stepped where a change in floor level occurs.

(e) Parapet walls - DPC's must be installed under the coping to parapets more than 300mm high (above the adjoining roof cladding), see Figure 3.3.4.2.

(f) In chimney stacks -

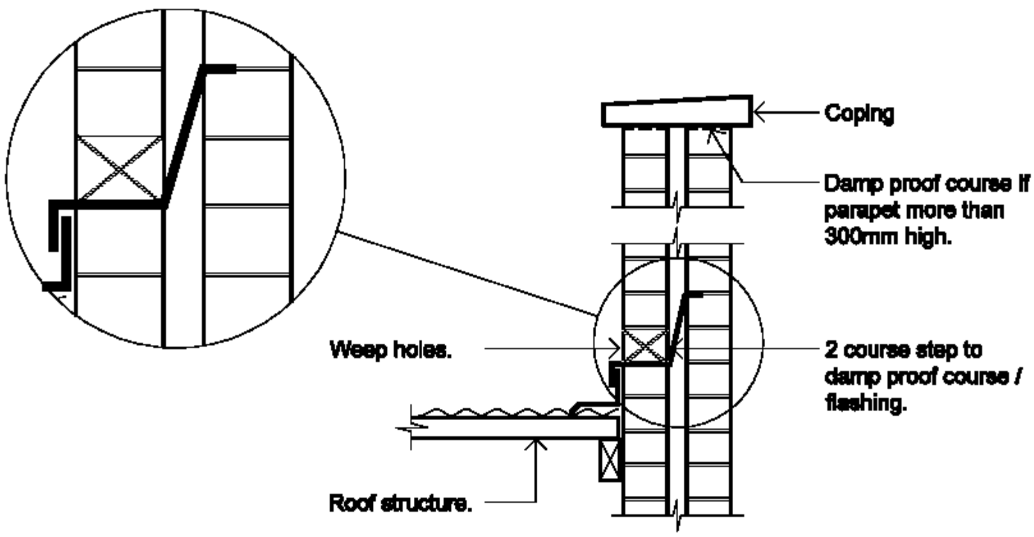
(i) the DPC must be installed between 150mm and 300mm above the highest point where the chimney meets the roof; or

(ii) two DPC's may be used to avoid a high flashing upstand, see Figure 3.3.4.3.

(g) Jointing - at lap joints, lap the DPC at least 150mm.

Figure 3.3.4.2

INSTALLATION OF DPC'S FOR PARAPET WALLS




NOTE: To avoid galvanic corrosion, metal flashings must be compatible with other metals they are in contact with, or spill from or onto.

Figure 3.3.4.3

CORRECT INSTALLATION OF DPC IN CHIMNEYS

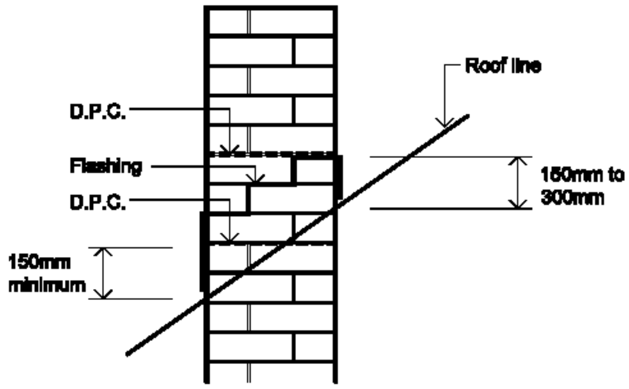







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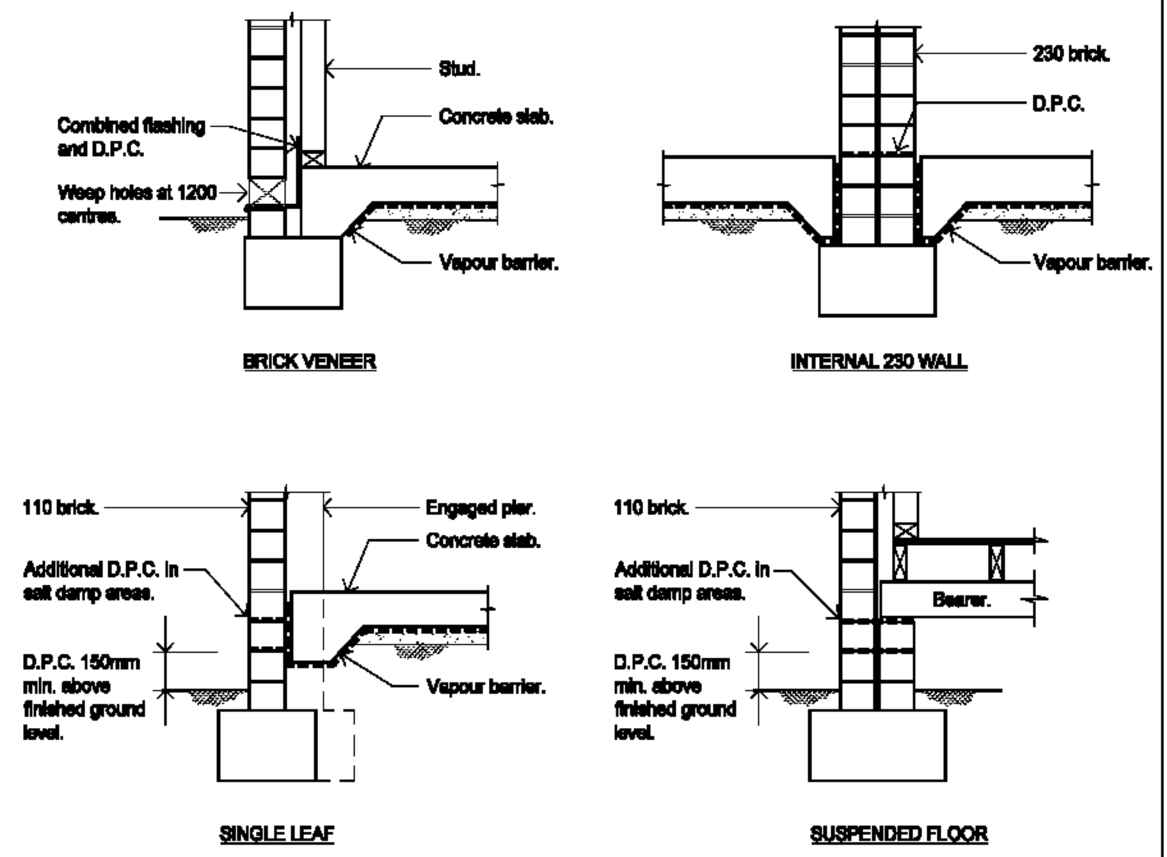
**Figure 3.3.4.4**

**CORRECT INSTALLATION OF DPC IN SUB-FLOOR STRUCTURES**

**Note:** In external walls all weepholes must be located above DPC in accordance with clause 3.3.1.6(c).

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## 3.3.4.6 Flashings

(a) General

Flashings must be manufactured in accordance with AS 2904; and

(i) be built in as the work proceeds; and

(ii) where electrolytic action could otherwise occur, different materials must be isolated in accordance with 3.5.1.2; and

(iii) flashings near the base of walls and above ground may be used instead of a DPC.

(b) Materials

Flashing materials must comply with Table 3.3.4.1.

**Table 3.3.4.1**

**SUITABLE FLASHING MATERIALS FOR INTERNAL AND EXTERNAL APPLICATIONS**

| LOCATION | SUITABLE FLASHING MATERIAL |
|---|---|
| **INTERNAL** | • Uncovered copper having a mass of not less than 2.8 kg/m2 and having a thickness of 0.3mm to 0.5mm<br>• Bitumen coated metal (normally aluminium) with a coated thickness of 0.6 to 1.00mm<br>• zinc coated steel with a thickness of not less than 0.6mm<br>• Embossed/Quilted polyethylene sheet with an average thickness of not less than 0.5mm.<br>• Uncovered annealed lead having a mass of not less than 10 kg/m2 |
| **EXTERNAL**<br><br>Roof to masonry wall flashings | • Embossed/Quilted polyethylene sheet with an average thickness of not less than 0.5mm.<br>• Uncovered annealed lead having a mass of not less than 20 kg/m2 in lengths of not exceeding 1.8m<br>• Uncovered copper having a mass of not less than 2.8 kg/m2 and having a thickness of 0.3mm to 0.5mm<br>• Bitumen coated metal (normally aluminium) with a coated thickness of 0.6 to 1.00 mm<br>• zinc coated steel with a thickness of not less than 0.6 mm |

(c) Flashing of openings

Openings in masonry walls that are exposed to the weather must be flashed in accordance with the following and Figure 3.3.4.5 and 6:

(i) In veneer construction the flashing must extend across the cavity and be turned up at least 150mm and fixed to the frame.

(ii) For cavity masonry construction the flashing must extend across the cavity and be turned up at least 150mm and built 30mm into an inner leaf joint.

(iii) Flashings must extend 100mm beyond openings each end.

(iv) Where protection such as a roof overhang is provided at a height of no less than 1/3 of the roof overhang above the top of an external opening, the flashing to the top of the opening may be omitted.

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Figure 3.3.4.5

FLASHING OF OPENINGS IN MASONRY WALLS

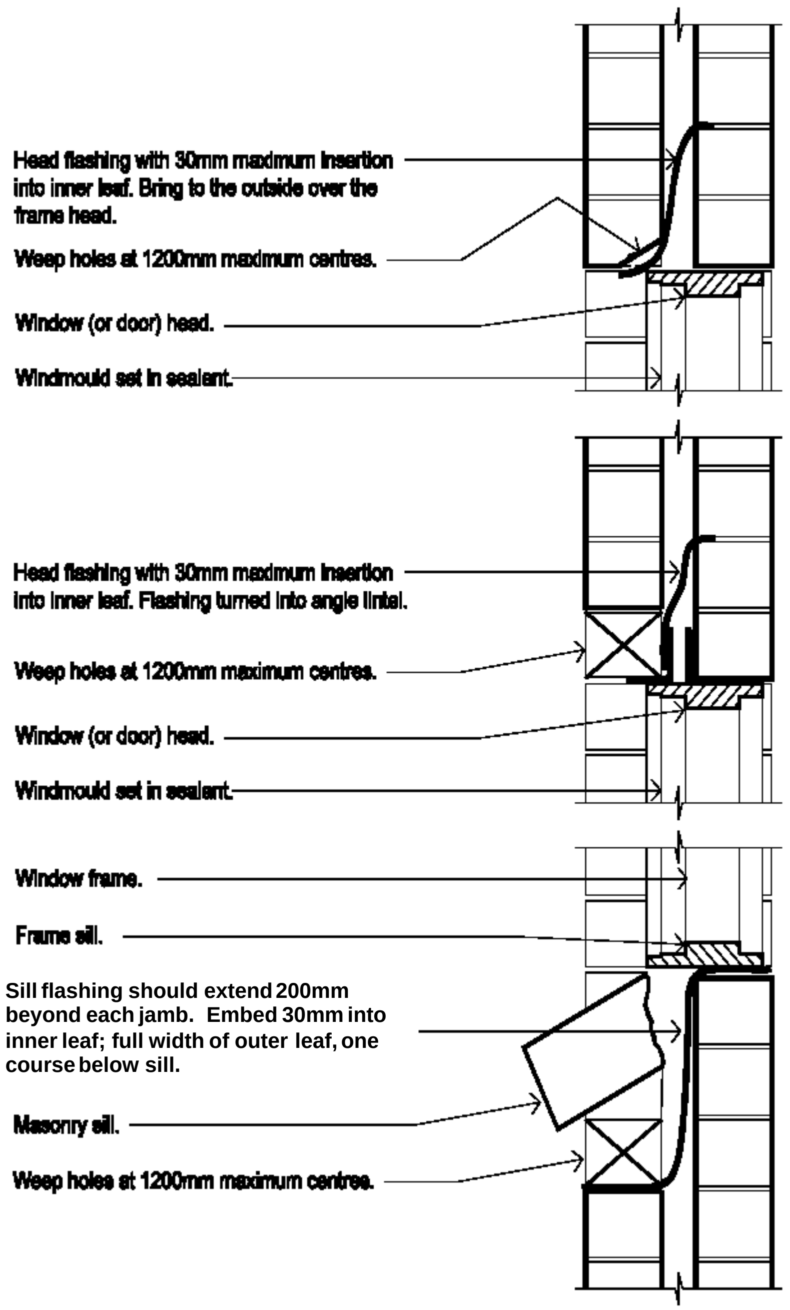
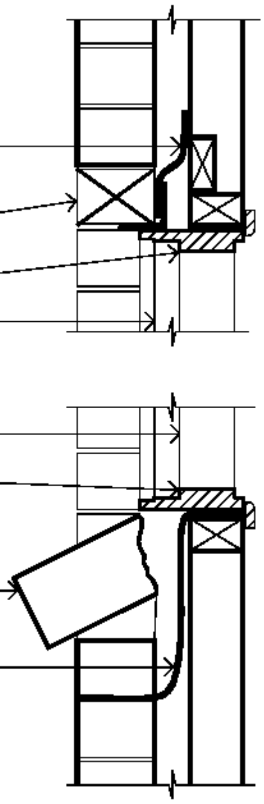


Figure 3.3.4.6

FLASHING OF OPENINGS IN MASONRY VENEER WALLS




(d) Flashing on to roof surfaces

Flashing to ensure weatherproof construction must be continued onto any roof surface adjoining the masonry, including a porch, canopy or similar roof; and-

(i) consist of a material that complies with Table 3.3.4.1; and

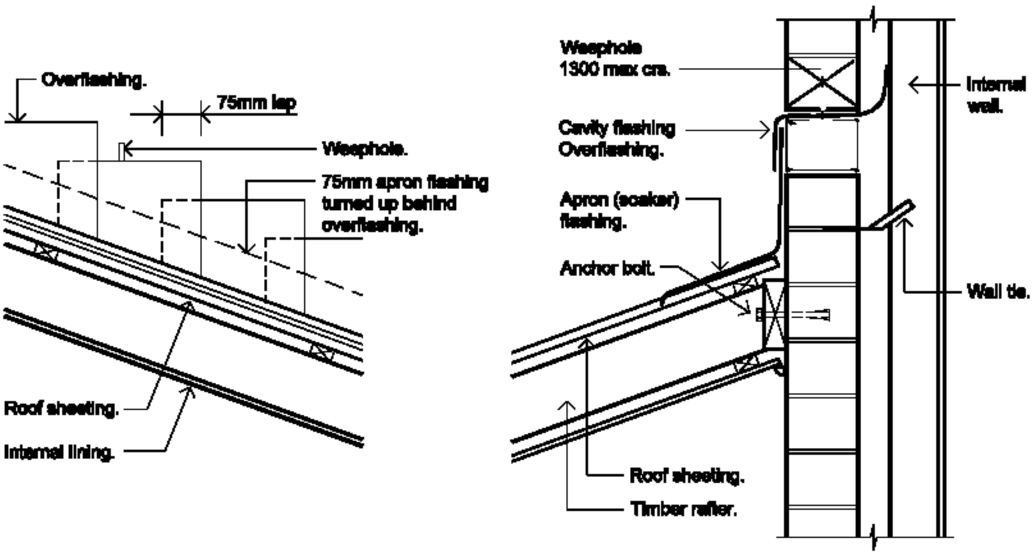
(ii) be installed as described in Figure. 3.3.4.7 and Part 3.5.1; and

(iii) for cavity walls - stepped and scribed to suit roof line and allowing a minimum of 75mm in height and 150mm in width for the dressing onto roof material; and

(iv) for single leaf masonry - stepped or set into a groove power cut parallel to and approximately 150mm above the line of the roofing material, scribed, riveted or sealed as required relative to adjacent roofing materials.

Figure 3.3.4.7

STEPPED CAVITY FLASHINGS




### 3.3.4.7 Weatherproofing for single skin masonry walls

(a) A waterproof coating material must be applied to all external surfaces of Class 1 buildings single skin masonry walls as follows:

(i) The coating must extend -

(A) to a level adjacent the internal finished floor level, if the external block work overhangs the edge of the slab 10mm, see Figure 3.3.4.9; or

(B) 50mm past the internal floor level if no edge overhang is provided to the block work, see Figure 3.3.4.9.

(ii) Acceptable external waterproof finishes are as follows:

(A) three coats of 100% acrylic based exterior quality gloss paint; or

(B) one complete coat of cement based paint and two coats of 100% acrylic based exterior quality gloss paint; or

(C) clear water repellent, provided the wall is protected by a roof overhang.

(b) Windows must be installed in accordance with Figure 3.3.4.8.

(c) A damp-proof course and vapour barrier must be installed in accordance with Figure 3.3.4.9.

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Figure 3.3.4.8

TYPICAL WINDOW INSTALLATION DETAILS FOR SINGLE SKIN MASONRY

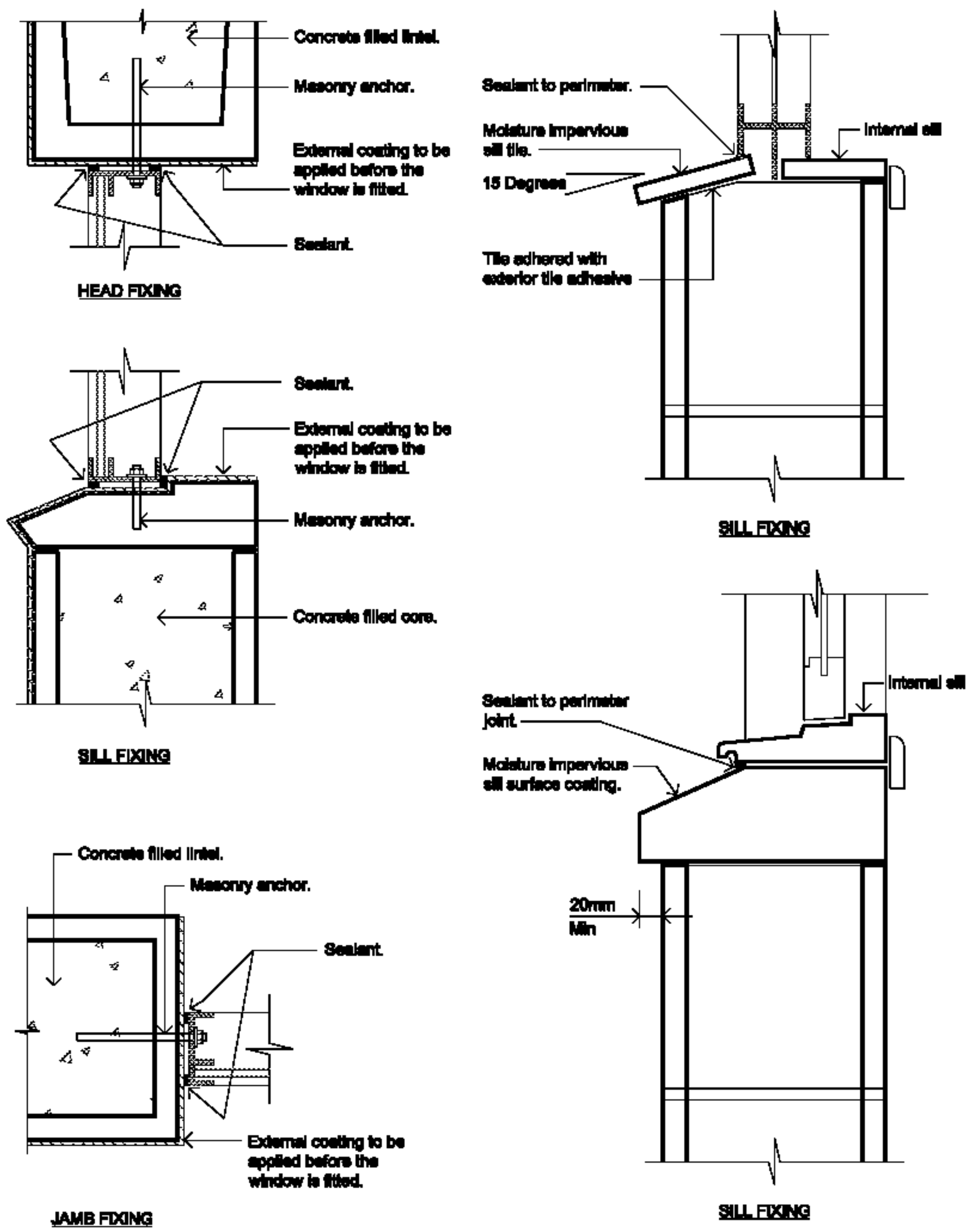




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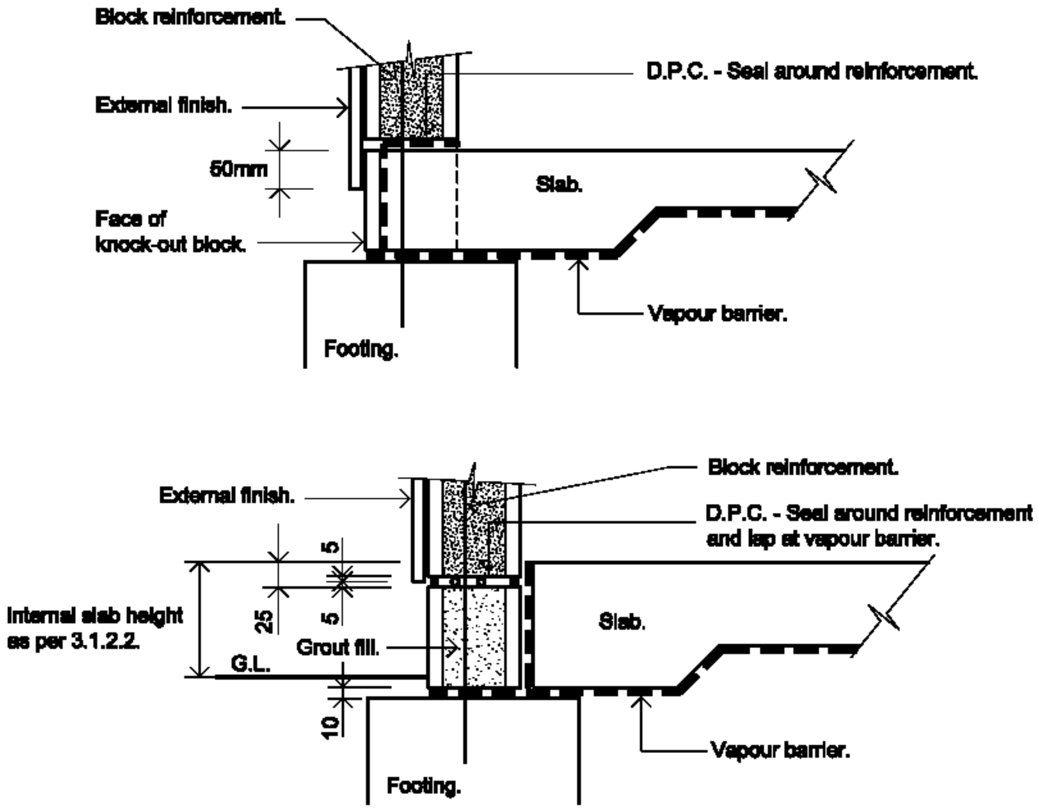
Figure 3.3.4.9

TYPICAL DAMP PROOF COURSES AND WEATHERPROOFING DETAILS FOR SINGLE SKIN MASONRY



# PART 3.3.5 EARTHWALL CONSTRUCTION

**Appropriate performance requirements:**

Where an alternative earthwall building system is proposed to that described in Part 3.3.5, that proposal must comply with the following performance requirements in Section 2 -

1. structural requirement P2.1; and
2. weatherproofing requirement P2.2.2.



## Definitions

**3.3.5** For the purpose of this Part:

**Adobe construction** means a type of construction using blocks of sun dried mud.

**Bulletin 5** means CSIRO-NBTC Bulletin 5 Earthwall construction 4th Edition 1987.

**Earthwall construction** means adobe construction, mechanically pressed-soil block construction or rammed-earth construction.

**Mechanically pressed-soil block construction** means construction using blocks produced by pressed block making machines.

**Rammed-earth construction** means construction in which damp earth is tamped in situ between temporary movable formwork.

## A. Acceptable construction manual

**3.3.5.0** Performance requirements P2.1 and P2.2.2 are satisfied if earthwall construction is designed and constructed in accordance with the following manual:

(a) Bulletin 5 CSIRO-NBTC Bulletin 5 Earthwall construction 4th Edition 1987.

**Explanatory information:**

Composite construction: Design requirements for other materials that may be used in combination with masonry ie heavy steel support beams etc. are described in Part 3.11 - Structural design.

## B. Acceptable construction practice

### 3.3.5.1 Application

Compliance with the acceptable construction practice provisions of Part 3.3.5 for earthwall construction for Class 1 and 10 buildings satisfies performance requirements P2.1 and P2.2.2, provided -

(a) the earthwall is constructed on footings that comply with Part 3.2; and

(b) the *design wind speed* of the area is not more than W41; and

**Explanatory information:**

Information on design wind speeds for particular areas may be obtained from the *relevant approval authority*.

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(c) the *earthwall construction* must not exceed two storeys in height and walls must be laterally restrained at intermediate floor levels; and

(d) the building must not be situated on a *site* that is subject to flooding; and

(e) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4.

**Explanatory Information:**

1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5 m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
2. For earthquake design H3, see AS 3700 or Part 3.10.2.

### 3.3.5.2 General construction

A building of *earthwall construction* must be constructed in accordance with the recommendations contained in *Bulletin 5* except where varied by this Part.

### 3.3.5.3 Minimum thickness of walls

In a building of *earthwall construction*, the thickness of a wall must be:

(a) In the case of *adobe construction* or rammed-earth construction-

(i) for an *external wall*, not less than 250mm; and

(ii) for an internal wall, not less than 200mm.

(b) In the case of mechanically pressed-soil block construction-

(i) for an *external wall*, not less than 250mm; and

(ii) for an internal wall, not less than 150mm.

### 3.3.5.4 Weatherproofing

Every building of earthwall construction-

(a) must be provided with a suitable means of protection to prevent water from the roof running down the face of every wall; and

(b) must, except in the case illustrated in Figure 1.3 of *Bulletin 5*, have the ground adjacent to the walls graded and paved in accordance with 1.2, 1.2.2 and 1.2.3 to prevent any surface water from reaching the walls.

**Explanatory information**:

Sample of test results may be required

Prior to and during construction, the following tests may be required by the *relevant approval authority*-

1. in the case of-
   a. *rammed-earth construction* - a sample panel at least 900mm long by 900mm high;
   b. *adobe construction* - a sample comprising of a least 3 blocks, made of the materials and by the methods to be used in the construction, to be provided for inspection on the site; and
2. in the case of *mechanically pressed-soil block construction* - tests, conducted in accordance with Appendix E of *Bulletin 5*, made on blocks of the kind to be used in the construction after they have been moist cured for seven days.

# PART 3.4

Amdt 0

# FRAMING

# PART 3.4 CONTENTS



Amdt 0

# PART 3.4.0 DEFINITIONS



## Definitions

**3.4.0.1** The following diagrams depict framing members and associated terminology used to describe them in the *Housing Provisions*.

In most cases the terminology is applicable for both steel and timber frame members.

**Figure 3.4.0.1**
**SPAN AND SPACING DEFINITIONS**

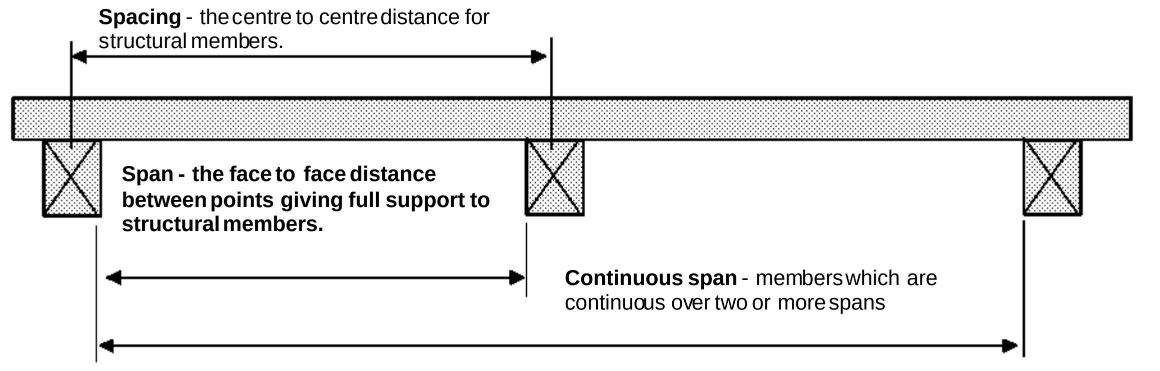



**Figure 3.4.0.2**
**TYPICAL ROOF FRAMING MEMBERS**

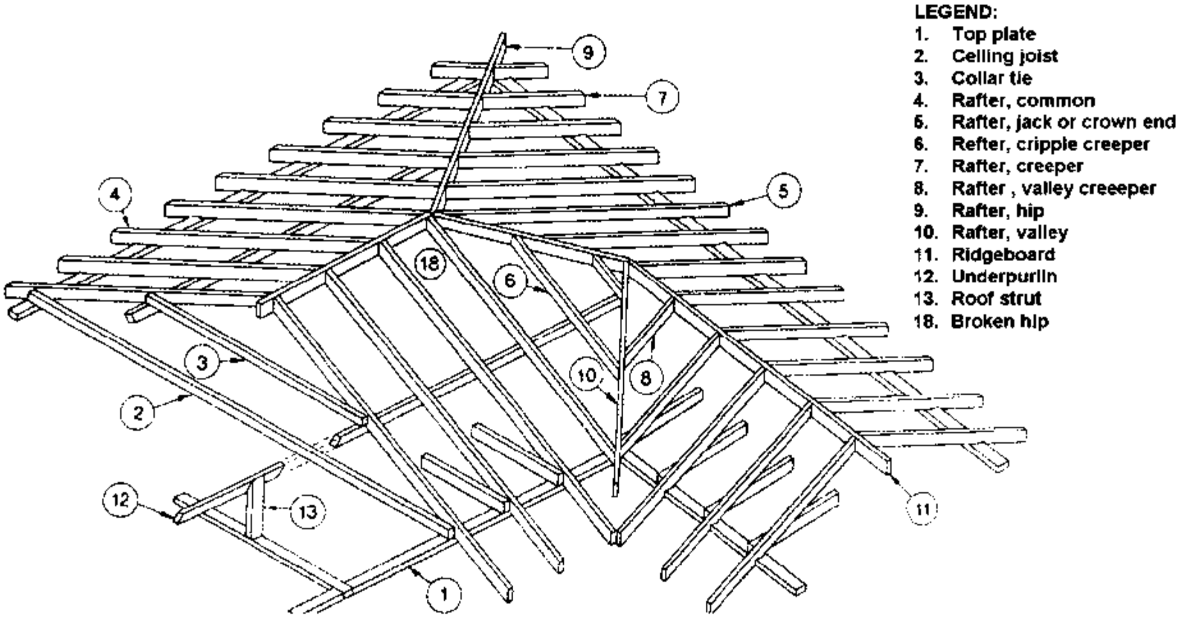
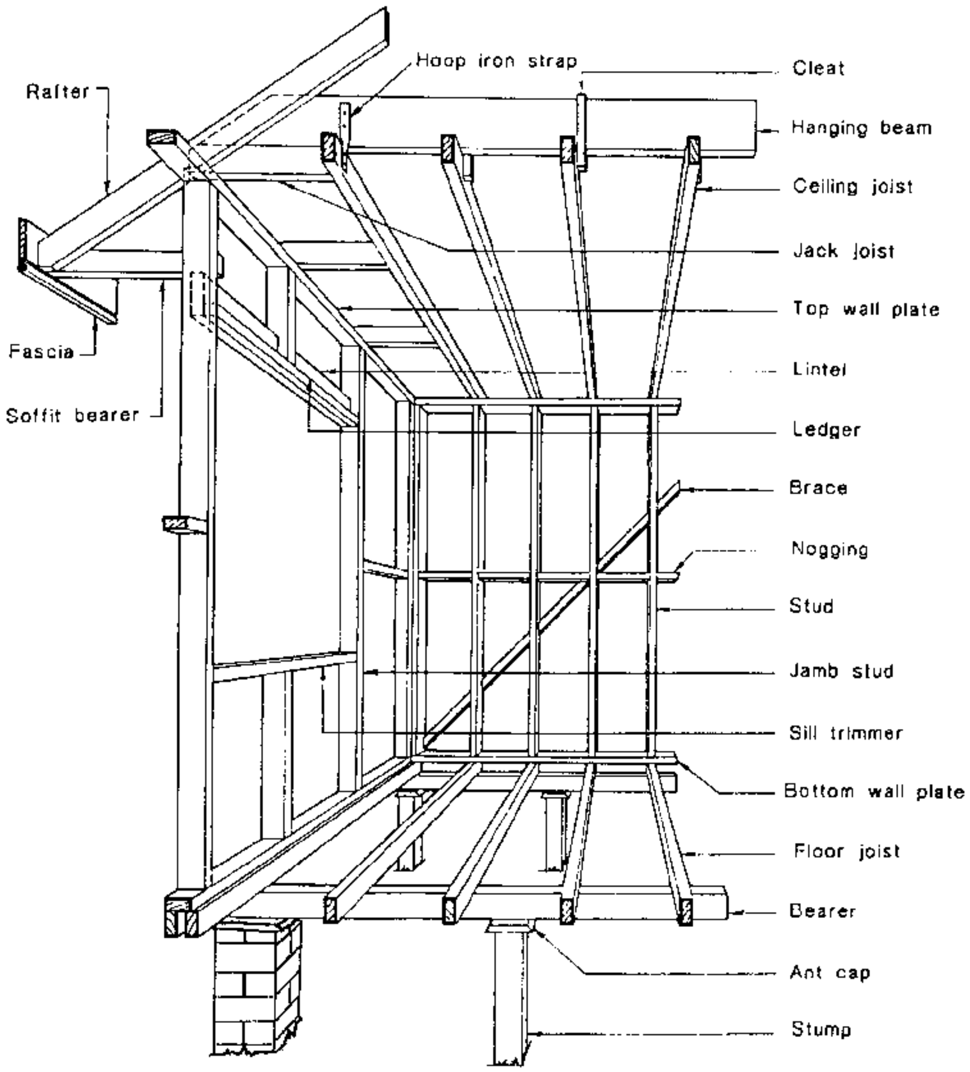


**Figure 3.4.0.3**
**TYPICAL WALL, FLOOR AND CEILING FRAMING MEMBERS**



# PART 3.4.1 SUB-FLOOR VENTILATION

**Appropriate performance requirements**

Where an alternative sub-floor ventilation system is proposed to that described in Part 3.4.1, that proposal must comply with the dampness performance requirement P2.2.3 in Section 2.



## Acceptable construction practice

### 3.4.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.4.1 for ventilation of the area beneath suspended floors satisfies performance requirement P2.2.3.

### 3.4.1.2 Sub-floor ventilation

The sub-floor space beneath the suspended floor of a building must be designed and constructed in accordance with the following -

(a) the subfloor space must -

 (i) be cleared of all building debris and vegetation; and

 (ii) be cross-ventilated by means of openings in the substructure walling; and

 (iii) contain no dead air spaces; and

 (iv) be graded in accordance with 3.1.2.2; and

 (v) have evenly spaced ventilation openings, see Figure 3.4.1, Diagram(a); and

(b) in masonry walls, the cross ventilation openings specified in (a) must be provided in both leaves of the masonry, with inner-leaf openings being aligned with outer leaf openings as precisely as possible to allow an unobstructed flow of air - see Part 3.3.1.8; and

(c) internal walls constructed in subfloor spaces must be provided with openings-

 (A) having an unobstructed area equivalent to that required for the adjacent external openings; and

 (B) evenly distributed throughout such internal walls, and

(d) minimum clearance between the ground surface and the underside of the lowest framing member must be 150mm, except where inspection is required for termite barriers installed in accordance with AS 3660.1, see Figure 3.4.1, Diagram (b); and

(e) internal and external wall vents to be provided at the rate of 7300 mm$^2$/m; and

(f) where external walls abut other construction or ventilation is obstructed by patios, paving or the like additional ventilation must be provided to ensure that the overall level of ventilation is maintained; and

(g) where the ground or sub-floor space is excessively damp -

(i) increase the level of sub-floor ventilation; or

(ii) provide a sealed impervious membrane over the ground and ensure ponding of water does not occur by grading the ground in accordance with Part 3.1.2.1.



**Figure 3.4.1**
**TYPICAL SUB-FLOOR VENTILATION DETAILS**

**Diagram a.** **Typical Cross Ventilation Of Sub-Floor Area**

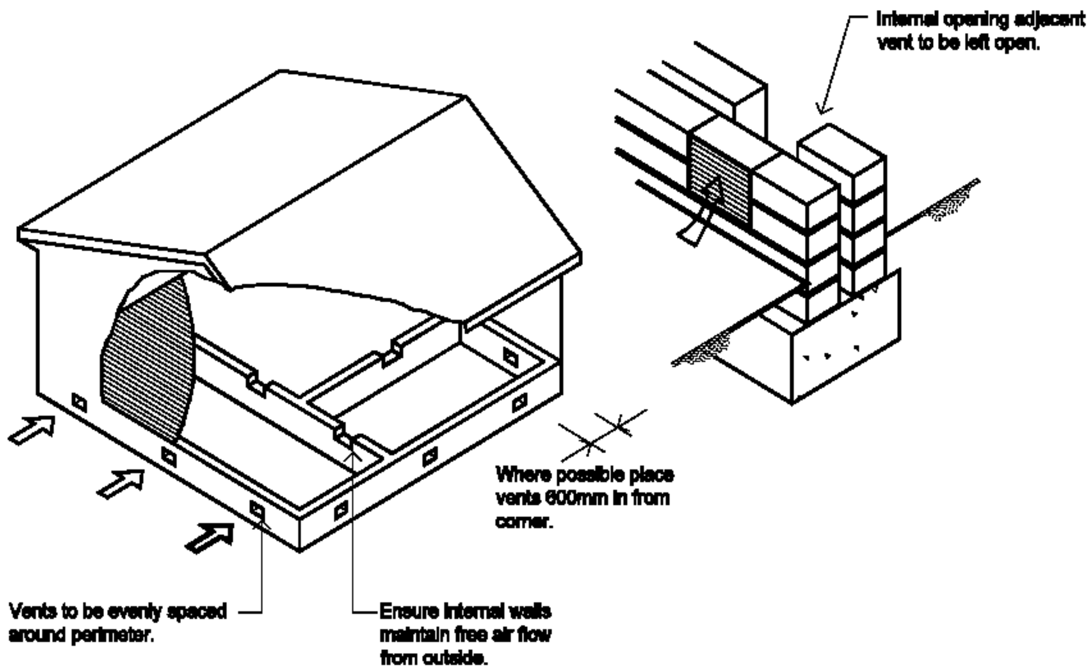
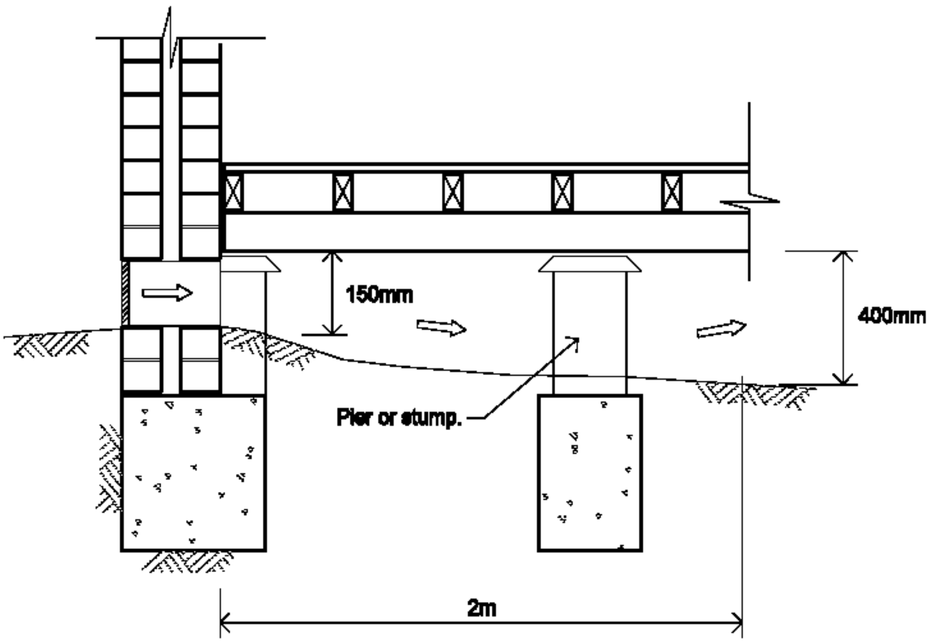


**Figure 3.4.1**
**TYPICAL SUB-FLOOR VENTILATION DETAILS**

**Note:** 400mm clearance required only where termite barriers are installed that need to be inspected (see 3.1.3).

**Diagram b.** **Sub-Floor Clearance Requirements**



# PART 3.4.2 STEEL FRAMING

**Appropriate performance requirements**
Where an alternative steel framing system is proposed to that described in Part 3.4.2, that proposal must comply with the structural performance requirement P2.1 in Section 2.

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## A. Acceptable construction manuals

**3.4.2.0** Performance requirement P2.1 is satisfied if the cold formed steel framing is designed and constructed in accordance with one of the following manuals:

(a) AS 1250 - The use of steel in structures.

(b) AS 3623 - Domestic metal framing.

(c) AS 4100 - Steel structures.

**Explanatory information:**
Composite construction: Design requirements for other materials used in combination with steel framing, including the use of concrete floors, heavy steel support beams etc. are described in Part 3.11 - Structural design; or 3.4.4 for structural steel members.

## B. Acceptable construction practice

### 3.4.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.4.2 for cold formed steel construction for Class 1 and 10 buildings satisfies performance requirement P2.1, provided-

(a) the frame is cold-formed metal framing designed and constructed in accordance with AS 3623 and/or AS 1538; and

(b) the frame material has a minimum yield stress of 250 MPa.

### 3.4.2.2 General

(a) Corrosion Protection
The steel frame:

(i) in areas more than 1km from the coast or not in a heavy industrial area must have a minimum coating class in accordance with AS 1397 of -

(A) Z275 (275 grams of zinc per square metre); or

(B) AZ150 (150 grams of aluminium/zinc per square metre); or

(ii) in areas within 1km of the coast or heavy industrial a higher coating class than that specified in (i) is *required.*

(b) The frame must be permanently earthed on completion of fixing.

**Explanatory information:**

The steel frame requirements of this Part should be considered in conjunction with steel frame design and construction advice from the manufacturer.

Higher coating classes may be required for members exposed to severe environments - see AS 1397.

The coating class describes the metallic coating type and the amount of coating applied to steel. The coating class begins with one or two letters, Z for zinc or AZ for aluminium/zinc. This is followed by a number which represents the minimum coating mass in grams per square metre.

Cut edges on framing components do not constitute a corrosion problem, as the surface area of the metallic coating on either side of the cut edge is far greater than the surface area of the cut edge itself.

Where hole cutting or cutting of members is required, cutting methods that clearly shear or leave clean edges are preferred over those that leave burred edges or swarf.

The adoption of appropriate brick cleaning measures will ensure no damage of any metal or metallic coated components, this would include the shielding of these components during the acid cleaning process. Channels to steel framing should be cleaned of mortar droppings.

Metallic coated steel should not come into contact with green wood containing acidic material or CCA treated timbers unless an impervious unconductive material is located between the dissimilar elements. The use of kiln or appropriately dried timbers is recommended where contact between the metallic coated steel component and timber is considered.

### 3.4.2.3 Steel floor framing

The following provisions apply to suspended steel floor framing for single-storey and both floors of two-storey construction:

(a) Suspended floors
The two types of suspended floor systems referred to in 3.4.2.3 are -

(i) in-plane systems, such as joist-only systems or systems with integral bearers; and

(ii) conventional joist-over-bearer systems, see Tables 3.4.2.1 and 3.4.2.2 for acceptable sizes and spacings.

(b) Frame support
When used in ground floor construction, all such systems must be installed on stumps, piers or masonry footings complying with Part 2. Conventional flooring can be installed on top of the floor frame.

(c) Levelling of sub-floor system
Fibre cement packers or similarly durable and compatible materials may be used if packing is required under suspended flooring systems and must be at least the width of the member to ensure adequate bearing capacity.

**Table 3.4.2.1**
**SPANS FOR C-SECTION FLOOR JOISTS**

| SPAN | SECTION | Maximum Joist spacing (mm) 450 | 600 |
|---|---|---|---|
| | | Maximum span (mm) | |
| Single span | C15012 | 2.7 | 2.7 |
| | C15015 | 3.3 | 3.0 |
| | C15019 | 3.6 | 3.3 |
| | C20015 | 4.5 | 3.9 |
| | C20019 | 4.8 | 4.2 |
| | C20024 | 5.1 | 4.5 |
| Continuous span | C15012 | 4.2 | 3.0 |
| | C15015 | 4.5 | 4.2 |
| | C15019 | 4.8 | 4.5 |
| | C20015 | 5.4 | 4.8 |
| | C20019 | 5.7 | 5.4 |
| | C20024 | 6.0 | 5.7 |

**Table 3.4.2.1**
**SPANS FOR C-SECTION BEARERS**

| Steel Section | SINGLE SPAN — Effective Bearer Spacing (m) 1.8 | 2.4 | 3.0 | 3.6 | 4.2 | CONTINUOUS SPAN — Effective Bearer Spacing (m) 1.8 | 2.4 | 3.0 | 3.6 | 4.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | MAXIMUM SPAN OF BEARER (m) | | | | | MAXIMUM SPAN OF BEARER (m) | | | | |
| C15915 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 2.7 | 2.5 | 2.4 | 2.3 | 2.1 |
| C15919 | 2.4 | 2.2 | 2.0 | 1.9 | 1.8 | 2.9 | 2.7 | 2.5 | 2.4 | 2.2 |
| C20015 | 2.9 | 2.7 | 2.4 | 2.1 | 1.8 | 3.4 | 2.7 | 2.4 | 2.1 | 1.8 |
| C20019 | 3.1 | 2.9 | 2.7 | 2.5 | 2.4 | 3.8 | 3.5 | 3.3 | 3.2. | 3.0 |
| C25019 | 3.6 | 3.4 | 3.2 | 3.0 | 2.6 | 4.6 | 3.8 | 3.4 | 3.0 | 2.6 |
| C25024 | 3.9 | 3.7 | 3.4 | 3.3 | 3.0 | 4.8 | 4.6 | 4.2 | 4.1 | 3.8 |

**Note:** For the purposes of this Table:
Loads must be evenly distributed along the member.
Sections must be stiffened at end supports.

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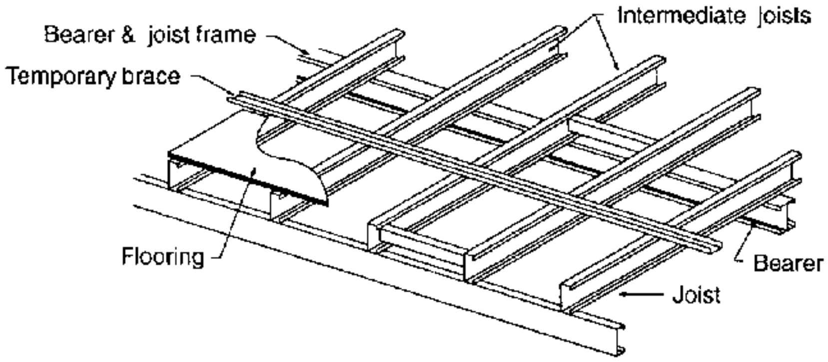
Figure 3.4.2.1
TYPICAL JOIST OVER -BEARER FLOORING SYSTEM






### 3.4.2.4 Steel wall framing

Steel wall framing must be constructed in accordance with Figures 3.4.2.2 to 3.4.2.4 and the following requirements:

(a) Bracing

(i) The wall frame must -

(A) have bracing designed in accordance with AS 3623; and

(B) be braced so that wind forces both during and after the erection of the frame are taken into account.

(ii) Wall frame bracing may be either:

(A) in-plane bracing as depicted in Figure 3.2.4.3; or

(B) steel strap bracing as depicted in Figure 3.2.4.3; or

(C) sheet bracing as described in Figure 3.4.3.2.

**Figure 3.4.2.2**
**TYPICAL WALL FRAMING AND SECTION MEMBERS**

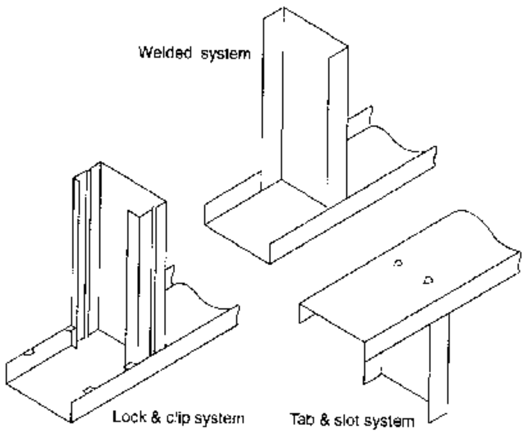
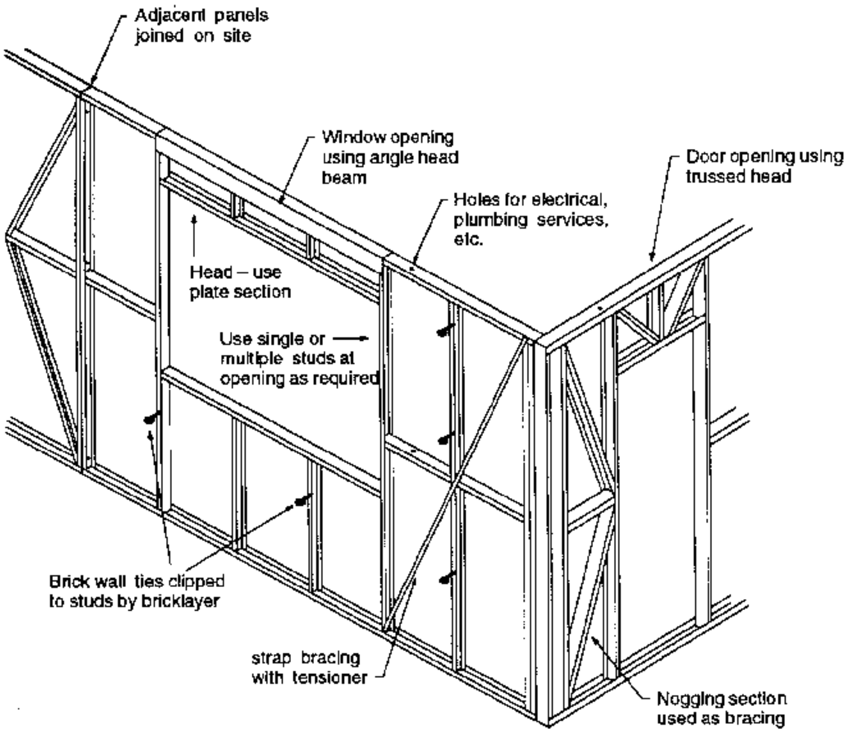



**Figure 3.4.2.3**
**TYPICAL BRACING SYSTEM DETAILS**



**Explanatory information:**

Steel frame bracing:

Frames are either in rigid or adjustable form. In the case of rigid frames, minor irregularities in flooring are accommodated by packing.

With adjustable frames, the tensioner assembly on the bracing can usually be adjusted to accommodate these irregularities. After tensioning, bracing straps should be securely fixed to each stud and nogging. (see Figure 3.4.2.3)

Long runs of external walling may have to be temporarily braced, until the roof members have been fixed. This can be carried out by using lengths of steel, timber or roof battens fixed to the top of the studs and secured to the ground or floor, as temporary props.

Further construction stage bracing may be required and must be installed before roof cladding commences. This is required to prevent side sway of the building during construction.

Construction bracing must be provided in the following minimum percentage of required vertical bracing:

40% single storey slab-on-ground buildings

40% upper storey of buildings with suspended floors

50% lower storey of 2 storey construction.

Amdt 0

(b) Hold-down of the wall to the footing system must be as follows:

(i) Common studs may be connected to the slab or other alternative flooring system as described in Figure 3.4.2.4 Diagram a.

(ii) Walls in areas with a *design wind speed* of more than W41 may be connected to the slab in accordance with Figure 3.4.2.4 Diagram b.

(c) Fixings for hold down of wall framing must be as close as practical to a stud and located -

(i) at the ends of each wall panel; and

(ii) at each side of openings up to 2400mm and two fixings at each side for openings greater than 2400mm; and

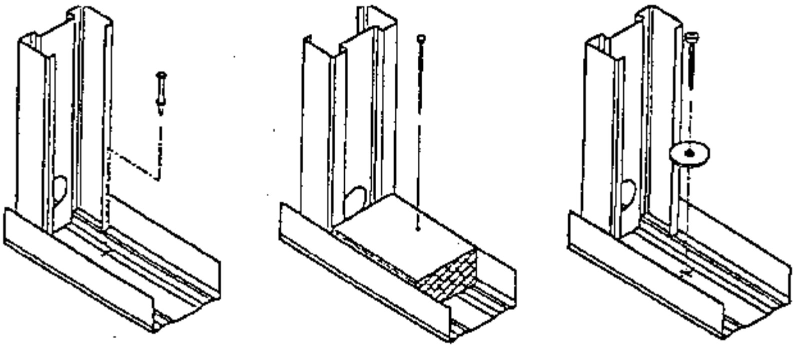
(iii) at each stud near ends of bracing; and

(iv) at a maximum of 1200mm.

**Figure 3.4.2.4**
**TYPICAL WALL FRAME HOLD DOWN CONNECTIONS**

**Note:** Fasteners must be installed in locations that achieve maximum grip while avoiding spalling the edge of the concrete slab.

**Diagram a.** **For Areas With A Design Wind Speed Of Not More Than W41**

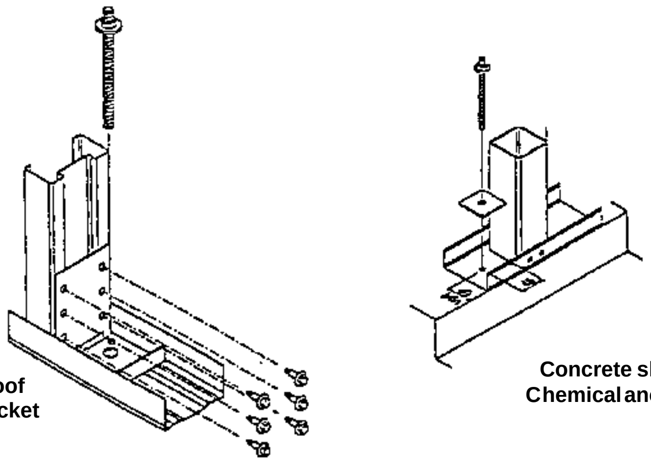


**Concrete slab - Tiled roof**
**Powder actuated fasters**

**Concrete slab - Tiled roof**
**75mm hand driven concrete nail through timber block**

**Concrete slab - Sheet roof**
**Masonry anchor with washer**

**Diagram b.** **For Areas With A Design Wind Speed Of More Than W41**



**Concrete slab - Sheet roof**
**Chemical anchor with bracket and wahser**

**Concrete slab - Sheet roof**
**Chemical anchor with wahser**

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(d) Packers
Packers used to level frames located under the bottom plate must be under each affected stud and should be of a size and the width of the plate and must be fibre cement or other similarly durable and compatible material.

### 3.4.2.5 Steel roof framing

Steel roofing systems may be of trussed construction, pitched or a combination of both and must be constructed in accordance with the following:

(a) Battens - steel or timber battens for roof cladding must be fixed by screwing, suitable nailing or clipping.

(b) Fascias and eaves - steel roof systems can include either steel or timber fascias and the eaves construction can be either boxed or raked.

(c) Bracing for roofs must be as follows:

(i) The bracing design must be in accordance with AS 3623 and fixed as per Figures 3.4.2.5 and 3.4.2.6.

(ii) Trusses must be temporarily braced in position during erection and then wind braced after erection, see Figure. 3.4.2.6.



**Figure 3.4.2.5**
**TYPICAL ROOF BRACING CONNECTION DETAILS**

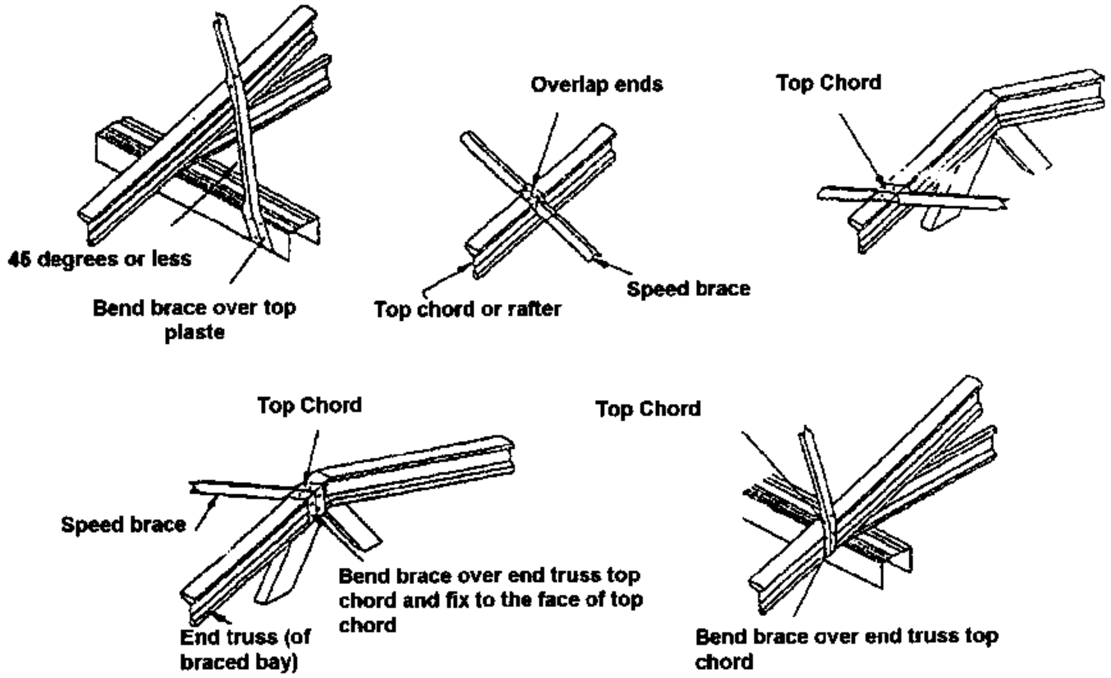
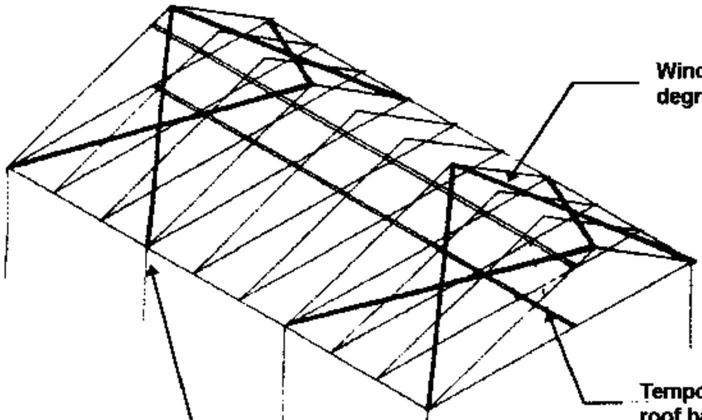


**Figure 3.4.2.6**
**TYPICAL TEMPORARY ROOF BRACING DETAILS**






**Explanatory information:**

Trusses and rafters are fixed in accordance with the design details. Generally, the roof members are fixed to the wall structure using conventional building methods.

**Fixings**

The fixings may incorporate nails, self-drilling screws, bolts and nuts or shear plate connectors (see Figure 3.4.2.5). The fixings should be adequate to ensure that a continuous load path exists from the roof to the foundations for all types of loading including uplift, downward and shear loading.

**Temporary roof bracing**

Temporary roof bracing is generally achieved using one run of roof battens along the full length of the house. It is preferable if the run nearest the roof apex is used for this purpose and fixed as each truss is properly positioned. Next, one run of ceiling battens should be positioned and fitted. This should preferably be the batten run nearest the centre of the building.

Where ceiling battens are not used a bottom chord tie should be installed in accordance with the design details.

**Wind bracing**

Wind bracing should be attached when all trusses have been erected and fixed. Generally all gable roofs and long hipped roofs require bracing in the roof plane. The strap bracing is installed similar to wall bracing and runs from the apex of the roof to the external wall, over the top of at least three trusses or rafters, at approximately 45° to the external walls. The bracing is fixed at the ends, tensioned and fixed to each intermediate truss or rafter.

### 3.4.2.6 Installation of services

To maintain the structural integrity of the frame all ancillary work must be in accordance with the following:

(a) Floor joists - service penetrations in floor joists must comply with Figure 3.4.2.8.

(b) Plumbing services

Plumbing pipe-work in steel framed construction must be run in the following ways:

(i) Pipe-work must be -

(A) run through pre-punched service holes in steel studs; and

(B) extra holes, where required, must be located near the centre-line of each stud provided -

(aa) the structural integrity of the member is not reduced; and

(bb) the hole is not more than 10% larger than the existing holes.

(ii) In masonry veneer construction, pipe runs may be located in the cavity and fixed to the studs with full pipe saddles and self drilling screws properly protected against galvanic corrosion in accordance with (v).

(iii) In construction where external cladding is attached directly to the steel stud work, piping can be -

(A) run over the ceiling; or

(B) suspended under the floor; or

(C) installed in accordance with (i).

(iv) Attachment of plumbing fittings

(A) Timber or steel noggings may be fitted between studs to support tap sets, baths and sinks; and

(B) where a steel nogging is used the tap set must be isolated to prevent corrosion by a durable non corrosive material such as timber, cement sheet etc (see Figure 3.4.2.7).

(v) Protection of copper pipes

Copper and brass pipes and fittings must be prevented from coming into contact with the steel frame by one of the following methods -

(A) where plumbing services pass through service holes, plastics grommets can be snapped into the service hole; or

**Explanatory Information:**

The use of gommets also has the effect of securely fixing the pipe to prevent water hammer.

(B) in other areas where copper piping may come into contact with metal framing, it must be lagged or isolated with neoprene sheeting or tape.

(c) Electrical services

(i) Electrical cables must be -

(A) run through pre-punched service holes in steel studs (See Figure. 3.4.2.7); or

(B) secured to steel framing with -

(i) P clips; or

(ii) plastic ratchet straps; or

(iii) half saddles fixed with screws or rivets.

(iv) extra holes, where required, must be comply with (b)(i)(B).

(v) Steel frames must be permanently earthed immediately after frame erection.

(vi) Backing plates for switches and power points should be fixed at the appropriate positions with suitable fasteners. Where it is impractical to fix directly onto studwork, steel or timber noggins can be fitted between the studs to provide necessary fixing and support.

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**Figure 3.4.2.8**
**TYPICAL INSTALLATION AND FIXING OF SERVICES**

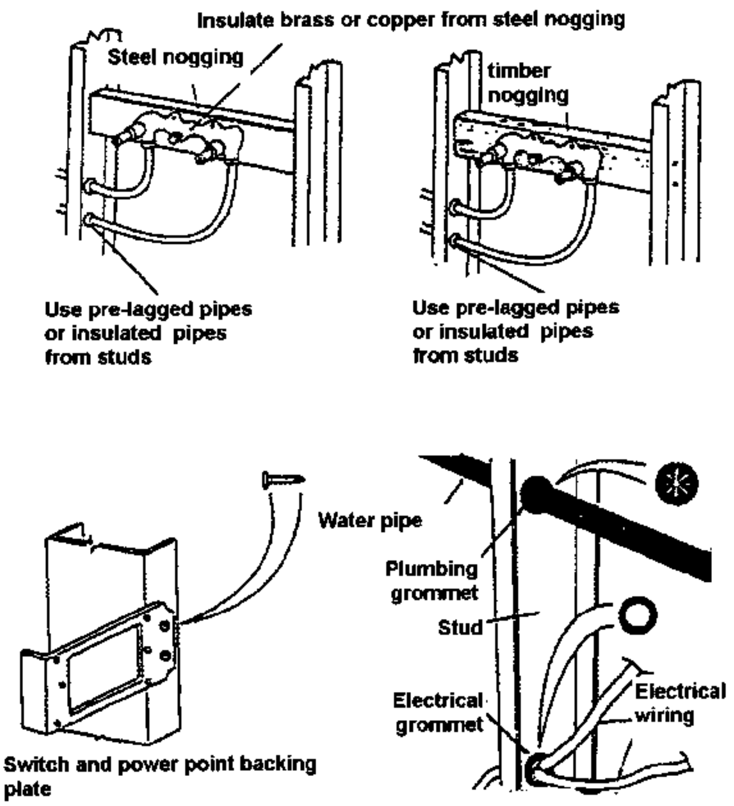
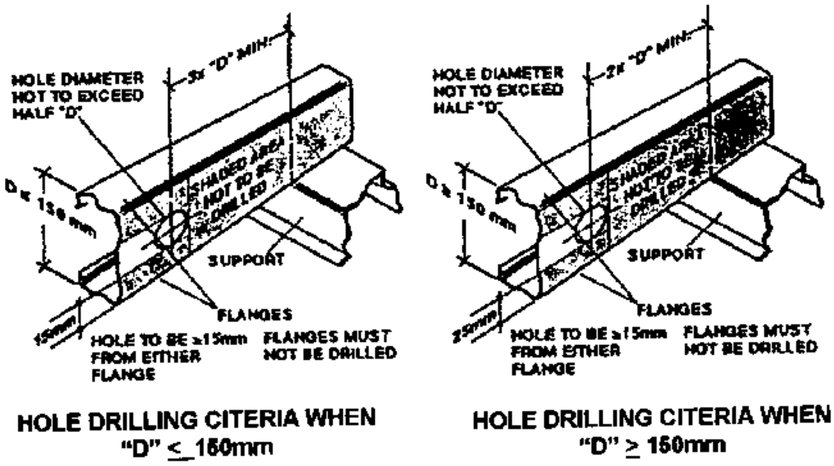


Figure 3.4.2.7
ACCEPTABLE PENETRATIONS TO STEEL FLOOR JOISTS






**Explanatory Information: Connections for steel framing**

The following fasteners and connections are acceptable for the assembly and erection of steel framed houses .

**Bolts:** Bolted connections are used as a means of on-site jointing, particularly where joints are highly loaded and offer a consistent design strength. bolt design for cold-formed sections is adequately covered in the Australian Standards.

**Rivets:** Riveted connections (either pre-drilled or self-piercing) are used for both factory and on-site fabrication and have also been used as elements of proprietary joining systems.

**Screw:** Self-drilling screws are widely used as a means of connection in almost every aspect of on-site work during the erection of steel framed houses. They are used for connecting wall frame modules, through to attachment of claddings and internal linings.

**Adhesives:** Adhesives are used in steel framing for attachment of internal linings, including flooring. They are generally used in combination with mechanical fasteners such as self-drilling screws. The screws are primarily used to fasten the linings while the adhesives set, although they continue to act as part of a composite fastening system.

**Clinches:** Clinching involves the connection of two thicknesses of sheet steel by extruding one sheet into the other using a punch and die, in such a way that the two pieces cannot be subsequently separated. A typical clinched joint used in factory fabrication is usually hydraulically activated whereas clinching systems used on site are typically pneumatic or electrically driven.

**Welds:** Welding (typically Mig) has been the most common form of connection during factory assembly for many years. The welded joint strength can vary and the metallic coating is affected in the weld area, the affected area will require post-painting (cold galvanising).

**Nails:** Hard steel twist nails are use in steel framing for both factory an on site fabrication. These nails can be used in materials up to 2mm thick. Nails have also been used for the connection of wall plates to concrete slabs. Where this is done by hand, a timber starter block is normally used. More recently, power actuated nails have been used.

# PART 3.4.3 TIMBER FRAMING

**Appropriate performance requirements:**
Where an alternative timber framing design is proposed to that described in Part 3.4.3, that proposal must comply with the structural performance requirement P2.1 in Section 2.

## A. Acceptable construction manuals

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**3.4.3.0** Performance requirement P2.1 is satisfied if a timber frame is designed and constructed in accordance with the one of the following manuals:

(a) AS 1684 - National timber framing code.

(b) Timber framing manual - 1994 (Timber Promotion Council).

(c) Timber framing manual - Supplementary Tables - 1995 (Timber Promotion Council).

(d) Timber framing manual W33N-W41N - 1994 (Timber Research and Development Advisory Council - Queensland).

(e) NSW Timber framing manual - 1996 (State Forests of NSW).

(f) In a Class 10a building with a *floor area* less than 60 m$^2$ located in an *alpine area*, and where the *design wind speed* does not exceed W33: CSIRO-DBC&E Special Report- Low Rise Domestic and Similar Framed Structures, Part 4-Supplementary Domestic Buildings for Built-up Areas, Sections I to V.

**Explanatory information:**

1. Composite construction: Design requirements for other materials used in combination with steel framing, including the use of concrete floors, heavy steel support beams etc. are described in Part 3.11 - Structural design; or 3.4.4.
2. For additional construction requirements in *high wind areas* (ie >W41), see Part 3.10.1.

## B. Acceptable construction practice

### 3.4.3.1 Application

Compliance with the acceptable construction practice provisions of Part 4.3.3 for timber frame construction for Class 1 and 10 buildings satisfies performance requirements P2.1, provided -

(a) the frame is constructed on footings that comply with Part 3.2; and

(b) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

> **Explanatory Information:**
>
> 1. Information on design wind speeds for particular areas may be obtained from the *relevant approval authority*.
> 2. A map indicating cyclonic regions of Australia is contained in Part 10.2.

(c) the size and fixing of the timber members must be in accordance with the appropriate requirements described in 3.4.3.7; and

(d) the frame is braced in accordance with the appropriate requirements described in 3.4.3.8; and

(e) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4; and

> **Explanatory Information:**
>
> 1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5 m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
> 2. For earthquake design H3, see AS 3700 or Part 9.2.

(f) the building is not constructed in an *alpine area*; and

(g) the building must be single storey construction; and

(h) the building must have a geometry and envelope that does not to exceed the limits given in Figure 3.4.3.0 and the following -

(i) maximum rafter or truss spacing; 600mm tile roof, 900mm sheet roof; and

(ii) maximum roof overhang - 750mm; and

(iii) maximum stud spacing 600mm; and

(iv) maximum floor joist spacing - 600mm; and

(v) maximum bearer spacing and span - 1800mm; and

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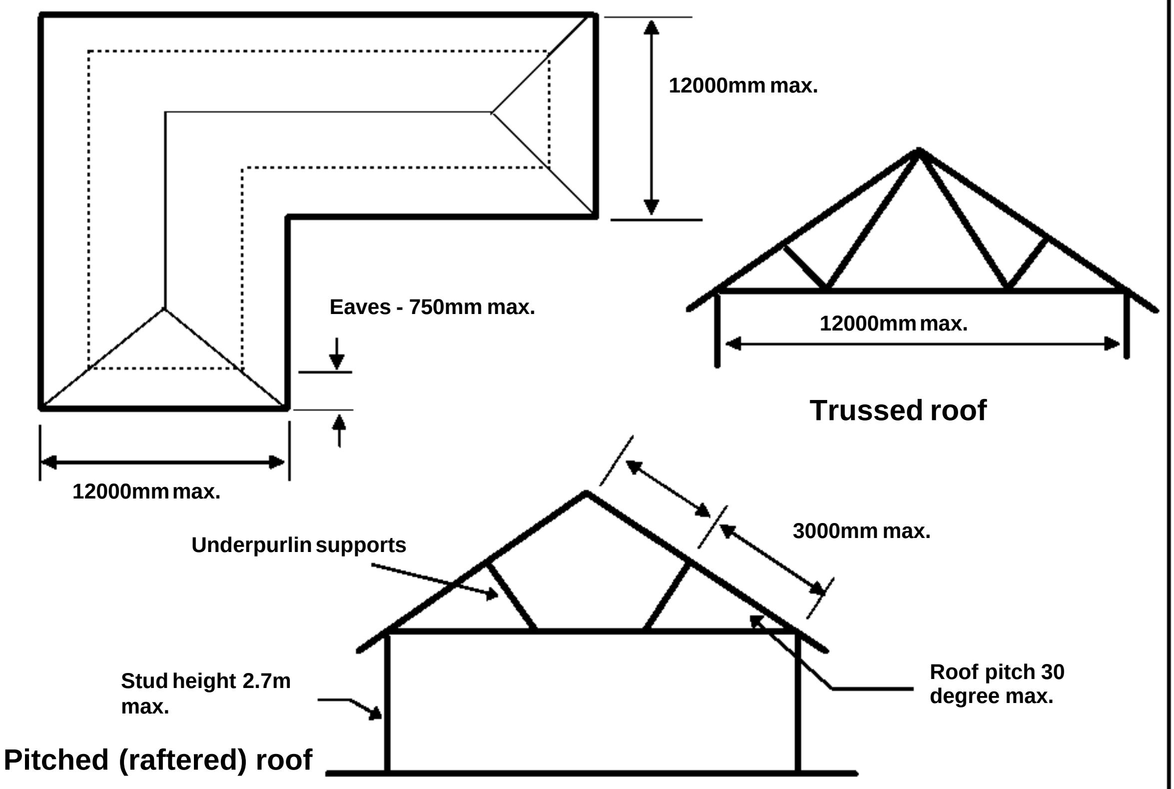
**Figure 3.4.3.0**
**LIMITS OF BUILDING GEOMETRY**




## 3.4.3.2 Materials

(a) Standards and Grades

(i) All timber used for structural purposes must be stress-graded in accordance with relevant Australian Standards and have the stress grade identified.

(ii) Where colours are used to indicate the stress grade, the following applies:

| | |
|---|---|
| F4 - Red | F11 - Purple |
| F5 - Black | F14 - Orange |
| F7 - Blue | F17 - Yellow |
| F8 - Green | F22 - White |

(iii) A higher stress grade can be used instead the specified stress grade.

(b) Corrosion Protection
All metal brackets, fixing plates and other associated fixings used in structural timber joints and bracing must have appropriate corrosion protection in accordance with the following manuals:

(i) AS 1214 for threaded fasteners.

(ii) AS 1397 for anchors, brackets and straps etc (minimum protection grade Z275).

(iii) AS 1650 for nails (minimum coating Type A).

(iv) AS 3566 for self drilling screws.



**STATE AND TERRITORY VARIATIONS**

**In Queensland after 3.4.3.2(b) insert Qld 3.4.3.2(c) as follows:**

**Qld 3.4.3.2(c)Timber Species**

(c) Timber Species
Timber used for structural purposes must be a species scheduled for the appropriate use in Schedules A, B or C in Queensland Forest Service of the Department of Primary Industries Technical Pamphlet No. 1 - Building Timbers, Properties and Recommendations for their Use in Queensland.

### 3.4.3.3 Floor Framing

Timber floor framing must be constructed in accordance with the following requirements:

(a) Drilling and notching of bearers and joist must be in accordance with Figure 3.4.3.1.

**Figure 3.4.3.1**
**DRILLING AND NOTCHING OF BEARERS AND JOISTS**

**Note:** For the purposes of this Figure:

1. Notches in both surfaces at the end of any member are not permitted.
2. Minor excesses in depth may be levelled by checking up to 6mm over supports.

**Diagram a.** **Drilling**

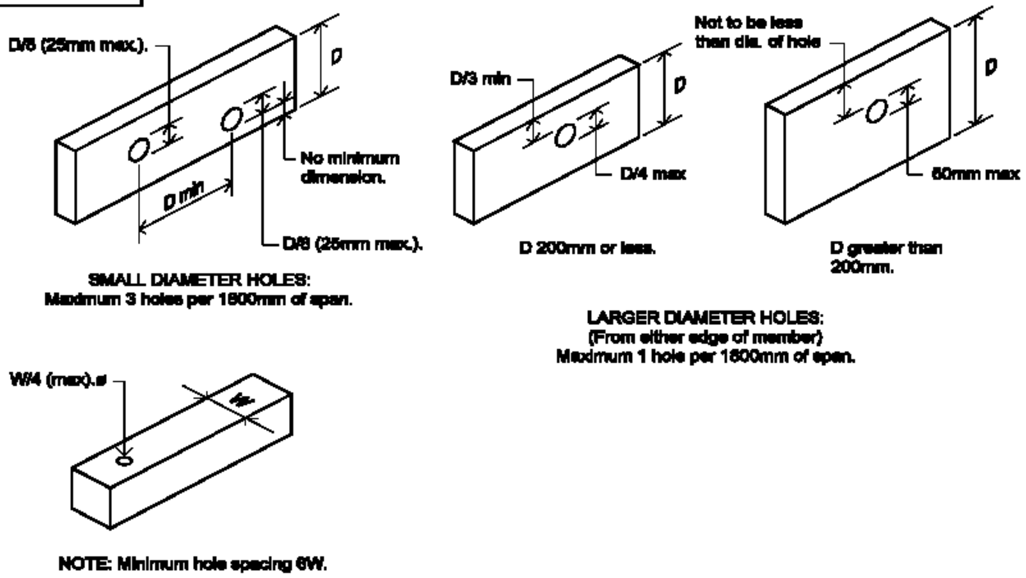
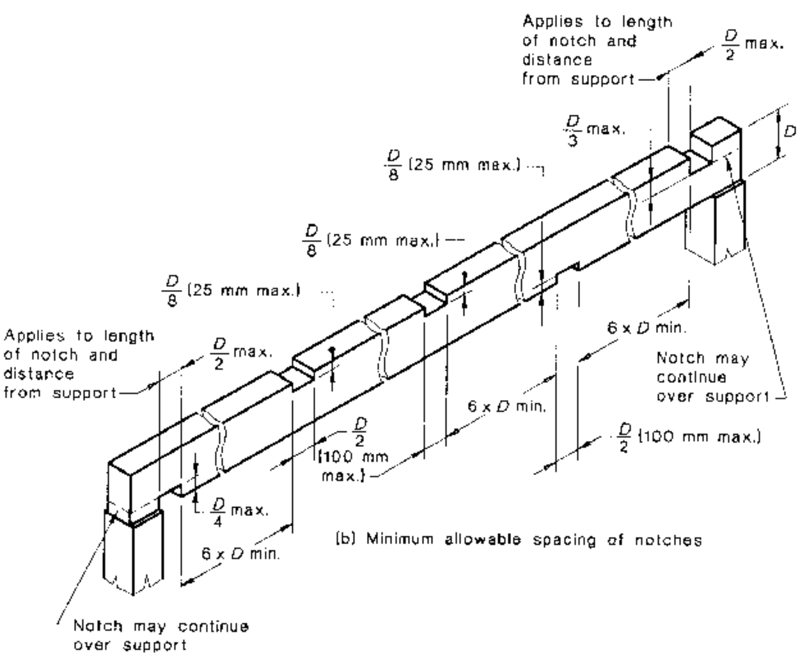



**Diagram b.** **Notching**




loadbearing walls as shown in Figure 3.4.3.2.

**Figure 3.4.3.2**
**SUPPORT FOR LOADBEARING WALLS - FITTED OR PLATFORM FLOORING**

**Note:** For non loadbearing gable end walls refer to Figure 3.4.3.3.

**Diagram a.** **Bearers supporting parallel loadbearing walls**

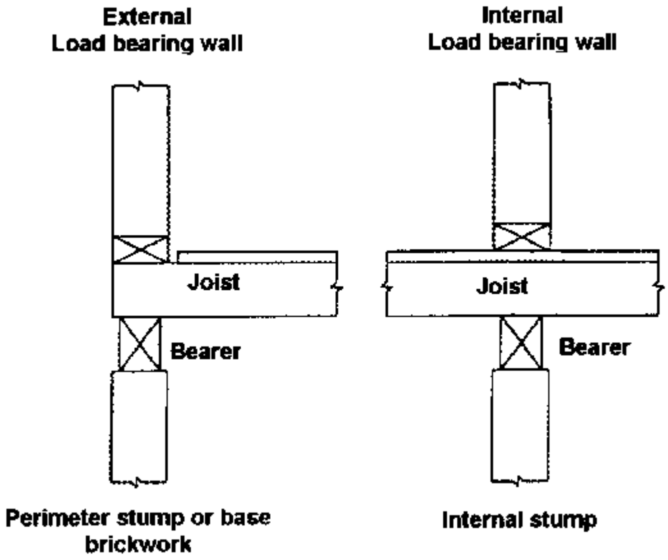
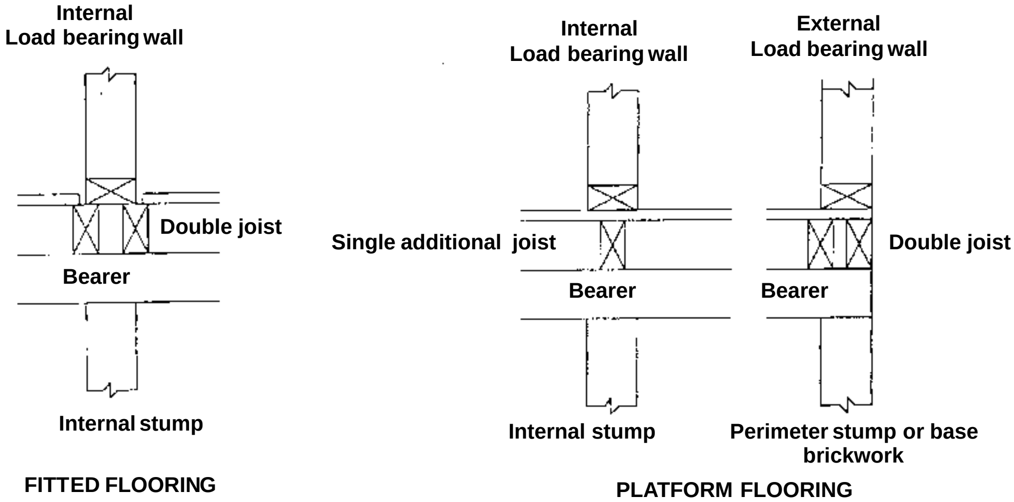



**Diagram b.** **Floor Joists Supporting Parallel Loadbearing Walls**




(c) Location of bearers and joists for non-load bearing walls
Bearers and joists supporting non-loadbearing walls (including gable-end walls) must be located as shown in Figure 3.4.3.3.

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**Figure 3.4.3.3**
**SUPPORT FOR NON - LOADBEARING WALLS**

**Note:** Bearers and joists are considered as supporting floor loads only.

**Diagram a.** **Internal Non-Loadbearing Walls**

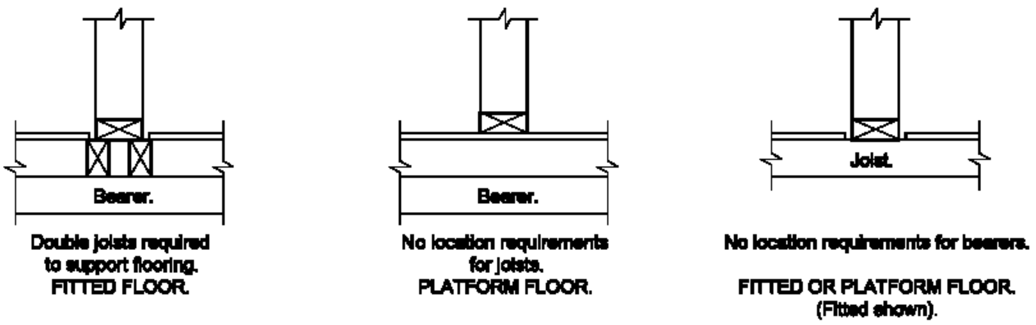
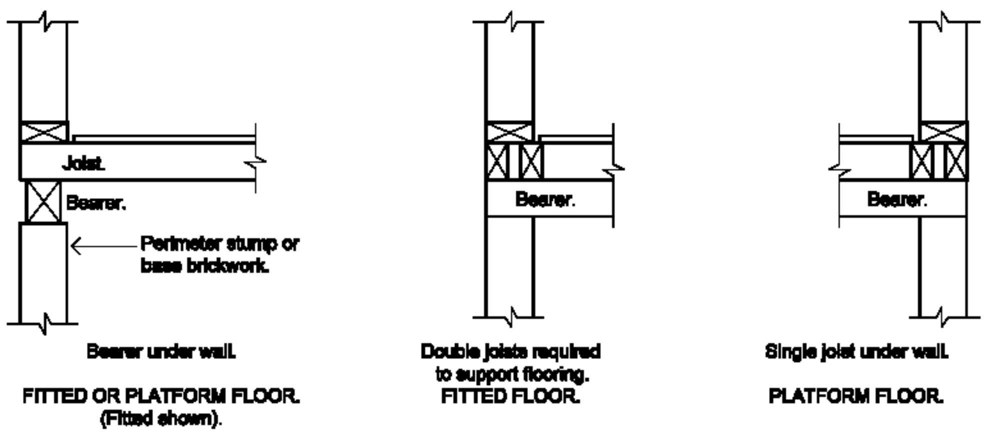



**Diagram b.** **External Non-Loadbearing Walls**

**Note:** External non-loadbearing walls must not support roof loads (eg. gable end wall in truss roof construction). However, ceiling loads may be supported.




(d) Deep floor joists

Where the depth of floor joist is equal to or exceeds four (4) times the width, the following must apply -

(i) blocking at each support to be provided as shown in Figure 3.4.3.4; and

(ii) herringbone strutting or solid blocking to be provided in evenly spaced rows between joists as follows -

(A) for spans up to 3.0m - not required; and

(B) for spans over 3.0m to 4.2m - one row; and

(C) for spans over 4.2m to 6.0m - two rows.

### 3.4.3.4 Flooring

(a) Flooring may be laid as a platform floor or fitted as shown in Figure 3.4.3.5.

(b) Strip tongue and groove flooring must be -

(i) fixed with a minimum of 50 x 2.8 mm Ø bullet head nails hand driven or 50 x 2.5 mm Ø nails machine driven; and

(ii) be installed in accordance with Table 3.4.3.1.

(c) Plywood structural flooring must be -

(i) manufactured in accordance with AS 2269; and

(ii) installed in accordance with Table 3.4.3.2.

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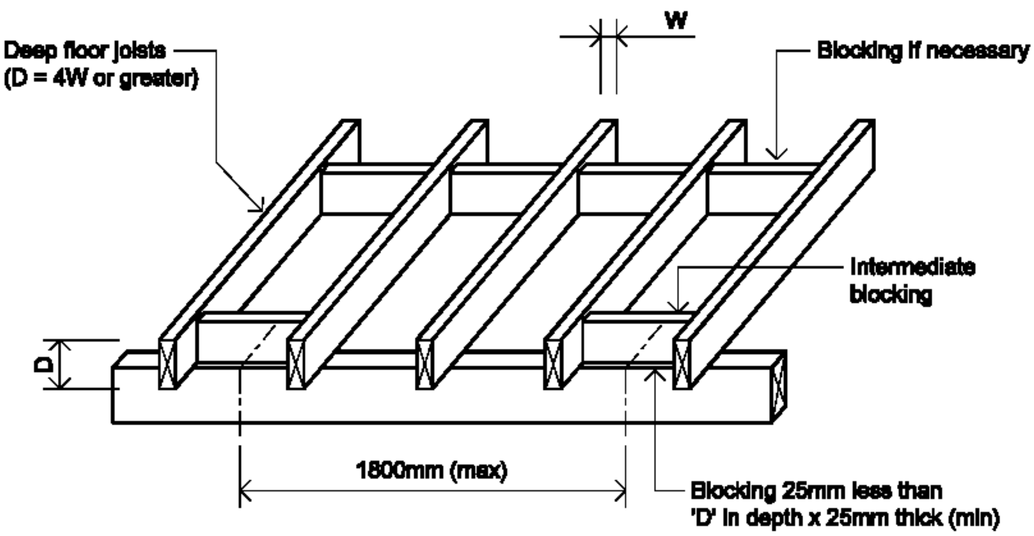
**Figure 3.4.3.4**
**BLOCKING FOR DEEP JOISTS**




(d) Particleboard structural sheet flooring must be -

(i) manufactured in accordance with AS 1859; and

(ii) installed in accordance with Table 3.4.3.3.

(e) Where tongue and groove platform floors are laid, joists may be located without reference to the position of walls except that double joists must be used under external and internal *loadbearing* walls.

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**Figure 3.4.3.5**
**PLATFORM AND FITTED FLOORS**

**Diagram a.** Non Loadbearing Walls On Platform Floors

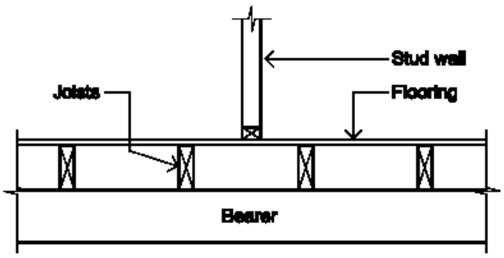


**Diagram b.** Fitted Floors

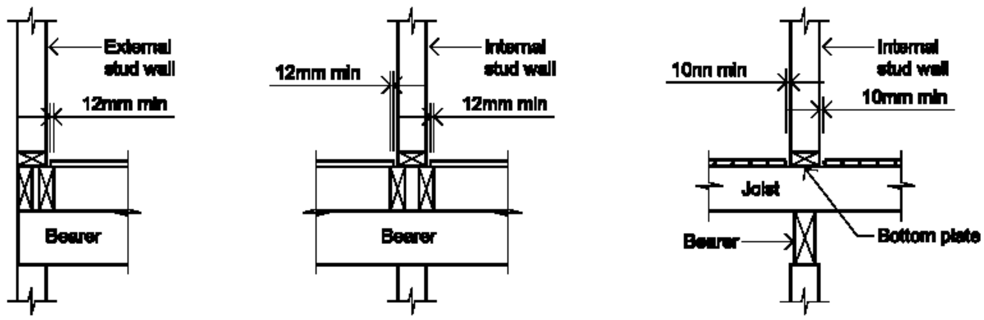


**Table 3.4.3.1**
**T & G STRIP FLOORING**

| TIMBER | VISUAL GRADE | THICKNESS (mm) | FLOOR JOIST SPACING (mm) | |
|---|---|---|---|---|
| | | | BUTTED OVER JOISTS | END-MATCHED |
| HARDWOOD (complying with AS 2796) | | | | |
| Density. 400-560 kg/m³ | STD & SEL | 19 | 510 | 390 |
| 560-720 kg/m³ | STD & SEL | 19 | 580 | 450 |
| 720 plus kg/m³ | UTILITY | 19 | 580 | 450 |
| | STD | 19 | 640 | 490 |
| | SEL | 19 | 680 | 520 |
| AUSTRALIAN GROWN CONIFERS (complying with AS 1782) | | | | |
| Density less than 560 kg/m | STD | 19 | 510 | 390 |
| Density greater than 560 kg/m³ | STD | 19 | 580 | 450 |
| RADIATA PINE (complying with AS 1492) | STD | 19 | 510 | 390 |
| CYPRESS (complying with AS 1810) | Seasoned One Grade | 20 | 580 | 450 |

**Table 3.4.3.2**
**PLYWOOD FLOORING**

| STRUCTURAL PLYWOOD THICKNESS (mm) | MAXIMUM JOIST SPACING | | MINIMUM FIXING REQUIREMENTS TO TIMBER |
|---|---|---|---|
| | F11 | F14 | |
| **12** | 420 | 440 | Plywood face grain must run at right angles to the joists. |
| **13** | 450 | 480 | Nails: Min. 2.8 mm Ø x 2.5 times plywood thickness. |
| **15** | 520 | 540 | Screws: No. 8 x 30 mm self drilling countersunk wood screws. |
| **17** | 560 | 600 | Fixing Spacing: 150 mm centres at end joints, 300 mm centres |
| **19** | 620 | 660 | at intermediate joints |

**Table 3.4.3.3**
**PARTICLEBOARD FLOORING**

| PARTICLEBOARD THICKNESS (mm) | MAXIMUM JOIST SPACING (mm) | MINIMUM FIXING REQUIREMENTS TO TIMBER JOISTS |
|---|---|---|
| **19** | 450 | Adhesive is mandatory between joists and floor.<br>Nails: 50 x 2.8 mm Ø galv. nails for hardwood and cypress joists and 65 x 2.8 Ø nails for softwood joists.<br>Screws: No. 10 x 50 mm Type 17 self drilling countersunk screws. |
| **22** | 600 | Fixing Spacing: 50 mm centres at butt edges; and 300 mm centres at intermediate joists. |

## 3.4.3.5 Wall framing

Timber wall framing must be constructed in accordance with the following requirements:

(a) Housing, notching, drilling, cutting and trenching of wall framing must be in accordance with the limits given in Figure 3.4.3.6.





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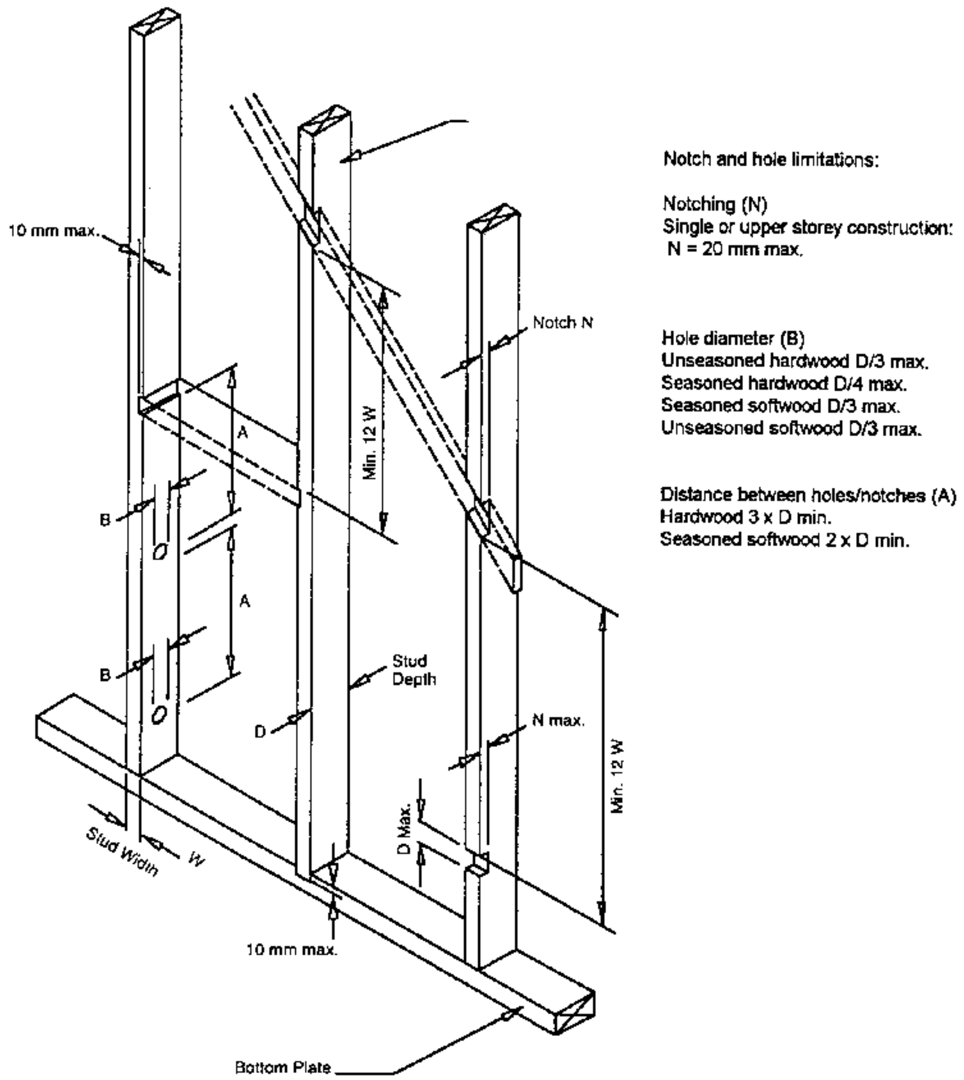
**Figure 3.4.3.6**
**HOUSING, NOTCHING, DRILLING, CUTTING AND TRENCHING**

**Note:** For the purposes of this Figure:

1. Where holes are smaller than the maximum permitted size, they may be located at closer spacings than those given provided their combined size is less than the maximum permitted size for a single hole.
2. Stud notching for bracing is not permissible where studs are designed as un-notched.
3. Plate trenching is not permissible where plates are designed as un-trenched.

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(b) Joining of wall plates

(i) Top wall plates must be joined at wall intersections or within the length of the wall by using noggings or metal nail plates to ensure continuity; and

(ii) butt joints in bottom plates are permitted provided ends of plates are fully supported.

(c) Wall plates supporting major loads

(i) Where top or bottom plates are required to support major point loads arising from roof struts, strutting beams, hanging beams, girder trusses and bearers they must be strengthened as shown in Figure 3.4.3.7; and

(ii) where major loads occur, the studs directly under the load or adjacent studs either side must be determined as studs supporting concentrated loads.

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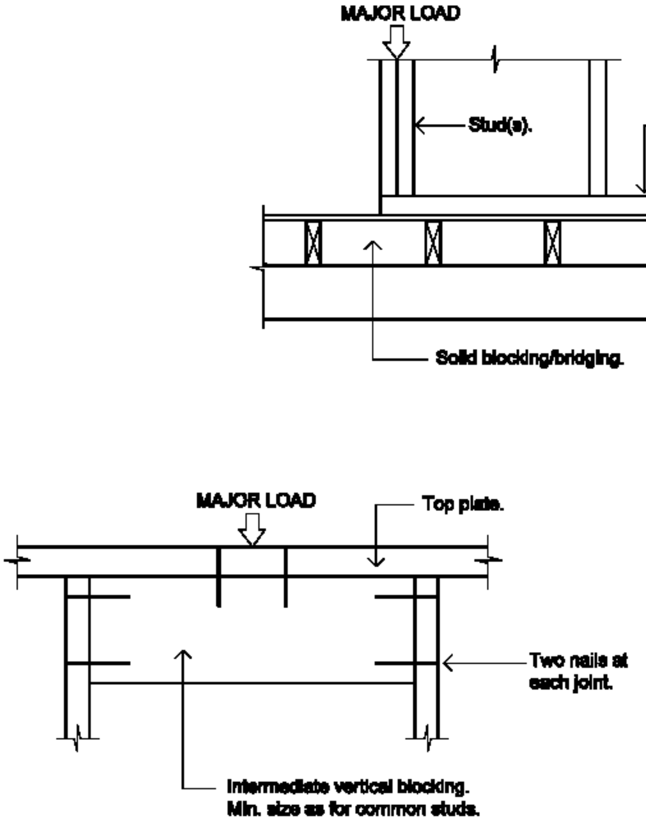
**Figure 3.4.3.7**

**SUPPORT FOR MAJOR LOADS**




NOTE: The use of metal nail plate connectors is recommended for the blocking to stud joint where the roof area supported exceeds 10sq.m. (max 15sq.m.).

Alternatively provide double blocking with 3 nails at each end joint (total of 6 nails at each stud).



SUPERSEDED

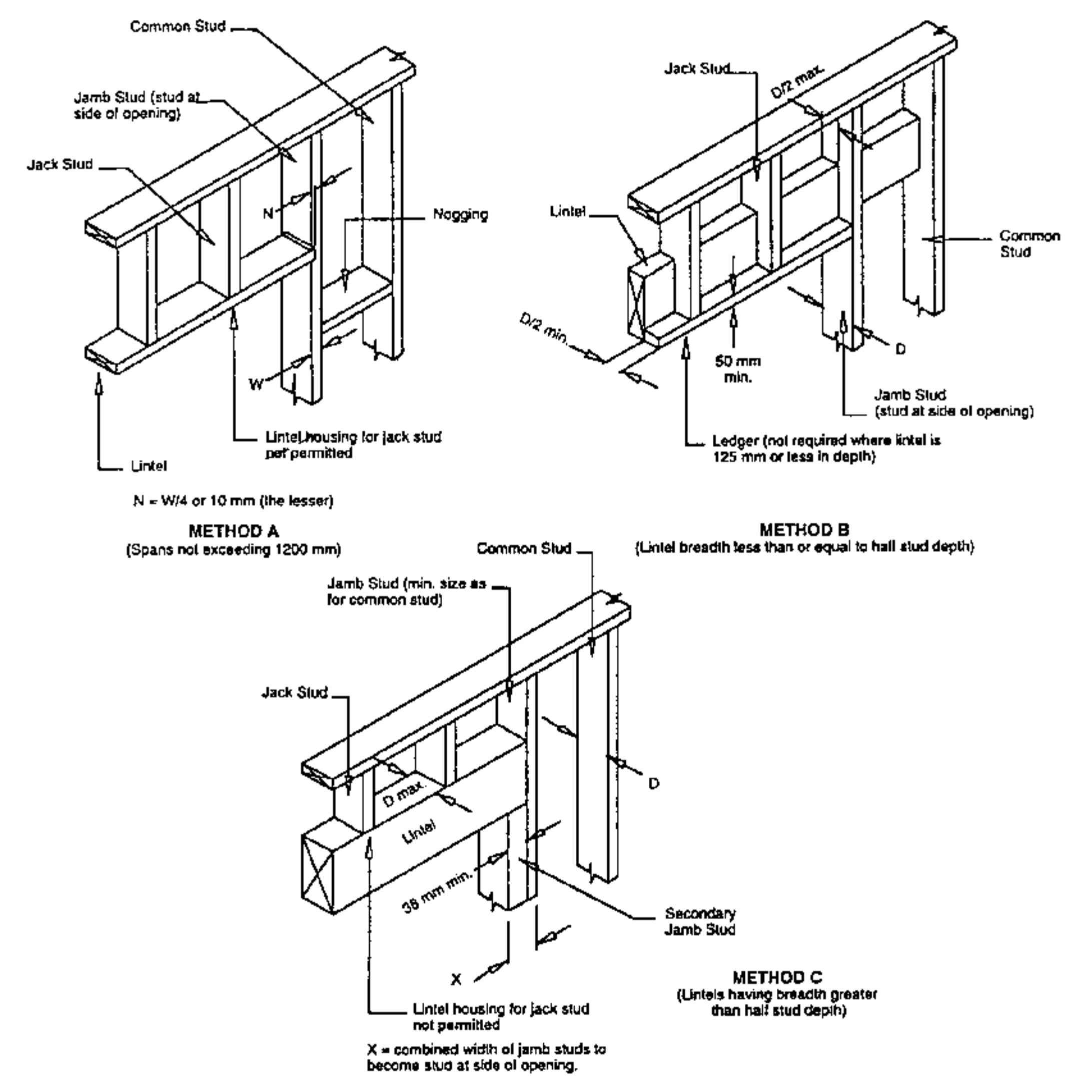
(d) Lintels

Lintels must be installed in accordance with the details shown in Figure 3.4.3.8.

**Figure 3.4.3.8**
**TYPICAL LINTEL INSTALLATION DETAILS**

**Note:** For the purposes of this Figure:

1. The use of unseasoned timber for lintels is not recommended where the lintel depth exceeds 175 mm (hardwood) or 300 mm (softwood) unless provision is made to minimise the effect of shrinkage (eg. use of a ledger as per Method B).
2. With Methods B and C it is permissible to locate the lintel immediately beneath the top plate with the top plate fixed to the lintel.
3. With Method B it is permissible to locate the first common stud immediately adjacent to the stud at side of opening with the combined width determined as Method C.

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(e) Noggings

(i) Noggings must be installed in wall frames at not greater than 1350mm centres vertically spaced. Additional rows may be installed where required for support of lining materials, fixtures, fittings etc or at openings.

(ii) Noggings must not be less than 25mm thick nor more than 25mm less in depth than the stud depth.

(iii) Alternate noggings may be offset up to 70mm about the centre line of the row.

(f) Lateral support of external walls

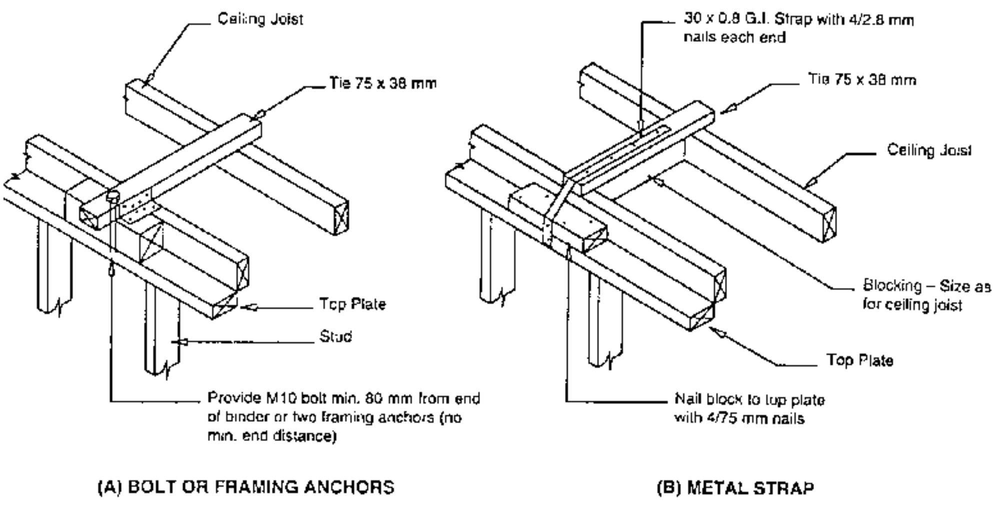
Lateral support of external walls must -

(i) be provided by internal walls at right angles, ceiling joists, roof trusses, ceiling or roof beams etc at a maximum of 3m centres, or less, along the length of wall; and

(ii) where no support is provided the wall must be fixed to the ceiling frame with binders at maximum of 3m centres in accordance with Figure 3.4.3.9.



**Figure 3.4.3.9**
**BINDERS TO CONNECT WALLS TO CEILING FRAME**



### 3.4.3.6 Conventional roofs

Conventional roof systems including roof beams, cathedral, skillion and coupled roofs, strutted or unstrutted must be installed in accordance with the configurations described in one of the acceptable construction manuals listed in 3.4.3.0 and the following :

(a) Ceiling joists must be -

(i) single lengths or joined at supports by either butt joining with 25 mm thick fish-plates or lapped at least three times the depth of the joist. Splices in ceiling joists must be nailed together, using 6/75 mm nails to each plate on each side of the join; and

(ii) fixed to top plate and rafter with nominal fixings; and

(iii) similar in spacing and direction to the main roof rafters so that when fixed they act as ties between opposing rafters.

(b) Hanging beams

(i) Hanging beams must be fixed to ceiling joists with timber or metal ceiling ties on alternate sides of the beam with not less than 3/75mm nails.

(ii) Blocking must be used under the beam at each support point and be securely fixed in place in accordance with Figure 3.4.3.10.

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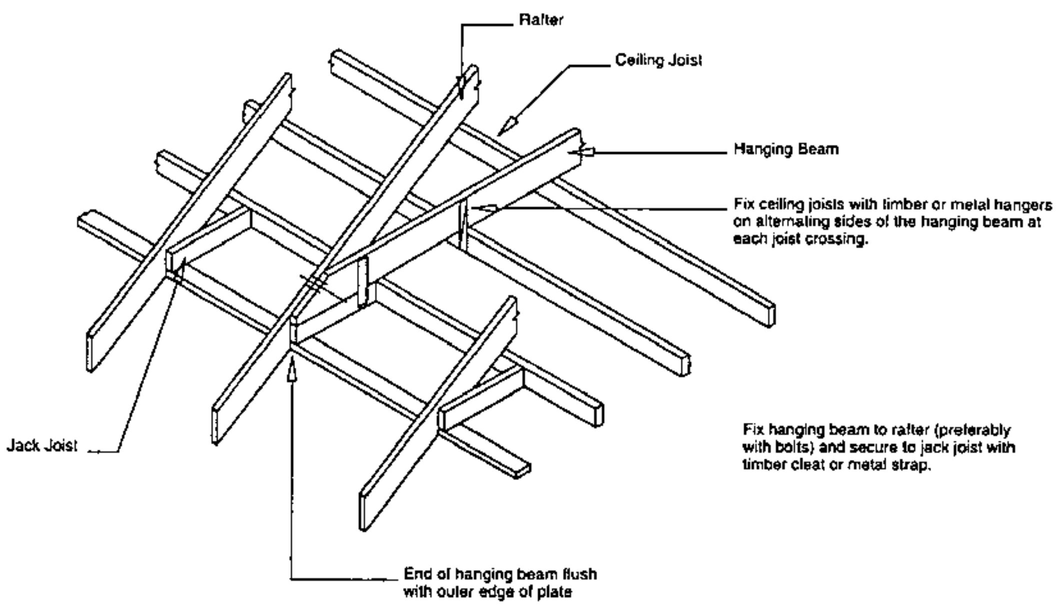
**Figure 3.4.3.10**
**END SUPPORT FOR HANGING OR STRUTTING BEAMS**



(c) Rafters

(i) Rafters must be nominally fixed to top plates and adjoining ceiling joists at one end and to the ridge board, hip or valley rafter at the other end; and

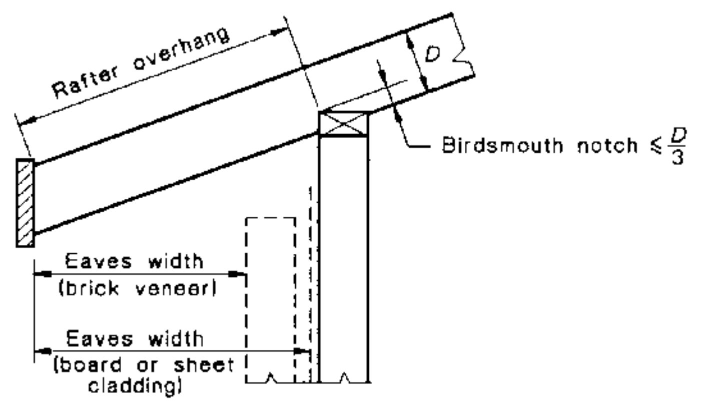
(A) single length members; or

(B) lapped 6 x depth , bolted with 2 10mm steel bolts and directly supported by an underpurlin.

(ii) Rafters may be supported by one or more underpurlins between the ridge and top plate.

(iii) The maximum allowable birdsmouth depth is one third of the rafter depth in accordance with Figure 3.4.3.11.

**Figure 3.4.3.11**
**RAFTER OVERHANG AND BIRDSMOUTHING**




(d) Ridge Boards

(i) Ridge boards must be of sufficient depth to give full bearing to the upper end of rafters and not less than 25 mm thick.

(ii) Opposing pairs of rafters must not be separated by more than their own thickness at either side of their ridge junction.

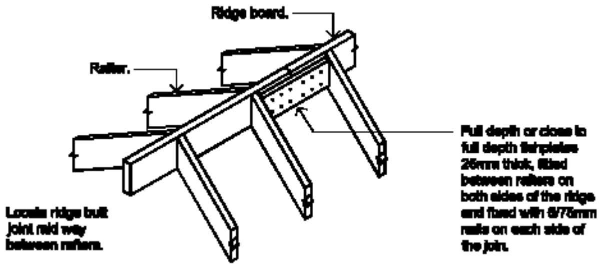
(iii) Where the junction between a hip or valley rafter and the ridge is required to be strutted, the full length of the ridge is required to be strutted as follows:

(A) 25 mm thick ridge boards - strutted at 1800 mm centres; or

(B) 35 mm or 38 mm ridge board - strutted at 2300 mm centres.

(iv) Where ridge boards are joined, the join should be closely butted with 25 mm thick full depth timber fish-plates each side, not less than 600mm long or alternatively scarf jointed. 6/65 mm nails to be provided to each plate on each side of the join in accordance with Figure 3.4.3.12.

**Figure 3.4.3.12**
**RIDGEBOARD SPLICING**




(e) Underpurlins

Underpurlins may be used to provide intermediate support to rafters and must be installed as follows:

(i) Underpurlins must be single lengths (where possible) and positioned at right angles to the direction of the rafters.

(ii) Single underpurlins must be located at or near the mid length of the rafters.

(iii) Where two or more underpurlins are used they must be equally spaced between the ridge and eaves.

(iv) Where underpurlins are joined in their length, the join must be halved and lapped, spiked together and located over a point of support.

(v) The ends of underpurlins must not cantilever by more than 25 percent of the allowable span. Refer to Figure 3.4.3.13.

(vi) Where hip, valley or jack rafters are required to act as supports for underpurlins, a tie-bolt truss or equivalent support system may be provided.

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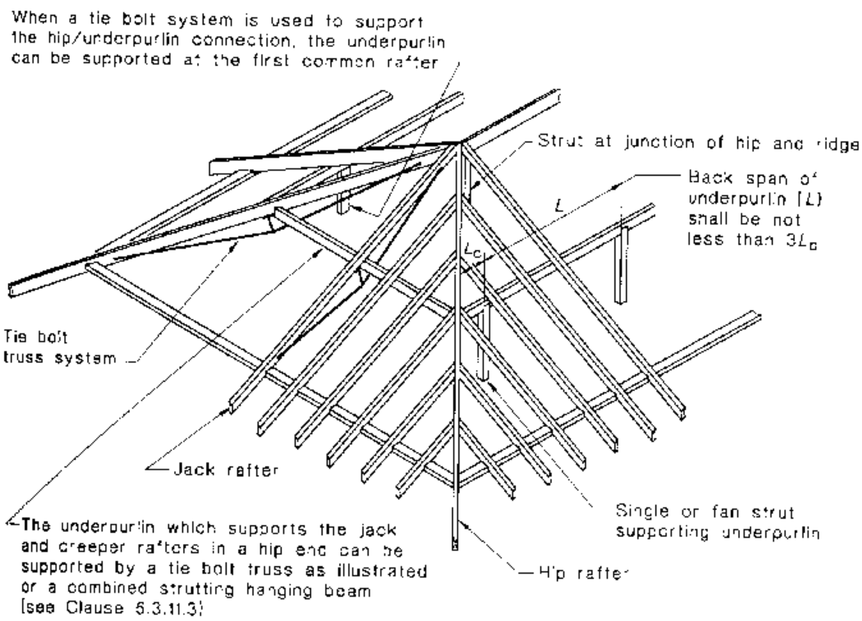
**Figure 3.4.3.13**
**HIP END CONSTRUCTION**




(f) Hip or valley rafters

(i) Hip rafters must be 50mm greater in depth (and may be 13mm less in width) than the adjacent common rafters.

(ii) Valley rafters must be 50mm greater in depth than the adjacent common rafters and may be 38mm in width.

(iii) Where hip or valley rafters are supported by underpurlins or struts they must have the same number of evenly spaced intermediate supports as the common rafters.

(iv) Valley rafters require underpurlin support from two directions.

(v) Support for hip rafters may be from one direction only.

(vi) A strut must be provided at the junction of the hip or valley rafter and the ridge board in cases where the span of such rafter exceeds 5000mm. This junction must be strutted for all hip or valley rafter spans.

(vii) In hipped roofs where common rafters are projected to form overhangs equal to or exceeding 600mm, the breadth of hip rafters must be increased to at least the breadth of the common rafters unless suitable reinforcing (such as approved fishplates extending 450mm on either side of the birdsmouthing) is provided.

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(g) Roof struts

Roof struts supporting roof members must be located so that they transfer loads to the *foundations* by the most direct route and as follows:

(i) Single roof struts must be fixed at an angle not exceeding 30 degrees from the vertical as described in Figure 3.4.3.14.

(ii) Fan struts must be as detailed in Figure 3.4.3.14.

(iii) Struts must be halved to the supported member and be supported on *load bearing* walls or strutting beams as detailed in Figure 3.4.3.14.

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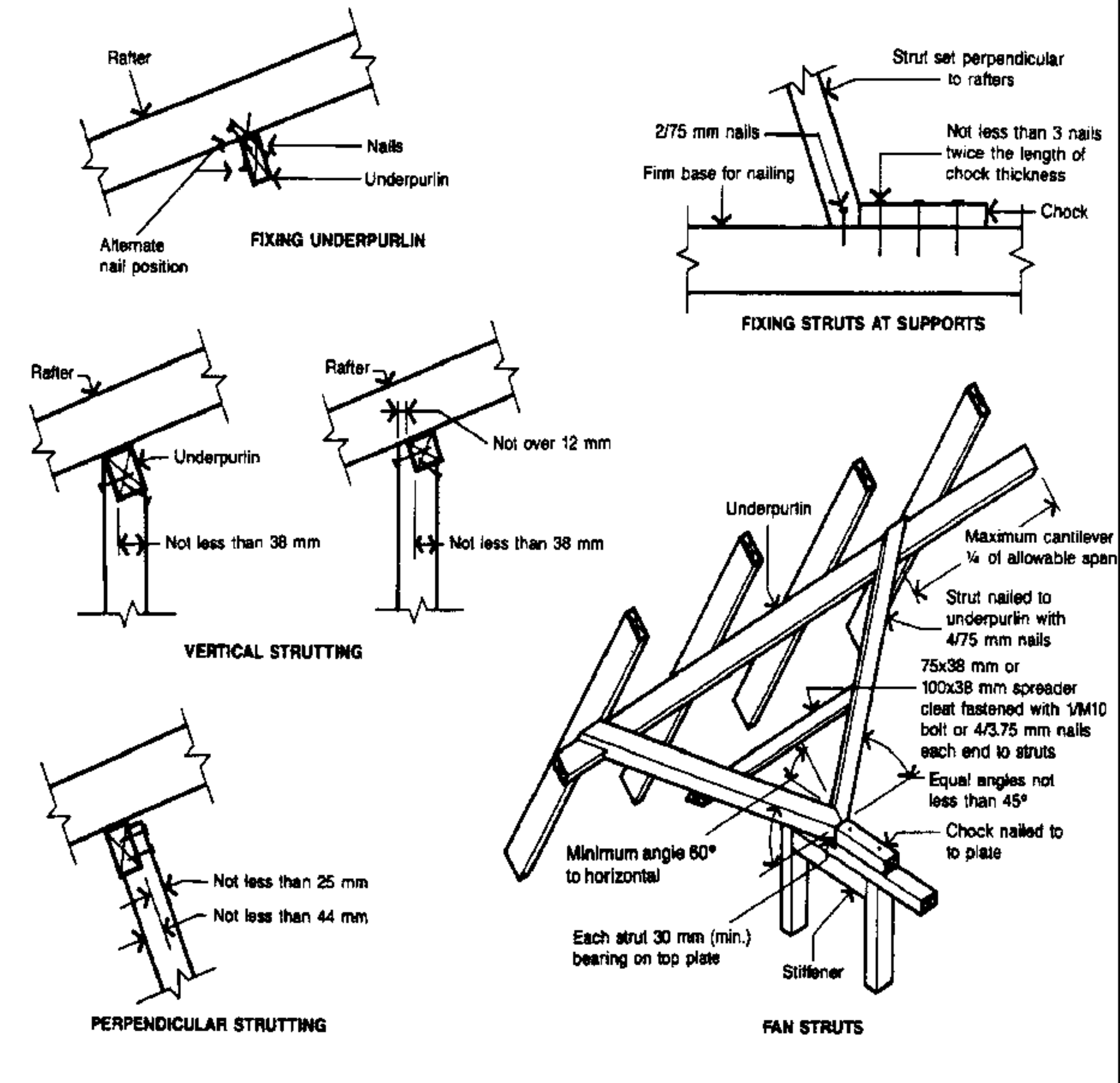
**Figure 3.4.3.14**
**TYPICAL ROOF STRUTTING**



(h) Strutting beams

Strutting beams must be installed in accordance with Figure 3.4.3.15, 3.4.3.10 and the following:

(i) Strutting beams may extend in any direction in the roof space provided -

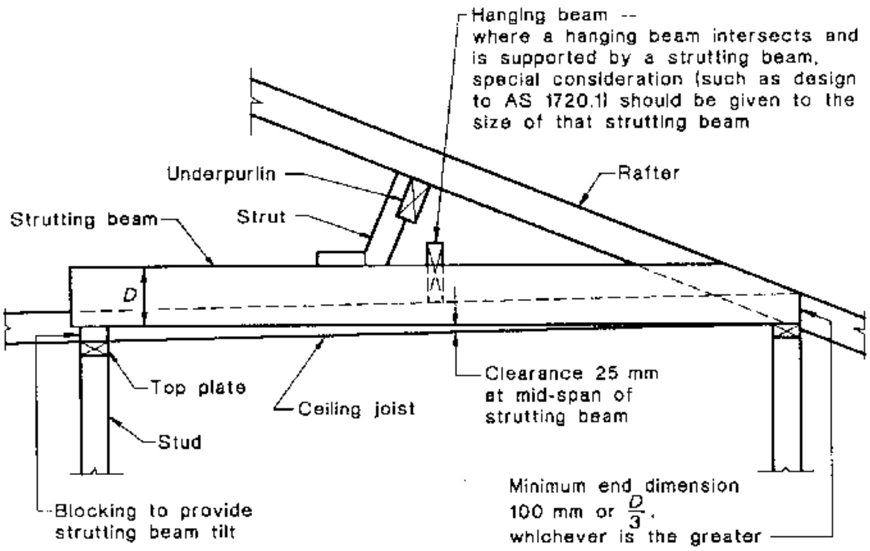
(A) their ends are supported on load bearing walls; and

(B) a clearance of at least 25mm is provided between the underside of the strutting beam and the ceiling or ceiling joists by blocking up the ends of the beam from the top plate.

(ii) The ends of strutting beams may be chamfered to avoid interference with roof cladding on low pitched roofs provided the end is reduced by the amount described in Figure 3.4.3.15.



**Figure 3.4.3.15**
**METHOD OF FIXING STRUTTING BEAMS**



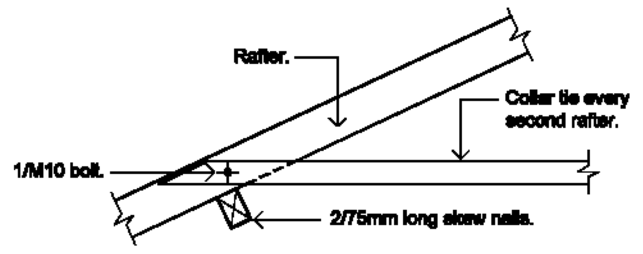

(i) Collar ties

Collar ties must be installed in roofs with a pitch greater than 10 degrees to each alternate rafter in accordance with Figure 3.4.3.16 and be fixed to rafters with -

(i) 2/75 mm nails each end for collar ties less than 4.2 m; or

(ii) one M10 bolt for collar ties more than 4.2 m in length.

**Figure 3.4.3.16**
**COLLAR TIES**

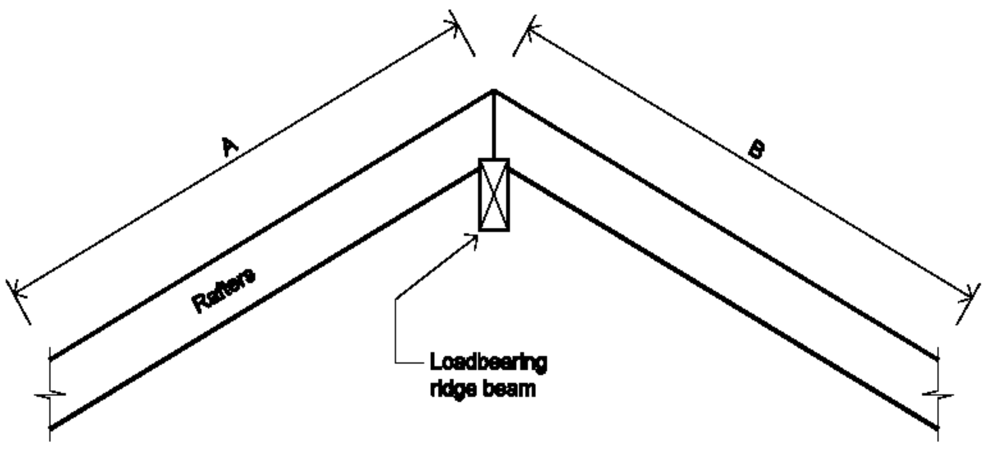



(j) Roof Beam Construction

Roof Beam Construction (cathedral, skillion, exposed rafter etc.) are normally considered to be large section rafters that are not birdsmouthed over wall plates and must be installed to ensure that the roof is stable and does not impart unbalanced lateral loads onto external wall frames. Refer to Figure 3.4.3.17.

**Figure 3.4.3.17**
**ROOF BEAM INSTALLATION**

**Note:** Length A and B is to be approximately equal span and pitch to ensure lateral load is balanced.



### 3.4.3.7 Acceptable timber frame sizes and fixing

A timber frame must be constructed using timber framing members with appropriate sizes and fixing as follows -

(a) sizes and spacings complying with Tables 3.4.3.4 to 3.4.3.7; and

(b) fixed in accordance with:

(i) Table 3.4.3.8 for frames in *design wind speed* areas W28 and W33; and

(ii) Table 3.4.3.9 for frames in *design wind speed* areas W41.

**Table 3.4.3.4**

**FLOOR FRAMING - AREAS WITH A DESIGN WIND SPEED NOT MORE THAN W41**

| Member | Unseasoned Timber | | | Seasoned Timber | | | |
|---|---|---|---|---|---|---|---|
| | F7 | F8 | F11 | F5 | F7 | F17 | F22 |
| **RAFTERED ROOF CONSTRUCTION - MAX. RAFTER SPAN 3000 mm** | | | | | | | |
| **Bearers - Sheet Roof** (Continuous Span) | 125x75 | 125x75 | 100x75 | 125x75 | 120x70 | 90x70 | 90x70 |
| **Bearers - Tile Roof** (Continuous Span) | 150x75 | 125x75 | 125x75 | 125x75 | 120x70 | 120x70 | 120x70 |
| **Floor Joists** (Continuous Span) | 100x50 | | 100x38 | | 120x35 | | |
| **TRUSSED ROOF CONSTRUCTION - MAX. TRUSS SPAN 12000 mm** | | | | | | | |
| **Bearers - Sheet Roof** (Continuous Span) | 150x75 | 150x75 | 125x75 | 140x70 | 140x70 | 120x70 | 120x70 |
| **Bearers - Tile Roof** (Continuous Span) | 200x75 | 175x75 | 150x75 | 190x70 | 170x70 | 170x70 | 120x70 |
| **Floor Joists** (Continuous Span) | 100x50 | 100x38 | 100x38 | 120x35 | 90x45 | 90x45 | 90x35 |

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**Table 3.4.3.5**

**WALL FRAMING - AREAS WITH A DESIGN WIND SPEED NOT MORE THAN W41**

**Note:** All dimensions are member depth x breadth.

| Member | Unseasoned Timber | | | Seasoned Timber | | | |
|---|---|---|---|---|---|---|---|
| | F7 | F8 | F11 | F5 | F7 | F17 | F22 |
| **RAFTERED ROOF CONSTRUCTION - MAX. RAFTER SPAN 3000 mm** | | | | | | | |
| **Bottom Plate - Sheet Roof** | 75x75 | 50x75 | 50x75 | 2/35x90 | 70x70 | 45x70 | 35x70 |
| **- Tile Roof** | 75x75 | 75x75 | 50x75 | 2/35x90 | 70x70 | 45x70 | 45x70 |
| **Studs - Sheet Roof** | 75x38 | 75x38 | 75x38 | 90x35 | 70x45 | 70x35 | 70x35 |
| **- Tile Roof** | 75x38 | 75x38 | 75x38 | 90x35 | 70x45 | 70x35 | 70x35 |
| **Top Plate - Sheet Roof** | 50x75 | 50x75 | 75x75 | 2/35x90 | 90x70 | 35x70 | 35x70 |
| **- Tile Roof** | 75x75 | 50x75 | 50x75 | 2/35x90 | 70x70 | 45x70 | 35x70 |
| **Jamb Studs - Sheet Roof** | | | | | | | |
| Opening 1200 | 75x75 | 75x75 | 75x38 | 90x45 | 70x45 | 70x45 | 70x45 |
| 1500 | 75x75 | 75x75 | 75x75 | 90x45 | 70x90 | 70x70 | 70x70 |
| 1800 | 75x100 | 75x75 | 75x75 | 90x70 | 70x90 | 70x70 | 70x70 |
| 2400 | 75x100 | 75x100 | 75x75 | 90x70 | 70x90 | 70x70 | 70x70 |
| **- Tile Roof** | | | | | | | |
| Opening 1200 | 75x75 | 75x75 | 75x38 | 90x45 | 70x45 | 70x45 | 70x45 |
| 1500 | 75x75 | 75x75 | 75x75 | 90x45 | 70x90 | 70x70 | 70x70 |
| 1800 | 75x100 | 75x75 | 75x75 | 90x70 | 70x90 | 70x70 | 70x70 |
| 2400 | 75x100 | 75x100 | 75x75 | 90x70 | 70x90 | 70x70 | 70x70 |
| **Lintels - Sheet Roof** | | | | | | | |
| Opening 1200 | 50x75 | 50x75 | 75x75 | 45x90 | 90x70 | 45x70 | 45x70 |
| 1500 | 100x75 | 75x75 | 75x75 | 90x45 | 120x70 | 45x70 | 45x70 |
| 1800 | 100x75 | 100x75 | 100x75 | 120x45 | 120x70 | 90x35 | 90x35 |
| 2400 | 150x75 | 150x75 | 150x75 | 140x70 | 170x70 | 120x35 | 90x70 |
| **- Tile Roof** | | | | | | | |
| Opening 1200 | 100x75 | 100x75 | 75x75 | 90x70 | 90x70 | 45x70 | 45x70 |
| 1500 | 125x75 | 125x75 | 100x75 | 120x70 | 90x70 | 90x35 | 90x35 |
| 1800 | 150x75 | 150x50 | 175x75 | 120x70 | 120x70 | 120x35 | 90x70 |
| 2400 | 200x75 | 200x75 | 175x75 | 170x70 | 170x70 | 140x70 | 120x70 |
| **TRUSSED ROOF CONSTRUCTION - MAX. TRUSS SPAN 12000 mm** | | | | | | | |
| **Bottom Plate - Sheet Roof** | 75x100 | 75x75 | 75x75 | 70x90 | 70x90 | 2/45x70 | 45x70 |
| **- Tile Roof** | 75x100 | 75x100 | 75x75 | --- | 70x90 | 2/45x70 | 2/45x70 |
| **Studs - Sheet Roof** | 100x38 | 100x50 | 75x38 | 90x45 | 90x35 | 70x35 | 70x35 |
| **- Tile Roof** | 100x38 | 100x38 | 75x38 | 90x45 | 90x35 | 70x35 | 70x35 |
| **Top Plate - Sheet Roof** | 75x100 | 75x75 | 75x75 | 70x90 | 70x90 | 45x70 | 45x70 |
| - Tile Roof | 75x100 | 75x100 | 75x75 | --- | 70x90 | 2/45x70 | 2/45x70 |
| **Jamb Studs - Sheet Roof** | | | | | | | |
| Opening 1200 | 100x38 | 75x75 | 75x38 | 90x45 | 90x45 | 70x45 | 70x45 |
| 1500 | 100x38 | 75x75 | 75x75 | 90x70 | 90x70 | 70x70 | 70x70 |
| 1800 | 100x50 | 75x75 | 75x75 | 90x70 | 90x70 | 70x70 | 70x70 |
| 2400 | 100x50 | 75x100 | 75x75 | 90x70 | 90x70 | 70x70 | 70x70 |
| **- Tile Roof** | | | | | | | |
| Opening 1200 | 100x75 | 100x50 | 75x38 | 90x70 | 90x45 | 70x45 | 70x45 |
| 1500 | 100x75 | 100x75 | 75x75 | 90x90 | 90x70 | 70x70 | 70x70 |
| 1800 | 100x75 | 100x75 | 75x75 | 90x90 | 90x70 | 70x70 | 70x70 |
| 2400 | 100x100 | 100x75 | 75x75 | 90x105 | 90x70 | 70x70 | 70x70 |
| **Lintels - Sheet Roof** | | | | | | | |
| Opening 1200 | 125x50 | 100x75 | 100x75 | 120x70 | 140x70 | 90x35 | 90x35 |
| 1500 | 150x50 | 125x75 | 125x75 | 140x70 | 170x70 | 90x70 | 90x70 |
| 1800 | 175x75 | 150x75 | 150x75 | 140x70 | 190x70 | 120x70 | 120x70 |
| 2400 | 225x75 | 200x75 | 200x75 | 190x70 | 240x70 | 170x70 | 170x70 |
| **- Tile Roof** | | | | | | | |
| Opening 1200 | 150x75 | 125x75 | 125x75 | 170x70 | 120x70 | 90x35 | 90x35 |
| 1500 | 175x75 | 175x75 | 150x75 | 190x70 | 170x70 | 120x70 | 120x70 |
| 1800 | 200x75 | 200x75 | 200x75 | 240x70 | 190x70 | 140x70 | 140x70 |
| 2400 | 275x75 | 275x75 | 250x75 | 290x70 | 240x70 | 190x70 | 170x70 |

**Table 3.4.3.6**

**ROOF FRAMING - AREAS WITH A DESIGN WIND SPEED NOT MORE THAN W33**

**Note:** All dimensions are member depth x breadth.

| Member | Unseasoned Timber | | | Seasoned Timber | | | |
|---|---|---|---|---|---|---|---|
| | F7 | F8 | F11 | F5 | F7 | F17 | F22 |
| **RAFTER ROOF CONSTRUCTION - MAXIMUM RAFTER SPAN 3000 mm** | | | | | | | |
| **Ceiling Joists** (600 crs.) (Continuous Span Max. 3.0m) | 125x38 | 125x38 | 125x38 | 120x45 | 120x35 | 120x35 | 90x45 |
| **Hanging Beams** (Maximum Span 4.2 m) | 275x50 | 300x38 | 250x50 | 240x45 | 240x45 | 190x45 | 190x45 |
| **Strutting Beams -Sheet Roof** | 275x75 | 275x75 | 250x75 | 240x90 | 240x90 | 190x70 | 190x70 |
| **- Tile Roof** (Maximum Span 4.2m) | --- | ---- | ---- | --- | 290x90 | 290x90 | 290x90 |
| **Underpurlins - Sheet Roof** | 100x75 | 100x50 | 100x50 | 120x70 | 90x70 | 70x70 | 70x70 |
| **- Tile Roof** (Continuous Span Max. 1.8m) | 150x75 | 125x75 | 125x75 | 140x70 | 120x70 | 90x70 | 90x70 |
| **Rafters - Sheet Roof** | 100x50 | 100x38 | 100x38 | 120x35 | 120x35 | 90x35 | 90x35 |
| **- Tile Roof** (Continuous Span Max. 3.0m) | 150x38 | 125x50 | 125x50 | 120x45 | 120x45 | 120x35 | 120x35 |
| **TRUSSED ROOF CONSTRUCTION - MAXIMUM TRUSS SPAN 12000 mm** | | | | | | | |
| Trusses, Connections, Bracing | To be engineer designed and certified | | | | | | |

**Table 3.4.3.7**

**ROOF FRAMING - AREAS WITH A DESIGN WIND SPEED OF NOT MORE THAN W41**

**Note:** All dimensions are member depth x breadth.

| Member | Unseasoned Timber | | | Seasoned Timber | | | |
|---|---|---|---|---|---|---|---|
| | F7 | F8 | F11 | F5 | F7 | F17 | F22 |
| **RAFTER ROOF CONSTRUCTION - MAXIMUM RAFTER SPAN 3000 mm** | | | | | | | |
| **Underpurlins - Sheet Roof** (Continuous Span max. 1.8m) | 125x75 | 125x50 | 100x75 | 120x70 | 120x70 | 70x70 | 70x70 |
| **Rafters - Sheet Roof** (Continuous Span max. 3.0m) | 125x38 | 100x50 | 100x38 | 140x45 | 120x45 | 90x35 | 90x35 |
| All Other Members | As per Table 3.4.3.3 above | | | | | | |

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**Table 3.4.3.8**

**CONNECTION/FIXINGS FOR AREAS WITH A DESIGN WIND SPEED OF W28 AND W33**

**Note:** For the purposes of this Table:

1. For effective skew nailing, the nail must be driven into one member not closer than 25mm or more than 38mm from the arris in contact with the adjoining member. The nail must be driven at an angle between 30 and 45 degrees to the face into which the nail is being driven.
2. Nails which are smaller than the nominated size, are other than plain shanked and/or are machine driven may be used providing their performance is not inferior to the nail sizes given above.

| JOINT | MINIMUM FIXING FOR EACH JOINT |
|---|---|
| **Floor Framing** | |
| Bearer to Timber Stump/Post | 4/75 x 3.75 Ø nails **plus** 1/30 x 0.8 mm G.I. strap over bearer and fixed both ends to stump with 4/2.8 mm Ø each end.<br>**OR** 1/M10 bolt through bearer halved to stump.<br>**OR** 1/M12 cranked bolt fixed vertically through bearer and bolted to stump **plus** 4/75 x 3.75 mm Ø nails. |
| Bearer to Masonry Column/Wall/ Pier (excluding brick veneer construction) | 1/M10 bolt or 1/50 x 4 mm M.S. bar fixed to bearer with M10 bolt and cast into masonry (to footing). |
| Bearer to Concrete Stump /Post or Pier in masonry veneer. | 1/6 mm Ø rod cast into stump, vertically through bearer and bent over. |
| Bearers to Steel Post | 1/M10 coach screw or bolt. |
| Floor Joist to Bearer | 2/75 x 3.1 mm Ø nails |
| **Wall Framing** | |
| Plates to Studs | Plates up to 38 mm thick - 2/75 mm nails through plate.<br>Plates 38 to 50 mm thick - 2/90 mm nails through plate.<br>**OR** 2/75 nail skewed or through nailed. |
| Noggings to Studs | 2/75 mm nail skewed or through nailed. |
| Timber Braces to Studs or Plates | 2/50 x 2.8 mm Ø nails at each joint. |
| Bottom Plates to Joists | Plates up to 38 mm thick - 2/75 mm nails at 600 mm (max.) centres<br>Plates 38 to 50 mm thick - 2/90 nails at 600 mm (max.) centres. |
| Bottom Plates to Concrete Slab | Masonry anchor, screw or bolt at not more than 1200 mm centres. |
| Multiple Studs | 1/75 mm nail at 600 centres (max.) |
| Posts to Bearers or Joists | 1/M12 or 2/M10 bolts (unless otherwise specified for tie-down). |
| **Roof Framing** | |
| Roof Trusses to Top Plates | To manufacturers recommendation<br>**OR** One framing anchor with three nails to each leg.<br>**OR** 1/30 x 0.8 mm G.I. strap over truss with strap ends fixed to plate with 3/2.8 mm Ø nails **plus** 2.75 mm skew nails. |
| Ceiling Joists to Top Plates | 2.75 mm skew nails **plus** where adjoining a rafter 1 x M10 bolt to every alternate rafter. |
| Rafters to Top Plates | 2/75 mm skew nails **plus** where adjoining a ceiling joist 1/75 or 1/90 mm nail fixing joist to rafter. |
| Collar Ties to Rafters | 1/M10 bolt for ties over 4.2 m or 2/75 mm nails for ties up to 4.2 m long. |
| Verandah Plates and Roof Beams to Post | 1/M12 or 2/M10 bolts (unless otherwise specified for tie-down). |

**Table 3.4.3.9**

**CONNECTION/FIXINGS FOR W41**

**Legend:** Nominal = Nominal Connection, refer Table 3.4.3.5.
N/A = Not Applicable

**Note:** Maximum spacing of battens 330 mm tile roof, 900mm sheet roof.

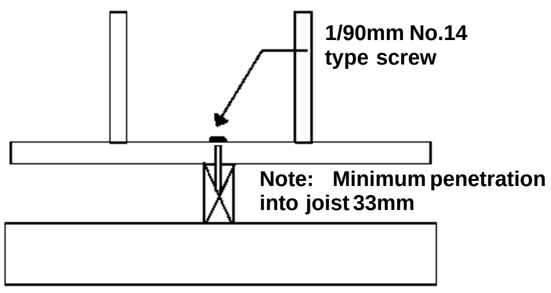
| JOINT/CONNECTION POSITION | CONNECTION/FIXING METHOD | | | |
|---|---|---|---|---|
| | RAFTERED ROOF (Maximum Rafter Span 3000 mm) | | TRUSSED ROOF (Maximum Truss Span 12000 mm) | |
| | Sheet Roof | Tile Roof | Sheet Roof | Tile Roof |
| **Bearers to Stumps, Piers etc.** | Nominal | Nominal | Nominal | Nominal |
| **Floors Joists to Bearers** | Nominal | Nominal | Nominal | Nominal |
| **Bottom Plates to Joists** | Method 1 or 2 @ each joist | Nominal | Method 1 or 2 each joist | Nominal |
| **Bottom Plates to Slab** | Method 4 to 6 @ 1200 crs. | Nominal | Method 4 to 6 1200crs. | Nominal |
| **Studs to Bottom Plates and Top Plates to Stud or Lintel** | Method 7 to 10 @ 1800 crs. | Method 7 to 10 @ 1800 crs. | Method 9 to 10 @ 1800 crs. | Method 9 to 10 @ 1800 crs. |
| **Studs at sides of Openings** | | | | |
| **Opening up to** | | | | |
| **1800** | Method 11 to 15 | Method 10 to 15 | Method 13 to 15 | Method 11 to 15 |
| **1800 - 2400** | Method 11 to 15 | Method 10 to 15 | Method 14 to 15 | Method 11 to 15 |
| **Rafters/Trusses to Top Plates, Underpurlins or Ridge** | Method 17 to 21 @ each rafter/truss | Method 16 to 21 each rafter/truss | Method 19 or 21 @ each rafter/truss | Method 16 to 21 @ each rafter/truss |
| **Ridgeboard/Beam or Underpurlins to Internal Walls** | Method 22 @ 1800 crs. | Method 22 @ 1800 crs. | N/A | N/A |
| **Roof Batten to Rafters/Trusses** | Method 27 to 30 | Method 23 to 30 | Method 27 to 30 | Method 23 to 30 |

**Figure 3.4.3.18**

**CONNECTION METHODS**

**a. BOTTOM PLATES TO JOISTS/BEARERS**

**METHOD 1**




**METHOD 2 - use M10 cuphead bolt**
**METHOD 3 - use M12 cuphead bolt**

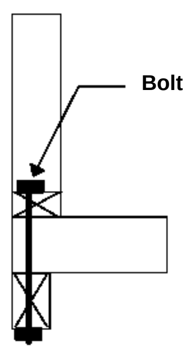



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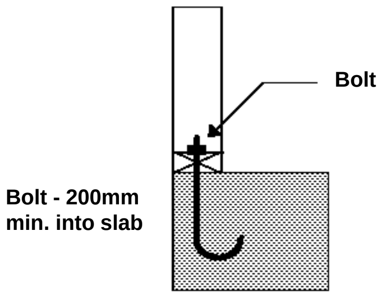
**Figure 3.4.3.18 (cont.)**

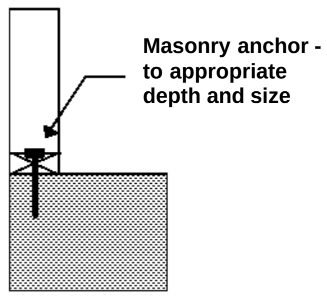
**CONNECTION METHODS**

**b. BOTTOM PLATES TO CONCRETE SLAB**

**METHOD 4 - use M10 cuphead bolt**
**METHOD 5 - use M12 cuphead bolt**

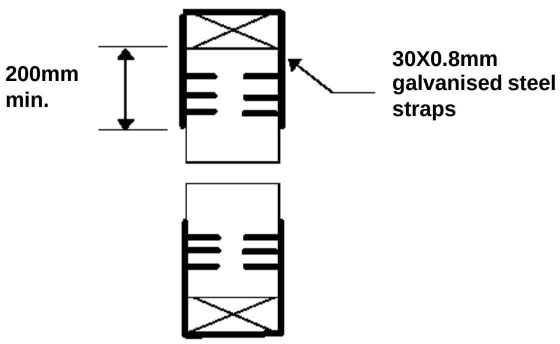



**METHOD 6**

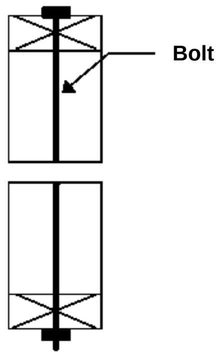



**c. STUDS TO PLATES OR LINTELS (AT OPENINGS)**

METHOD 7 **- use 3/2.8 dia. each end of strap**
METHOD 8 **- use 4/2.8 dia. each end of strap**

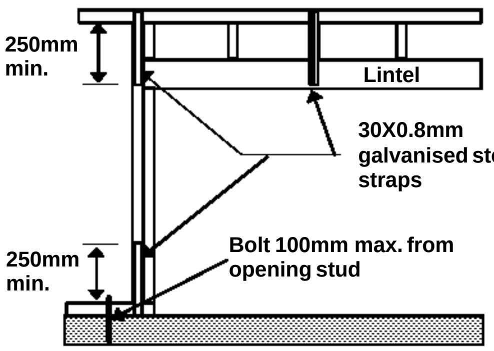



METHOD 9 **- use M10 cuphead bolt**
METHOD 10 **- use M12 cuphead bolt**




**d. STUDS AT SIDE OF OPENINGS**

METHOD 11 **- use 3/2.8 dia. nails each end of strap**




METHOD 12 **-. 4/2.8 dia. nails each end of strap**
METHOD 13 **-. 6/2.8 dia. nails each end of strap**

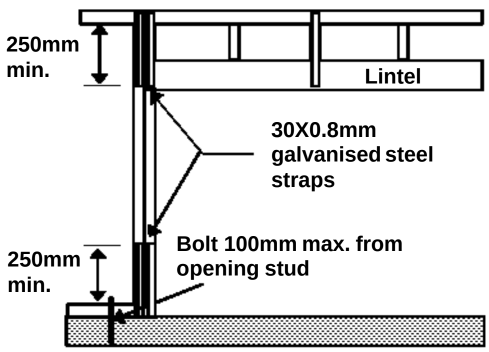



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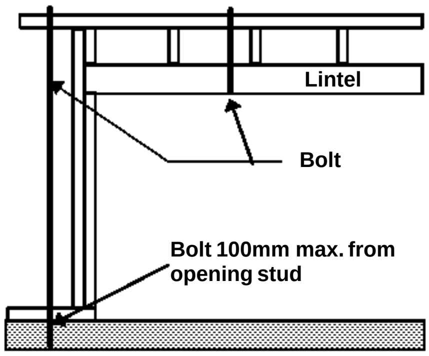
**Figure 3.4.3.18 (cont.)**

**FRAME CONNECTION METHODS**

**d. STUDS AT SIDE OF OPENINGS (cont.)**

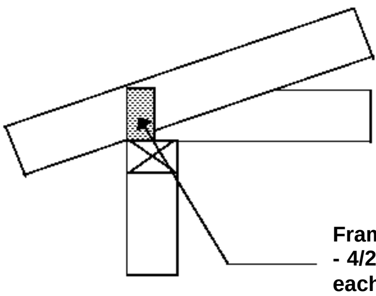
**METHOD 14 - use M10 cuphead bolt** **METHOD 15 - use M12 cuphead bolt**



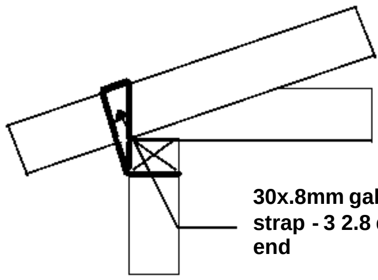

**e. RAFTERS/TRUSSES TO TOP PLATES, UNDERPURLINS OR RIDGE**

**Note:** Rafters nailed to top plate with 2/75mm skew nails.

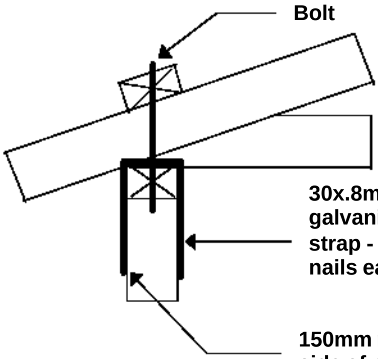
**METHOD 16 - 1/framing anchor**
**METHOD 17 - 2/framing anchors**




**METHOD 18**




**METHOD 19 - use M10 cuphead bolt**




**METHOD 20 - use 30x0.8mm strap**
**METHOD 21 - use 2/30x0.8mm straps**

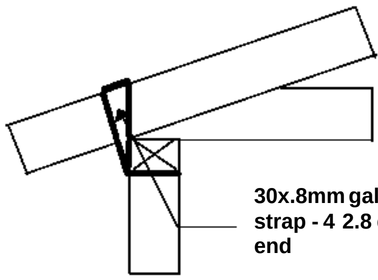







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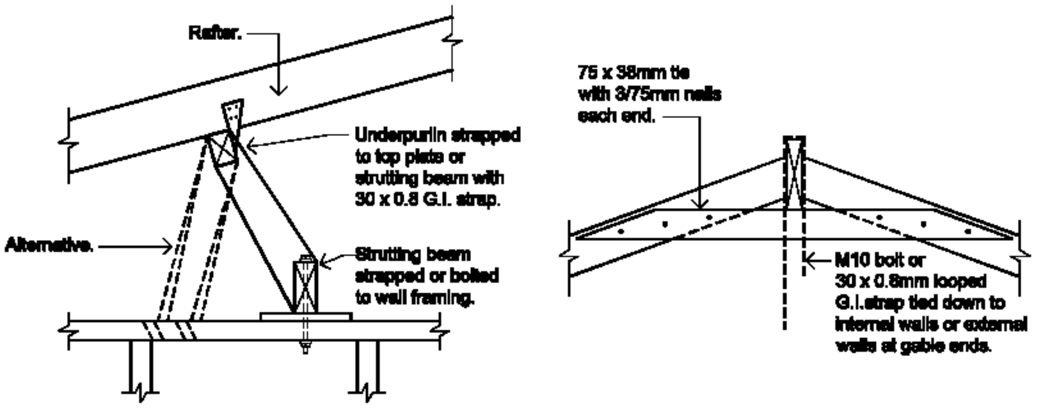
**Figure 3.4.3.18 (cont.)**

**FRAME CONNECTION METHODS**

**f. RIDGEBOARD/BEAM OR UNDERPURLIN TO INTERNAL WALLS**

**METHOD 22**

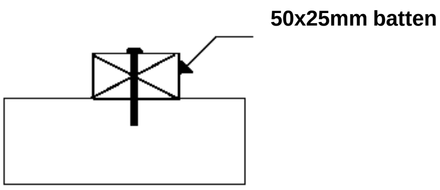



**g. ROOF BATTENS TO RAFTERS/TRUSSES**

**METHOD 23 - 1/65X2.8mm nail**

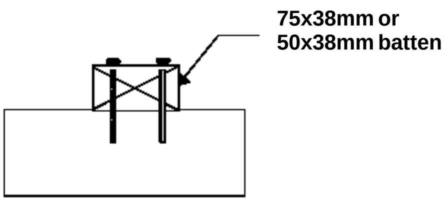
**METHOD 24 - 1/75X3.15mm nail**

**METHOD 25 - 1/75X3.15mm grooved nail**




Note: Minimum penetration into rafter 50mm

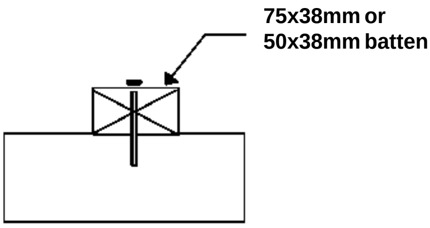
**METHOD 26 - 2/75X3.15mm grooved nails**




Note: Minimum penetration into rafter 38mm

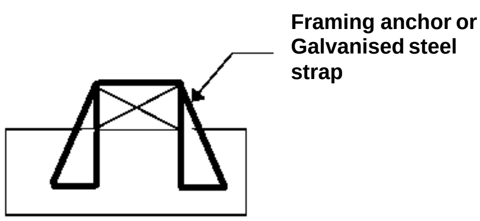
**METHOD 27 - 1/75mm No. 14 Type screw 38mm min. penetration into receiving member**

**METHOD 28 - 1/90mm No. 14 Type screw 50mm min. penetration into receiving member**




**METHOD 29 - use 2 framing anchors - 4/2.8mm nails each leg**

**METHOD 30 - use 30x0.8mm strap - 4/2.8mm nails each end**



**3.4.3.8 Bracing of timber frames**

Timber frames must be braced in accordance with the following -

(a) timber sub-floors must be braced in accordance with the appropriate method described in 3.2.5; and

(b) timber walls must be braced in accordance with the appropriate method described in 3.4.3.8(d); and

(c) roof framing must be braced in accordance with one of the acceptable construction manuals described in 3.4.3.0.

(d) Wall bracing

Bracing must be provided to resist horizontal forces applied to the building during and after construction as follows:

(i) Temporary bracing must -

(A) be provided during construction; and

(B) be at least equivalent to 60% of the permanent bracing required in Table 3.4.3.11; and

(C) may consist of either part of the permanent bracing such as diagonal timber, metal angle or sheet bracing; or temporary braces; and

(D) be installed prior to the installation of the roof frame.

(ii) Permanent wall bracing must -

(A) be provided in accordance with the appropriate method described in Table 3.4.3.11; and

(B) be at right angles to both the length and width of the building; and

(C) be evenly distributed as shown in Figure 3.4.3.19; and

(D) for every internal and external wall have -

(aa) a diagonal timber brace or diagonal metal angle; or

(bb) sheet braces with a minimum width of 900mm; and

(E) have two braces installed in each wall where the length of wall permits; and

(F) where 2 diagonal braces are used in a length of wall they must be in opposing directions; and

(G) be located as near as possible to external corners.

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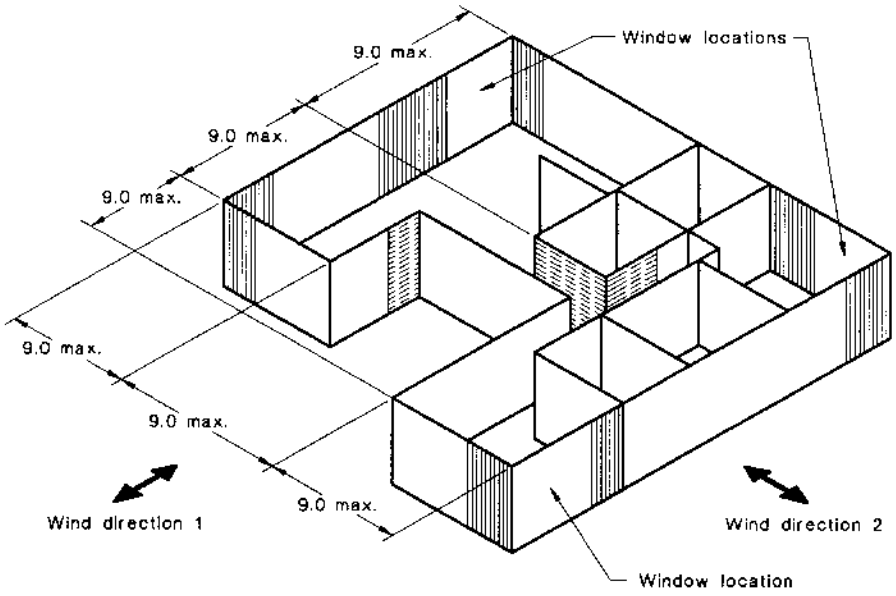
**Figure 3.4.3.19**

**DISTRIBUTION OF BRACING WALLS**

**Note:** x = 9 m for areas with a *design wind speed* of W28-W41




**LEGEND**

= A minimimum of two bracing units in each overall wall length of external walls

= Other bracing units distributed evenly

**Table 3.4.3.11**

**WALL BRACING REQUIREMENTS**

**Note:** For brace installation details see:

1. Method 1 and 2 - Figure 3.4.3.20 for metal bracing and 3.4.3.21 for sheet bracing; or
2. Method 3 - refer to one of the acceptable construction manuals listed in 3.4.3.0.

| BUILDING WIDTH(m) | METHOD OF WALL BRACING | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DESIGN WIND SPEED | | | | | | | | |
| | W28 | | | W33 | | | W41 | | |
| | Roof Slope (degrees) | | | Roof Slope (degrees) | | | Roof Slope (degrees) | | |
| | 0 -10 | 10 -20 | 20 -30 | 0 -10 | 10 -20 | 20 -30 | 0 -10 | 10 -20 | 20 -30 |
| **6** | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| **8** | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| **10** | 1 | 1 | 2 | 1 | 1 | 2 | 3 | 3 | 3 |
| **12** | 1 | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 3 |

Figure 3.4.3.20

**SHEET BRACING DETAILS - METHOD 1 AND 2**

**Diagram a.** SHEET BRACING

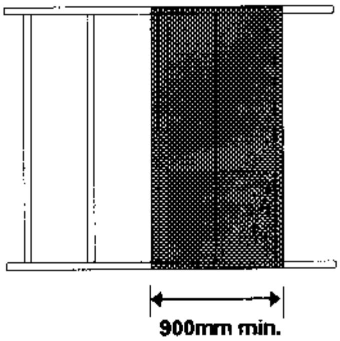



**Table a. SHEET BRACING THICKNESS (mm)**

| STRESS GRADE | PLYWOOD STUD SPACING | | HARDBOARD | | FIBRE CEMENT BRACING PANEL | |
|---|---|---|---|---|---|---|
| | 450 | 600 | | | | |
| **F11** | 4.5 | 7 | RD | 5.5<br>Minimum sheet width 1200mm | Flat sheet | 5 |
| **F14** | 4.0 | 6 | GP | 6.4<br>Minimum sheet width 900mm | Flat sheet | 6 |
| **F27** | 3.0 | 4.5 | - | - | - | - |

**Table b. FIXING FOR SHEET BRACING**

| BRACING MATERIAL | FIXING FROM SHEET EDGES (mm) | INTERMEDIATE STUD FIXING (mm) | EDGE STUD FIXING (mm) |
|---|---|---|---|
| **PLYWOOD** | 7 | 300 | 150 |
| **HARDBOARD** | 10 vertical edge - 20 top and bottom edges | 300 | 100 |
| **FIBRE CEMENT BRACING PANEL** | 12 except<br>50 from sheet corners | 150 | 100 |

**Note:** For the purposes of this Table:

1. Use flat head nails 2.8mm dia. x 30mm long min.
2. Panel edges should be supported by studs.
3. Maximum stud spacin g 600 mm

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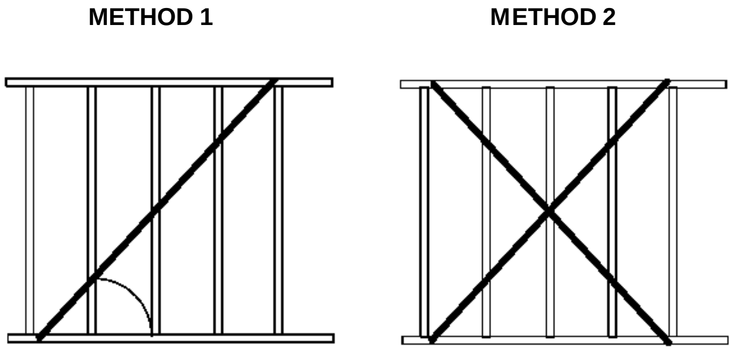
**Figure 3.4.3.21**

**METAL BRACING DETAILS**




**30° min. - 60° max. angle to braces (Method 1 and 2)**

**Table a. Metal bracing**

| METHOD (as per Table 3.4.3.11) | NUMBER OF BRACES PER WALL | FIXING | SPECIAL CONSIDERATIONS |
|---|---|---|---|
| **METHOD 1** | 1 | 2 each stud; and<br>3 each plate face | Nails - Flathead 30mmx2.8mm dia. |
| **METHOD 2** | 2 | 3 each stud; and<br>4 each plate face and top and bottom of plate | a. Nails - Flathead 30mmx3.15mm dia.<br>b. The brace is returned over the top of the plate and under the bottom plate and nailed |

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# PART 3.4.4 STRUCTURAL STEEL MEMBERS

**Appropriate performance requirements:**
Where an alternative structural steel member system is proposed to that described in Part 3.4.4, that proposal must comply with the structural performance requirement P2.1 in Section 2.

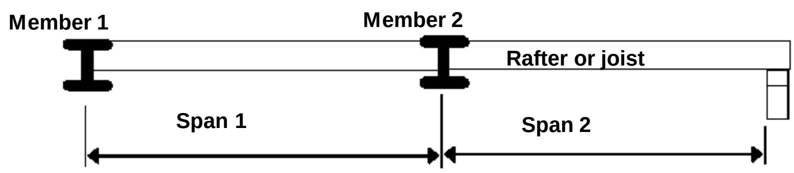


## Definitions

**3.4.4** The following definitions are used in this Part:

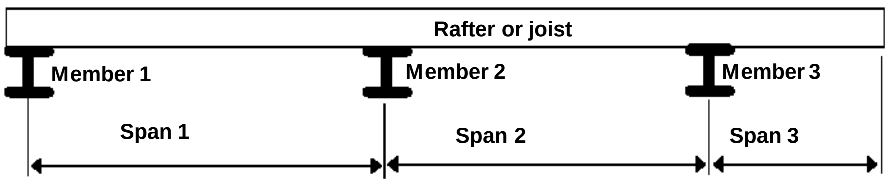
**Figure 3.4.4.0**
**EFFECTIVE MEMBER SPACING FOR STRUCTURAL STEEL BEARERS AND STRUTTING BEAMS**

**Diagram a.** **Single spanning rafter or joist**




| Design member | Member 1 | Member 2 |
|---|---|---|
| **Effective member spacing** | 0.5 x Span 1 | 0.5 x (Span 1 + Span 2) |

**Diagram b.** **Continuous spanning rafter or joist**




| Design member | Member 1 | Member 2 | Member 3 |
|---|---|---|---|
| **Effective member spacing** | 0.4 x Span 1 | 0.6 x (Span 1 + Span 2) | 0.5 x (Span 2) + Span 3 |

Steel member abreviations are as follows:

**TFB** means a tapered flange beam.

**UB** means a universal beam.

**RHS** means a rectangular hollow section.

**PFC** means a parallel flange chanel.

**TFC** means a tapered flange channel.

**EA** means an equal angle.

**UA** means an unequal angle.

**SHS** means a square hollow section.

**CHS** means a circular hollow section.

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## A. Acceptable construction manuals

**3.4.4.0** Performance requirement P2.1 is satisfied if structural steel sections are designed and constructed in accordance with one of the following manuals:

(a) AS 1250 - The use of steel in structures

(b) AS4100 - Steel structures

> **Explanatory information:**
>
> Composite construction: Design requirements for other materials used in combination with structural steel members are described in Part 3.4.2, 3.4.3 or Part 3.11 - Structural design.

## B. Acceptable construction practice

### 3.4.4.1 Application

Compliance with the acceptable construction practice provisions of Part 3.4.4 for structural steel members for Class 1 and 10 buildings satisfies performance requirement P2.1, provided-

(a) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

> **Explanatory Information:**
>
> 1. Information on *design wind speeds* for particular areas may be obtained from the *relevant approval authority*.
> 2. A map indicating cyclonic regions of Australia is contained in Part 3.10.2.

(b) Steel sections first dimensions to be vertical.

(c) All loads are uniformly distributed (unless otherwise noted or allowed for).

(d) for earthquake design, the building is defined as a design category H1 or H2 domestic structure in accordance with AS 1170.4.

**Explanatory Information:**

1. This covers all sites except those identified by the site investigation as having soft soil (having a soil profile with more than 5m of soft clay, loose sand, silt or uncontrolled fill) as defined by AS 1170.4.
2. For earthquake design H3, see Part 3.9.2.

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(e) The building is not constructed in an *alpine area*.

### 3.4.4.2 Structural steel members

(a) Structural steel members may be used as follows:

(i) Bearers supporting non-load bearing stud wall and timber floor, Figure 3.4.4.1.

(ii) Strutting beams supporting roof and ceiling loads, Figure 3.4.4.2.

(iii) Lintels supporting roof, ceiling, frame and timber floor, Figure 3.4.4.3.

(iv) Columns, 3.4.4.3.

(b) Structural steel members described in this Part must be protected against corrosion in accordance with 3.4.4.4.

(c ) Joists, bearers and lintels must be restrained from lateral movement or twisting along their length by -

(i) other construction as set out by AS 4100; or

(ii) fixing rafters or joists to the top flange of the member so that it prevents that member from moving laterally.

(d) End supports for joists, bearers and lintels must transfer loads to the footings and have a bearing distance as follows:

(i) for single spans is to be at least that of the width of the member; and

(ii) for continuous spans, internal bearing is to be at least 2 times the width of the member.

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**Figure 3.4.3.1**

**BEARER SUPPORTING A TIMBER FLOOR AND NON-LOADBEARING STUD WALL**

**Diagram a. - Bearer connection examples**

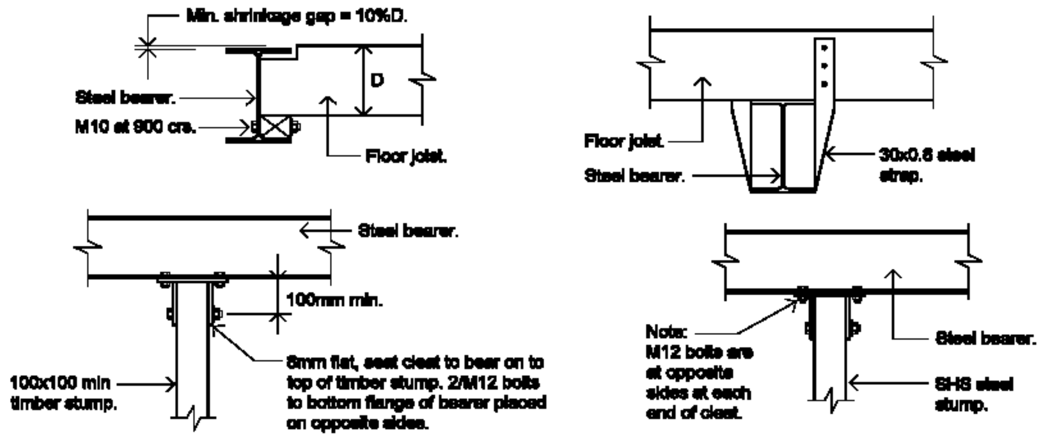


**Table a. - Acceptable bearer spans**

| Steel Section | SINGLE SPAN | | | | | CONTINUOUS SPAN | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Effective Bearer Spacing (m)* | | | | | *Effective Bearer Spacing (m)* | | | | |
| | *1.8* | *2.4* | *3.0* | *3.6* | *4.2* | *1.8* | *2.4* | *3.0* | *3.6* | *4.2* |
| | MAXIMUM SPAN OF BEARER (M) | | | | | MAXIMUM SPAN OF BEARER (M) | | | | |
| **125TFB** | 4.1 | 3.8 | 3.6 | 3.4 | 3.2 | 4.7 | 4.3 | 3.8 | 3.5 | 3.2 |
| **180UB16.1** | 5.1 | 4.7 | 4.5 | 4.3 | 4.1 | 5.9 | 5.5 | 5.2 | 5.0 | 4.7 |
| **200UB18.2** | 5.6 | 5.2 | 5.0 | 4.7 | 4.6 | 6.5 | 6.0 | 5.7 | 5.5 | 5.3 |
| **250UB25.7** | 6.8 | 6.4 | 6.0 | 5.8 | 5.6 | 7.9 | 7.4 | 7.0 | 6.7 | 6.4 |
| **250x150x9.0RHS** | 7.7 | 7.1 | 6.7 | 6.4 | 6.2 | 8.8 | 8.2 | 7.8 | 7.4 | 7.1 |
| **250x150x5.0RHS** | 6.8 | 6.3 | 5.9 | 5.7 | 5.5 | 7.8 | 7.2 | 6.8 | 6.5 | 6.3 |
| **310UB32.0** | 7.9 | 7.3 | 7.0 | 6.7 | 6.4 | 9.1 | 8.5 | 8.1 | 7.7 | 7.4 |
| **125x75x2.0RHS** | 3.1 | 2.8 | 2.6 | 2.5 | 2.4 | 4.0 | 3.7 | 3.5 | 3.3 | 3.1 |
| **125x75x3.0RHS** | 3.5 | 3.2 | 3.0 | 2.8 | 2.7 | 4.4 | 4.1 | 3.9 | 3.7 | 3.5 |
| **150x50x2.0RHS** | 3.4 | 3.1 | 2.8 | 2.7 | 2.5 | 4.2 | 3.9 | 3.7 | 3.5 | 3.4 |
| **150x50x3.0RHS** | 3.7 | 3.4 | 3.2 | 3.0 | 2.9 | 4.6 | 4.3 | 4.1 | 3.9 | 3.7 |
| **100TFC** | 3.2 | 2.9 | 2.7 | 2.6 | 2.4 | 3.7 | 3.2 | 2.8 | 2.6 | 2.4 |
| **150PFC** | 4.8 | 4.5 | 4.2 | 4.0 | 3.9 | 5.5 | 5.1 | 4.9 | 4.7 | 4.5 |
| **180PFC** | 5.4 | 5.1 | 4.8 | 4.6 | 4.4 | 6.3 | 5.9 | 5.6 | 5.3 | 5.1 |
| **200PFC** | 5.9 | 5.5 | 5.2 | 5.0 | 4.8 | 6.8 | 6.3 | 6.0 | 5.7 | 5.50 |
| **250PFC** | 7.2 | 6.7 | 6.4 | 6.1 | 5.9 | 8.4 | 7.8 | 7.4 | 7.1 | 6.8 |
| **300PFC** | 8.1 | 7.6 | 7.2 | 6.9 | 6.6 | 9.4 | 8.8 | 8.3 | 8.0 | 7.7 |

**Note:** For the purposes of this Table:

1. Steel is base grade
2. Load must be evenly distributed along the member.
3. For continuous floor bearers, the variation in span length should not be more than 10%.
4. See 3.4.2.3 for provisions that apply to suspended floors in single storey and ground floor construction of suspended steel floor frames.
5. Effective bearer spacing is a measure of the width of the load area being supported by the member, see Figure 3.4.4.0.

**Figure 3.4.4.2**

**STRUTTING BEAM SUPPORTING A ROOF AND CEILING**

**Diagram a. Strutting beam application**

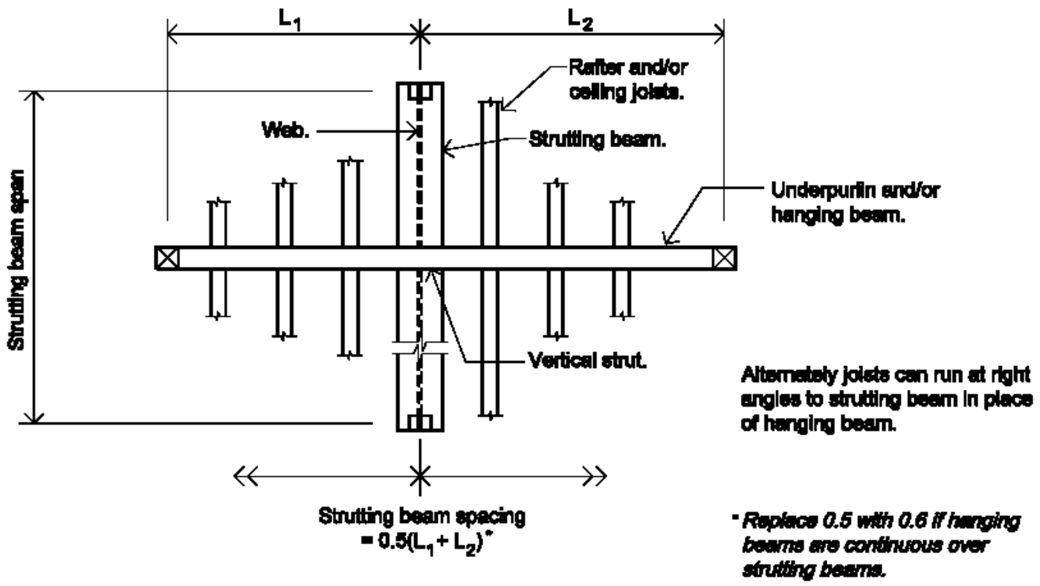


**Table a. - Acceptable strutting beam spans**

| Steel Section | STEEL SHEET ROOF | | | | | TILED ROOF | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Strutting Beam Spacing (m)* | | | | | *Strutting Beam Spacing (m)* | | | | |
| | *1.8* | *2.4* | *3.0* | *3.6* | *4.2* | *1.8* | *2.4* | *3.0* | *3.6* | *4.2* |
| | MAXIMUM SPAN OF STRUTTING BEAM (M) | | | | | MAXIMUM SPAN OF STRUTTING BEAM (M) | | | | |
| 125TFB | 5.7 | 5.4 | 5.1 | 4.9 | 4.6 | 4.9 | 4.6 | 4.4 | 4.2 | 4.1 |
| 150UB14.0 | 6.4 | 6.0 | 5.7 | 5.4 | 5.1 | 5.5 | 5.2 | 4.9 | 4.7 | 4.5 |
| 200UB18.2 | 7.9 | 7.4 | 7.1 | 6.8 | 6.5 | 6.9 | 6.4 | 6.1 | 5.8 | 5.6 |
| 250UB31.4 | 10.0 | 9.4 | 9.0 | 8.7 | 8.4 | 8.8 | 8.2 | 7.8 | 7.5 | 7.2 |
| 310UB46.2 | 11.9 | 11.3 | 10.8 | 10.5 | 10.1 | 10.6 | 10.0 | 9.5 | 9.1 | 8.8 |
| 100TFC | 4.6 | 4.4 | 4.2 | 3.9 | 3.7 | 4.0 | 3.7 | 3.6 | 3.4 | 3.2 |
| 150PFC | 6.7 | 6.3 | 6.0 | 5.8 | 5.6 | 5.8 | 5.5 | 5.2 | 5.0 | 4.8 |
| 200PFC | 8.2 | 7.7 | 7.4 | 7.1 | 6.8 | 7.2 | 6.7 | 6.4 | 6.1 | 5.9 |
| 250PFC | 10.0 | 9.4 | 9.0 | 8.7 | 8.4 | 8.8 | 8.2 | 7.8 | 7.5 | 7.3 |
| 300PFC | 11.1 | 10.5 | 10.1 | 9.7 | 9.4 | 9.8 | 9.3 | 8.8 | 8.4 | 8.2 |

**Note:**

1. If point load applied, then it should be located within the middle third of the strutting beam span.
2. Top and bottom flanges of strutting beam must be laterally restrained at the loading point.
3. Strutting beam must be tied down at the support points, in the case of steel sheet roofs
4. Steel is base grade.

**Figure 3.4.4.3**

**LINTELS SUPPORTING ROOF, FRAMES AND TIMBER FLOORS**

**Diagram a. - Lintels supporting roof and floors**

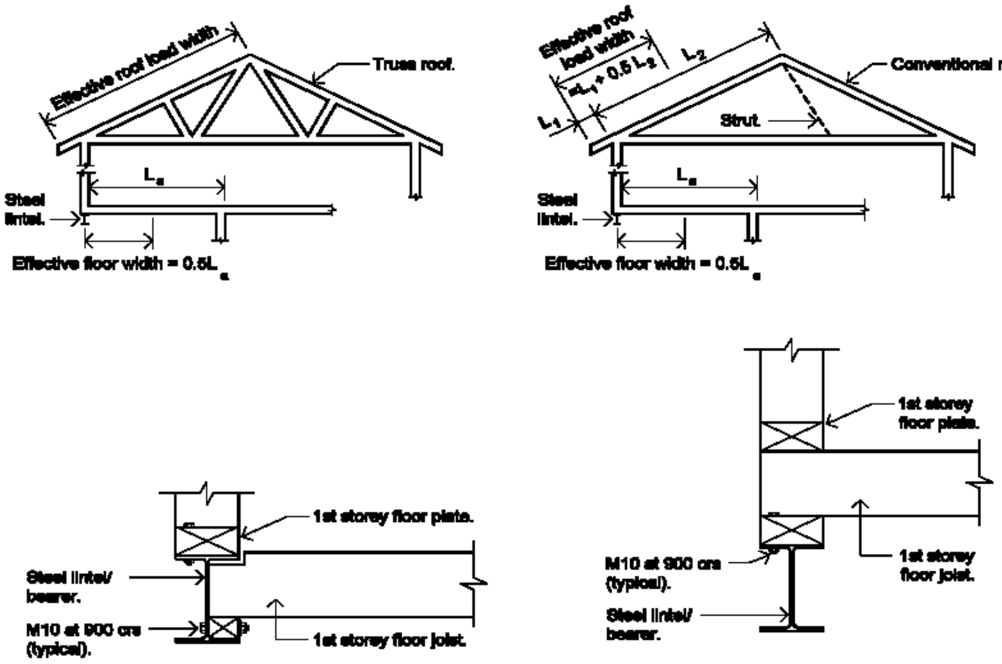


**Table a. - Acceptable spans for lintels**

| Steel Section | STEEL SHEET ROOF | | | | | TILED ROOF | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Effective Load Width (m) | | | | | Effective Load Width (m) | | | | |
| | 1.8 | 2.4 | 3.0 | 3.6 | 4.2 | 1.8 | 2.4 | 3.0 | 3.6 | 4.2 |
| | MAXIMUM SPAN OF LINTEL (M) | | | | | MAXIMUM SPAN OF LINTEL (M) | | | | |
| 125TFB | 3.7 | 3.4 | 3.2 | 3.0 | 2.8 | 3.6 | 3.3 | 3.0 | 2.9 | 2.7 |
| 150UB14.0 | 4.1 | 3.9 | 3.7 | 3.5 | 3.3 | 4.0 | 3.7 | 3.5 | 3.3 | 3.2 |
| 200UB25.4 | 5.6 | 5.3 | 5.0 | 4.8 | 4.7 | 5.4 | 5.1 | 4.8 | 4.6 | 4.5 |
| 250UB31.4 | 6.6 | 6.2 | 5.9 | 5.7 | 5.5 | 6.3 | 6.0 | 5.7 | 5.4 | 5.2 |
| 100TFC | 2.8 | 2.6 | 2.4 | 2.3 | 2.1 | 2.7 | 2.5 | 2.3 | 2.1 | 2.0 |
| 150PFC | 4.4 | 4.1 | 3.9 | 3.7 | 3.6 | 4.2 | 3.9 | 3.7 | 3.6 | 3.4 |
| 200PFC | 5.4 | 5.0 | 4.8 | 4.6 | 4.4 | 5.1 | 4.8 | 4.6 | 4.4 | 4.2 |
| 250PFC | 6.6 | 6.2 | 5.9 | 5.7 | 5.5 | 6.3 | 6.0 | 5.7 | 5.4 | 5.3 |
| 75x75x5EA | 1.3 | 1.2 | 1.1 | - | - | 1.3 | 1.1 | - | - | - |
| 90x90x6EA | 1.9 | 1.6 | 1.5 | 1.3 | 1.2 | 1.7 | 1.5 | 1.4 | 1.3 | 1.2 |
| 100x100x6EA | 2.0 | 1.8 | 1.6 | 1.5 | 1.4 | 1.9 | 1.7 | 1.5 | 1.4 | 1.3 |
| 125x75x6UA | 2.3 | 2.0 | 1.8 | 1.7 | 1.5 | 2.2 | 1.9 | 1.7 | 1.6 | 1.4 |
| 150x100x10UA | 3.9 | 3.6 | 3.2 | 2.9 | 2.7 | 3.7 | 3.3 | 3.0 | 2.8 | 2.6 |

**Note:**

1. Top flange of lintel must be laterally restrained at the loading points
2. Load must be evenly distributed along the member, eg joists
3. Angle lintels - first dimension corresponds to vertical leg, eg 100x75x6UA, 100 mm leg is vertical.
4. For lintels supporting masonry walls, see 3.3.3.

### 3.4.4.3 Columns

Columns may support the area provided for in Table 3.4.4.1 provided:

(a) The effective height of the column is determined in accordance with Figure 3.4.4.4; and

(b) the floor area to be supported is determined in accordance with Figure 3.4.4.5; and

(c) the load eccentricity between the centre of the column and the applied vertical loading complies with Figure 3.4.4.6.



**Figure 3.4.4.4**

**DETERMINING EFFECTIVE COLUMN HEIGHT**

**Note:** For the purposes of this Figure, to determine the column effective height, the actual column height (H) in Diagram a. must be multiplied by a column height factor (F1) in Table a.

**Diagram a. Column height (H)**

**Note:** H = Distance measured from the top of footing to underside of supported beam or bearer, or between intermediate lateral bracing points.

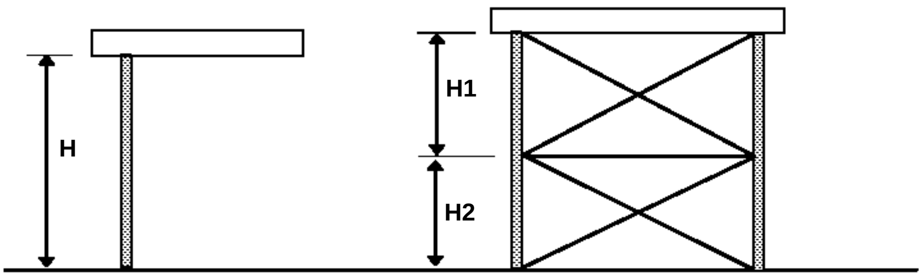


**Table a. COLUMN HEIGHT FACTOR (F1)**

| BASE DETAIL | BRACING SYSTEM: Fully Braced [(1)] Construction | BRACING SYSTEM: Unbraced Construction (cantilever columns) [(2)] |
|---|---|---|
| Cast into footing | 1.00 | 2.60 |
| Fixed by bolts to footing or slab | 1.20 | must not be used |
| Fixed by intermediate floor or bracing in both directions | 1.20 | 2.60 |

**Note:** For the purposes of this Table:

1. Flooring system is fully braced to footing level by a combination of column bracing sets, and timber or masonry bracing walls
2. Flooring system is braced to footing level by the provision of cantilever steel columns only (ie no column bracing sets, timber or masonry bracing walls)

**Figure 3.4.4.5**

**DETERMINING FLOOR AREA SUPPORTED**

**Note:** Total area supported

The total are supported depends on the position of the column in the structure as shown in Figure a. To calculate the correct area supported by a column, match the column's position with those shown in Diagram a. which shows a plan view of a floor and then calculate the total area supported from Table a.

**Diagram a. AREA SUPPORTED BY COLUMNS (Plan view)**

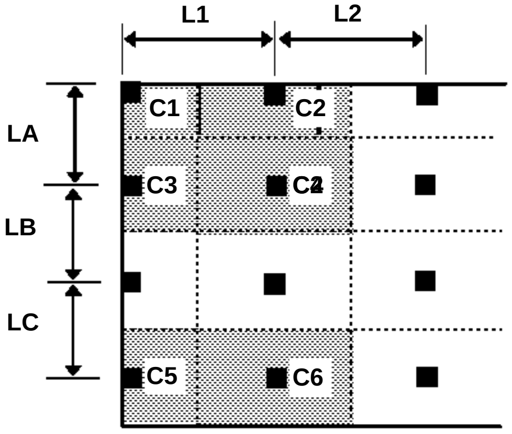


**Table a. AREA SUPPORTED BY COLUMNS**

| COLUMN | TOTAL AREA SUPPORTED |
|---|---|
| C1 | 0.375L1 x 0.375LA |
| C2 | 0.625(L1 + L2) x 0.375LA |
| C3 | 0.375L1 x 0.625(LA + LB) |
| C4 | 0.625(L1 + L2) x 0.625(LA + LB) |
| C5 | 0.375L1 x (L cant + 0.5LC) |
| C6 | 0.625(L1 + L2) x (L cant + 0.5LC) |

**Figure 3.4.4.6**

**ACCEPTABLE LOAD ECCENTRICITY FOR COLUMNS**

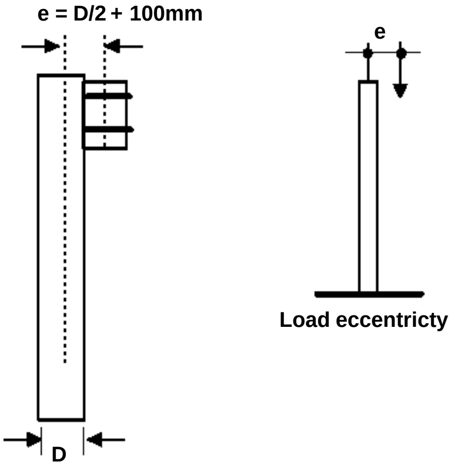






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**Table 3.4.4.1**

**COLUMNS - SUPPORTING TIMBER FLOOR ONLY**

**Note:** Tabulated values are the columns sections to be used

| COLUMN EFFECTIVE HEIGHT (mm) | | FLOOR AREA SUPPORTED ($m^2$) | | | | |
|---|---|---|---|---|---|---|
| | | 5 | 10 | 15 | 20 | 25 |
| CHS C250 | 600 | 60.3 x 3.6 | 88.9 x 4.0 | 101.6 x 5.0 | 114.3 x 5.4 | 139.7 x 5.0 |
| | 1200 | 60.3 x 4.5 | 88.9 x 4.0 | 101.6 x 5.0 | 114.3 x 5.4 | 139.7 x 5.0 |
| | 1800 | 60.3 x 4.5 | 88.9 x 4.0 | 101.6 x 5.0 | 114.3 x 5.4 | 139.7 x 5.0 |
| | 2400 | 60.3 x 4.5 | 88.9 x 4.0 | 101.6 x 5.0 | 114.3 x 5.4 | 139.7 x 5.0 |
| | 3600 | 76.1 x 3.6 | 101.6 x 4.0 | 114.3 x 4.5 | 139.7 x 5.0 | 139.7 x 5.0 |
| CHS C350 | 600 | 60.3 x 2.9 | 88.9 x 2.6 | 101.6 x 3.2 | 114.3 x 3.6 | 139.7 x 3.5 |
| | 1200 | 60.3 x 2.9 | 88.9 x 2.6 | 101.6 x 3.2 | 114.3 x 3.6 | 139.7 x 3.5 |
| | 1800 | 60.3 x 2.9 | 101.6 x 2.6 | 114.3 x 3.2 | 114.3 x 3.6 | 139.7 x 3.5 |
| | 2400 | 76.1 x 2.3 | 101.6 x 2.6 | 114.3 x 3.2 | 139.7 x 3.0 | 139.7 x 3.5 |
| | 3600 | 88.9 x 2.6 | 101.6 x 2.6 | 114.3 x 3.2 | 139.7 x 3.0 | 165.1 x 3.0 |
| SHS C350 | 600 | 50 x 50 x 2.5 | 75 x 75 x 2.5 | 75 x 75 x 4.0 | 100 x 100 x 4.0 | 100 x 100 x 4.0 |
| | 1200 | 65 x 65 x 2.0 | 75 x 75 x 2.5 | 75 x 75 x 4.0 | 100 x 100 x 4.0 | 100 x 100 x 4.0 |
| | 1800 | 65 x 65 x 2.0 | 75 x 75 x 3.0 | 100 x 100 x 3.0 | 100 x 100 x 4.0 | 100 x 100 x 4.0 |
| | 2400 | 65 x 65 x 2.0 | 75 x 75 x 3.0 | 100 x 100 x 3.0 | 100 x 100 x 4.0 | 100 x 100 x 5.0 |
| | 3600 | 65 x 65 x 2.5 | 75 x 75 x 4.0 | 100 x 100 x 3.0 | 100 x 100 x 4.0 | 100 x 100 x 5.0 |
| SHS C450 | 600 | 50 x 50 x 2.0 | 65 x 65 x 2.5 | 75 x 75 x 3.0 | 100 x 100 x 2.8 | 100 x 100 x 3.3 |
| | 1200 | 50 x 50 x 2.0 | 65 x 65 x 2.5 | 75 x 75 x 3.0 | 100 x 100 x 3.0 | 100 x 100 x 3.3 |
| | 1800 | 50 x 50 x 2.3 | 75 x 75 x 2.3 | 75 x 75 x 3.3 | 100 x 100 x 3.0 | 100 x 100 x 3.8 |
| | 2400 | 65 x 65 x 2.0 | 75 x 75 x 2.5 | 75 x 75 x 3.5 | 100 x 100 x 3.0 | 100 x 100 x 3.8 |
| | 3600 | 65 x 65 x 2.3 | 100 x 100 x 2.0 | 100 x 100 x 2.8 | 100 x 100 x 3.8 | 100 x 100 x 4.0 |

**COLUMNS - SUPPORTING TILE ROOF ONLY**

| COLUMN EFFECTIVE HEIGHT (mm) | | FLOOR AREA SUPPORTED ($m^2$) | | | | |
|---|---|---|---|---|---|---|
| | | 5 | 10 | 15 | 20 | 25 |
| CHS C250 | 600 | 60.3 x 3.6 | 60.3 x 3.6 | 76.1 x 3.6 | 76.1 x 4.5 | 88.9 x 4.0 |
| | 1200 | 60.3 x 3.6 | 60.3 x 3.6 | 76.1 x 3.6 | 76.1 x 4.5 | 101.6 x 4.0 |
| | 1800 | 60.3 x 3.6 | 60.3 x 3.6 | 76.1 x 3.6 | 76.1 x 4.5 | 101.6 x 4.0 |
| | 2400 | 60.3 x 3.6 | 60.3 x 4.5 | 76.1 x 3.6 | 88.9 x 4.0 | 101.6 x 4.0 |
| | 3600 | 60.3 x 3.6 | 76.1 x 3.6 | 76.1 x 4.5 | 88.9 x 4.0 | 101.6 x 4.0 |
| CHS C350 | 600 | 60.3 x 2.3 | 60.3 x 2.3 | 76.1 x 2.3 | 88.9 x 2.6 | 101.6 x 2.6 |
| | 1200 | 60.3 x 2.3 | 60.3 x 2.9 | 76.1 x 2.3 | 88.9 x 2.6 | 101.6 x 2.6 |
| | 1800 | 60.3 x 2.3 | 60.3 x 2.9 | 88.9 x 2.6 | 88.9 x 2.6 | 101.6 x 2.6 |
| | 2400 | 60.3 x 2.3 | 76.1 x 2.3 | 88.9 x 2.6 | 88.9 x 2.6 | 101.6 x 2.6 |
| | 3600 | 60.3 x 2.3 | 76.1 x 2.3 | 88.9 x 2.6 | 101 x 2.6 | 101.6 x 3.2 |
| SHS C350 | 600 | 50 x 50 x 2.0 | 50 x 50 x 2.5 | 65 x 65 x 2.5 | 75 x 75 x 2.5 | 75 x 75 x 3.0 |
| | 1200 | 50 x 50 x 2.0 | 50 x 50 x 2.5 | 65 x 65 x 2.5 | 75 x 75x 2.5 | 75 x 75 x 3.0 |
| | 1800 | 50 x 50 x 2.0 | 65 x 65 x 2.0 | 65 x 65 x 2.5 | 75 x 75 x 2.5 | 75 x 75 x 3.0 |
| | 2400 | 50 x 50 x 2.0 | 65 x 65 x 2.0 | 65 x 65 x 2.5 | 75 x 75 x 2.5 | 75 x 75 x 4.0 |
| | 3600 | 50 x 50 x 2.5 | 65 x 65 x 2.5 | 75 x 75 x 2.5 | 75 x 75 x 3.0 | 75 x 75 x 4.0 |
| SHS C450 | 600 | 50 x 50 x 1.6 | 50 x 50 x 2.0 | 65 x 65 x 2.0 | 65 x 65 x 2.3 | 65 x 65 x 2.8 |
| | 1200 | 50 x 50 x 1.6 | 50 x 50 x 2.0 | 65 x 65 x 2.0 | 65 x 65 x 2.3 | 65 x 65 x 2.8 |
| | 1800 | 50 x 50 x 1.6 | 65 x 65 x 1.6 | 65 x 65 x 2.0 | 65 x 65 x 2.5 | 75 x 75 x 2.5 |
| | 2400 | 50 x 50 x 1.6 | 50 x 50 x 2.5 | 65 x 65 x 2.3 | 75 x 75 x 2.3 | 75 x 75 x 2.8 |
| | 3600 | 50 x 50 x 2.0 | 65 x 65 x 2.0 | 75 x 75 x 2.3 | 100 x 100 x 2.0 | 100 x 100 x 2.3 |

### 3.4.4.4 Corrosion protection

Structural steel members must be protected against corrosion in accordance with Table 3.4.4.2.

**Explanatory Information:**

1. For internal steelwork, where the steel is situated in basically permanently dry location, the steel normally needs little or no protection
2. Beams over kitchens and bathrooms and the like, where moisture may be present may need increased protection.
3. All externally exposed steelwork needs to be protected. Table 3.4.4.1 provides recommendations for protective treatment in typical applications. For applications outside the scope of this table, seek specialist advice.



**Table 3.4.4.2**

**PROTECTIVE COATINGS FOR STEELWORK**

| ENVIRONMENT | LOCATION | MINIMUM PROTECTIVE COATING | |
|---|---|---|---|
| **MODERATE** | **INTERNAL** | No protection required | |
| More than 1 km from coast or non - heavy industrial areas | **EXTERNAL** | **Option 1.** | 2 coats alkyd primer; or |
| | | **Option 2.** | 2 coats alkyd gloss |
| | | **Option 3.** | Hot dip galvanise 300 g/ m$^2$ min |
| | | **Option 4.** | Hot dip galvanise 100 g/m$^2$ min plus - a. 1 coat solvent based vinyl primer; or b. 1 coat vinyl gloss or alkyd. |
| **SEVERE** Within 1 km from coast or heavy industrial areas | **INTERNAL** | **Option 1.** | 2 coats alkyd primer |
| | | **Option 2.** | 2 coats alkyd gloss |
| | **EXTERNAL** | **Option 1.** | Inorganic zinc primer plus 2 coats vinyl gloss finishing coats |
| | | **Option 2.** | Hot dip galvanise 300g/m$^2$ |
| | | **Option 3.** | Hot dip galvanise 100 g/m$^2$ min plus - a. 2 coats solvent based vinyl primer; or b. 2 coats vinyl gloss or alkyd. |

**Note:** For the purposes of this Table:

1. Heavy industrial areas means industrial environments around major industrial complexes. There are only a few such regions in Australia, examples of which occur around Port Pirie and Newcastle.
2. The outer and inner leaf of an external masonry wall of a building, including walls under open carports are considered to be external environments.
3. Where a paint finish is applied the surface of the steel work must be hand or power tool cleaned to remove any rust immediately prior to painting.
4. All zinc coatings (including inorganic zinc) require a barrier coat to stop conventional domestic enamels from peeling.
5. Refer to the paint manufacturer where decorative finishes are required on top of the minimum coating specified in the table for protection of the steel against corrosion.

PART 3.5

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# ROOF AND WALL CLADDING

# PART 3.5 CONTENTS



**Explanatory Information:**

These provisions relate to installing systems to waterproof roofs, walls and wall openings.

It should be noted that other construction methods may be used to achieve the same results as specified in this Part provided they comply with the appropriate performance requirement.





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# PART 3.5.1 ROOF CLADDING

**Appropriate performance requirements:**
Where an alternative roof cladding is proposed to that described in Part 3.5.1, that proposal must comply with the structural performance requirement P2.1 and the weatherproofing requirement P2.2.2 in Section 2.



## A. Acceptable construction manuals

**3.5.1.0** Performance requirements P2.1 and P2.2.2 are satisfied if cladding for roofs on Class 1 and 10 buildings complies with one of the following manuals:

(a) AS 2049 - Roof tiles.

(b) AS 2050 - Fixing of roofing tiles.

(c) AS 1562.1 - Design and installation of sheet roof and wall cladding.

(d) AS/NZ 4256 Pts 1, 2, 3 and 5; and AS 2424 - Plastic sheet roofing.

(e) AS 2908.1 - Cellulose fibre reinforced corrugated cement sheets (provided safety mesh is installed in accordance with AS 2424 Clause 2.3.3 as per PVC and GRP sheeting requirements).

(f) ASTM D3018-90 - Asphalt shingles.

(g) AS/NZ 4200 - Installation of pliable membrane and underlay.

## B. Acceptable construction practice

### 3.5.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.5.1 for roof cladding for Class 1 and 10 buildings satisfies performance requirements P2.1 and P2.2.2, provided -

(a) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**

1. Information on design wind speeds for particular areas may be obtained from the *relevant approval authority*.
2. A map indicating cyclonic regions of Australia is contained in Part 3.10.1.

(b) roof tiles are installed in accordance with 3.5.1.2; and

(c) sheet roofing is installed in 3.5.1.3.

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### 3.5.1.2 Roof tiling

(a) General

Roof tiles, complying with AS 2049, must be installed, fixed and flashed in accordance with the relevant provisions of this Part.

(b) Fixing

(i) Roof tiles on roofs with a pitch not more than 35 degrees must be fixed in accordance with Figure 3.5.1.1.

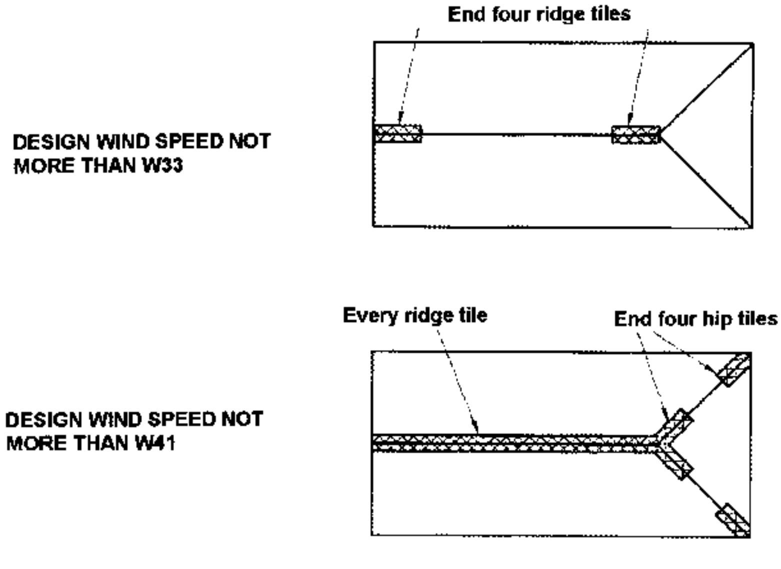
(ii) Fixings for roof battens and batten sizes must comply with Part 3.4.3.

(c) Weatherproofing of tiled roofs

All tiled roof flashings, ridge and hip tiles must be installed in accordance with Figure 3.5.1.2.

**Figure 3.5.1.1**

**RIDGE AND HIP TILES MECHANICAL FIXING REQUIREMENTS - PITCH NOT MORE THAN 35 DEGREES**




| Design wind speed | Tile fixing | | Ridge fixing (see Figure 3.5.1.1) | | Barge fixing |
|---|---|---|---|---|---|
| | Edge of roof | Field of roof | Ridge tiles | Hip ridge tiles | |
| <W33 | Mechanically fix each full tile in 2nd course and then either every 2nd tile in every course, or every tile in every 2nd course. | | Mechanically fix the end four ridge tiles | Mortar in accordance with Part 3.1.6 | Mechanically fix each barge tile |
| W33 - W41 | Mechanically fix each full tile in 2nd course | Mechanically fix each 2nd full tile | Mechanically fix every ridge tile | Mechanically fix the end four hip ridge tiles | Mechanically fix each barge tile |

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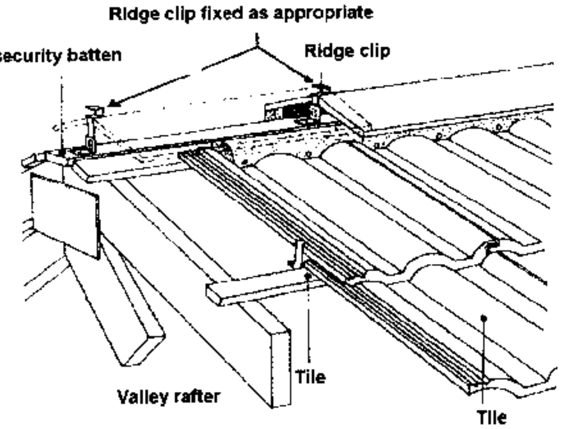
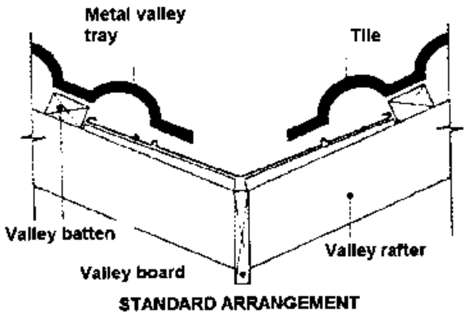
**Figure 3.5.1.2**

**TILED ROOF FLASHING AND OTHER DETAILS**

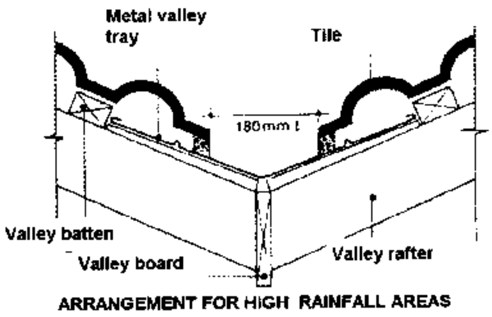
**a. Mechanical fixing-ridge clip (Also see Figure 3.5.1.1)**



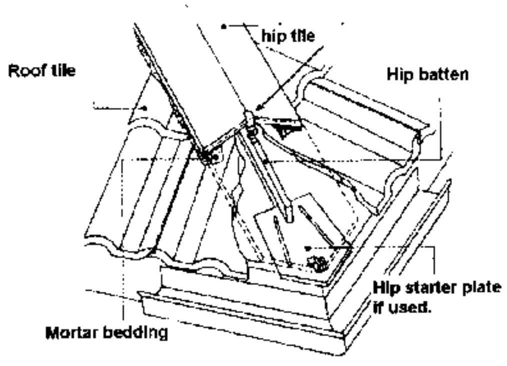

**b. Dry valley**




**c. Bedded and pointed valley**




**d. Fixing of hip tiles**



### 3.5.1.3 Metal sheet roofing

(a) Design and installation

The design and installation of metal sheet roofing must comply with the relevant provisions of this Part.

(b) Corrosion protection - coatings

Metal sheet roofing must be protected from corrosion in accordance with Table 3.5.1.1.

**Table 3.5.1.1**

**ACCEPTABLE CORROSION PROTECTION FOR SHEET ROOFING**

| ROOF ENVIRONMENT (as per Figure 3.4.4.7) | METAL COATING IN ACCORDANCE WITH AS 1397 | |
|---|---|---|
| | **Metallic coated steel** | **Metallic and organic coating** |
| **Moderate**<br>Inland areas with no salt or heavy industry pollution | a. Z450 galvanised<br>b. AZ150 zinc/aluminium | a. Z275 galvanised<br>b. AZ150 zinc/aluminium |
| **Severe**<br>Close to the sea with frequent onshore winds and in local areas with heavy industrial pollution | AZ200 | Not suitable |

(c) Corrosion protection - compatibility of materials

Where different metals are used in a roofing systems, including cladding, flashings, fasteners, downpipes etc, they must be compatible with each other (to prevent corrosion due to an adverse chemical reaction) as described in Table 3.5.1.2; and

(i) no lead materials can be used upstream from zinc- aluminium coated materials; and

(ii) no copper materials can be used upstream from galvanised coated materials.

(d) Fastening Systems

Metal sheet roofing must -

(i) be fixed at spacings in accordance with Figure 3.5.1.5; and

(ii) use fastening devices made of a compatible metal to the roofing as per 3.5.1.2 (c); and

(iii) when using both clipped and pierced fastening systems-

(A) employ an anti-capillary feature in the side lap of the sheet, to prevent capillary action drawing moisture into the lap and allowing the lap to drain (achieved by not over tightening the sheet fixings, see Figure 3.5.1.3); and

(B) wherever possible have the sheets laid so that the side lap is facing away from prevailing weather.

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**Table 3.5.1.2**

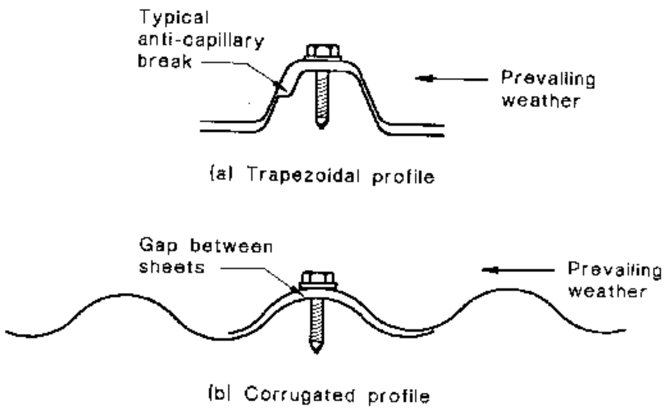
**ACCEPTABILITY OF CONTACT BETWEEN DIFFERENT ROOFING MATERIALS**

**Note**: For the purposes of this Table
No - means the metal cannot be used in association with the other metal; and
Yes - means the metal can be used in association with the other metal.

| CLADDING MATERIAL | ACCESSORY OR FASTENER MATERIAL | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Stainless steel | | Zinc- coated steel and Zinc | | Zinc/Aluminium coated steel | | Lead | |
| | Atmosphere Classification (S = Severe and M = Moderate environment as Per Table 3.5.1.3) | | | | | | | |
| | S | M | S | M | S | M | S | M |
| **Copper and copper alloys** | No | Yes | No | No | No | No | No | Yes |
| **Stainless steel (300 series)** | Yes | Yes | No | No | No | No | No | Yes |
| **Zinc-coated steel and zinc** | No | Yes | Yes | Yes | Yes | Yes | No | Yes |
| **Zinc/aluminium coated steel** | No | Yes | Yes | Yes | Yes | Yes | No | No |
| **Lead** | Yes | Yes | No | Yes | No | No | Yes | Yes |

**Figure 3.5.1.3**

**SIDE LAPPING FASTENING DETAIL**



(e) Laying of sheets

(i) Sheets must be laid wherever possible using complete lengths from ridge to eaves; or

(ii) where a complete length cannot be laid -

(A) each run should be laid in specific sequence (see Figure 3.5.1.4) from bottom to top before moving on to the next run; and

(B) the distance for end lapping where sheets meet is as follows:

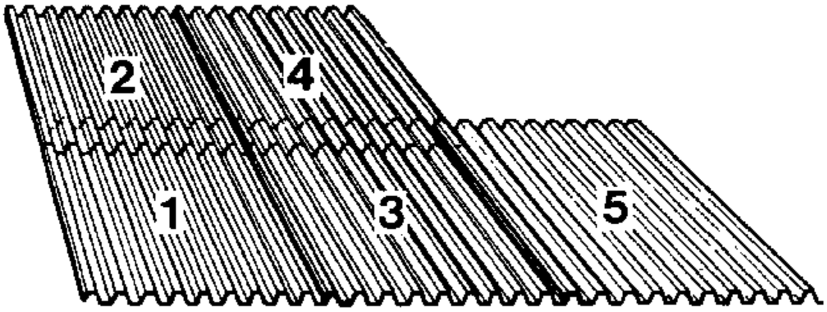
(aa) for roof slopes between 5-15 degrees (1 in 12 - 1 in 4), a lap of 200mm; and

(bb) for roof slopes above 15 degrees (1 in 4), a lap of 150mm; and

(iii) sheets must be stop ended (ie each valley turned up 60 degrees) at the ridge line of each length.

**Figure 3.5.1.4**

**SHEET LAYING SEQUENCE**




(f) Maximum span and pitch of metal roofs

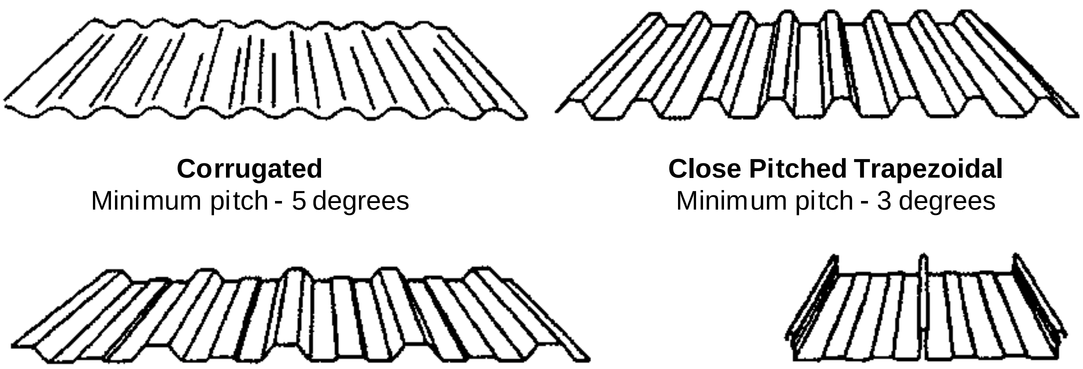
Metal sheet roofing must comply with the pitch and span limitations between roofing supports as described in Figure 3.5.1.5.

**Figure 3.5.1.5**

**MAXIMUM SPAN AND FIXING FOR METAL SHEET ROOFING**

**Note**: The end span of some trapezoidal roofing systems may need to be reduced to 1500 (see proprietary information).

**Diagram a.** **Typical profiles -** Pitch is appropriate for a sheet run up to 25m in length



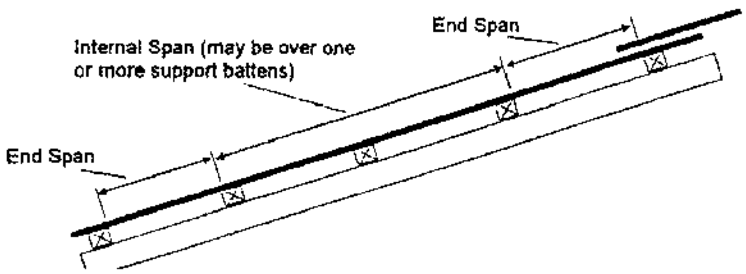
**Corrugated**
Minimum pitch - 5 degrees

**Close Pitched Trapezoidal**
Minimum pitch - 3 degrees

**Trapezoidal**
Minimum pitch - 3 degrees

**Concealed Fastened**
Minimum pitch - 1 degree

**Diagram b.** **End and internal roof spans**




**Note:** End span is also the end of sheets where they overlap with an adjoining sheet.

| PROFILE | BASE METAL THICKNESS (mm) | END SPAN (mm) | INTERNAL SPAN (mm) | FIXING (crest fastening) | |
|---|---|---|---|---|---|
| | | | | END SPAN | INTERNAL SPANS |
| **Corrugated** | 0.42 | 950 | 1200 | Every second rib | Every third rib |
| **Close pitched trapezoidal** | 0.42 | 1900 * | 2400 | Every rib | Every second rib |
| **Trapezoidal** | 0.42 | 1350 | 1700 | Every rib | |
| **Concealed Fasteners** | 0.48 | 1800 | 2100 | Every rib | |

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(g) Sheet metal roof flashings and cappings

(i) Roof flashings and cappings must be purpose made, machine-folded sheet metal sections of materials compatible with all up and downstream metal roof covering materials in accordance with 3.5.1.3(c).

(ii) The type of fasteners for flashings and cappings must comply with 3.5.1.2 (e).

(iii) The frequency of fastener fixings for transverse flashings and cappings must comply with Table 3.5.1.3.

**Table 3.5.1.3**
**FASTENER FREQUENCY FOR TRANSVERSE FLASHINGS AND CAPPINGS**

| ROOF TYPE | FIXING FREQUENCY | FASTENER TYPE |
|---|---|---|
| **Concealed fastened roofs** | Every rib | Rivets and self drilling screws |
| **Pierced fastened roofs** | Every 2nd Rib | Self drilling screws or rivets |
| **Corrugated roofs** | Every 4th Rib | Self drilling screws or rivets |

(iv) Joints in flashing and cappings must be 25mm minimum, fastened at intervals not exceeding 40mm and lapped in the direction of the fall of the roof.

(v) Wall and step flashings must be fastened into masonry walls with galvanised or zinc/aluminium sheet metal wedges at each end of each length and at intermittent intervals not exceeding 500mm and must overlap by 50mm minimum in the direction of flow.

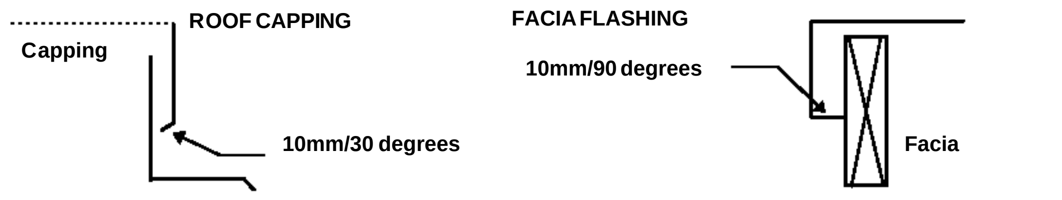
(vi) Lead flashings must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a potable (drinking) water catchment area.

(vii) Anti capillary breaks must be installed as follows and as per Figure 3.5.1.6 -

(A) for flat surfaces - 10 mm/30 degree fold; and

(B) all other surfaces - 10 mm/90 degree or 135 degree fold.

**Figure 3.5.1.6**
**ANTI CAPILLARY BREAKS**





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(viii) Acceptable flashing configurations are shown in Figure 3.5.1.7.

**Figure 3.5.1.7**
**ACCEPTABLE FLASHING DETAILS**

**Diagram a. Parapet flashing**

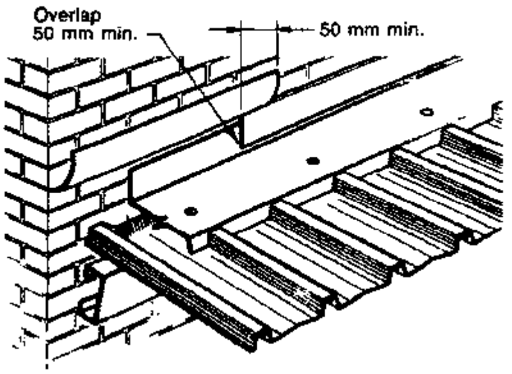
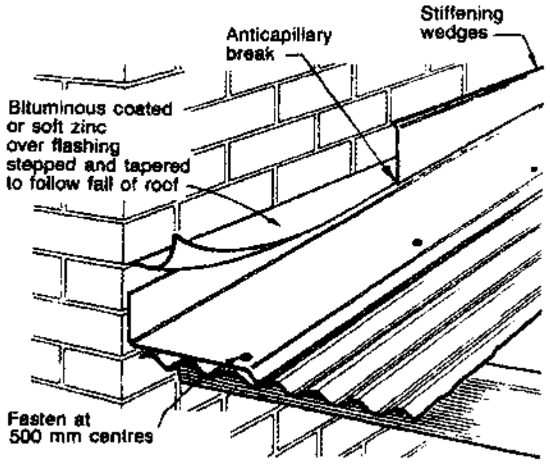



**Diagram b. Parapet and end wall flashing**




(h) Penetrations must be flashed as follows:
- (i) Collar flashings must permit the total drainage of the area above the penetration.
- (ii) On the completion of installation the roof structure must be restored to its original strength by installing roof trimmers and soaker supports as necessary.
- (iii) The type of fasteners for flashings and cappings must comply with 3.5.1.2(e).
- (vi) Lead flashings must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a potable water catchment area.
- (v) Acceptable flashing for penetration details are shown in Figure 3.5.1.8.
- (vi) Clearance for heating appliance roof support members must be in accordance with Part 3.7.3.

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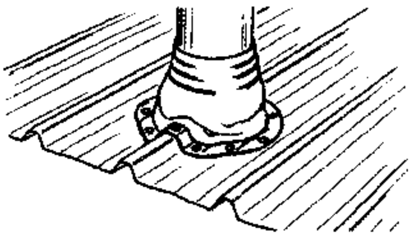
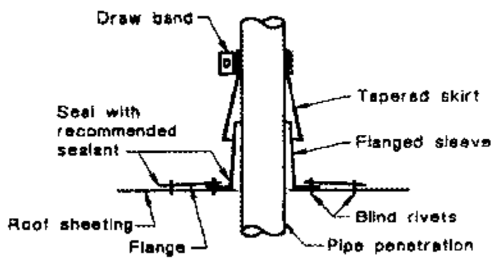
**Figure 3.5.1.8**

**TYPICAL ROOF PENETRATION FLASHING DETAILS**

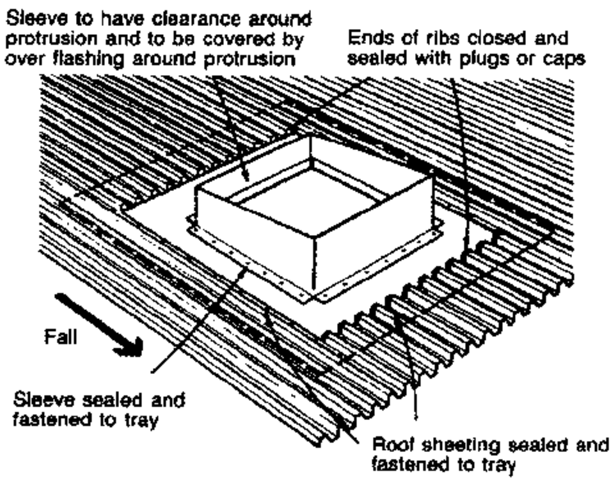
**a. PVC aprons**



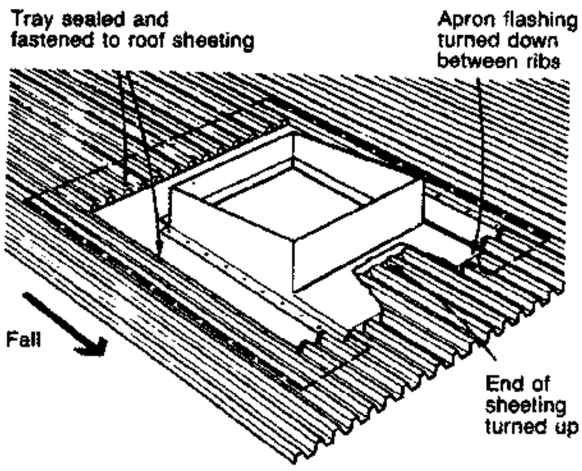
**b. Collar flashings**




**c. Large peneatrations - ribs stop ended and sealed**




**d. Large penetrations - using apron**

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# PART 3.5.2 GUTTERS AND DOWNPIPES

**Appropriate performance requirements:**
Where an alternative gutter and downpipe system is proposed to that described in Part 3.5.2, that proposal must comply with the weatherproofing performance requirements P2.2.1 and P2.2.2 in Section 2.



## A Acceptable construction manual

**3.5.1.0** Performance requirements P2.2.1 and P2.2.2 are satisfied if gutters and downpipes are designed and constructed in accordance with the following manual:

(a) AS 3500.3 - Stormwater drainage installations.

## B. Acceptable construction practice

### 3.5.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.5.2 for guttering and downpipes to roofs on Class 1 and 10 buildings where they are installed to control roof rainwater run-off satisfies performance requirements P2.2.1 and P2.2.2 provided -

(a) the roof drainage system is connected to a stormwater drainage system that complies with 3.1.2; and

(b) the roof drainage system is designed so that any overflow during heavy rain periods is prevented from flowing back into the building.

**Explanatory Information:**

1. The installation of drainage systems from roofs and sub-soil drains is optional. Accordingly these requirements need only be applied when these systems are used.
2. Information on drainage requirements outside the allotment can be obtained from the *relevant approval authority*.

### 3.5.2.2 Materials

Gutters, downpipes and flashings must be manufactured in accordance with:

(a) AS 2179 for metal; and

(b) AS 1273 for uPVC components; and

(c) be compatible with all upstream roofing materials in accordance with 3.5.1.2(c).

### 3.5.2.3 Selection of guttering

The size of guttering must -

(a) be in accordance with Table 3.5.2.2; and

(b) be suitable to remove rainwater falling at the appropriate rainfall intensity listed in Table 3.5.2.1 as follows -

(I) for eaves gutters - 20 year *average recurrence interval*; or

(ii) for internal box and valley gutters - 100 year *average recurrence interval.*

### 3.5.2.4 Installation of gutters

(a) Gutters must be installed to a minimum fall of -

(i) 1:500 for eaves gutters, unless fixed to metal facias; and

(ii) 1:100 for box gutters.

(b) Eaves gutters must be supported by brackets (securely fixed at stop ends) and at a maximum of 1200mm centres.

(c) Valley gutters on a roof pitch -

(i) greater than 12.5 degrees must have a minimum width of 400mm and be wide enough to allow the roof covering to overhang a minimum of 150mm each side of the gutter; or

(ii) less than 12.5 degrees must be designed as a box gutter.

### 3.5.2.5 Downpipes - size and installation

(a) Downpipes must be securely fixed to walls.

(b) The maximum spacing between downpipes should be no more than 12m.

(b) Downpipes should be fixed as close as possible to valley gutters and if the downpipe is further than 1200mm from a valley then provisions for overflow must be made.

(c) Where high-fronted gutters are installed, provision should be made to avoid any overflow from flowing back into the roof or building structure (ie install slotted gutters, overflow boxes with a mid section size of 150x150mm at a maximum of 2000m centres etc).

(d) Downpipes must -

(i) be compatible with other roofing materials used in the roofing system as described in 3.5.1.2 (c); and

(ii) be selected in accordance with appropriate eaves gutter section as listed in Table 3.5.2.2.

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**Table 3.5.2.1**

**RAINFALL INTENSITIES**

| Locality | Rainfall intensity mm/h — Average recurrence interval, once in - 20 years | 100 years | Locality | Rainfall intensity mm/h — Average recurrence interval, once in - 20 years | 100 years |
|---|---|---|---|---|---|
| **A.C.T.** | | | **S.A.** | | |
| Canberra | 137 | 194 | Adelaide | 123 | 186 |
| | | | Mt Gambier | 108 | 168 |
| **NSW** | | | Murray Bridge | 117 | 181 |
| Albury | 135 | 191 | Port Augusta | 124 | 189 |
| Broken Hill | 180 | 181 | Port Pirie | 125 | 201 |
| Goulburn | 145 | 197 | Yorktown | 118 | 197 |
| Kiama | 224 | 283 | | | |
| Newcastle | 181 | 233 | **WA** | | |
| Orange | 152 | 214 | Albany | 142 | 217 |
| Sydney | 214 | 273 | Broome | 252 | 343 |
| Tweed Heads | 245 | 303 | Bunbury | 148 | 215 |
| Wollongong | 233 | 294 | Derby | 254 | 343 |
| | | | Geraldton | 132 | 173 |
| **VIC.** | | | Kalgoorlie | 116 | 180 |
| Ballarat | 127 | 184 | Perth | 146 | 214 |
| Benalla | 133 | 187 | Port Hedland | 233 | 332 |
| Geelong | 118 | 172 | Tom Price | 164 | 222 |
| Horsham | 120 | 174 | | | |
| Lakes Entrance | 124 | 179 | **TAS.** | | |
| Melbourne | 127 | 185 | Burnie | 118 | 191 |
| Mildura | 125 | 174 | Flinders Island | 128 | 184 |
| Stawell | 127 | 185 | Hobart | 99 | 155 |
| | | | Launceston | 101 | 150 |
| **QLD.** | | | Queenstown | 118 | 183 |
| Brisbane | 251 | 333 | St. Marys | 205 | 266 |
| Bundaberg | 241 | 318 | | | |
| Cairns | 282 | 368 | **NT** | | |
| Cape York | 301 | 388 | Alice Springs | 139 | 204 |
| Cloncurry | 172 | 228 | Darwin | 285 | 366 |
| Innisfail | 254 | 323 | Katherine | 230 | 304 |
| Mackay | 273 | 363 | | | |
| Mt Isa | 169 | 223 | | | |
| Noosa | 253 | 320 | | | |
| Rockhampton | 248 | 336 | | | |
| Toowoomba | 189 | 251 | | | |
| Townsville | 260 | 346 | | | |
| Weipa | 293 | 370 | | | |

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**Table 3.5.2.2**

**GUTTER AND DOWNPIPE SELECTION**

**Table a. Gutter sizes for various rainfall intensities and roof catchment areas per downpipe**

| Design Rainfall Intensity (mm/h) (as per Table 3.5.2.1) | Roof Catchment Area per Downpipe - m² | | | | |
|---|---|---|---|---|---|
| | 30 | 40 | 50 | 60 | 70 |
| | Size of Gutter Required to Drain Roof Catchment Area into One (1) Downpipe (A, B, C, D, E and F defined in Table b.) | | | | |
| 90 | A or C | A or C | A or C | A or C | A or C |
| 120 | A or C | A or C | A or C | A or C | A or D |
| 140 | A or C | A or C | A or C | A or D | B or E |
| 160 | A or C | A or C | A or C | A or E | B or E |
| 175 | A or C | A or C | A or D | B or E | E |
| 200 | A or C | A or C | A or D | B or E | F |
| 225 | A or C | A or C | A or B | E | F |
| 255 | A or C | A or D | B or E | E | F |
| 275 | A or C | A or D | B or E | F | F |
| 325 | A or C | B or E | F | F | F |
| 425 | A or C | E | F | F | F |

**Table b. Gutter sizes for various rainfall intensities**

| Gutter Type (as per Table a.) | Gutter description | Minimum Cross Sectional Area mm² |
|---|---|---|
| A | Medium Rectangular Gutter | 6500 |
| B | Large Rectangular Gutter | 7900 |
| C | 115 mm D Gutter | 5200 |
| D | 125 mm D Gutter | 6300 |
| E | 150 mm D Gutter | 9000 |
| F | Gutter must designed in accordance with AS 2180 | |

**Table c. Downpipe selection**

| Down pipe Section | Gutter Sections - (as per Table b.) | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| 75 mm dia. | Yes | Yes | Yes | Yes | No |
| 100 mm x 50 mm | Yes | Yes | Yes | Yes | Yes |
| 90 mm dia. | Yes | Yes | Yes | Yes | Yes |
| 100 mm x 75 mm | Yes | Yes | Yes | Yes | Yes |

**Legend:** Yes - downpipe is suitable for the eaves gutter selection; and
No - downpipe is not suitable for the eaves gutter selection.

**Explanatory Information:**

Stormwater drainage systems specified in the Housing Provisions are not designed to remove all of the water during exceptionally heavy rain, especially in tropical areas. Accordingly, it is necessary to design and install the system so that when overflowing occurs any water is directed away from the inside of the building.

This may be achieved by using slotted gutters, locating the gutter so that it is below the top edge of the fascia, the installation of rainwater heads with overflow slots etc.

To enable the drainage system to achieve optimum capacity it must be cleaned and maintained on a regular basis, especially in areas where large trees overhang roof drainage systems.

Special attention needs to be given to box gutters, valley gutters etc located above the internal areas of a building. In these situations if adequate overflow controls cannot be implemented there may be a need to increase the size and capacity of drainage components to remove all water anticipated during heavy rain periods. The design for such systems can be taken from AS 3500.3.

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# PART 3.5.3 WALL CLADDING

**Appropriate performance requirements:**
Where an alternative wall cladding is proposed to that described in Part 3.5.3, that proposal must comply with the structural performance requirement P2.1 and the weatherproofing requirement P2.2.2 in Section 2.



**Acceptable construction practice**

### 3.5.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.5.3 for wall cladding for Class 1 and 10 buildings satisfies performance requirements P2.1 and P2.2.2, provided -

(a) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**

1. Information on *design wind speeds* for particular areas may be obtained from the *relevant approval authority*.
2. A map indicating cyclonic regions of Australia is contained in Part 3.10.1.
3. For wall cladding in a areas with a *design wind speed* of more than W41 refer to the appropriate design manual listed in 3.11.

(b) wall cladding is installed in accordance with -

(i) 3.5.3.1 for timber weatherboard cladding; and

(ii) 3.5.3.2 for fibre cement planks and weatherboard cladding; and

(iii) 3.5.3.3 for fibre cement sheet and plywood sheet cladding; and

(iv) fibre cement sheet eaves are installed in accordance with 3.5.3.3; and

(v) openings in cladding are flashed in accordance with 3.5.3.4

### 3.5.3.2 Timber weatherboard cladding

Timber cladding must be installed as follows:

(a) Splayed timber weatherboards must be fixed as shown in Figure 3.5.3.1 with a minimum lap of -

(i) 30mm for hardwood, cypress and treated pine; and

(ii) 20mm for western red cedar; and

(iii) 25mm for baltic pine.

(b) Profiled timber boards must -

(i) be fixed with the overlap and groove closely fitted; and

(ii) with tongue and groove profile, always fixed tongue edge up.

(c) Spacing of fixings must be -

(i) one nail per board at each stud at not more than 650mm centres measured along the board; and

(ii) nailed so that they do not penetrate the tip or thinner edge of the board beneath, ie for 30mm lap, nail 35mm from the butt, see Figure 3.5.3.1.

(d) Nails used to fix timber cladding must -

(i) be where nails are punched and filled prior to painting, with standard steel bullet-head nails; or

(ii) be in all other cases hot-dipped galvanised flat head or bullet head nails; and

(iii) not be uncoated copper or steel nails for western red cedar (silicon bronze, monel metal, stainless steel or hot dipped galvanised are suitable).

(e) Acceptable nail sizes are -

(i) hardwood and cypress frames: 50x2.8mm plain shank.

(ii) softwood frames: 50x3.15mm annular threaded.

**3.5.3.3 Fibre cement planks and weatherboard cladding**

Fibre cement plank and weatherboard cladding must be installed as follows:

(a) 7.5mm (minimum) fibre cement planks and weatherboards must be -

(i) manufactured in accordance with AS 2908.2; and

(ii) fixed with a minimum lap of 25mm, see Figure 3.5.3.2.

(b) 7.5mm (minimum) fibre cement planks and weatherboards must be fixed in accordance with Figure 3.5.3.2 with a maximum stud spacing of 600mm.

(c) Acceptable fixings for 7.5mm fibre cement planks and weatherboards are for -

(i) timber studs: 2.8x40mm galvanised fibre cement nails; and

(ii) steel studs: 8-18 x 35mm self embedding head screws.
(see Figure 3.5.3.2)

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**Figure 3.5.3.1**

**FIXING OF WALL CLADDING**

**Diagram a.** **Timber Cladding**

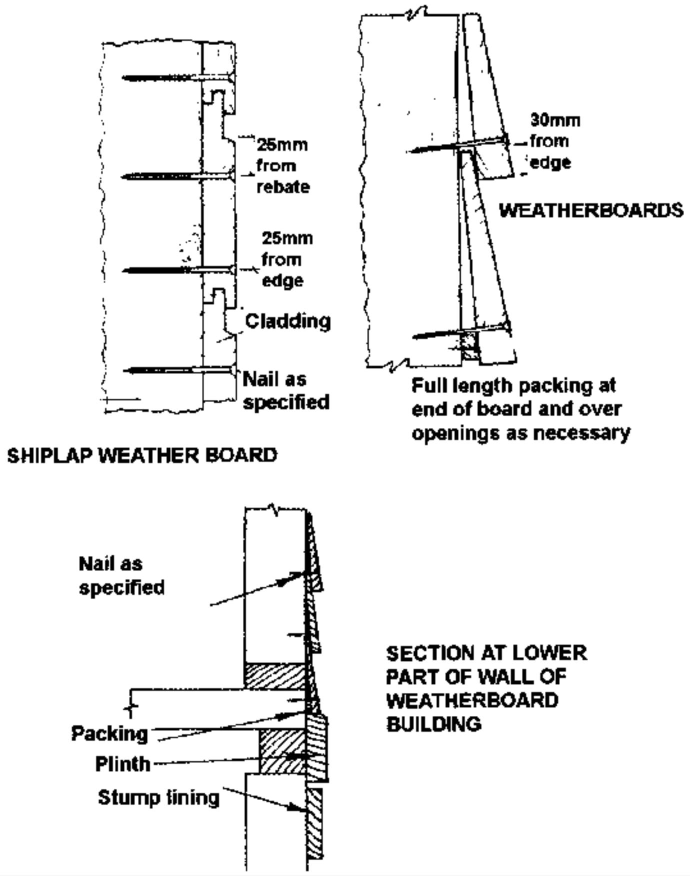
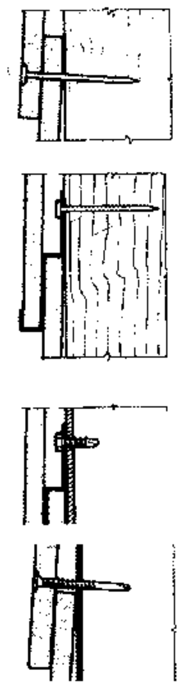



**Diagram b.** **Fibre Cement Planks And Weatherboards**



**Note:** Stud clips may be used instead of direct nailing

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### 3.5.3.4 Sheet wall cladding

(a) Fibre cement sheets:

(i) Fibre cement sheets used as external wall cladding must be fixed as specified in Table 3.5.3.1 and Figure 3.5.3.2.

(ii) Where the external cladding also acts as structural sheet bracing, the lesser of the stud and fixing spacings for both applications must be used.

(iii) External fibre cement sheets and claddings must comply with AS 2908.2.

Table 3.5.3.1

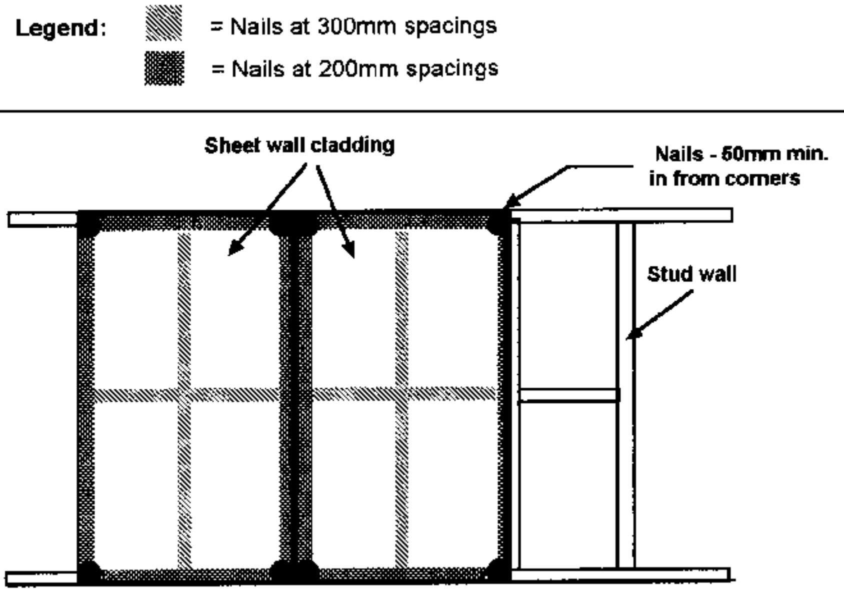
STUD AND WALL SPACINGS FOR 6 MM FIBRE CEMENT SHEET WALL CLADDING

| Design wind speed | STUD SPACING | | NAIL SPACING (2.8 mm fibre cement nails) | | | |
|---|---|---|---|---|---|---|
| | Within 1200 mm of ends of building | Elsewhere | Within 1200 mm of ends of building | | Elsewhere | |
| | | | Body | Edges | Body | Edges |
| W28 | 600 | 600 | 300 | 200 | 300 | 200 |
| W33 | 600 | 600 | 200 | 200 | 300 | 200 |
| W41 | 450 | 600 | 200 | 200 | 200 | 200 |



Figure 3.5.3.2

SHEET FIXING DETAIL




(b) Structural plywood external cladding:

(i) Structural plywood cladding must comply with AS 2269; and

(ii) where structural plywood acts as cladding and combined structural bracing it must comply with Table 3.5.3.2; and

(iii) sheets, up to 9mm thick, must be fixed using 2.8/3.5x30mm long galvanised clouts or flat head nails -

(A) spaced at -

(aa) 150mm along sheet edges; and

(bb) 300mm for intermediate fixings; and

(B) for sheets thicker than 9mm -

(aa) use a diameter of 2.8 or 3.5mm; and

(bb) the length is calculated using the following formula:

NAIL LENGTH L = PL + 10 Da
Where PL = Plywood thickness and
Da = Diameter of nail

(C) located at a minimum of 9mm from the edge of the sheet.

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**Explanatory Information:**
The above formula is applied as follows:
For 12 mm plywood and 2.8 mm diameter nail
L = 12 +28 mm; therefore the nail length must be 40 mm.

**Table 3.5.3.2**

**MINIMUM STRUCTURAL PLYWOOD THICKNESS FOR COMBINED BRACING AND EXTERNAL CLADDING**

| Plywood stress grade | Stud spacing (mm) | | | | | |
|---|---|---|---|---|---|---|
| | Plywood face grain Parallel to studs | | | Plywood face grain At right angles to studs | | |
| | 450 | 600 | 900 | 450 | 600 | 900 |
| F8 | 9 | 12 | 16 | 7 | 9 | 12 |
| F11 | 8 | 12 | 16 | 6 | 8 | 12 |
| F14 | 7 | 12 | 16 | 6 | 7 | 12 |

### 3.5.3.5 Eaves and soffit linings

External fibre cement sheets and linings used as eaves and soffit linings must -

(a) comply with AS 2908.2; and

(b) be fixed in accordance with Table 3.5.3.3 and Figure. 3.5.3.3 using -

(i) 2.8 x 30mm FC nails; or

(ii) No. 8 Wafer head screws (for 4.5mm and 6mm sheets only).; or

(iii) No. 8 Self embedding head screws (for 6mm sheets only).

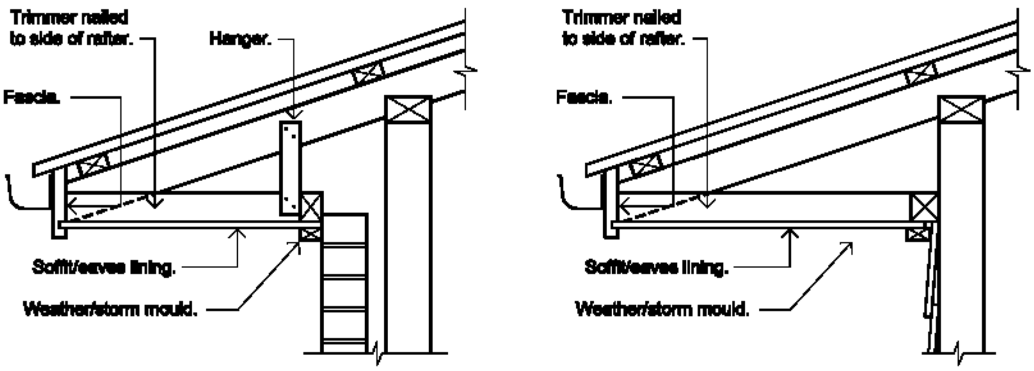
**Table 3.5.3.3**

**TRIMMER AND FASTENER SPACINGS FOR 4.5 AND 6 MM FIBRE CEMENT EAVES AND SOFFIT LININGS**

| Maximum eaves Width | Design wind speed | Maximum Trimmer spacings (mm) | | Maximum Fastener Spacings (mm) | |
|---|---|---|---|---|---|
| | | Within 1200 mm of the external corners of the building | Remainder of sheet | Within 1200 mm of the external corners of the building | Remainder of sheet |
| 600 | W28 | 600 | 900 | 200 | 300 |
| | W33 | 600 | 800 | 200 | 300 |
| | W41 | 500 | 700 | 200 | 300 |
| 1200 | W28 | 600 | 750 | 200 | 300 |
| | W33 | 600 | 700 | 200 | 300 |
| | W41 | 500 | 650 | 200 | 300 |

**Figure 3.5.3.3**

**EAVES TRIMMER DETAIL**




### 3.5.3.6 Flashings to wall openings

Openings in external wall cladding exposed to the weather must be flashed as follows:

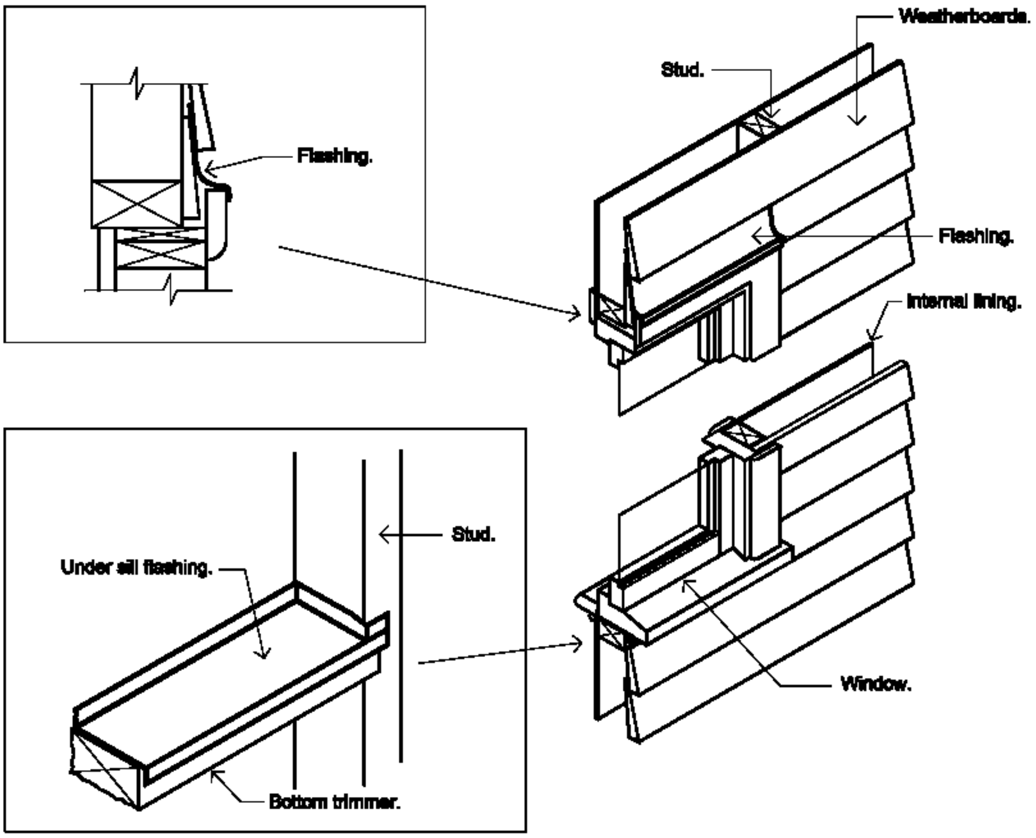
(a) All openings must be adequately flashed using materials that comply with AS 2904.

# PART 3.5.3 WALL CLADDING

(b) Flashings must be securely fixed at least 25 mm under the cladding and extend over the ends and edges of the framing of the opening, see Figure 3.5.3.4.

**Figure 3.5.3.4**

**TYPICAL WINDOW FLASHING DETAIL**



# PART 3.6

# GLAZING

# PART 3.6 CONTENTS



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# PART 3.6 GLAZING

**Appropriate performance requirements:**

Where an glazing system is proposed to that described in Part 3.6, that proposal must comply with the following performance requirements in Section 2 -

1. structural requirement P2.1; and
2. weatherproofing requirement P2.2.2.

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## Definitions

**3.6** The following definitions are used in this Part:

**Perimeter of building** means the external envelope of a building.

**Unobstructed opening** means a glazed area that a person could mistake for an open doorway or clearway and walk into the glazed panel.

## A. Acceptable construction manuals

**3.6.0** Performance requirements P2.1 and P2.2.2 are satisfied if glazing is installed in Class 1 and 10 buildings in accordance with the following manual:

(a) AS 1288- Glass in buildings - Selection and installation.

## B. Acceptable construction practice

### 3.6.1 Application

Compliance with the acceptable construction practice provisions of Part 3.6 for glazing installed in Class 1 and 10 buildings satisfies performance requirements P2.1 and P2.2.2, provided-

(a) the building is located in a non-cyclonic area with a *design wind speed* of not more than W41; and

**Explanatory Information:**

1. Information on *design wind speeds* for particular areas may be obtained from the relevant approval authority.
2. For glazing in *high wind areas* refer to AS 1288.

(b) glazing must be manufactured in accordance with AS 1288; and

(c) safety glass must be legibly marked in accordance with AS 1288; and

(d) glass balustrades and sloped overhead glazing must comply with AS 1288.

### 3.6.2 Glazing sizes and installation

Glazing used in buildings must comply with the following requirements -

(a) glazing used in the perimeter of buildings and supported on all sides must comply with the appropriate provisions listed in 3.6.3; and

(b) glazing used in areas where the potential for human impact could occur must comply with the appropriate provisions listed in 3.6.4.



### 3.6.3 Perimeter framed glazing (supported on all sides)

Glazing installed in the perimeter of buildings must comply with the following -

(a) for ordinary annealed fully framed glass, Table 3.6.1 (see also Figure 3.6.2); or

(b) for ordinary annealed patterned fully framed glass, Table 3.6.1.

**Explanatory Information:**
For other types of perimeter glazing including toughened, wired, laminated and unframed glazing refer to AS 1288.

**Table 3.6.1**

**FULLY FRAMED GLASS - MAXIMUM AREAS IN SQUARE METRES**

| Minimum nominal thickness (mm) | Design Wind Speed | | |
|---|---|---|---|
| | W28 | W33 | W41 |
| **Ordinary annealed fully framed glass** | | | |
| 3 | 2.55 | 1.82 | 1.27 |
| 4 | 4.42 | 3.15 | 2.21 |
| 5 | 6.73 | 4.81 | 3.36 |
| 6 | 9.46 | 6.76 | 4.73 |
| 8 | 14.28 | 10.2 | 7.14 |
| **Ordinary annealed, patterned, fully framed glass** | | | |
| 3 | 2.08 | 1.48 | 1.04 |
| 4 | 3.81 | 2.72 | 1.9 |
| 5 | 5.99 | 4.28 | 2.99 |
| 6 | 8.6 | 6.14 | 4.3 |

### 3.6.4 Human impact safety requirements

The thickness and type of glazing installed in areas of a building that have a high potential for human impact (an area of a building frequented by the occupants during everyday activities in which a person could fall into or against the glazed panel) must comply with the following appropriate requirements -

(a) doors, 3.6.5; and

(b) door side panels, 3.6.6; and

(c) full height glass panels, 3.6.7; and

(d) glazed panels, other than doors or side panels, on the perimeter of rooms, 3.6.8; and

(e) shower screens, shower doors and bath enclosures, 3.6.9.

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### 3.6.5 Doors

Glass (except leadlight panels) in doors must be Grade A safety glazing material in accordance with Table 3.6.3 and Figure 3.6.1, except that:

(a) In fully framed panels, ordinary annealed glass with a maximum area of 0.5 $m^2$ in accordance with Table 3.6.4 may be used provided a chair rail not less than 40mm wide is installed in the door.

(b) Unframed doors must be glazed with toughened safety glass with a standard nominal thickness of not less than 10mm.

(c) Doors to showers and bath enclosures must be glazed in accordance with 3.6.9.

### 3.6.6 Side panels

(a) All framed glass (except leadlight panels) in side panels with their nearest vertical sight line less than 300mm from the nearest edge of the doorway opening must be of Grade A safety glazing material in accordance with Table 3.6.3 and Figure 3.6.1, except that -

  (i) where the lowest visible sight line is 1200mm or greater above the highest abutting finished floor level, ordinary annealed glass in accordance with Table 3.6.2 may be used; or

  (ii) where the lowest visible sight line is less than 1200mm above the highest abutting finished floor level, ordinary annealed glass in accordance with Table 3.6.4, up to an area of 0.5$m^2$, may be used.

(b) Framed glass panels with the nearest vertical sight line 300mm or greater from the nearest edge of the door opening are not considered to be side panels for the purposes of the *Housing Provisions*.

| Table 3.6.2<br>MAXIMUM AREAS OF ORDINARY ANNEALED GLASS IN SIDE PANELS | |
|---|---|
| **Minimum nominal thickness (mm)** | **Maximum area of pane (m2)** |
| 3 | 0.8 |
| 4 | 1.4 |
| 5 | 2.2 |
| 6 | 3.3 |



### 3.6.7 Full height framed glazed panels

(a) A glazed panel located in a building so that it is capable of being mistaken for an *unobstructed opening* must be glazed with -

(i) Grade A safety glazing material in accordance with Table 3.6.3, or

(ii) ordinary annealed glass complying with Table 3.6.3 provided the glazed area is not greater than $0.9m^2$.

(b) Glazed panels are not considered capable of being mistaken for an *unobstructed opening* where any of the following apply -

(i) the clear opening width is less than or equal to 500mm; or

(ii) the lowest sight line of the opening is 500mm or greater above the highest abutting finished floor level; or

(iii) the glass is marked by means of a permanent motif or other decorative treatment on or etched into the glass, of sufficient magnitude to be readily apparent, or the glass is opaquely coloured or patterned to indicate it's presence; or

(iv) a chair rail or handrail (not less than 40mm thick) or the like is provided at a height of 865mm above the adjoining ground level; or

(v) internal partitions clearly form walls of a passageway and conform with item (a); or

(vi) the difference in floor level on either side of the panel is greater than 500mm.

Figure 3.6.1

IDENTIFICATION OF GLAZING REQUIREMENTS FOR DOORS AND SIDE PANELS

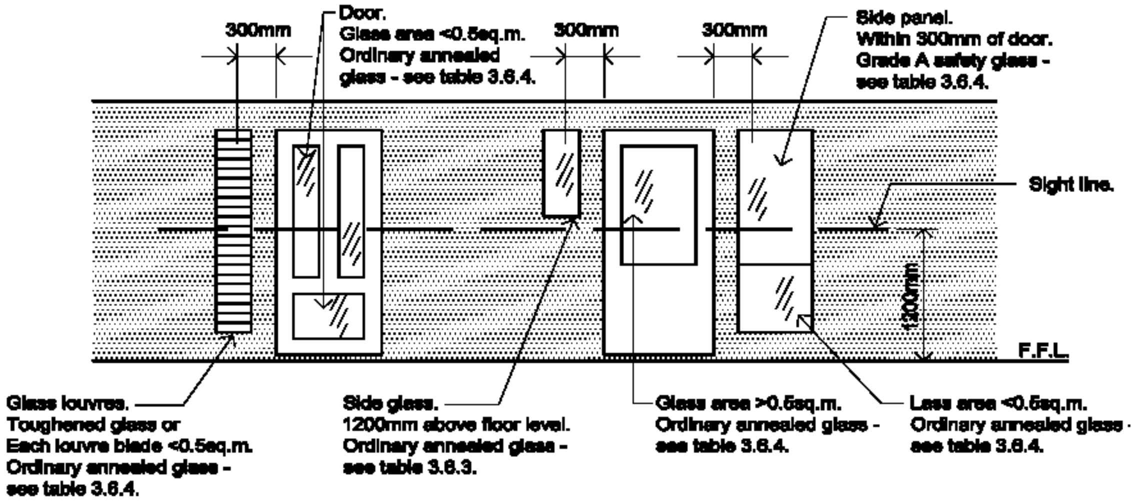



Table 3.6.3

MAXIMUM AREAS GLAZING MATERIAL FOR FRAMED GLASS DOORS, FRAMED GLASS SIDE PANELS, AND OTHER FRAMED GLAZED PANELS

| Type of Glass | Minimum nominal thickness (mm) | Maximum area of pane ($m^2$) |
|---|---|---|
| Patterned or clear ordinary annealed glass | 3 | 0.1 |
| | 4 | 0.3 |
| | 5 | 0.5 |
| | 6 | 0.9 |
| Grade A Toughened safety glass | 3 | 1 |
| | 4 | 2 |
| | 5 | 3 |
| | 6 | 4 |
| Grade A Laminated safety glass | 5.38 | 2 |
| | 6.38 | 3 |
| | 8.38 | 5 |

### 3.6.8 Glazed panels, other than doors or side panels, on the perimeter of rooms

All framed glazing where the lowest sight line of the glazing panel is less than 500 mm from the highest abutting finished floor level must be -

(a) Grade A safety glazing material in accordance with Table 3.6.3; or

(b) ordinary annealed glass in accordance with Table 3.6.4 (see also Figure 3.6.2).



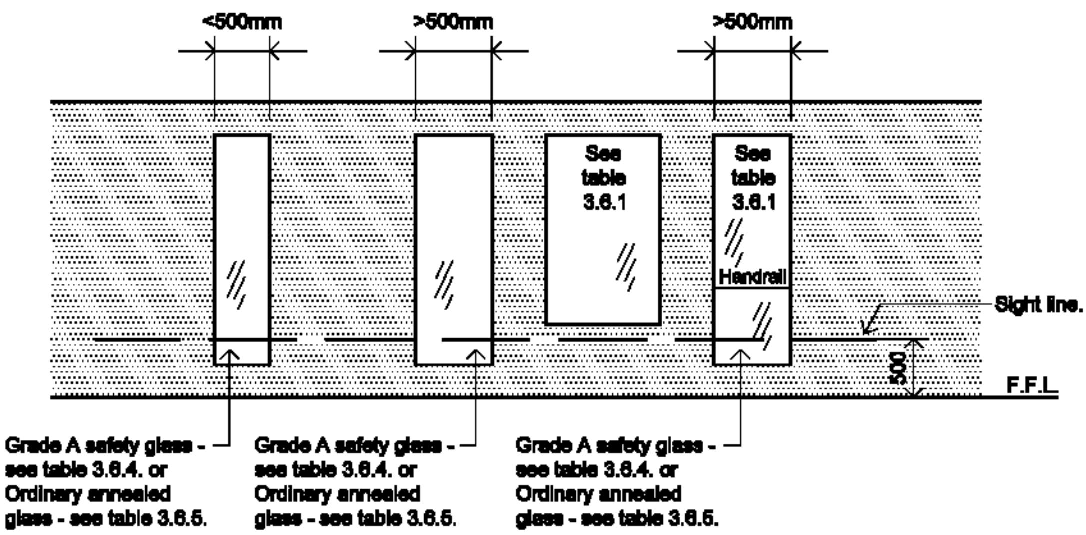
**Table 3.6.4**

**MAXIMUM AREAS OF ORDINARY ANNEALED GLASS WHERE THE LOWEST SIGHT LINE IS LESS THAN 500 MM FROM THE HIGHEST ABUTTING FLOOR LEVEL**

| Minimum nominal thickness (mm) | Maximum area of pane ($m^2$) |
|---|---|
| 3 | 0.1 |
| 4 | 0.3 |
| 5 | 0.5 |

**Figure 3.6.2**

**IDENTIFICATION OF GLAZING REQUIREMENTS FOR GLAZED PANELS**



### 3.6.9 Shower doors, shower screens and bath enclosures

(a) All shower doors, shower screens, bath enclosures, and associated windows, where the lowest sight line is less than 1500mm above the highest abutting finished level of the floor, bottom of the bath, or shower base, must -

(i) for framed panels be glazed with -

(A) Grade A safety glazing material in accordance with Table 3.6.3; or

(B) Grade B safety glazing material in accordance with Table 3.6.5; or

(ii) for panels or doors with any edge exposed must be toughened safety glass in accordance with Table 3.6.3 with a minimum nominal thickness of 5mm.

(b) For the purposes of this part -

(i) a window is part of a bath enclosure or shower if it is less than 500mm horizontally from the internal perimeter of the floor of the bath or shower (see Figure 3.6.3); and

(ii) a window is not part of the bath or shower if a person in the bath or shower is protected from the window by permanent safety glazing or permanent material able to resist human impact.

(c) Associated windows referred to in (b) (i), in external walls may incorporate annealed glass panels of not less than 4mm thickness, and not greater than $0.1m^2$ in area.

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**Explanatory Information:**

Care should be taken when using showers fitted with safety wired glass, safety organic-coated glass, and laminated safety glass products that are liable to damage from thermal shock. Thermal shock occurs from hot water from the shower hitting the shower screen during cold weather.

**Table 3.6.5**

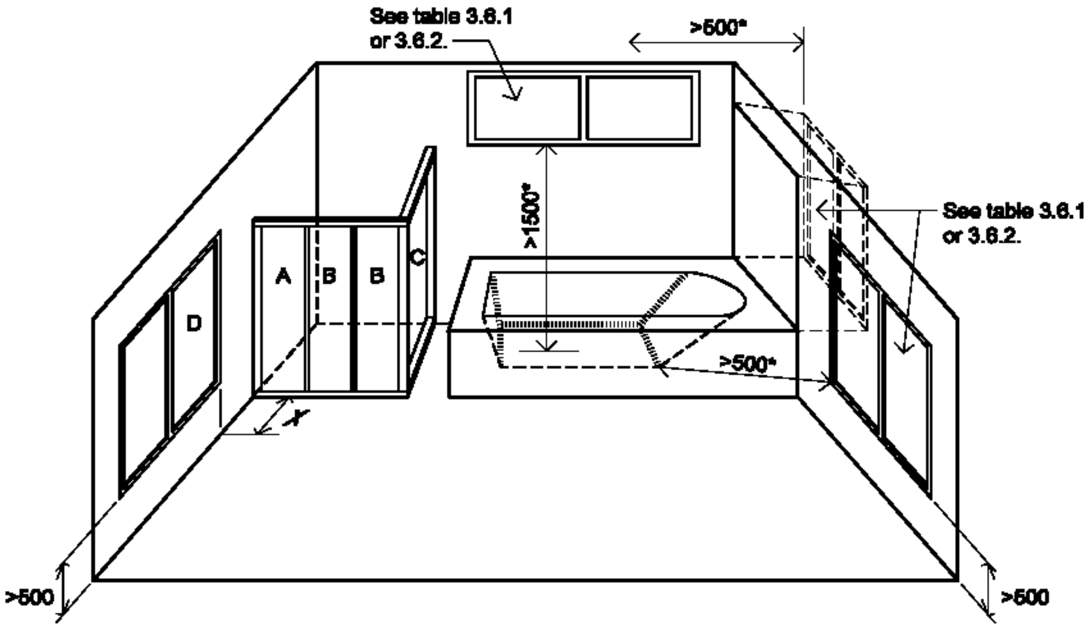
**MAXIMUM AREAS OF GRADE B SAFETY GLAZING MATERIALS FOR SHOWER DOORS, SHOWER SCREENS AND BATH ENCLOSURES**

| Type of Glass | Standard nominal thickness (mm) | Maximum area of pane ($m^2$) | Area (Fig. 3.6.3) |
|---|---|---|---|
| **Safety wired glass** | Greater than or equal to 6 | 2.5 | A, B, C |
| **Safety organic coated glass** | 3 | 1 | A, B, C, D |
| | 4 | 1.5 | |
| | 5 | 2 | |
| | Greater than or equal to 6 | 3 | |



**Figure 3.6.3**

**IDENTIFICATION OF GLAZING REQUIREMENTS FOR SHOWER DOORS, SHOWER SCREENS AND BATH ENCLOSURES**



# PART 3.7

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# FIRE SAFETY

# PART 3.7 CONTENTS



**Continued**

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## CONTENTS (continued)

# PART 3.7.1 FIRE SEPARATION

**Appropriate performance requirements**
Where an alternative fire separation design is proposed to that described in Part 3.7.1, that proposal must comply with the Protection from the spread of fire performance requirement P2.3.1 in Section 2.



## Acceptable construction practice

### 3.7.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.7.1 for fire separation between Class 1 and 10 buildings satisfies performance requirement P2.3.1.

### 3.7.1.2 General concession - non-combustible materials

The following materials, though *combustible* or containing *combustible* fibres, may be used wherever a *non-combustible* material is *required* in the *Housing Provisions*-

(a) plasterboard; and

(b) perforated gypsum lath with a normal paper finish; and

(c) fibrous-plaster sheet conforming to AS 2185 Specification for Fibrous Plaster Products; and

(d) fibre-reinforced cement sheeting; and

(e) pre-finished metal sheeting having a *combustible* surface finish not exceeding 1 mm thickness and where the *Spread-of-Flame Index* of the product is not greater than 0; and

(f) bonded laminated materials where-

(i) each laminate is *non-combustible*; and

(ii) each adhesive layer does not exceed 1 mm in thickness; and

(iii) the total thickness of adhesive layers does not exceed 2 mm; and

(iv) the *Spread-of-Flame Index* and the *Smoke-Developed Index* of the laminated material as a whole does not exceed 0 and 3 respectively.

### 3.7.1.3 External walls of Class 1 buildings

An *external wall* of a Class 1 building, and any openings in that wall, must comply with 3.7.1.5 if the wall is less than-

(a) 900 mm from an allotment boundary other than the boundary adjoining a road alignment or other public space; or

(b) 1.8 m from another building on the same allotment other than an appurtenant Class 10 building or a detached part of the same Class 1 building.

### 3.7.1.4 Measurement of distances

(a) The distance from any point on an *external wall* of a building to an allotment boundary or another building is the distance to that point measured along a line at right angles from the allotment boundary or *external wall* of the other building which intersects that point without being obstructed by a wall complying with 3.7.1.5.

(b) Where a wall within a specified distance is *required* to be constructed in a certain manner, only that part of the wall (including any openings) within the specified distance need be constructed in that manner.

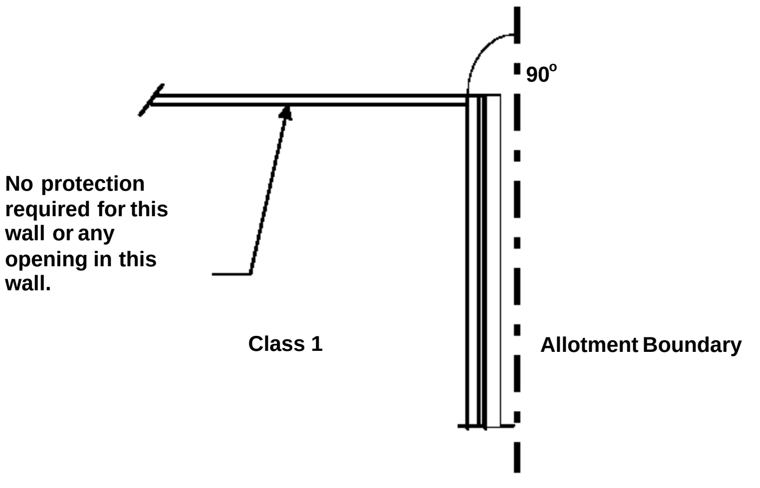
(see Figure 3.7.1.1 and 3.7.1.2)



**Figure 3.7.1.1**

**WALLS AT RIGHT ANGLES TO THE BOUNDARY**

**Note:** No protection required for the wall at right angles or more to the boundary.




### 3.7.1.5 Construction of external walls

(a) *External walls* (including gables) *required* to be *fire resisting* (referred to in 3.7.1.3 or 3.7.1.6) must extend to the underside of a *non-combustible* roof covering or *non-combustible* eaves lining and must-

(i) have an FRL of not less than 60/60/60 when tested from the outside; or

(ii) be of masonry-veneer construction in which the external masonry veneer is not less than 90mm thick; or

(iii) be of masonry construction not less than 90mm thick.

(See Figure 3.7.1.3(a) and (b))

**Explanatory Information:**

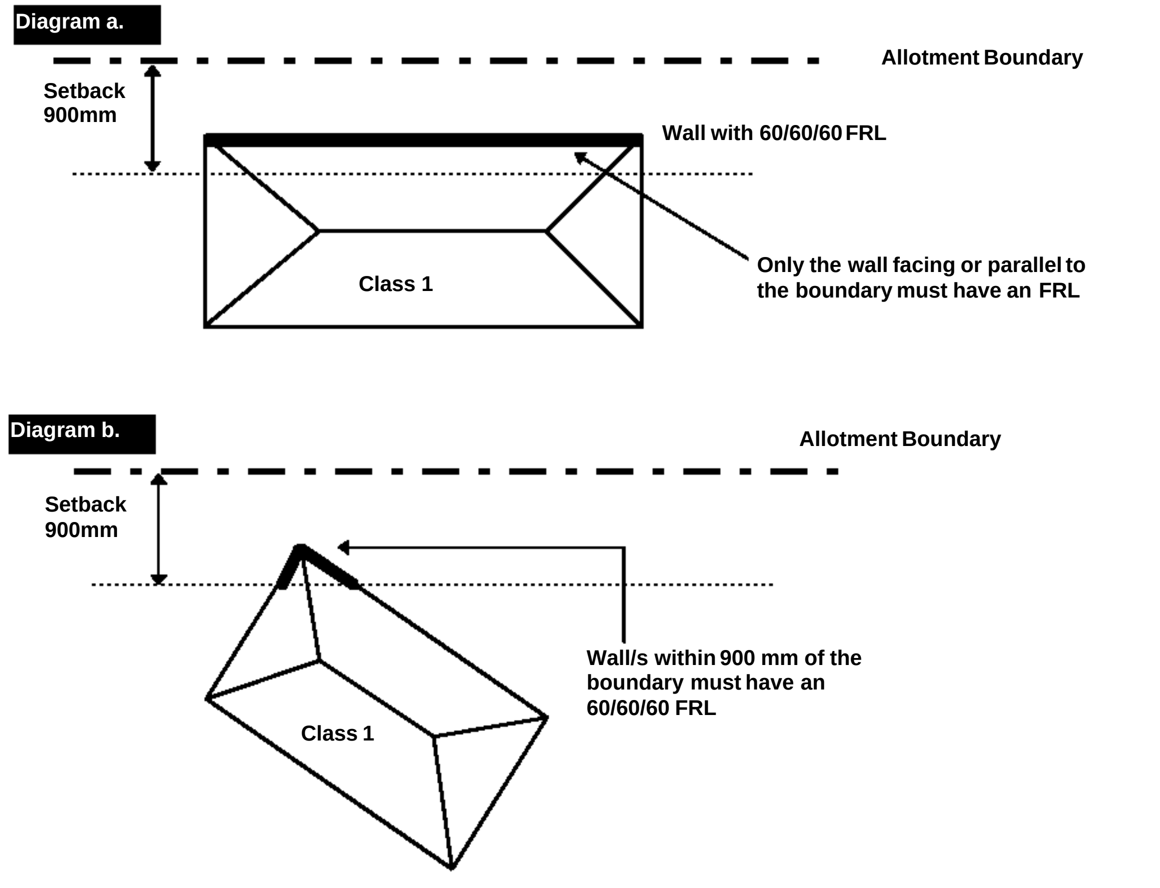
See Figure 3.7.1.7 and 3.8.6.2 for internal separating wall construction under the one common roof.



**Figure 3.7.1.2**

**MEASUREMENT OF DISTANCES (Plan view)**

**Note:** Setback distance is measured at right angles to the boundary




(b) Openings in *external walls* required to be *fire resisting* (referred to in 3.7.1.3 or 3.7.1.6) must be protected by-

(i) non-openable fire *windows* or other construction with an FRL of not less than - /60/ - ; or

(ii) *self-closing* solid core doors not less than 35mm thick.

(c) Sub-floor vents, roof vents, weepholes and penetrations for pipes, conduits and the like need not comply with (b).

(d) Concessions for boundary windows

Despite the requirements in (b), in a Class 1a or Class 10 building a *window* to a *non-habitable* room that faces the boundary of an adjoining allotment may be 600mm from that boundary provided the opening is not more than 900x600mm and -

(i) the *window* is steel framed, there are no opening sashes and it is glazed in wired glass; or

(ii) the opening is enclosed with translucent glass blocks.



**STATE AND TERRITORY VARIATIONS**

**3.7.1.5(d) does not apply in New South Wales.**

**Figure 3.7.1.3(a)**

**ACCEPTABLE CONSTRUCTION OF EXTERNAL WALLS**

**Note:** Wall to extend to the underside of *non-combustible* roof covering; or *non-combustible* eaves lining.

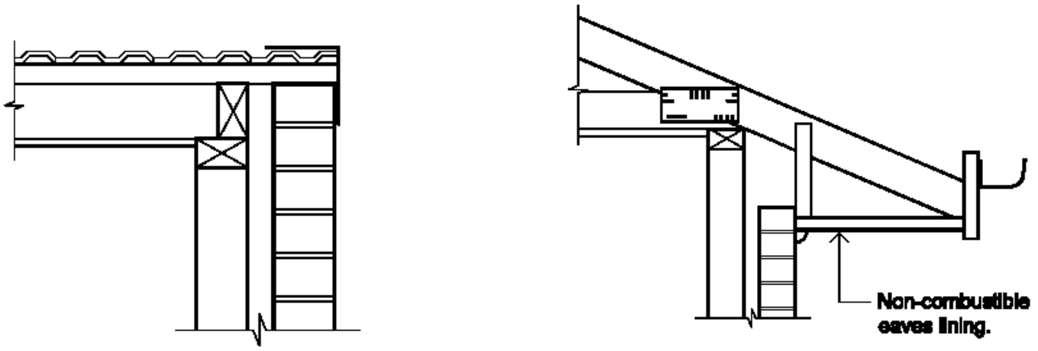
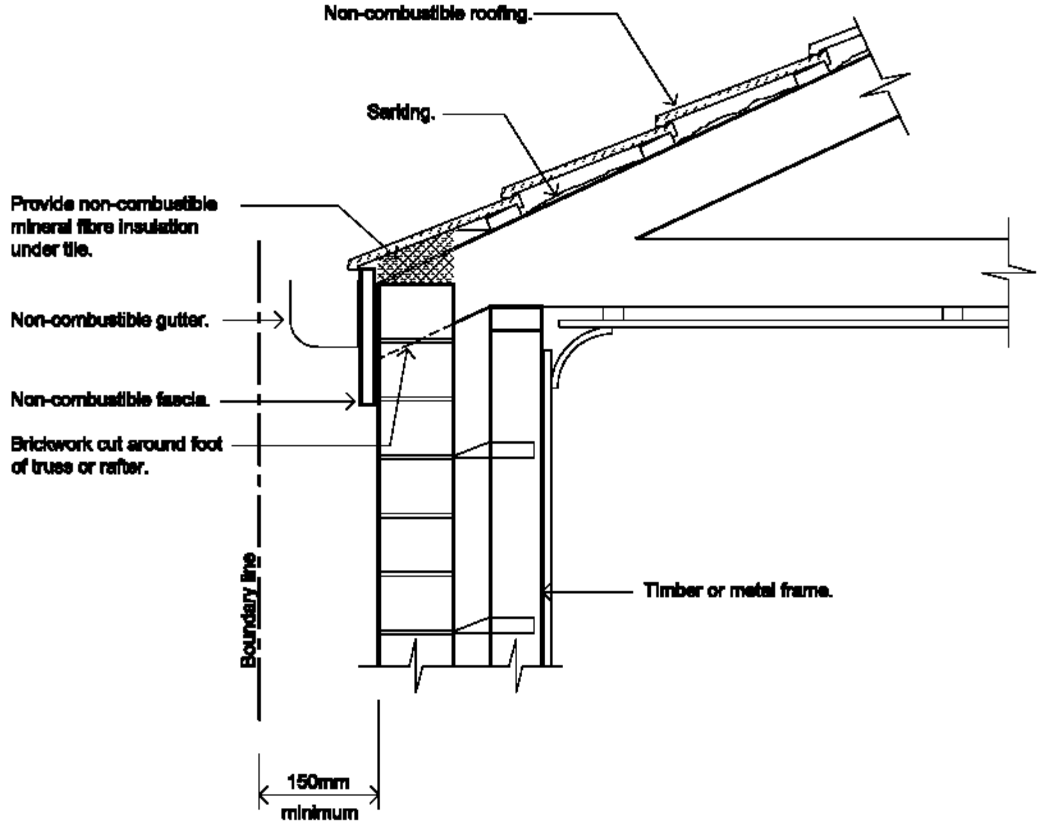


Figure 3.7.1.3(b)

**ACCEPTABLE CONSTRUCTION OF EXTERNAL WALLS**

**Note:** For the purposes of this Table:

1. The *external wall* must extend to the underside of a *non-combustible* roof covering; or *non-combustible* eaves lining.
2. Where sarking is installed it must located so that ponding of water is avoided between the fascia and the first roofing batten.






### 3.7.1.6 Class 10a buildings

(a) Where a Class 10a building is located between a Class 1 building and the allotment boundary, other than the boundary adjoining a road alignment or other public space, the Class 1 building must be protected by one of the following methods shown in Figure 3.7.1.4.

(b) Where a Class 10a building is located between a Class 1 building to which it is appurtenant and another building on the same allotment, the Class 1 building must be protected in one of the methods shown in Figure 3.7.1.5.

(c) Where two or more Class 10a buildings on the same allotment are appurtenant to different Class 1 buildings, the Class 10a buildings must be separated in accordance with one of the methods depicted in Figure 3.7.1.6.

**Figure 3.7.1.4**

**PROTECTION OF CLASS 1 BUILDINGS - CLASS 10a BETWEEN CLASS 1 AND THE ALLOTMENT BOUNDARY**

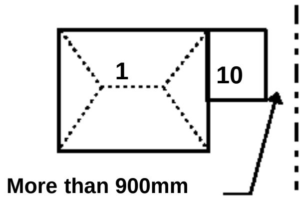
**Legend:**

Wall with an FRL of 60/60/60

Allotment boundary

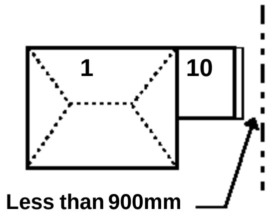
**a. 900mm from allotment boundary**

The Class 10a building is not less than 900mm from the allotment boundary, other than the boundary adjoining a road alignment or other public space.



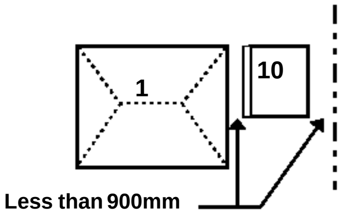

**b. External wall to Class 10a building with FRL**

An *external wall* of the Class 10a building which is less than 900mm from an allotment boundary, other than the boundary adjoining a road alignment or other public space, complies with 3.7.1.5.



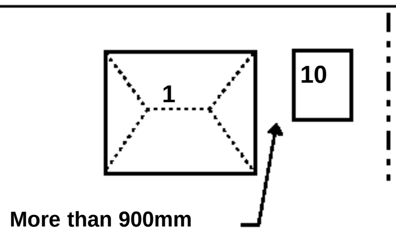

**c. External wall to Class 10a building with FRL**

An *external wall* of the Class 10a building which is less than 900mm from the Class 1 building complies with 3.7.1.5.




**d. 900mm separation between buildings**

The Class 1 building is not less than 900mm from the Class 10a building.




**e. Class 1 building with FRL to external wall**

An *external wall* of the Class 1 building which is less than 900mm from the Class 10a building complies with 3.7.1.5.

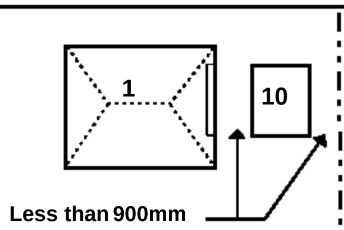


**Figure 3.7.1.4**

**PROTECTION OF CLASS 1 BUILDINGS - CLASS 10a BETWEEN CLASS 1 AND OTHER BUILDINGS ON ALLOTMENT**

**Legend:**

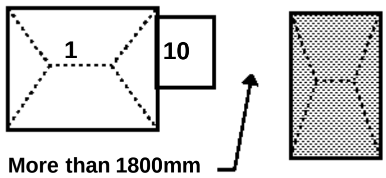
Wall with a FRL or 60/60/60

Other Class building on allotment

Allotment boundary

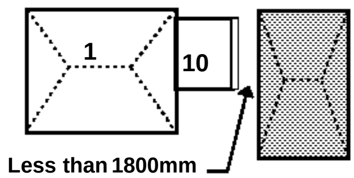
**a.** **1800mm from other building on allotment**

The Class 10a building is not less than 1.8m from the other building.



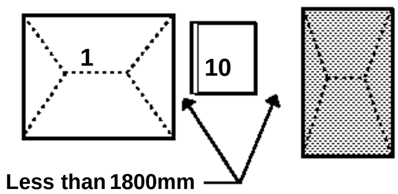

**b.** **External wall to Class 10a building with FRL**

An *external wall* of the Class 10a building which is less than 1.8m from the other building complies with 3.7.1.5.



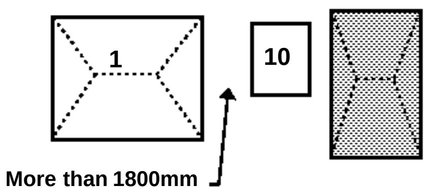

**c.** **External wall to Class 10a building with FRL**

An *external wall* of the Class 10a building which is less than 1.8m from the Class 1 building complies with 3.7.1.5.




**d.** **1800mm separation between Class 1 and 10a**

The Class 1 building is not less than 1.8m from the Class 10a building.




**e.** **Class 1 building with FRL to external wall**

An *external wall* of the Class 1 building which is less than 1.8m from the Class 10a building complies with 3.7.1.5.

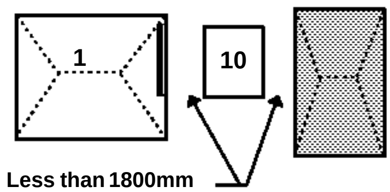



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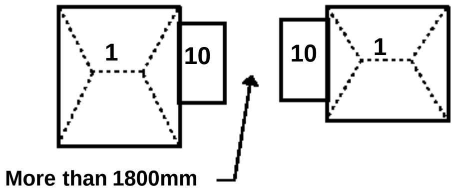
**Figure 3.7.1.6**

**PROTECTION OF CLASS 1 BUILDINGS - SEPARATION OF CLASS 10a BUILDINGS ON AN ALLOTMENT**

**Legend:** Wall with a FRL or 60/60/60

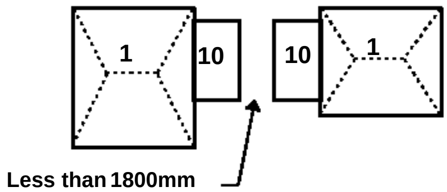
**a. 1800mm between Class 10a buildings**

Each 10a must be separated from each other by a distance of not less than 1.8 m.



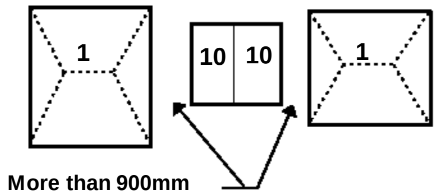

**b. External wall to Class 10a building with FRL**

Each 10a must be separated from each other by *external walls* complying with 3.7.1.5.



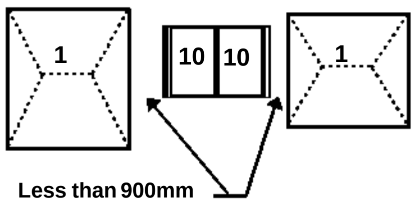

**c. 900mm separation between Class 10a and Class 1 buildings**

Each 10a must be separated from each Class 1 building by a distance of not less than 900mm.



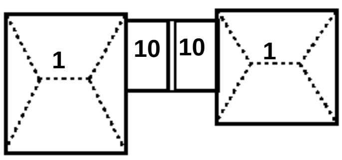

**d. External wall to Class 10a buildings with FRL**

Each 10a must be separated from each Class 1 building by *external walls* complying with 3.7.1.5.




**e. Class 10a buildings with FRL to separating wall**

Each 10a must be separated by a wall complying with 3.7.1.5.

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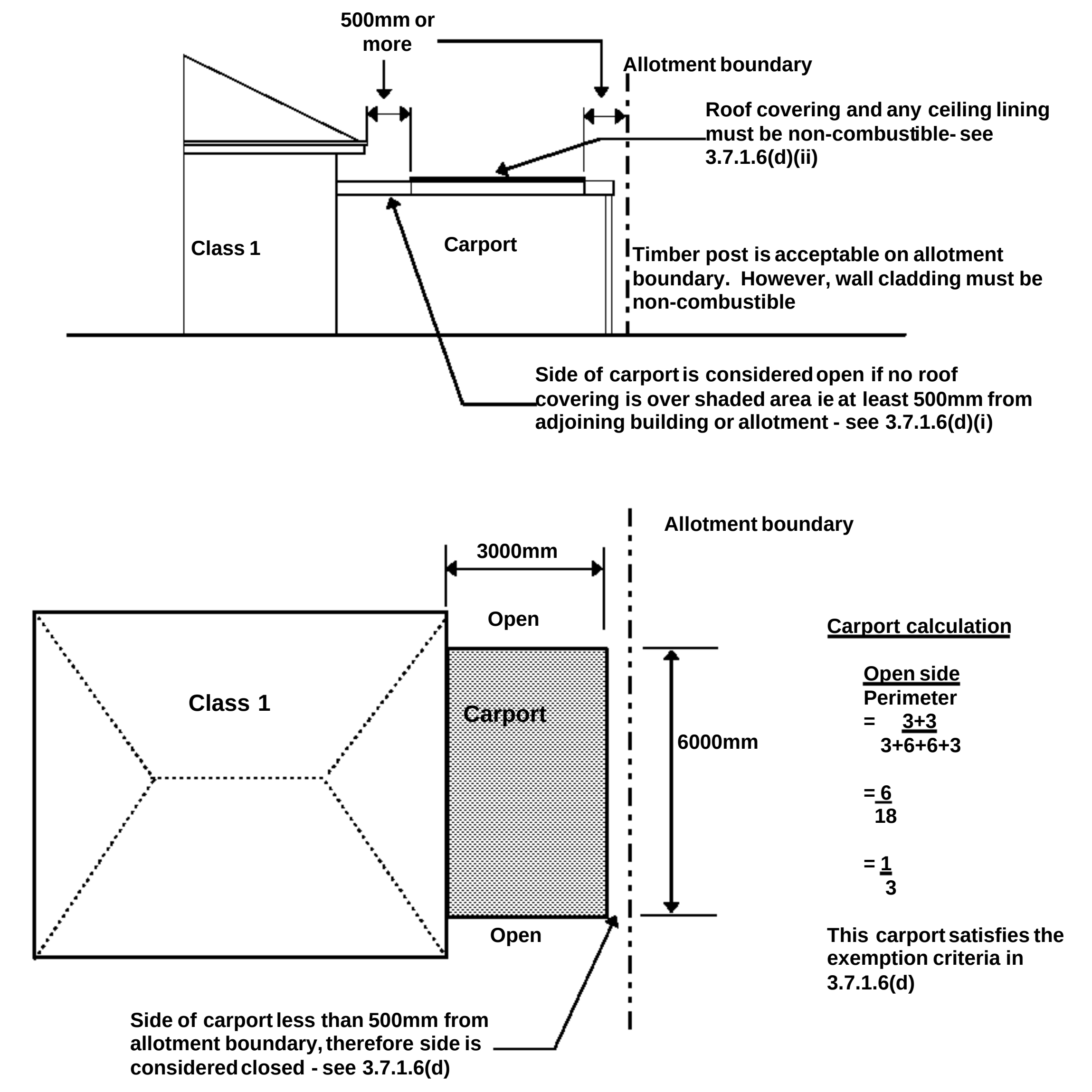
(d) A carport is exempt from (a), (b) and (c) if-

(i) it has two or more sides open and at least one third of its perimeter open and, for the purposes of this clause, a side is considered to be open if the roof covering adjacent to that side is at least 500mm from another building or allotment boundary (see Figure 3.7.1.7); and

(ii) it has a *non-combustible* roof covering and any ceiling lining and wall cladding, including gables, is also *non-combustible* (see Figure 3.7.1.7); and

**Figure 3.7.1.7**

**IDENTIFYING AN OPEN CARPORT**





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(iii) it does not provide direct vertical support to any part of the Class 1 building; and

(iv) in the case where it has a common roof structure with the Class 1 building and the carport does not have a ceiling (see Figure 3.7.1.8), the opening between the top of the wall of the Class 1 building and the underside of the roof covering is infilled with-

(A) a *non-combustible* material; or

(B) construction clad with *non-combustible* material on the carport side.

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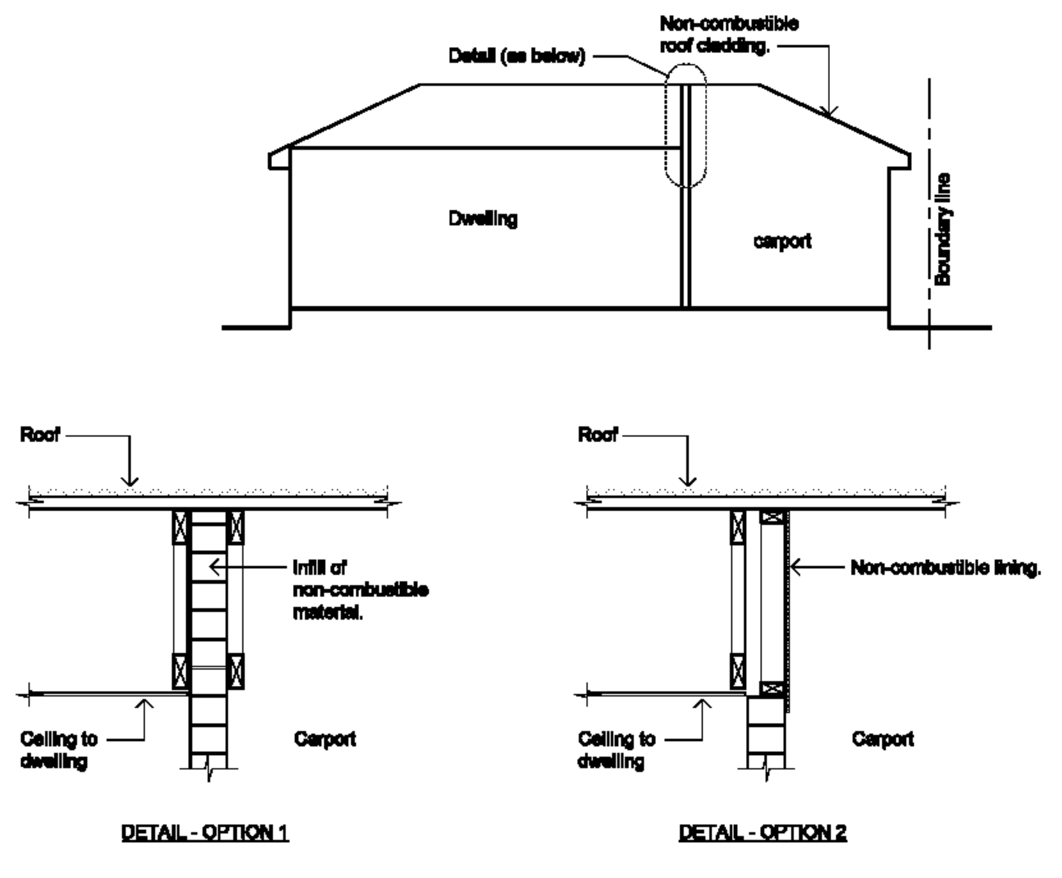
**FIGURE 3.7.1.8**

**REQUIREMENTS FOR NON-COMBUSTIBLE INFILL PANELS TO CARPORT**



### 3.7.1.7 Allowable encroachments

(a) An encroachment is any construction between the *external wall* of the building and the allotment boundary, or the *external walls* of two buildings on the same allotment and relates to any *external wall* of a -

(i) Class 10a building required to comply with 3.7.1.5; or

(ii) Class 1 building.

(b) The encroachments allowed within 900mm of an allotment boundary or within 1.8m of another building on the same allotment are-

(i) fascias, gutters, downpipes and the like; and

(ii) eaves with *non-combustible* roof cladding and *non-combustible* lining; and

(iii) flues, chimneys, pipes, domestic fuel tanks, cooling or heating appliances or other services; and

(iv) light fittings, electricity or gas meters, aerials or antennas; and

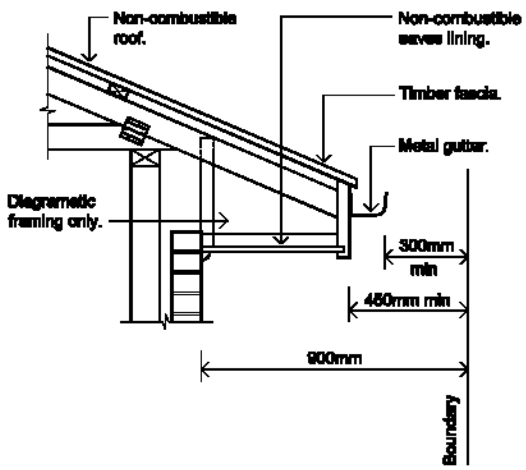
(v) pergolas or sun blinds; and

(vi) unroofed terraces, landings, steps and ramps, not more than 1m in height.

(c) Encroachments listed in (b)(i), if *combustible*, b(ii) and b(iii) must not be built within 450mm of an allotment boundary nor be built within 900mm of the *external wall* or associated encroachments of another building on the same allotment. (see Figure 3.7.1.9)

**FIGURE 3.7.1.9**

**ALLOWABLE ENCROACHMENTS FOR NON-COMBUSTIBLE CONSTRUCTION**

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### 3.7.1.8 Separating walls

(a) A wall that separates Class 1 dwellings, or separates a Class 1 building from a Class 10a building which is not appurtenant to that Class 1 building must have an FRL of not less than 60/60/60 and-

(i) commence at the footings or ground slab, see Figure 3.7.1.10; and

(ii) extend-

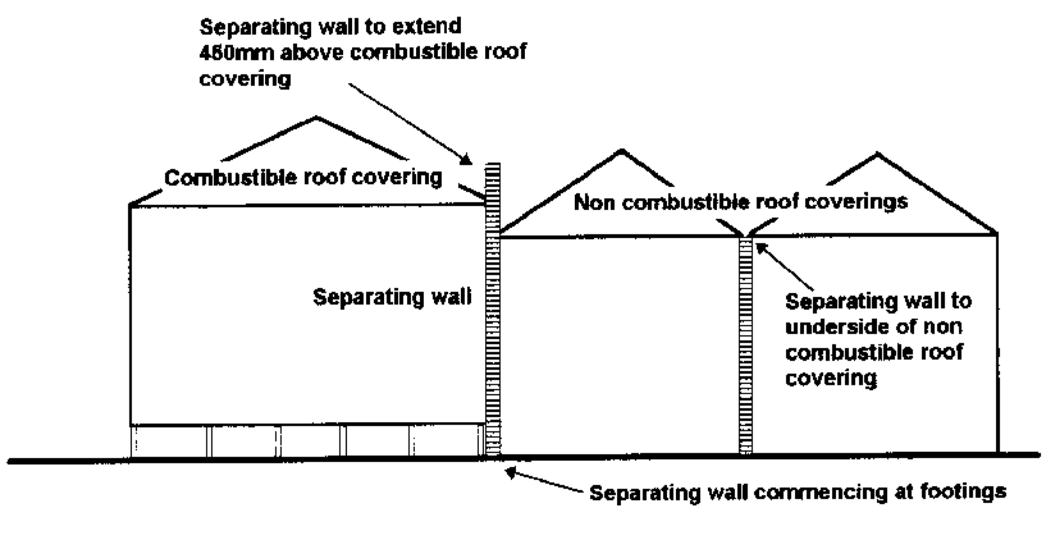
(A) if the building has a *non-combustible* roof covering, to the underside of the roof covering, see Figure 3.7.1.10 and 3.7.11; or

(B) if the building has a *combustible* roof covering, to not less than 450mm above the roof covering, see Figure 3.7.1.10.

(b) A *separating wall* of *lightweight construction* must be tested in accordance with Specification C1.8 of the BCA Volume One.

**FIGURE 3.7.1.10**

**SEPARATING WALL CONSTRUCTION**




(c) A *separating wall* complying with (a)(ii)(A)-

(i) must not be crossed by timber or other *combustible* building elements except for roof battens with dimensions of 75x50mm or less; and

(ii) must have any gap between the top of the wall and the underside of the roof covering packed with mineral fibre or other suitable *fire-resisting* material.

(d) Where a building has a masonry veneer external wall, any gap between the *separating wall* and the external masonry veneer must be-

(i) not greater than 50mm; and





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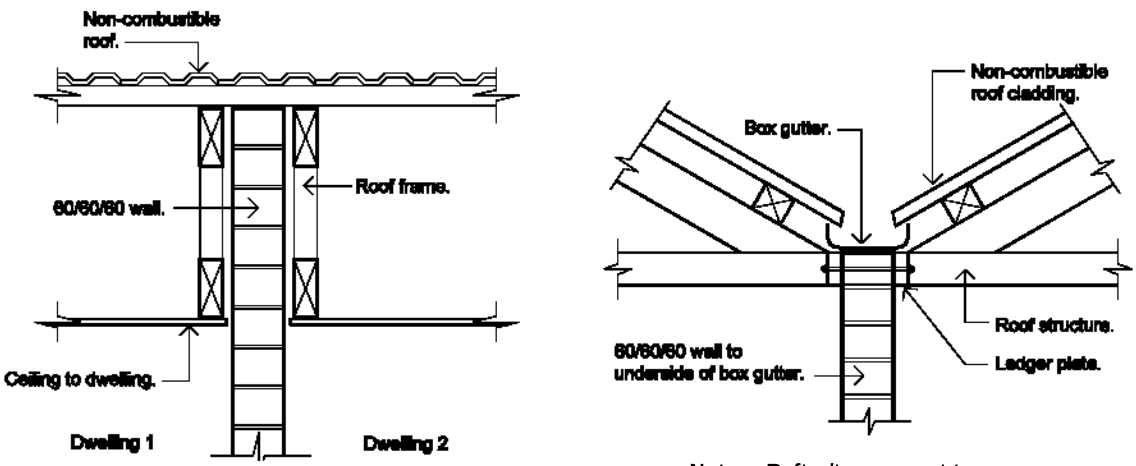
(ii) packed with a mineral fibre or other suitable *fire-resisting* material with the packing arranged to maintain any weatherproofing requirements of Part 3.3.

**FIGURE 3.7.1.11**

**SEPARATING WALL CONSTRUCTION - UNDERSIDE OF NON-COMBUSTIBLE ROOF**




Note: Roof battens may pass over seperating wall

Note: Rafter/trusses not to pass through seperating wall

### 3.7.1.9 Sarking-type materials

Any *sarking-type material* used in the roof of a Class 1 building must have a *Flammability Index* of not more than 5.

### 3.7.1.10 Roof lights

*Combustible* roof lights, skylights or the like installed in a roof or part of a roof *required* to have a *non-combustible* covering must-

(a) have an aggregate area not more than 20 % of the roof or part of the roof; and

(b) be not less than-

(i) 900mm from-

(A) the allotment boundary other than the boundary adjoining a road alignment or other public space; and

(B) the vertical projection of a separating wall extending to the underside of the roof covering; and

(ii) 1.8m from any roof light or the like in another building on the allotment other than an appurtenant building or a detached part of the same building.

(See Figure 3.7.1.12)





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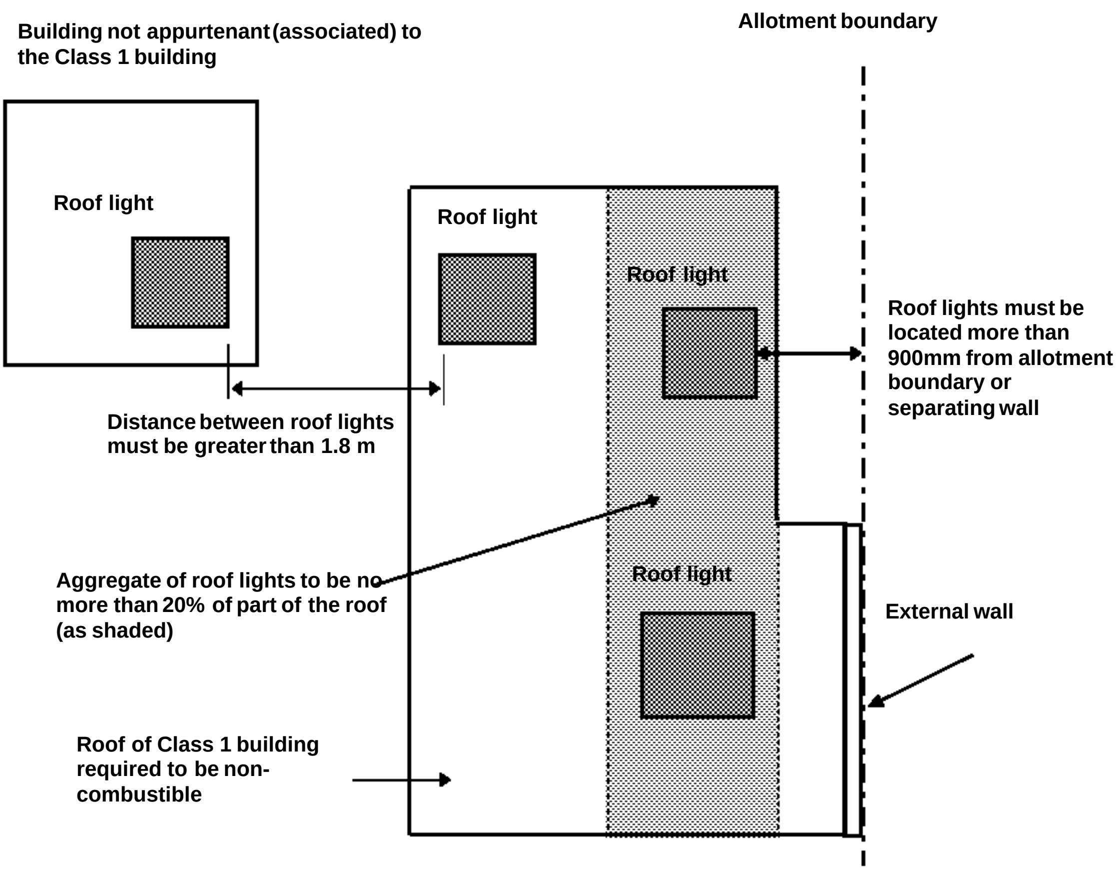
**FIGURE 3.7.1.12**

**LOCATION OF COMBUSTIBLE ROOF LIGHTS**

**Note:** Roof lights depicted in Figure 3.7.1.12 are combustible.



# PART 3.7.2 SMOKE ALARMS

**Appropriate performance requirements**
Where an alternative smoke alarm system is proposed to that described in Part 3.7.2, that proposal must comply with the fire detection and early warning performance requirement P2.3.2 in Section 2.



## Acceptable construction practice

### 3.7.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.7.2 satisfies performance requirement P2.3.2.

### 3.7.2.2 Requirements for smoke alarms

Smoke alarms must be installed in Class 1 buildings as follows:

(a) Installation requirements
Smoke detection and alarm systems must be installed as follows:

(i) In Class 1a buildings - consist of a system of smoke alarms located in accordance with 3.7.2.3; or

(ii) in Class 1b buildings - consist of a system of smoke alarms-

(A) located in accordance with 3.7.2.4; and

(B) complying with Specification E2.2(a) of the BCA-Volume One.

(b) Design of smoke alarms
Smoke alarms must comply with AS 3786.

(c) Smoke alarms must be connected to the consumer mains power where consumer power is supplied to the building.

**STATE AND TERRITORY VARIATIONS**

**3.7.2.2(a)(i) does not apply in the Northern Territory.**

**Note:** Smoke alarms are not required in Class 1a buildings in the Northern Territory.

### 3.7.2.3 Location - Class 1a buildings

Smoke alarms must be installed in a Class 1a building on or near the ceiling in -

(a) any storey containing bedrooms-

(i) between each part of the dwelling containing bedrooms and the remainder of the dwelling; or

(ii) where bedrooms are served by a hallway, in that hallway; and

(b) any other storey not containing bedrooms.
(see Figure 3.7.2.2)

### 3.7.2.4 Location - Class 1b buildings

In a Class 1b building, smoke alarms must be installed on or near the ceiling-

(a) in every bedroom and associated hallway; and

(b) on each other storey.
(see Figure 3.7.2.2)



**FIGURE 3.7.2.1**

**LOCATION OF SMOKE ALARM**

**Legend:** ● **Smoke alarm**

**Diagram a.** **Class 1a buildings**

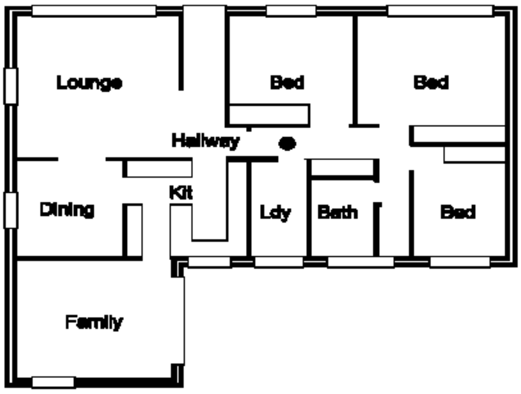
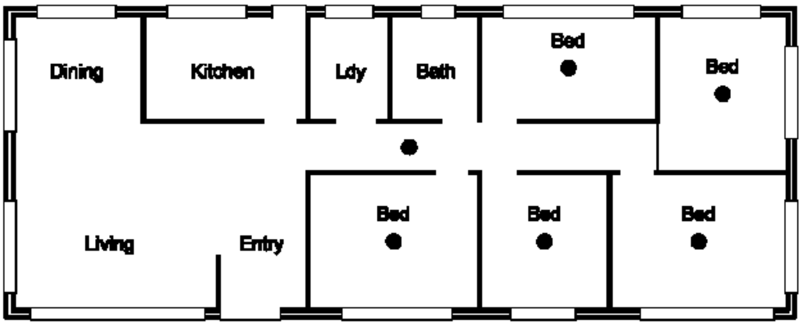



**Diagram b.** **Class 1b buildings**

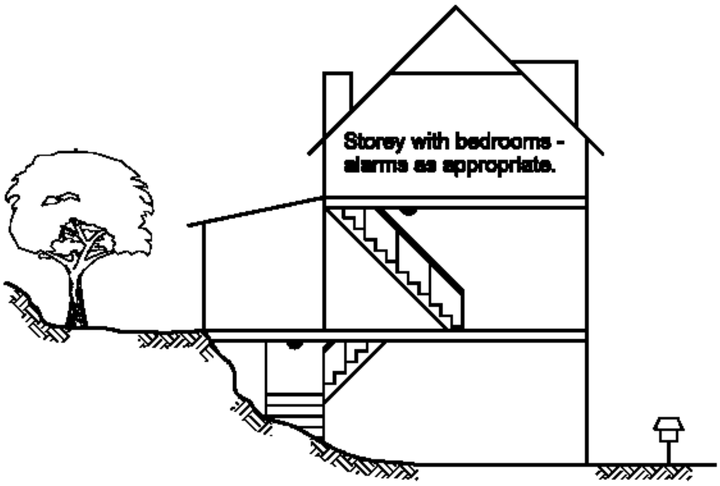





SUPERSEDED

**FIGURE 3.7.2.2**

**LOCATION OF SMOKE ALARMS ON DIFFERENT STOREYS**




(d) Smoke alarms installed on each storey not containing bedrooms - located in the area of the stairway.

**Explanatory Information:**

**1. HOW DOES A SMOKE ALARM WORK ?**

There are 2 types of smoke alarms.

**1.1 Photoelectric**: This type of smoke alarm uses a light source and photocell. As the smoke enters the detection chamber it interferes with the light beam which in turn causes the alarm to sound.

**1.2 Ionisation**: A small amount of radioactive material is used to create an electrical current which travels through ionised air. When smoke enters the detection chamber it impedes the flow of current and causes the alarm to sound.

**2. LOCATION OF SMOKE ALARMS**

When deciding on the position of smoke alarms it is important to remember that they are intended to detect smoke before it reaches the sleeping occupants of a building.

The ensuing alarm is designed to wake the occupants and give them time to evacuate the building.

**2.1 Added flexibility when considering detector location**

As mentioned earlier, the introduction of the performance requirement gives the approval authority flexibility when considering the location of smoke alarms.

For instance, in Class 1a buildings if the deemed-to-satisfy requirement states that the smoke alarm should be located in the hallway, and there is a bathroom adjacent this location (that will potentially cause false alarms) the approval authority could accept the alarm being installed in the bedroom as a suitable option using the performance clause.

**Explanatory information (cont):**

This approach should also be adopted when considering sleep-outs or similar type residential buildings that are not connected to the remainder of the building by a hallway or other enclosed structure. In these situations the alarm could be located in the room itself.

**2.2 Protection of sleeping areas in Class 1a buildings**

The deemed-to-satisfy provisions require that a smoke alarm be located "between each area containing bedrooms and the remainder of the dwelling".

In some dwellings the bedrooms are located in a common area and connected by a hallway. In this instance the alarm should be located as shown in diagram for "Location - Class 1a buildings".

**2.3 Location of the smoke alarm on other storeys**

A smoke alarm is also required on each other storey that is not already provided with a smoke alarm.

The favoured location for this alarm will be in the path of travel people will most likely take to evacuate the building. This will ensure an alarm will be raised before smoke makes the common exit path impassable.

eg If the bedrooms are on the first floor, then an alarm should be positioned near the area of the inter connecting stair at ground level.

If the other storey is not connected to the remainder of the building (for instance a ground floor garage) then the alarm should be centrally located in the lower area.

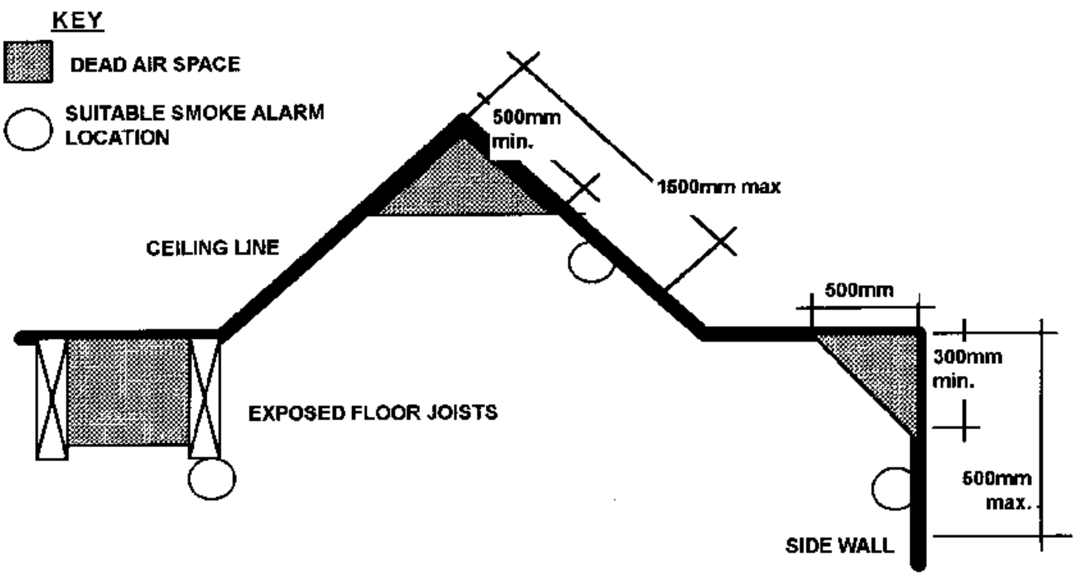



**DIAGRAM 1 - DEAD AIR SPACE AND PROPER MOUNTING OF SMOKE ALARMS ON SIDE WALLS**

**2.4 Installation of smoke alarms**

Smoke alarms should be installed on or near the ceiling with special care being taken to avoid dead air spaces.

A dead air space is an area in which trapped hot air will prevent smoke from reaching the alarm. This space generally occurs at the apex of cathedral ceilings, the corner junction of walls and ceilings, between exposed floor joists etc (See Diagram 2).

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**Explanatory information (cont):**

If it is impractical to mount the smoke alarm on the ceiling then it may be located on the wall. The recommended position is between 300 mm and 500 mm of the ceiling (See Diagram 2).

The distance from the apex of a cathedral ceiling to the top of the alarm should be between 500 mm and 1500 mm.

**3. MAINTENANCE OF SMOKE ALARMS**

For smoke alarms to be effective it is important that they are adequately maintained (it should be noted that the BCA does not require smoke alarms to be maintained).

The operation of most smoke alarms can be readily checked by depressing a button on the outside of the alarm. The test should be conducted in accordance with manufacturer's instructions.

The battery in most smoke alarms will need to be renewed on an annual basis. Some smoke alarms will emit a warning sound when the battery needs replacement. The new battery should be the type specified by the manufacturer as installation of incorrect batteries will seriously affect the operation of the smoke alarm.

The alarm should also be cleaned annually. This usually involves carefully vacuuming to remove dust particles that may affect the operation of the unit. Once again full details will be in the manufacturer's brochure.

**4. FALSE ALARMS**

Smoke alarms are extremely sensitive and may detect smoke and moisture created by common household activities (such as burnt toast or steam from a bathroom).

Accordingly, to reduce the likelihood of false alarms, the smoke alarm should not be located near cooking appliances and bathrooms. However if it is necessary to locate alarms in these positions, an ionisation type alarm is more suitable near bathrooms, while a photoelectric alarm may be used near cook appliances.

Each type of smoke alarm will be provided with a different method for switching off a false alarm. They range from a simple time delay switch that deactivates the alarm for a period of time while the smoke clears to opening a window to remove the contaminated air.

If false alarms persist, then the smoke alarm should be checked initially to see if the correct type has been used for the location and then if the false alarm continues, moved to a more suitable location.

**5. INTERCONNECTION OF SMOKE ALARMS**

Some types of alarm are capable of interconnection to the other alarms so that if one alarm sounds then the other alarms are also activated adding an enhanced level of safety. There is no requirement in the BCA that smoke alarms be interconnected. However, it should be noted that an interconnected system would potentially meet the BCA performance requirements.

**6. SMOKE DETECTORS CONNECTED TO HOME SECURITY PANELS**

A system of smoke alarms connected to a home security panel is also an option to enhanced the level of fire protection in a dwelling.

Therefore, using the performance requirement P2.3.2, the approval authority should give careful consideration on accepting these systems in lieu of the deemed-to-satisfy requirements.

When assessing the suitability of these systems the relevant approval authority should ensure:

a. the detectors used in the system comply with 3.7.2.1(b);

b. the system complies with State/Territory electricity requirements where necessary; and

c. in new houses the system has 2 independent sources of power (ie battery back-up to the mains power).

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# PART 3.7.3 HEATING APPLIANCES

**Appropriate performance requirements:**
Where an alternative heating appliance is proposed to that described in Part 3.7.3, that proposal must comply with the heating appliance performance requirement P2.3.3 in Section 2.



## A. Acceptable construction manuals

**3.7.3.0** Performance requirement P2.3.3 is satisfied if a heating appliance is installed in accordance with the one of the following manuals:

(a) Domestic oil-fired appliances are installed in accordance with AS 1691.

(b) Domestic solid-fuel burning appliances are installed in accordance with AS 2918.

(c) Boilers and pressure vessels are installed in accordance with AS 1200.

## B. Acceptable construction practice

### 3.7.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.7.3 for the installation of heating appliances satisfies performance requirement P2.3.3.

### 3.7.3.2 Open fireplace construction

An open fireplace must be constructed as follows (also see Figure 3.7.3.1):

(a) All masonry must be constructed in accordance with Part 3.3.

(b) The front hearth must be constructed of stone, concrete, masonry or similar material so that -

(i) it extends not less than 300mm beyond the front of the fireplace opening and not less than 150mm beyond each side of that opening; and

(ii) its upper surface does not slope away from the back hearth.

(c) The base of the back hearth must be constructed of stone, concrete, masonry or similar material and any *combustible* flooring or framing members must be situated not less than 150mm from its upper surface.

(d) The fireplace walls up to a height of 300mm above the underside of the arch or lintel-

(i) must be constructed in 2 separate leaves of solid masonry with an overall thickness not less than 180mm thick, excluding any cavity; and

(ii) must not consist of concrete block masonry in the construction of the inner leaf; and

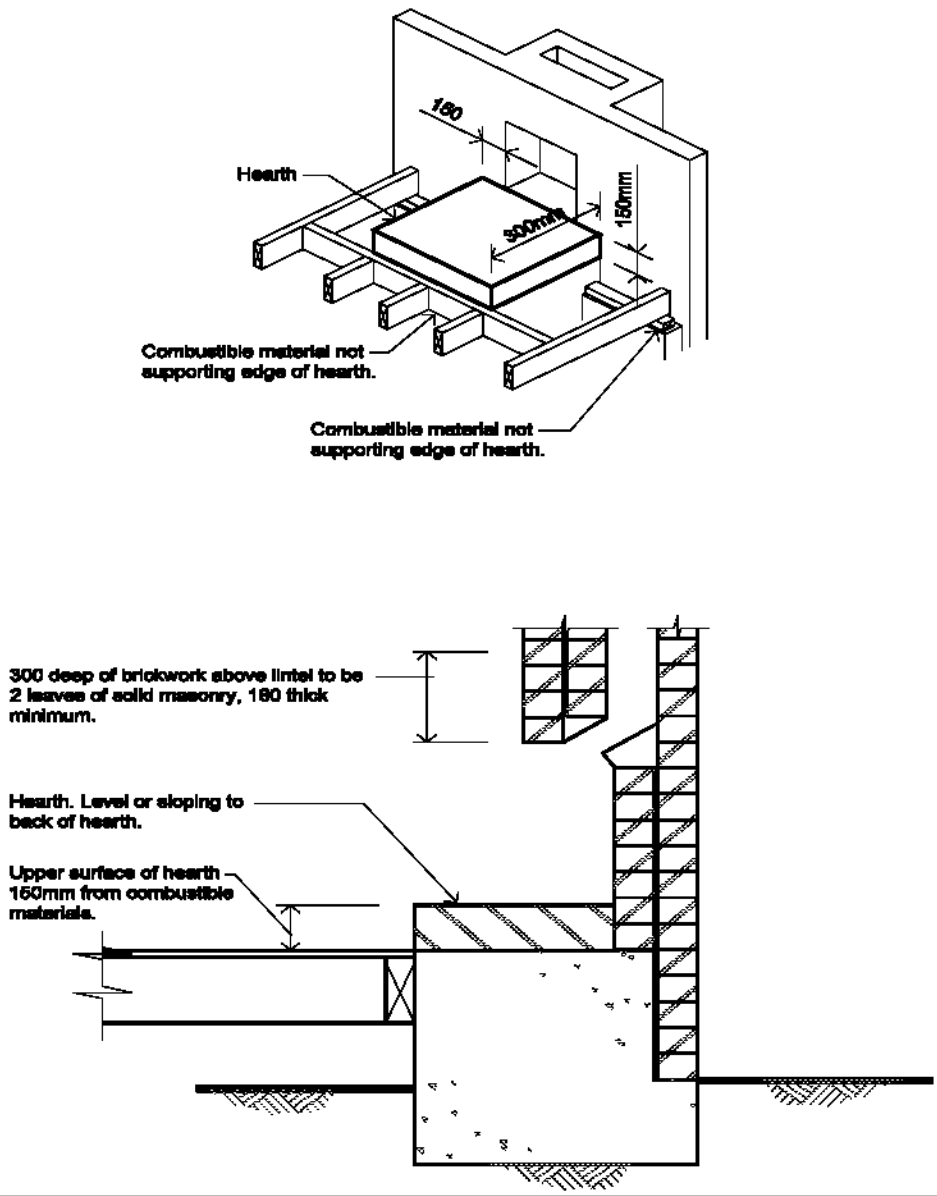
(iii) must be constructed of masonry units with a net volume, excluding cored and similar holes, not less than 75% of their gross volume, measured on the overall rectangular shape of the units, and with an actual thickness of not less than 100mm.

(e) The fireplace must be constructed on footings complying with 3.2.5.5.



**Figure 3.7.3.1**

**FIRE PLACE CLEARANCE FROM COMBUSTIBLE MATERIALS**



### 3.7.3.3 Chimney construction

The construction of a chimney must comply with Part 3.3 and the following:

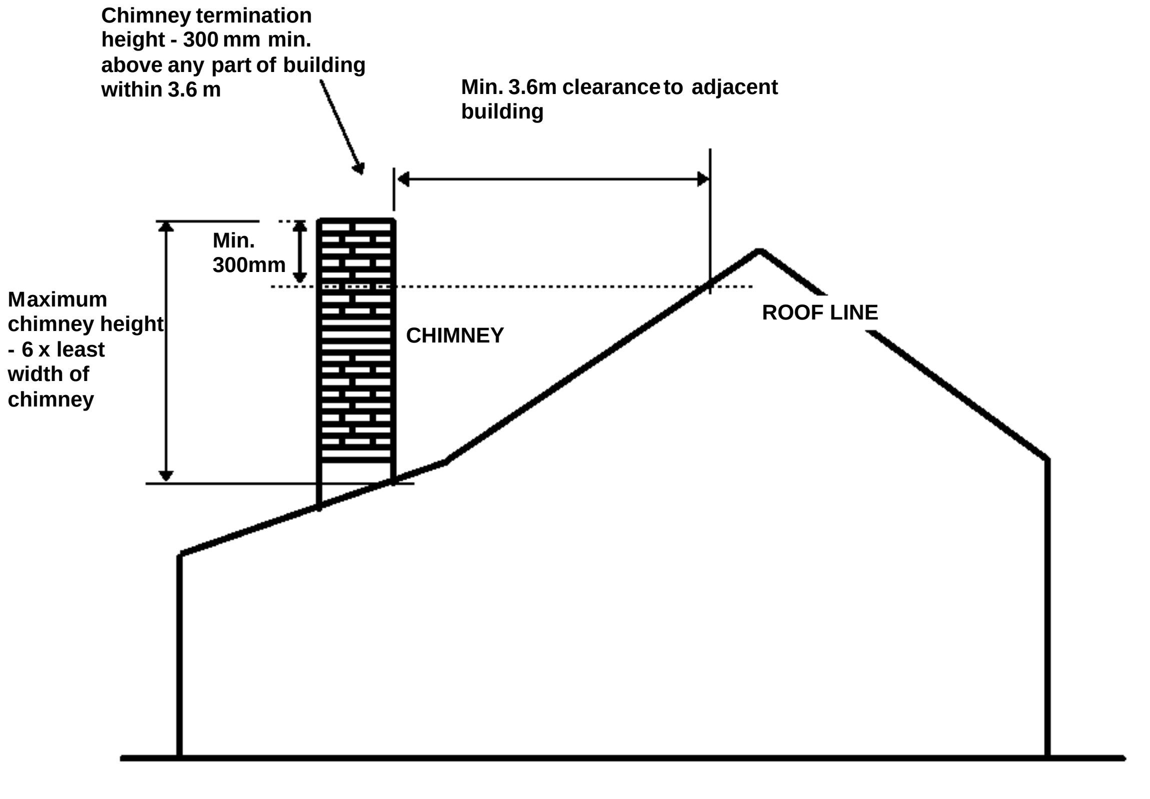
(a) The walls of the chimney above the level referred to in 3.7.3.2 (d) must be lined internally to a thickness of not less than 10mm with composition mortar parging.

(b) The chimney or flue must terminate at least 300mm above any part of the building within a horizontal distance of 3.6m, see Figure 3.7.3.2.



**Figure 3.7.3.2**

**SECTION SHOWING HEIGHT AND POSITION OF CHIMNEY**




### 3.7.3.4 Installation of insert fire places and flues

An insert fire place and flue must comply with the following:

(a) The insert fire place must be tested and passed the tests *required* by AS 2918.

(b) The insert fire place must be fitted into a masonry fire place (including chimney) constructed in accordance with 3.3.

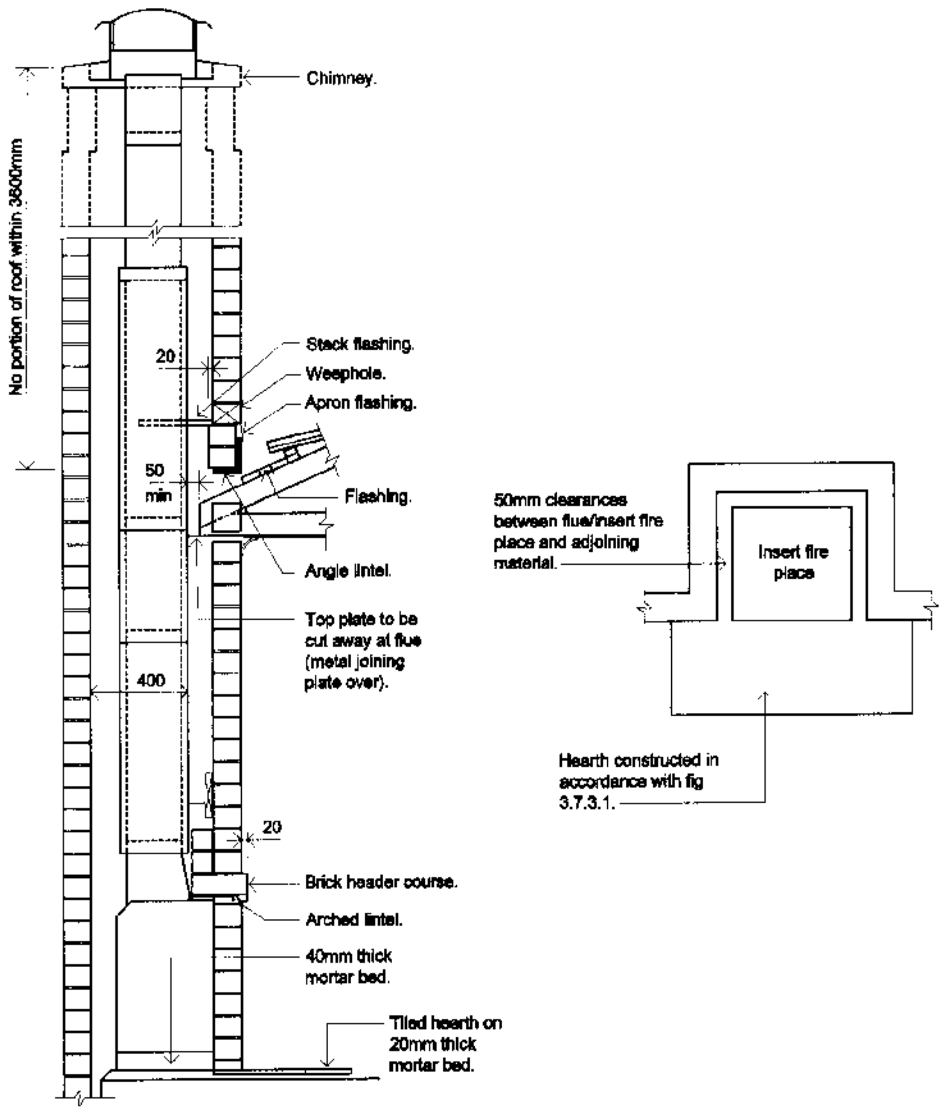
(c) the flue must be -

(i) double skin and have been tested and pass the tests *required* by AS 2918; or

(ii) cast iron, cellulose fibre reinforced cement not less than 9.5mm thick, galvanised steel not less than 1.2mm thick or such other material of at least equivalent strength and durability, installed in accordance with Section 6 of AS 1691, as though it is a flue connected to an oil heating appliance; and

**Figure 3.7.3.3**

**TYPICAL INSTALLATION OF FIRE PLACE FLUE INSERTS**



(d) there must be a minimum clearance of 50mm between the outer flue and adjacent materials; and

(e) the flue must terminate in accordance with Figure 3.7.3.2; and

(f) the hearth must be constructed in accordance with 3.7.3.1 (b), (c) and (e).

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### 3.7.5 Installation of free standing heating appliances

The installation of a free standing heating appliance must comply with the following -

(a) the heating appliance must have been tested and passed the tests *required* by AS 2918 and -

(i) must be located 1200mm from adjoining walls (other than a masonry wall); or

(ii) has a heat shield between the adjoining wall (other than a masonry wall) and the heating appliance in accordance with Figure 3.7.3.4.

(b) where a heat shield is used, it is installed in accordance with Figure 3.7.3.4 and it must be a minimum of 90mm masonry constructed in accordance with Part 3.3; and

(c) the heating appliance must be installed on a hearth -

(i) complying with 3.7.3.1(b) and (c), except that the hearth must extend 400mm from the appliance in accordance with Figure 3.7.3.4; or

(ii) where a heat shield is installed, in accordance with Figure 3.7.3.4; and

(d) the flue must have been tested and passed the tests *required* by AS 2918; and

(ii) be installed in accordance with Figure 3.7.3.5.

(iii) must terminate in accordance with Figure 3.7.3.2.

**Explanatory Information:**

Flue types or installation of flues in areas not specifically covered by the following figures must be installed in accordance with AS 2918.

**Figure 3.7.3.4**

**ACCEPTABLE LOCATION OF FREE STANDING HEATING APPLIANCES**

**Diagram a.** ELEVATION

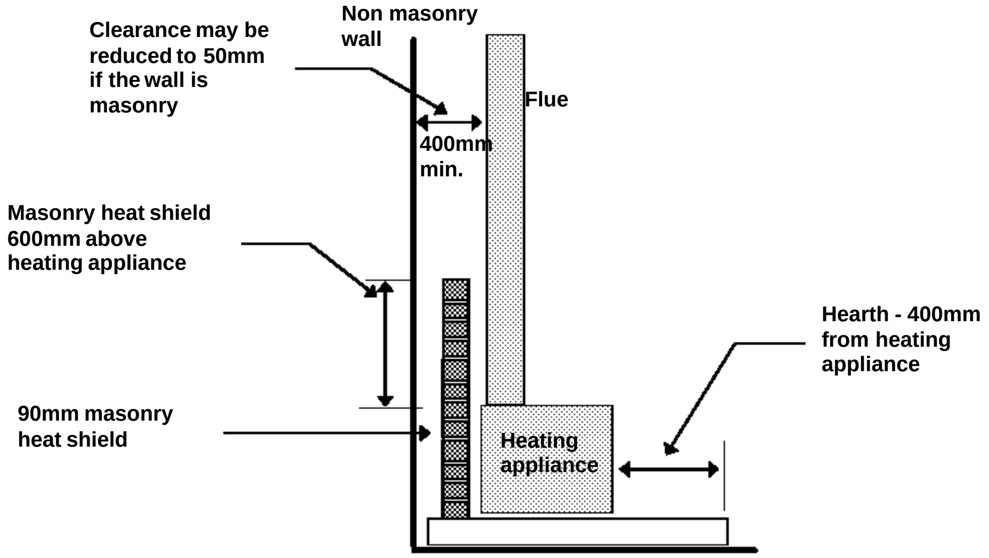


**Diagram b.** PLAN VIEW

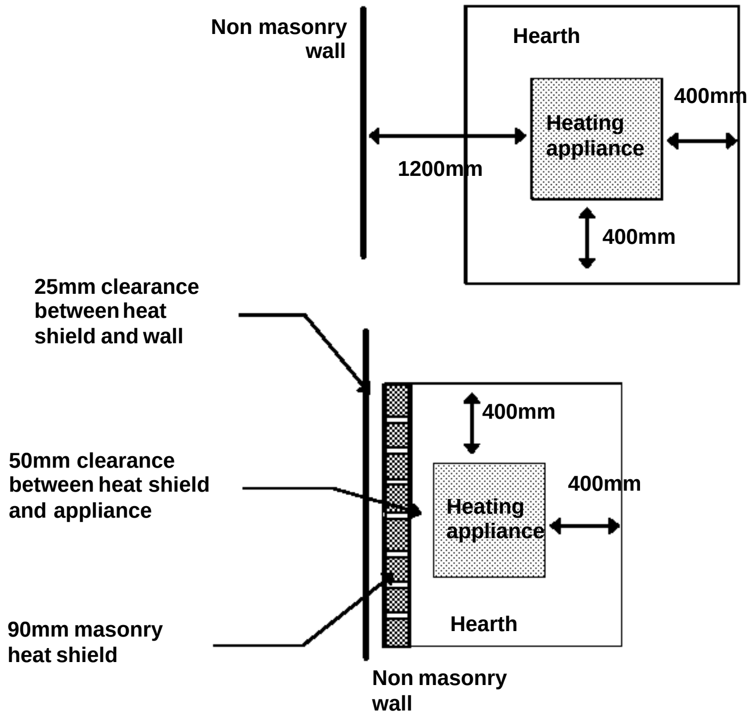


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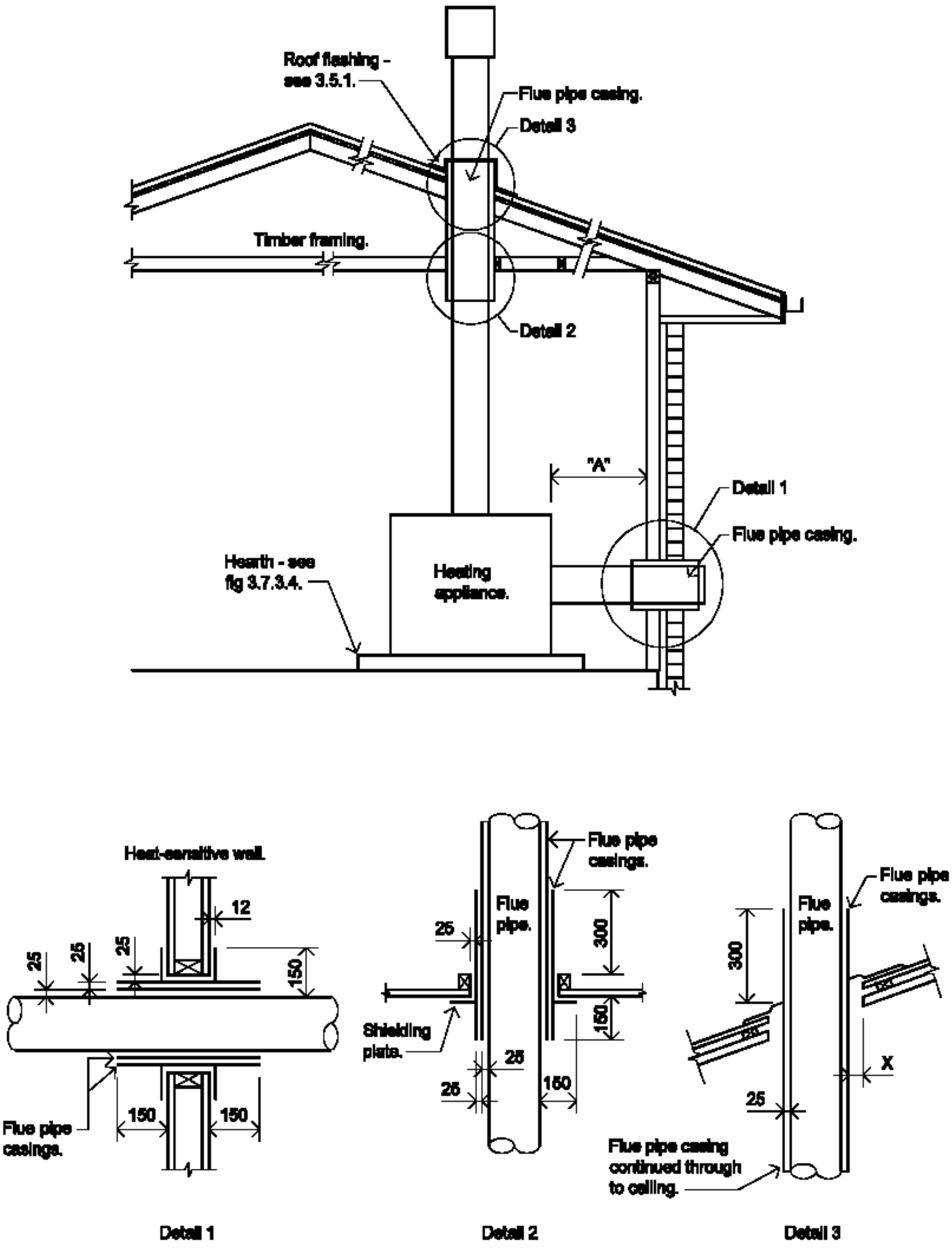
**Figure 3.7.3.5**

**ACCEPTABLE FLUE INSTALLATION DETAILS**

**Note:** Flue pipe size - 150mm maximum (for other sizes see AS 2918)



# PART 3.7.4 BUSHFIRE AREAS

**Appropriate performance requirements:**
Where an alternative bushfire protection design is proposed to that described in Part 3.7.4, that proposal must comply with the bushfire area performance requirement P2.3.4 in Section 2.

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## A. Acceptable construction manuals

**3.7.4.0** Performance requirement P2.3.4 is satisfied if a Class 1 building located in *designated bushfire prone areas* as defined under relevant State and Territory legislation is constructed in accordance with one of the following manuals:

(a) AS 3959 - Construction of buildings in bushfire prone areas.

(b) South Australian Minister's Specification SA G5 101.

Note: Minister's Specification means a Specification as issued from time to time by the Minister responsible for the Building Code in South Australia.

**STATE AND TERRITORY VARIATIONS**

1. **3.7.4.0(b) does not apply in New South Wales.**
2. **3.7.4.0(a) does not apply in South Australia.**

## B. Acceptable construction practice

### 3.7.4.1 Application

Compliance with the acceptable construction practice provisions of Part 3.7.4. for Class 1 buildings constructed in *designated bushfire prone areas* satisfies performance requirement P2.3.4.

### 3.7.4.2 Bushfire protection

Protection measures against the danger of bushfires must prevent the entry of burning debris to the underfloor area, through wall penetrations such as windows, doors and vents and gaps in eaves and roof coverings by-

(a) protecting the underfloor area and lower portion of the wall by closing off the space with non-combustible, weather resistant materials (see Figure 3.7.4.1); and

(b) installing metallic and corrosion-resistant screens to windows, doors and sub floor vents; and

(c) installing non-combustible roofing and sarking (see Figure 3.7.4.1); and

(d) the underside of eaves are fully enclosed.

**Figure 3.7.4.1**

**BUSHFIRE PROTECTION MEASURES**

**Diagram a.** Protection Of Ridge For Sheeted Roofs

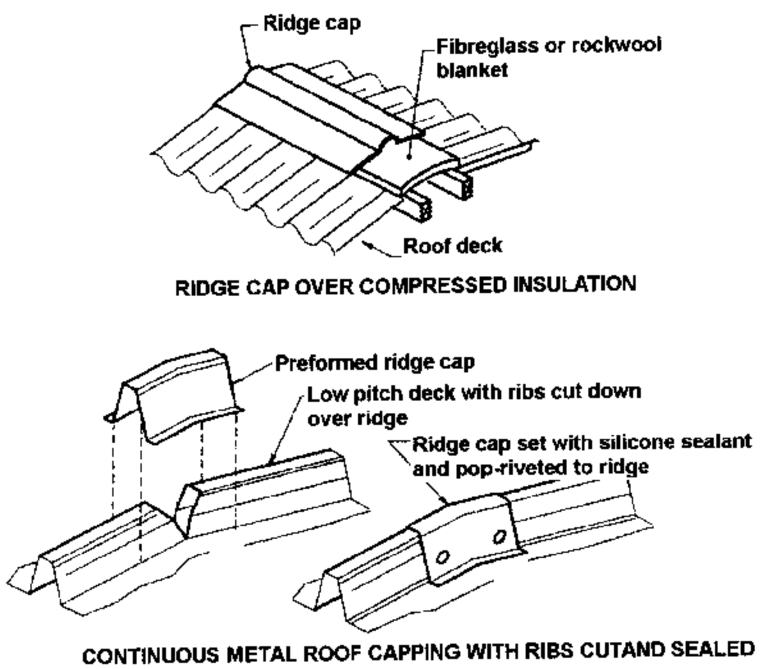



**Diagram b.** Protection Of Eaves

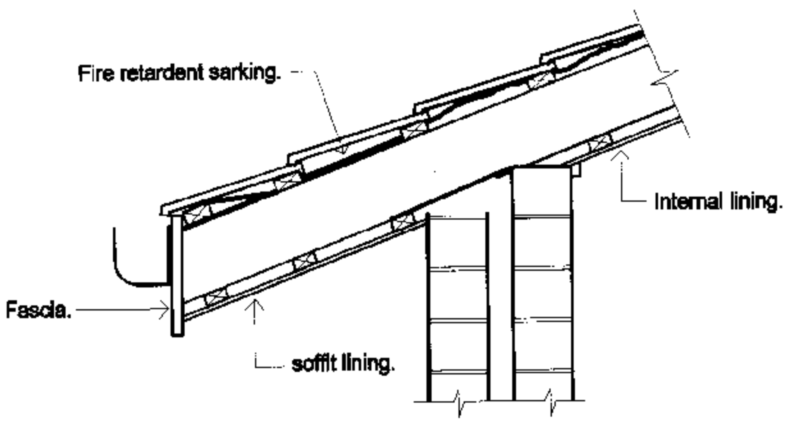
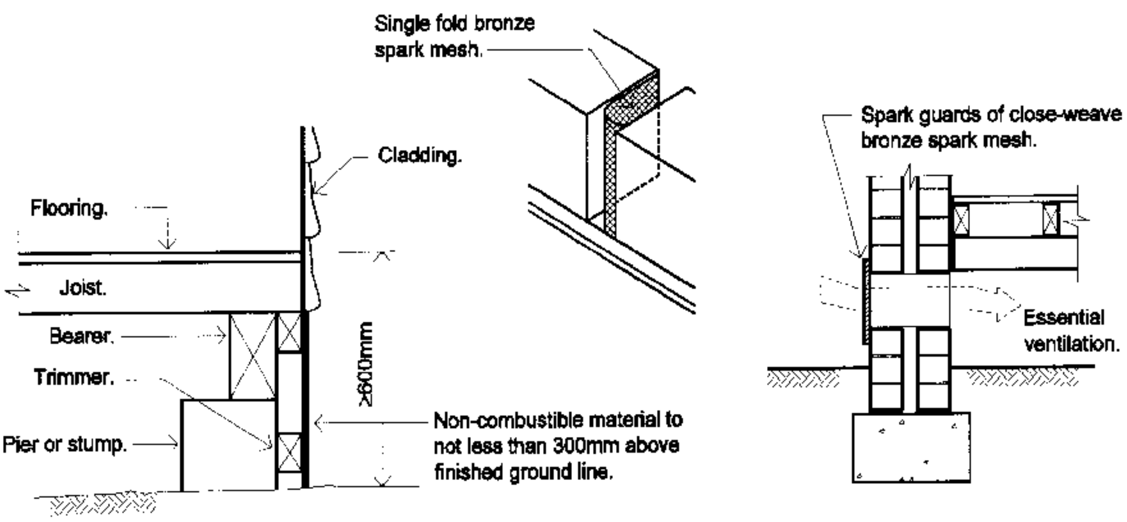


**Figure 3.7.4.1**

**BUSHFIRE PROTECTION MEASURES**

**Diagram c.** **Protection Of Sub-Floor Areas**




**Explanatory information:**

The provisions of this Part are applicable to Class 1 buildings constructed on land that has been declared under appropriate State and Territory legislation to be prone to danger from bushfires.

In South Australia schedule 18 of the Regulations under the SA Development Act 1993 sets out bush fire risk areas of the Mount Lofty Ranges that have been declared bushfire-prone areas for the purpose of the BCA. The protection methods must comply with the requirements of the Ministers' Specification SA G5 101.

In Victoria the Building Regulation 6.4 under the Victoria Building Act provides that a Council after consultation with the Chief Officer may determine that all or part of the municipal district is a designated bushfire area for the purpose of the BCA. Information about the designation of any area would be available from the relevant local authority administration and the fire brigade.

In Queensland bushfire prone areas may be declared under Local Government's planning schemes. Bushfire risks are to be taken into account for standards for residential development in such areas.

In the ACT, NT, Tasmania and WA no areas have been designated as bushfire-prone areas.

Further technical information about bushfire protection is available from Standards Australia in SAA Hand Book HB 36 "Building in bushfire-prone areas" and CSIRO National Building Technology Centre Notes on the Science of Building NSB 154 "Houses exposed to bushfires".

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# PART 3.7.5 ALPINE AREAS

**Appropriate performance requirements:**
Where an alternative alpine area egress design is proposed to that described in Part 3.7.5, that proposal must comply with the alpine area performance requirement P2.3.5 in Section 2.



**Acceptable construction practice**

### 3.7.5.1 Application

Compliance with the acceptable construction practice provisions of Part 3.7.5 for Class 1 buildings which are located in *alpine areas* (see Figure 3.7.5.2) satisfies performance requirement P2.3.5.

### 3.7.5.2 External doorways

An external door in a Class 1 building constructed in an *alpine area*, which may be subject to a build-up of snow must -

(a) open inwards; and

(b) be marked "OPEN INWARDS" on the inside face of the door in letters not less than 75mm high and in a colour contrasting with that of the background; and

(c) if it serves a corridor or stairway, be positioned in an alcove or recess with-

 (A) no horizontal dimension of the alcove or recess less than twice the width of the door; and

 (B) the door positioned to open against a wall such that the distance from any part of its swing to the nearest point of entry of the stairway or corridor is not less than the width of the door.

### 3.7.5.3 External ramps

An external ramp serving and external doorway must have a gradient not steeper than 1 in 12.

### 3.7.5.4 Discharge of external doorways providing a means of egress

A building in an *alpine area* must be constructed so that -

(a) for any external walls more than 3.6m above the natural ground level, the distance of that part of the building from the allotment boundary (other than a road alignment) must not be less than 2.5m plus 100mm for each 300mm or part by which that part of the external wall exceeds a height of 3.6m; and

(b) an external doorway may discharge into a court between wings of a building provided the wings are at least 6m apart; and

(c) where an external doorway discharges opposite a barrier or embankment which is more than 900mm above the threshold of that doorway, the distance between the threshold and the barrier is not less than twice the height of the barrier or 6m, whichever is the lesser, see Figure 3.7.5.3.

### 3.7.5.5 External trafficable structures

External stairways, ramps, access bridges or other trafficable structures to the building must have-

(a) a floor surface that consists of steel mesh or other suitable material if it is used as a means of egress; and

(b) any required balustrade constructed so that its sides are not less than 75% open.



**Figure 3.7.5.1**

**DESIGN FOR SAFE EGRESS IN ALPINE AREAS - MINIMUM DIMENSIONS OF ALCOVE OR RECESS AT EXTERNAL DOORWAY**

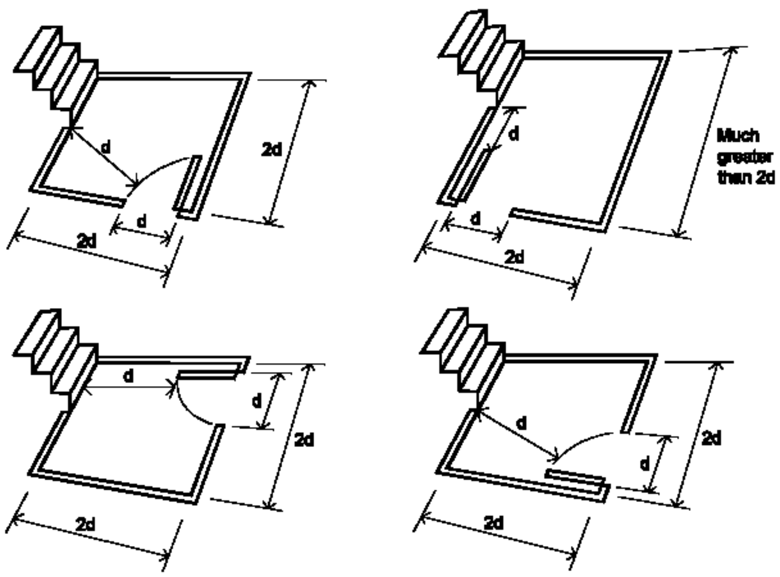


**Figure 3.7.5.2**

**ALPINE AREAS**

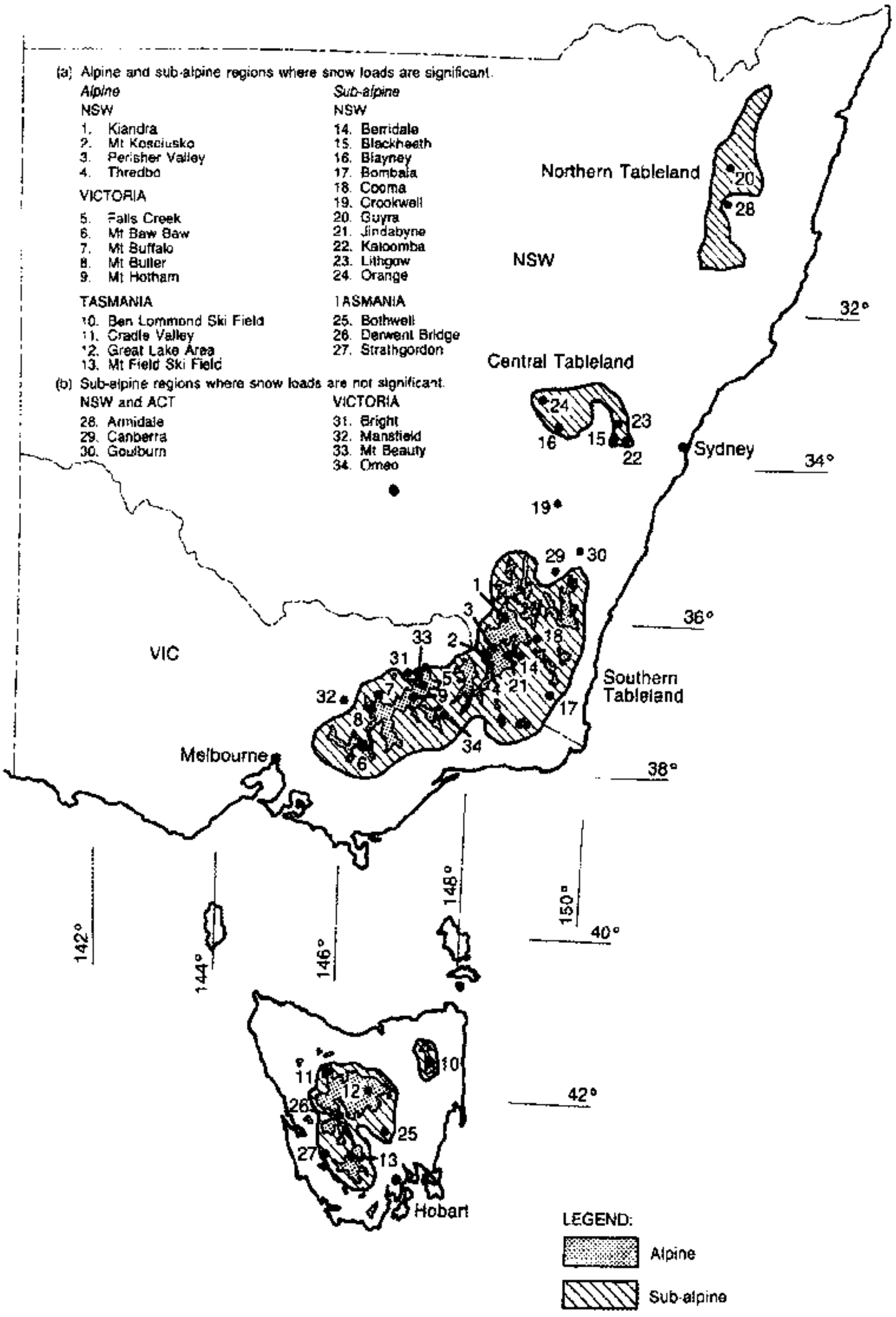
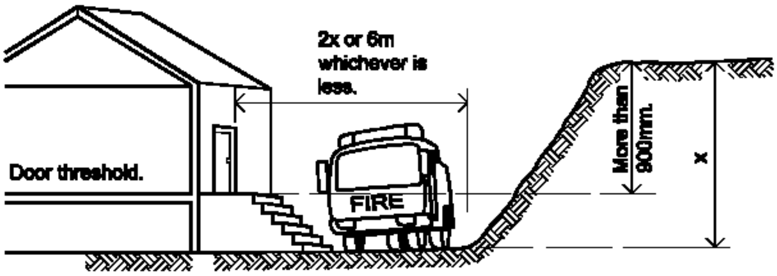


**Figure 3.7.5.3**

**DESIGN FOR SAFE EGRESS IN ALPINE AREAS - DISCHARGE OF EXTERNAL DOORWAY**




**Explanatory information:**

Alpine areas are located in ACT, NSW, Victoria and Tasmania. It is noted that in the ACT the Canberra area is designated as a sub-alpine region where snow loads are not considered significant.

# PART 3.8

Amdt 0

# HEALTH AND AMENITY





SUPERSEDED

# PART 3.8 CONTENTS



Amdt 0

# PART 3.8.1 WET AREAS

**Appropriate performance requirements:**
Where an alternative system for protecting wet areas in a building is proposed to that described in Part 3.8.1, that proposal must comply with the wet area performance requirement P2.4.1.



## Definitions:

**3.8.1** Definitions used in this Part are as follows:

**Enclosed shower** means a shower area enclosed for a height of 1.8m above the shower floor area by water resistant walls, glazed panels or doors, metal framed shower screens, curtain or other similar materials that will control the spread of water.

**Prefinished shower base** means a waterproof preformed prefinished shower base which is installed as the finished floor of a shower compartment.

**Shower tray** means a waterproof liner which is installed in the shower compartment prior to the application of the floor and wall finishing system.

**Waterproof** means that a system or material will not allow the penetration of water.

**Waterproof membrane** means an applied waterproof barrier that is installed in the shower compartment.

**Water resistant** means a system or material that will restrict water migration.

**Wet area** means an area as defined in 3.8.1.2, within a building supplied with water from a water supply system and includes bathrooms, showers, laundries, *sanitary compartments* , kitchens and the like.

**Wet area fixture** means a bath, laundry trough, basin, sink or similar fixture designed to contain water.

## A. Acceptable construction manual

**3.8.1.0** Performance requirement P2.4.1 is satisfied if *wet areas* in a Class 1 and 10 building are waterproofed in accordance with the following manual:

(a) AS 3740 - Waterproofing of wet areas within residential buildings.

(b) SA Minister's Specification SA F1.7 - Water proofing of wet areas in buildings.

**Note:** **Minister's Specification** means a Specification as issued from time to time by the Minister responsible for the Building Code in South Australia.

**STATE AND TERRITORY VARIATIONS**

1. **Part 3.8.1.0 (a) does not apply in South Australia.**
   **Note:** Also see SA 3.2 for additional requirements for waterproofing.
2. **Part 3.8.1.0 (b) does not apply in New South Wales.**

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## B. Acceptable construction practice

### 3.8.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.1 for *wet areas* in Class 1 and 10 buildings satisfies performance requirement P2.2.1 provided -

(a) the *wet area* is protected in accordance with the appropriate requirements of 3.8.1.3, 3.8.1.4, 3.8.1.5 and 3.8.1.6; and

(b) complies with the appropriate details described in Figures 3.8.1.5 to 3.8.1.11.

### 3.8.1.2 Wet areas

The following areas of a building must be protected from the effects of water:

(a) Shower floor areas:

(i) Shower floors with a hob or set down:

(A) Within an *enclosed shower* (see Figure 3.8.1.1) -

(aa) to the outer face of the hob; or

(bb) where there is a minimum 25mm set down to the shower, 100mm past the outside of the set down (see Figure 3.8.1.1); or

(B) Where there is no *enclosed shower*, the area within 1.5m measured horizontally from a point vertically below the shower rose (see Figure 3.8.1.1).

(ii) Floors adjacent showers located above baths where there is no enclosure, the area within 1.5m of the shower rose (see Figure 3.8.1.2).

(iii) Shower floors with no hob or 25mm set down, or a shower designed for disabled access - the whole floor of the room.

(b) Wall areas:

The walls (including corner junctions) -

(i) of an *enclosed shower* (see Figure 3.8.1.1); or

(ii) where there is no *enclosed shower*, within 1.5m of the shower fitting, to a height of 1.8m above the floor (see Figure 3.8.1.1); and

(iii) immediately adjacent or behind a wet area fixture -

(A) to a height not less than 150mm above the fixture if it is within 75mm of the wall; and

(B) for the full width or breadth of the fixture (see Figure 3.8.1.3).

(c) Floor, wall and bench junctions:

(i) The junction between the floor and wall if the wall and floor are *required* to be protected.

(ii) The junction between the wall and any bench top or horizontal surface containing a wet area fixture if the wall is *required* to be protected.

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**Figure 3.8.1.1**

**ENCLOSED AND UNENCLOSED SHOWER - AREA TO BE PROTECTED**

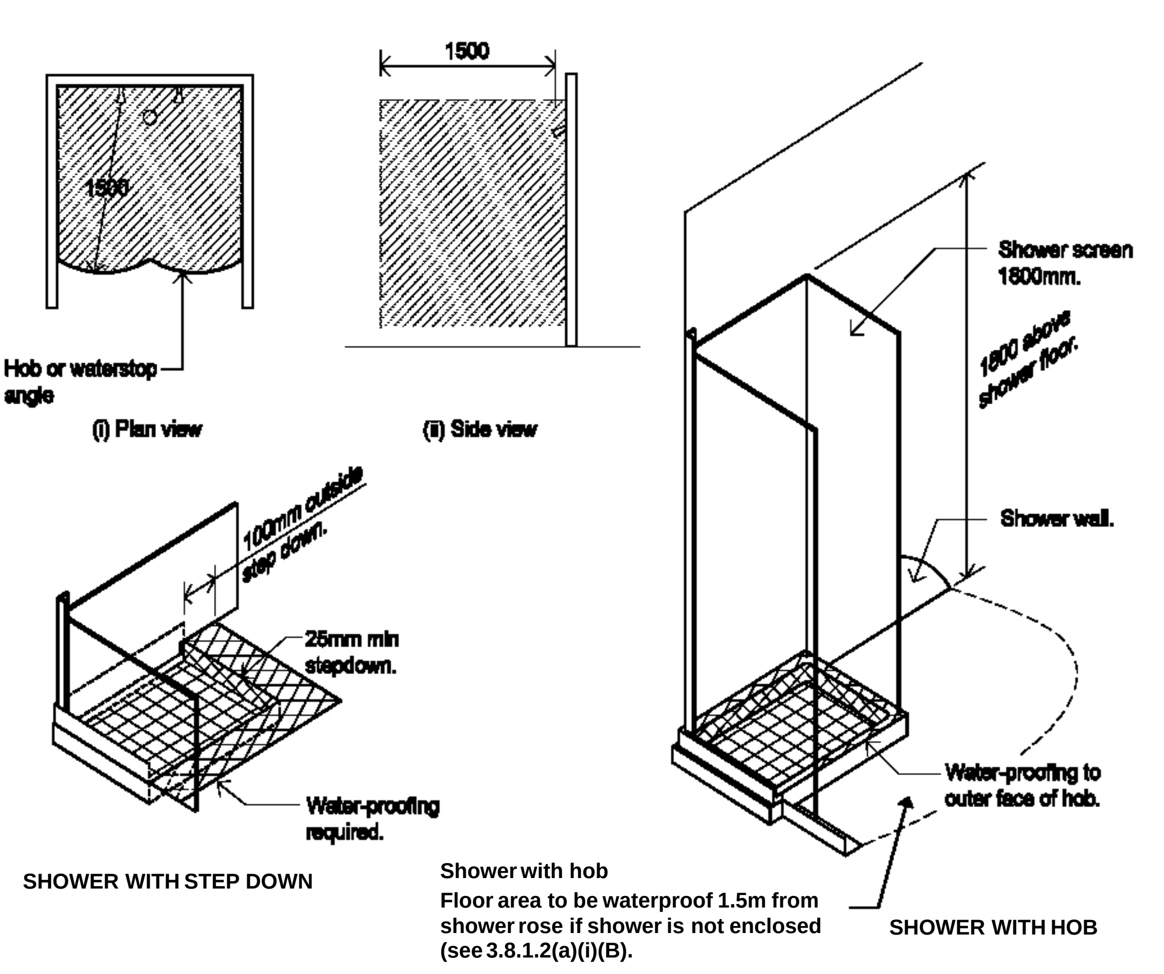




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**Figure 3.8.1.2**

**SHOWERS ABOVE BATHS - AREA TO BE PROTECTED**

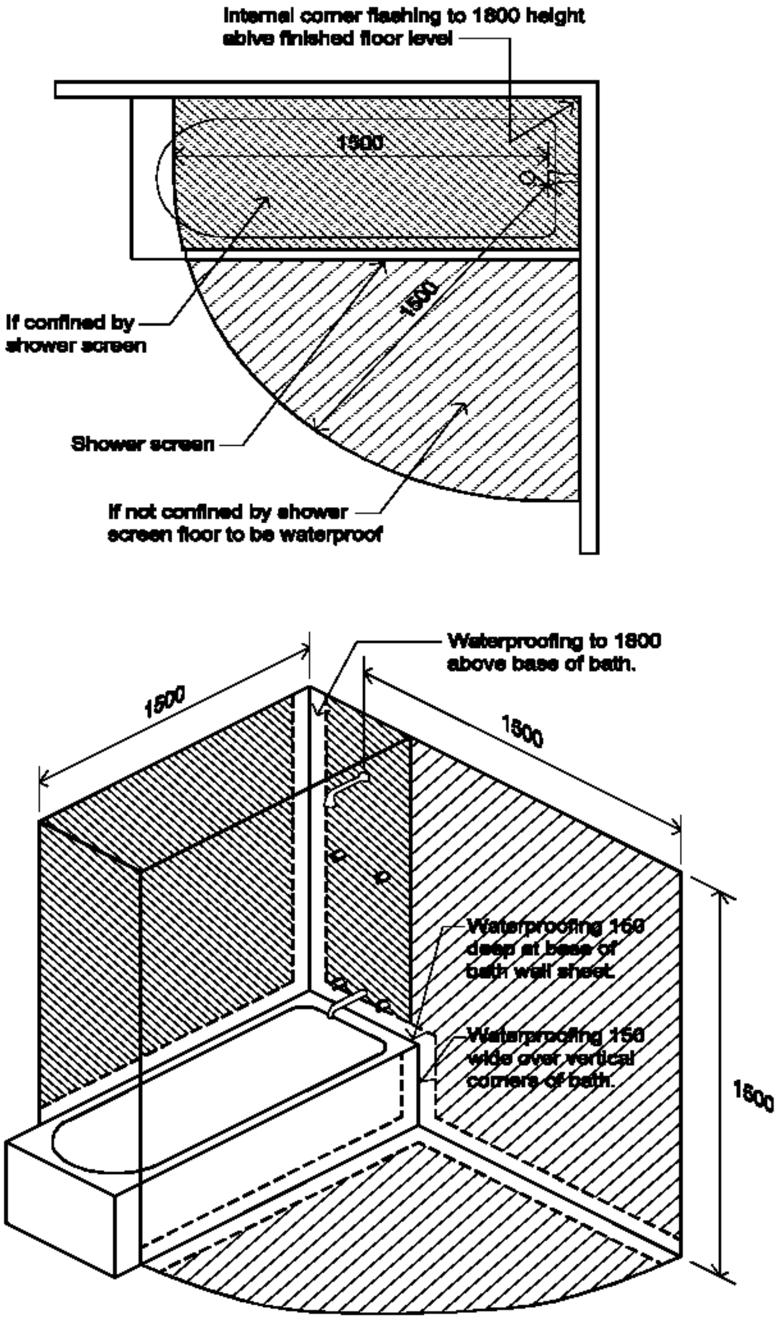
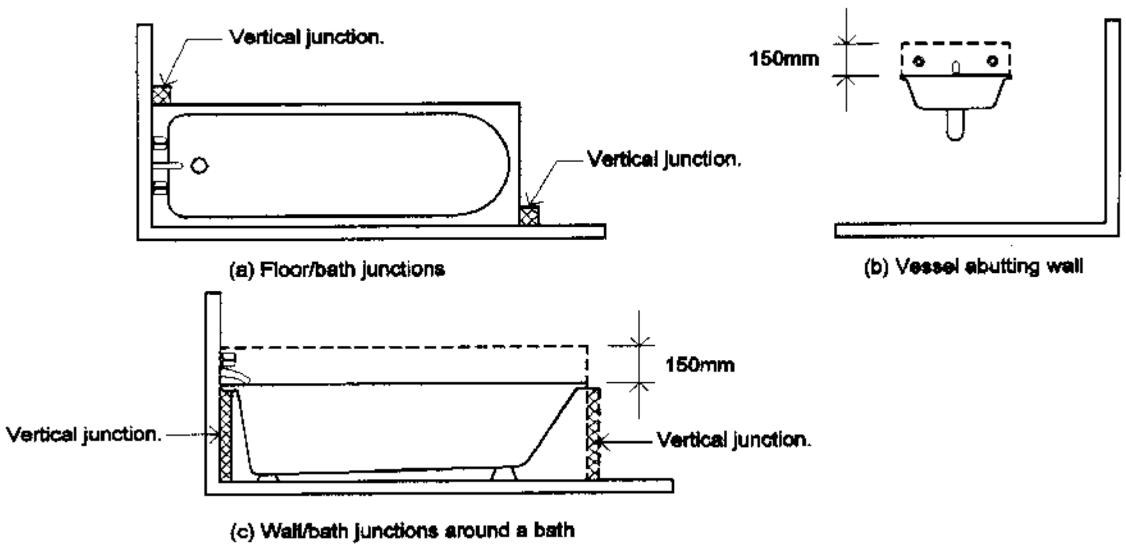


Figure 3.8.1.3

BATH AND WALL FIXTURES - AREA TO BE PROTECTED






### 3.8.1.3 Materials - general

Materials used in *wet area waterproofing* and *water resistant* construction must be as follows:

(a) Flashing angles must be *waterproof* and have minimum dimensions as follows -

(i) wall angles - 40x40mm; and

(ii) floor angles - 25mm above finished adjoining floor level x 50mm.

(b) Grout used for ceramic tiles must comply and be installed in accordance with AS 3958.1.

(c) Flexible sealants must be waterproof, neutral, self curing, flexible and mould resisting or polysulphide-based sealants complying with AS 1526 and AS 1527.

**Explanatory Information:**

Flexible sealants must be compatible with the adjoining materials, especially waterproof membranes as some sealants may damage the integrity of these systems.

**3.8.1.4 Protection of shower floors in wet areas**

The shower floor area as defined in 3.8.1.2(a) must be *waterproof* and protected as follows:

(a) The floor must be protected by one of the following systems -

(i) a *shower tray* with sides which are the greater of -

(A) 100mm above the finished floor surface; and

(B) 75mm above the adjoining structural floor level; and

(C) 25mm above the maximum possible water level of the shower compartment; or

(ii) a waterproof membrane extending 100mm up the adjoining shower or bathroom area walls and turned down into a drainage flange; or

(iii) a prefinished shower base.

(b) In shower areas (other than outside a bath) the floor must have a minimum grade of 1:60 to the shower trap or drainage flange.

**Explanatory Information:**

Where the whole shower floor is required to be waterproof the grade to the drainage flange may need to be increased to 1:40 for an area of 600mm around the flange to prevent ponding of water over the shower floor area.

(c) Floor areas may be finished with grouted glazed tiles -

(i) adhered to the floor substrate; or

(ii) bedded in mortar.

(d) Finished wall and floor tile junctions must not be grouted, but sealed with flexible sealant to provide a flexible movement joint.

**3.8.1.5 Protection of walls in wet areas**

*Wet area* walls as defined in 3.8.1.2(b) must be *water resistant* as follows:

(a) The wall is *water resistant*, consisting of either of the following materials:

(i) smooth finished concrete; or

(ii) cement rendered masonry; or

(iii) terrazzo; or

(iv) pre-finished wall panels sealed with a flexible sealant; or

(b) the walls consist of a *water resistant* finish (or lining) suitably attached or adhered to a *water resistant* substrate with all joints sealed in accordance with 3.8.1.6.

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(i) For the purposes of this clause suitable *water resistant* wall substrates are -

(A) wet area plasterboard sheet; or

(B) fibre cement sheet; or

(C) masonry.

(ii) For the purposes of this clause suitable *water resistant* wall finishes or linings are-

(A) ceramic tiles; or

(B) slate; or

(C) stone tiles; or

(D) sheet vinyl with a minimum thickness of 1mm wear layer, fully bonded to the substrate, with joints welded or seam-sealed.

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### 3.8.1.6 Sealing of wall junctions and joints

Wall, floor and bench junctions as defined in 3.8.1.2(c) and wall joints in *wet areas* must be sealed as follows:

(a) Vertical wall junctions in shower areas must be -

(i) flashed; and

(ii) where the flashing is above a shower tray or membrane, lapped inside the shower tray or membrane a minimum of 25mm (where possible); and

(iii) for wet area plasterboard or reinforced cement sheet, reinforced with tape set in *water resistant* taping compound and sealed with *water resistant* sealer.

(b) Horizontal and vertical joints (other than wall junctions) in substrate wall linings for wet area plasterboard or fibre cement sheet must be reinforced with tape set in *water resistant* taping compound and sealed with *water resistant* sealant.

(c) Treatment of the junction between the wall and shower floor or bath

The junction between the wall and shower or bath must be sealed with a flexible sealant in accordance with Figure 3.8.1.11.

(d) Treatment of the junction between the wall and adjacent fixtures

The junction between the wall and *wet area fixtures* or benches containing a *wet area fixture* must be sealed with a flexible sealant in accordance with Figure 3.8.1.11.

(e) Tap fittings in shower recesses must be sealed with flexible sealant or sealed with a waterproof flange in accordance Figure 3.8.1.6.

(f) Finished wall and floor tile junctions must not be grouted, but sealed with a flexible sealant to create a flexible movement joint.

Figure 3.8.1.5

TYPICAL VIEW OF SHOWER RECESS AND LINING MATERIALS

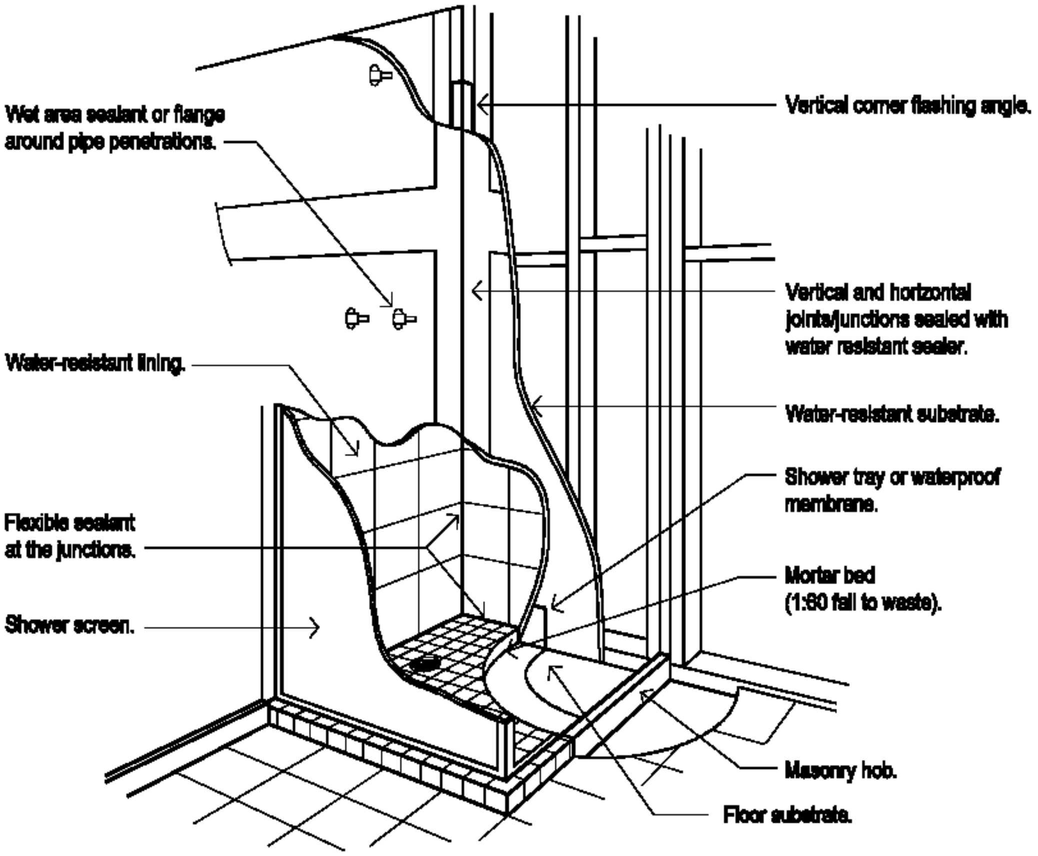


Figure 3.8.1.6

TYPICAL INSTALLATION OF TAP FLANGE

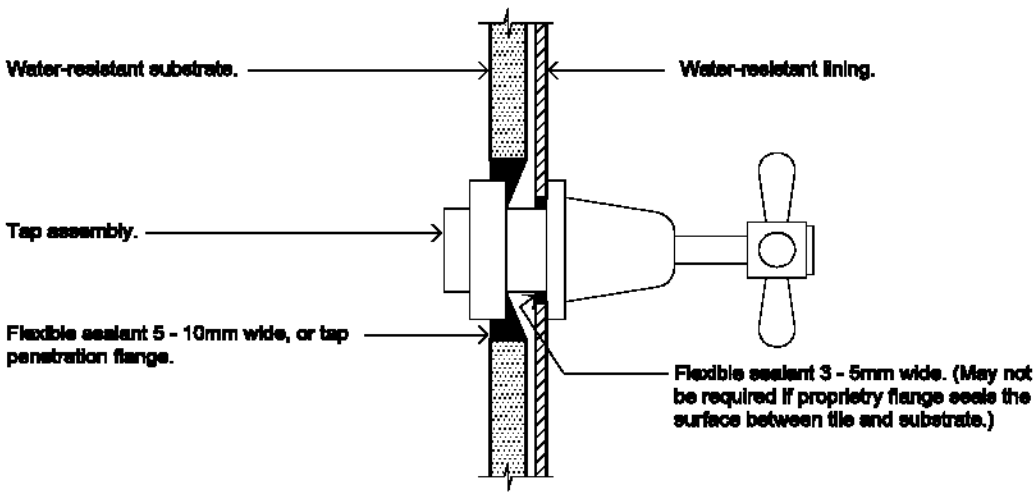

**Figure 3.8.1.7**

**TYPICAL INSTALLATION OF PREFORMED SHOWER TRAYS IN TIMBER AND MASONRY WALLS**

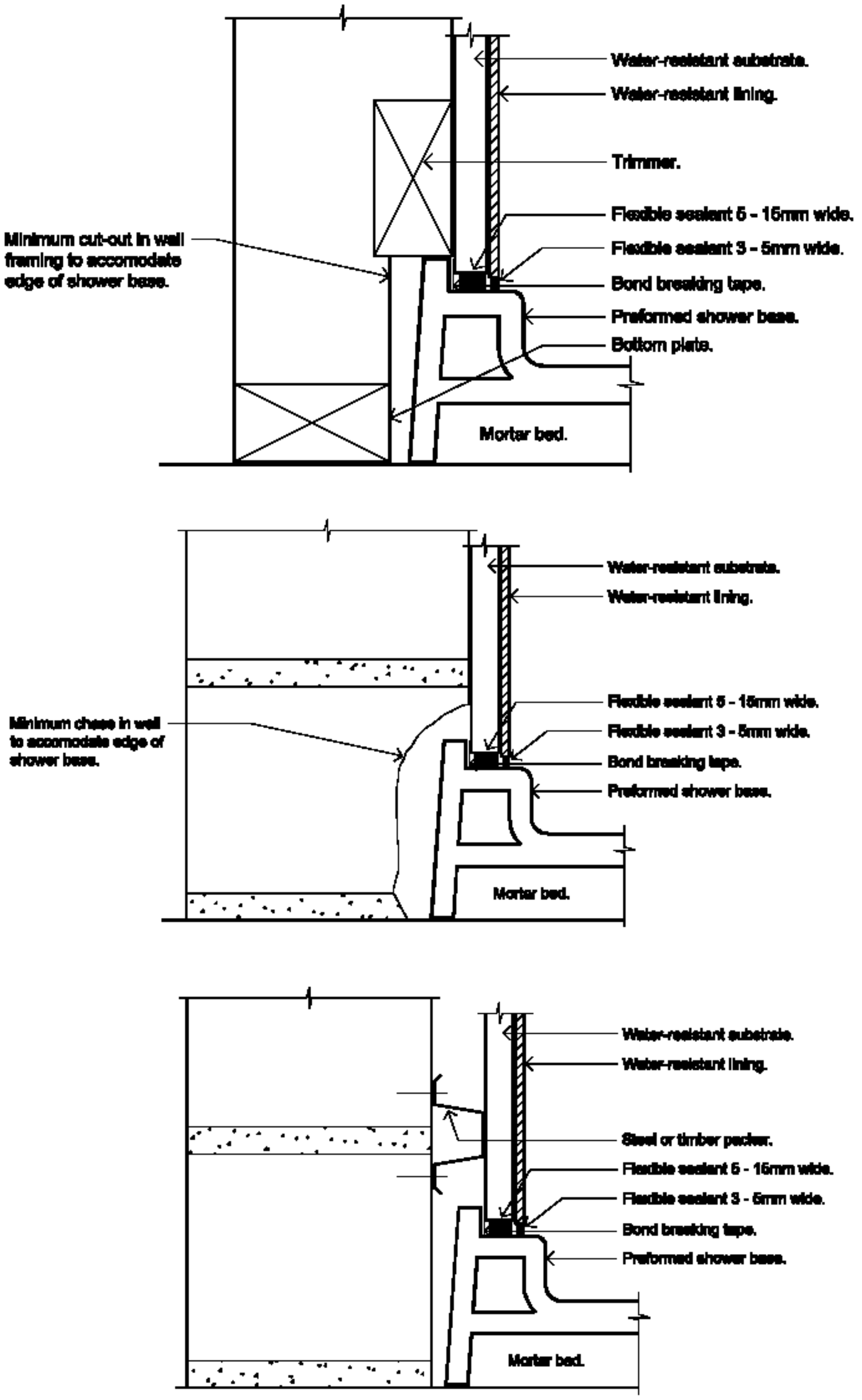


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Figure 3.8.1.8

FLOORS IN SHOWER AREAS

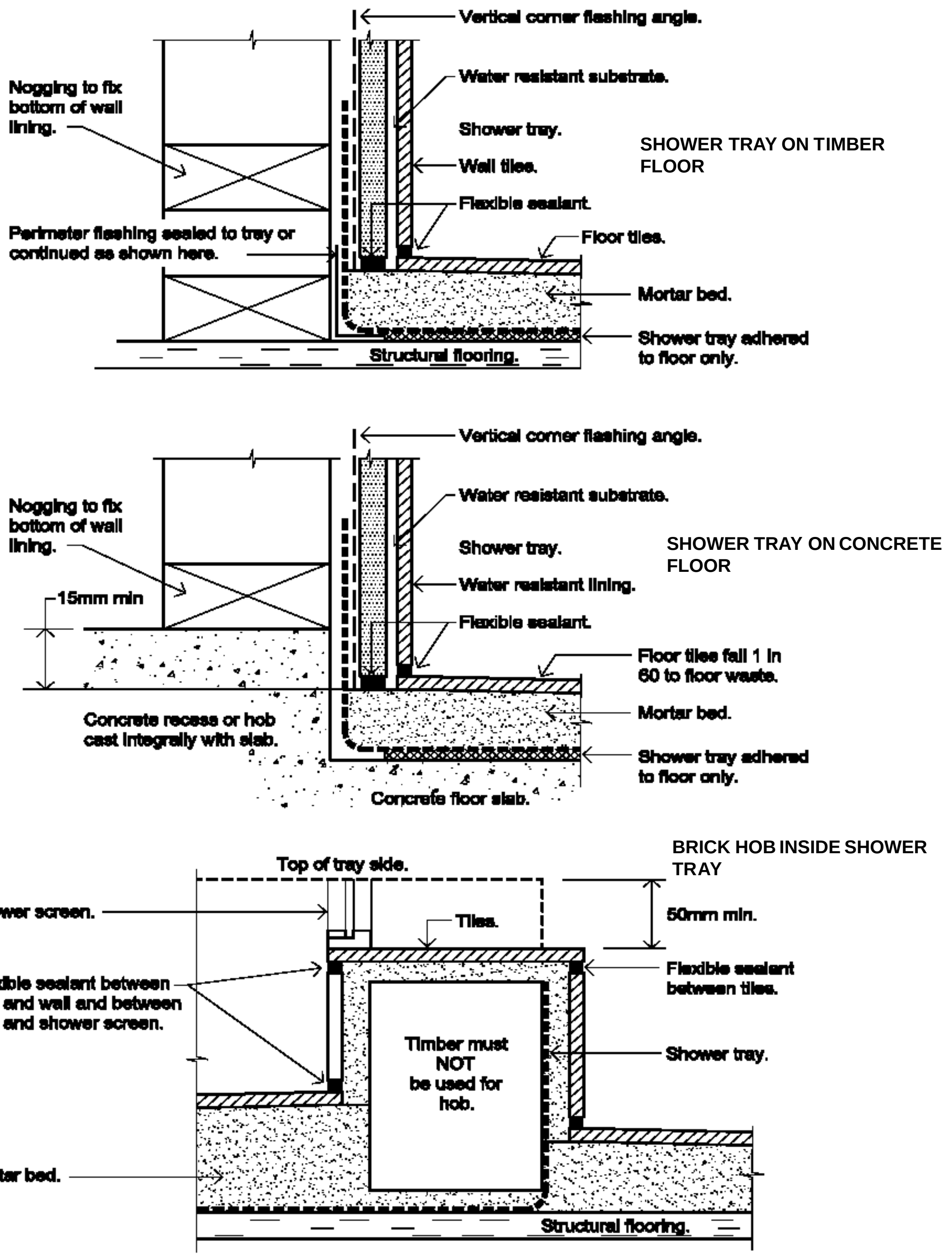

Figure 3.8.1.9

TYPICAL INSTALLATION OF WATERPROOF MEMBRANE TO SHOWER FLOOR

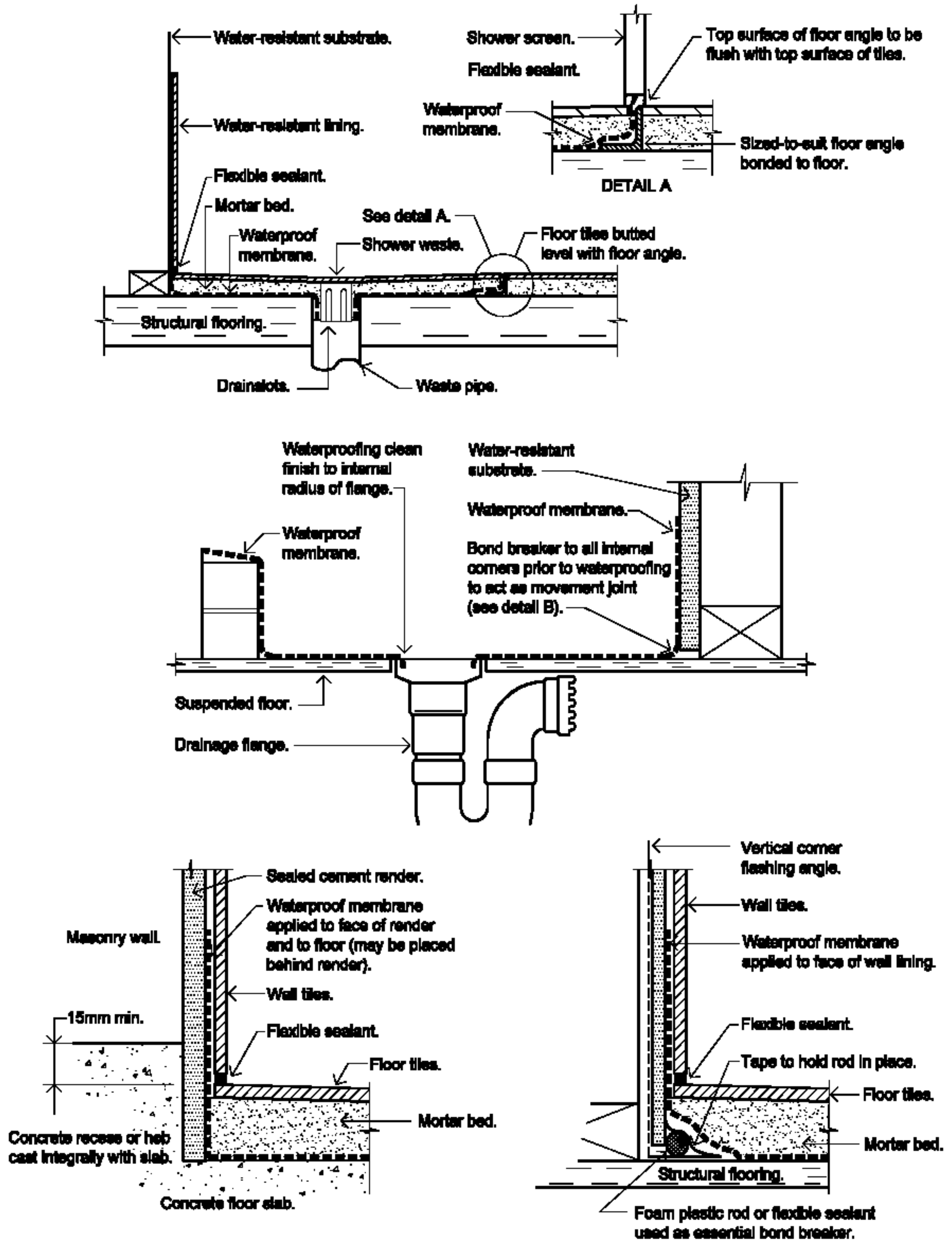


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**Figure 3.8.1.10**

**TYPICAL WALL JUNCTIONS WITH FIXTURES**

**Diagram a.** WALL AND BENCH TOP JUNCTION

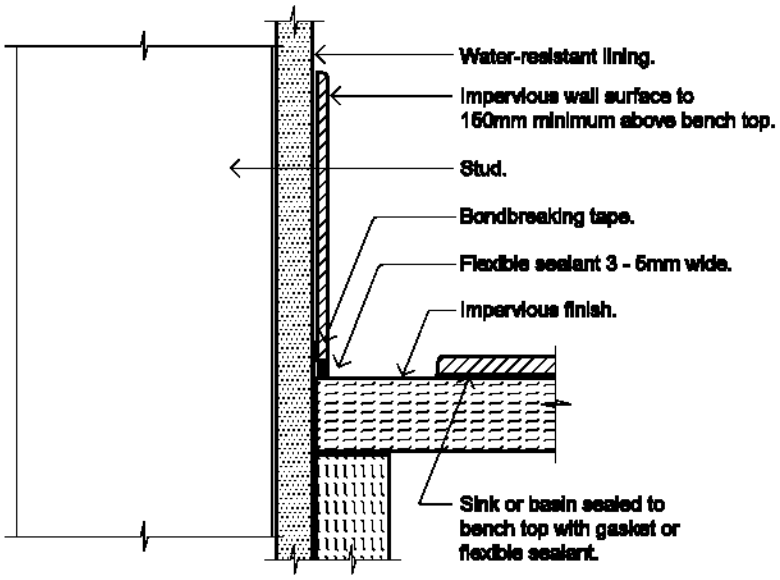


**Diagram b.** WALL AND LAUNDRY SINK JUNCTION

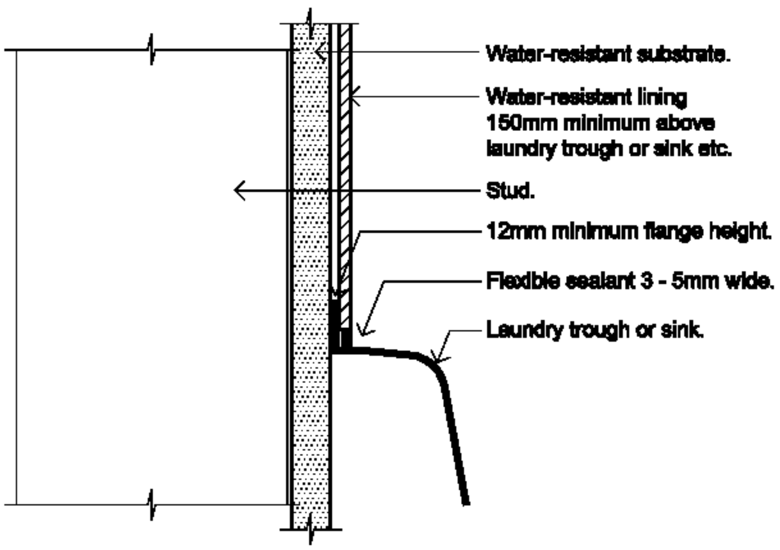


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**Figure 3.8.1.11**

**TYPICAL WALL AND BATH JUNCTIONS**

**Diagram a.** MASONRY WALL JUNCTION

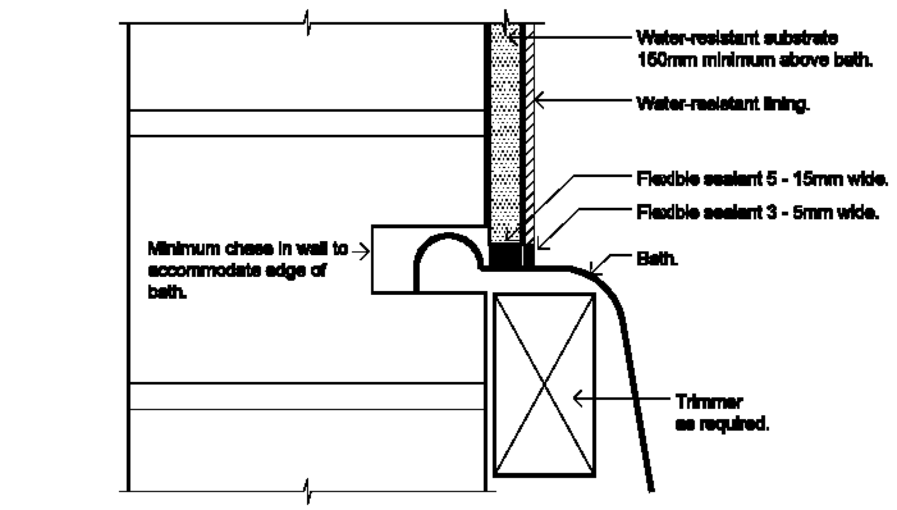
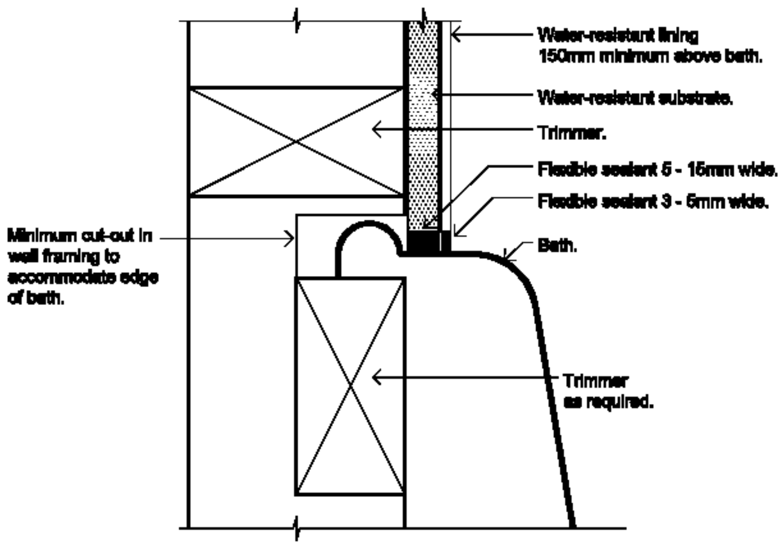



**Diagram b.** TIMBER WALL JUNCTION



# PART 3.8.2 ROOM HEIGHTS

**Appropriate performance requirements:**
Where an alternative ceiling height is proposed to that described in Part 3.8.2, that proposal must comply with the room height performance requirement P2.4.2 in Section 2.



**Acceptable construction practice**

## 3.8.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.2 for acceptable heights for rooms in Class 1 and 10 buildings satisfies performance requirement P2.4.2.

## 3.8.2.2 Ceiling heights

The minimum ceiling heights must be as follows in -

(a) a *habitable room* excluding a kitchen - 2.4 m; and

(b) a kitchen - 2.1 m; and

(c) a corridor, passageway or the like - 2.1 m; and

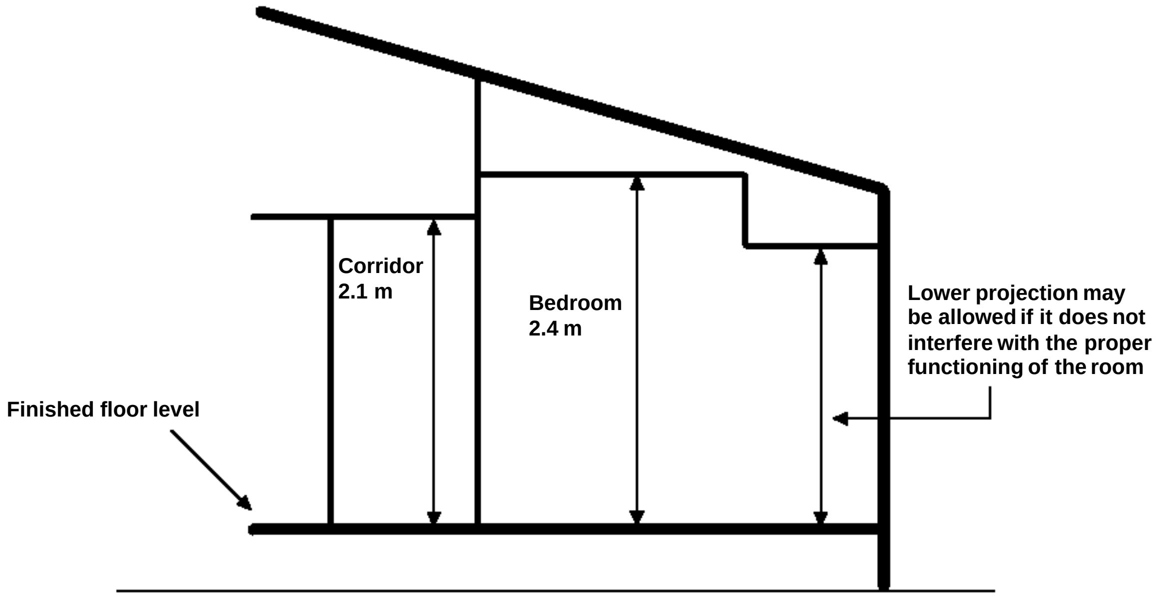
(d) a bathroom, shower room, laundry, *sanitary compartment*, airlock, pantry, storeroom, garage, car parking area or the like - 2.1 m; and

(e) an attic room, room with a sloping ceiling or projection below ceiling line or a non-habitable room or similar space - a height that does not unduly interfere with the proper functioning of the room or space.

(see Figure 3.8.2.1)

**Figure 3.8.2.1**

**MEASUREMENT OF ACCEPTABLE ROOM HEIGHTS**



# PART 3.8.3 FACILITIES

**Appropriate performance requirements:**

Where an alternative arrangement for facilities is proposed to that described in Part 3.8.3, that proposal must comply with the facilities performance requirement P2.4.3 in Section 2.



**Acceptable construction practice**

### 3.8.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.3 for the number of facilities to be installed in Class 1 buildings satisfies performance requirement P2.4.3.

### 3.8.3.2 Required facilities

(a) A Class 1 building must be provided with the following facilities -

(i) a kitchen sink and facilities for the preparation and cooking of food; and

(ii) a bath or shower; and

(iii) clothes washing facilities, comprising at least one washtub and space in the same room for a washing machine; and

(iv) a closet pan and washbasin.

**STATE AND TERRITORY VARIATIONS**

**3.8.3.2(a)(iii) is replaced as follows in Victoria.**

(a) (iii) except in a movable unit constructed under section 18 of the *Housing Act 1983* on the same allotment as another building, clothes washing facilities, comprising at least one wash-tub and space in the same room for a washing machine; and

(b) If any of these facilities are detached from the main building, they must be set aside for the exclusive use of the occupants of the building.

STATE AND TERRITORY VARIATIONS

**Part 3.8.3.3 is added as follows in Tasmania.**

**Installation of closet fixtures**

(a) If a sufficient sewerage system is not available, an authorised alternative means of disposal of sewage, may be installed.

(b) If sanitary facilities are not water-flushed, the following provisions apply.

(i) A pit latrine, an incinerating toilet, a chemical toilet, a removable pan or a non-flushing urinal must not be within 2 m of a building containing habitable rooms.

(ii) The floor on which a removable pan is placed must be impervious.

(iii) A room containing a composting toilet must be separated from habitable rooms by way of a permanently ventilated air lock (which may be a circulation space).

(iv) The minimum ventilation *required* under (iii) shall be the greater of-

(A) 8000 $mm^2$; or

(B) 1/500th of the *floor area* of the circulation space.

(v) Access for maintenance or removal of waste from a composting toilet must be by way of an access door which opens directly to the outside of the building.

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# PART 3.8.4 LIGHT

**Appropriate performance requirements:**
Where an alternative lighting system is proposed to that described in Part 3.8.4, that proposal must comply with the light performance requirement P2.4.4 in Section 2.

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## Acceptable construction practice

### 3.8.4.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.4 for the acceptable level of light for a Class 1 building satisfies performance requirement P2.4.4.

### 3.8.4.2 Natural lighting

Natural lighting must be provided in a Class 1 building to all *habitable rooms,* in accordance with the following:

(a) Natural lighting must be provided by *windows* that-

  (i) have an aggregate light transmitting area measured exclusive of framing members, glazing bars or other obstructions of not less than 10 % of the *floor area* of the room; and

  (ii) are open to the sky or face a court or other space open to the sky or an open verandah, carport or the like.

(b) A *window required* to provide natural light that faces a boundary of an adjoining allotment must not be less than a horizontal distance of 900 mm from that boundary.

(c) Natural lighting to a room in a Class 1 building may come through a glazed panel or opening from an adjoining room (including an enclosed verandah) if-

  (i) the glazed panel or opening has an area of not less than 10 % of the *floor area* of the room to which it provides light; and

  (ii) the adjoining room has *windows* with an aggregate light transmitting area of not less than 10 % of the combined *floor areas* of both rooms; and

  (iii) the areas specified in (i) and (ii) may be reduced as appropriate if direct natural light is provided from another source.

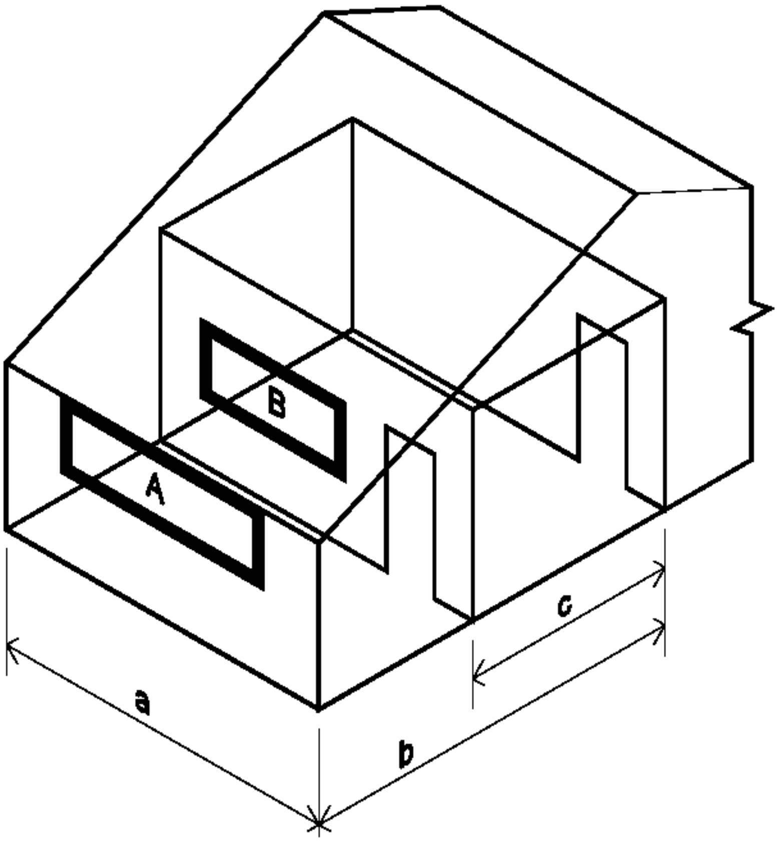
  (see Figure 3.8.4.1)

**Figure 3.8.4.1**

**METHOD OF DETERMINING BORROWED LIGHT**

$$A = \frac{a \times b}{10}\ m^2$$

$$B = \frac{a \times c}{10}\ m^2$$




### 3.8.4.3 Artificial lighting

Sanitary compartments, bathrooms, shower rooms, airlocks and laundries must be provided with artificial light if natural lighting in accordance with the relevant provisions of 3.8.4.2 is not available as follows -

(a) at a minimum rate of one light fitting per 16 $m^2$ of *floor area*; or

(b) in accordance with AS 1680.

**STATE AND TERRITORY VARIATIONS**

**3.8.4.3(a) does not apply in New South Wales.**

# PART 3.8.5 VENTILATION

**Appropriate performance requirements:**
Where an alternative ventilation system is proposed to that described in Part 3.8.5, that proposal must comply with the room height performance requirement P2.4.5 in Section 2.



## A. Acceptable construction manuals

**3.8.5.0** Performance requirement P2.4.5 is satisfied if a mechanical ventilation system is installed in accordance with the following manual:

(a) AS 1668.2 - Mechanical ventilation for acceptable indoor air quality; except that any contaminated air from a *sanitary compartment* or bathroom may -

(i) exhaust directly to outside the building by way of ducts; or

(ii) exhaust into the roof space provided it is adequately ventilated by open eaves, and/or wind driven roof vents or the roof is clad in roofing tiles.

## B. Acceptable construction practice

### 3.8.5.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.5 for the ventilation of buildings satisfies performance requirement P2.4.5.

### 3.8.5.2 Ventilation requirements

Ventilation must be provided to a *habitable room, sanitary compartment*, bathroom, shower room, laundry and any other room occupied by a person for any purpose by any of the following means:

(a) Direct ventilation

Permanent openings, *windows* doors or other devices which can be opened-

(i) with an aggregate opening or openable size not less than 5 % of the *floor area* of the room *required* to be ventilated; and

(ii) open to-

(A) a suitably sized court, or space open to the sky; or

(B) an open verandah, carport, or the like; or

(C) an adjoining room in accordance with (b).

(b) Ventilation borrowed from an adjoining room

Natural ventilation to a room may come through a *window*, opening, ventilating door or other device from an adjoining room (including an enclosed verandah) if-

(i) the room to be ventilated is not a *sanitary compartment*; and

(ii) the *window*, opening, door or other device has a ventilating area of not less than 5 % of the *floor area* of the room to be ventilated; and

(iii) the adjoining room has a *window*, opening, door or other device with a ventilating area of not less than 5 % of the combined *floor areas* of both rooms; and

(iv) the ventilating areas specified may be reduced as appropriate if direct natural ventilation is provided from another source.

(See Figure 3.8.5.1)

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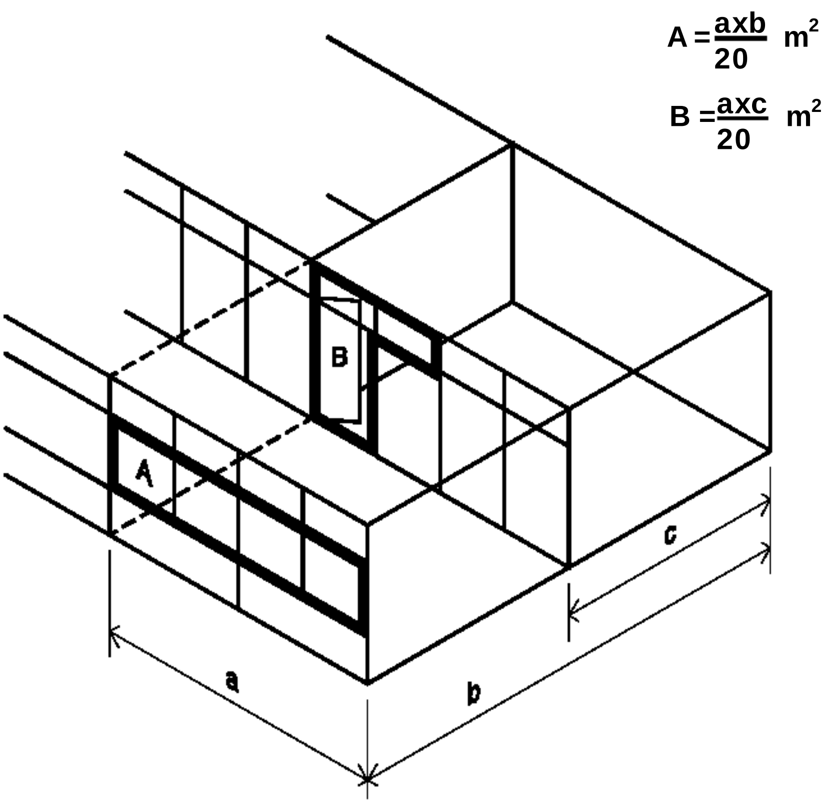
**Figure 3.8.5.1**

**METHOD OF DETERMINING BORROWED VENTILATION**



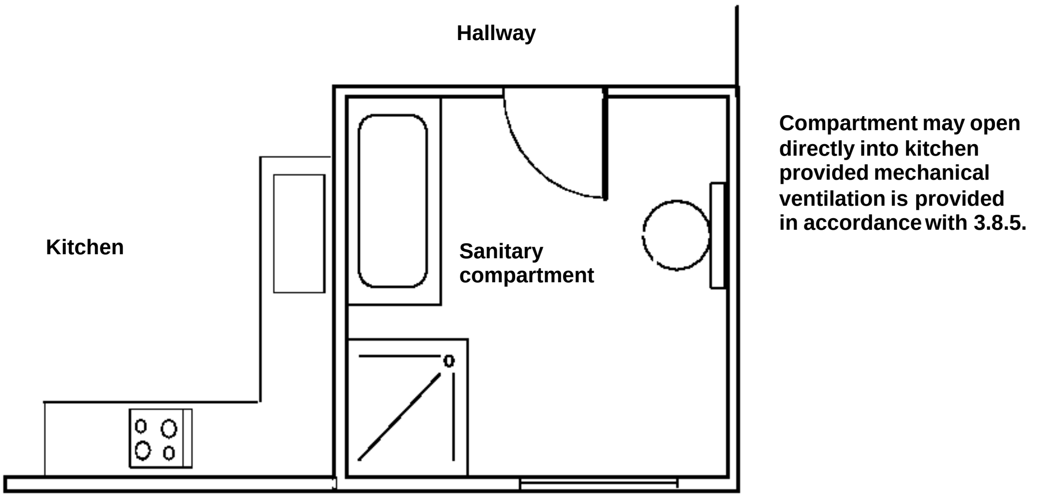
### 3.8.5.3 Location of sanitary compartments

*Sanitary compartments* must not open directly into a kitchen or pantry unless -

(a) access is by an airlock, hallway or other room, see Figure 3.8.5.2; or

(b) the room containing the closet pan is provided with mechanical exhaust ventilation installed in accordance with 3.8.5.

**Figure 3.8.5.2**
**ACCEPTABLE LOCATION OF NON VENTILATED SANITARY COMPARTMENT**



# PART 3.8.6 SOUND INSULATION

**Appropriate performance requirements:**
Where an alternative sound insulation system is proposed to that described in Part 3.8.6, that proposal must comply with the sound insulation performance requirement P2.4.6 in Section 2.



## Acceptable construction practice

### 3.8.6.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.6 for noise insulation to separating walls between Class 1 buildings satisfies performance requirement P2.4.6.

### 3.8.6.2 Sound insulation requirements

(a) A separating wall between 2 or more Class 1 buildings must -

(i) achieve the *Sound Transmission Class* (STC) and sound impact levels required by Table 3.8.6.1; and

(ii) be installed in accordance with the appropriate requirements of 3.8.6.4 and 3.8.6.5.

(b) STC levels may be determined in accordance with AS 1276.

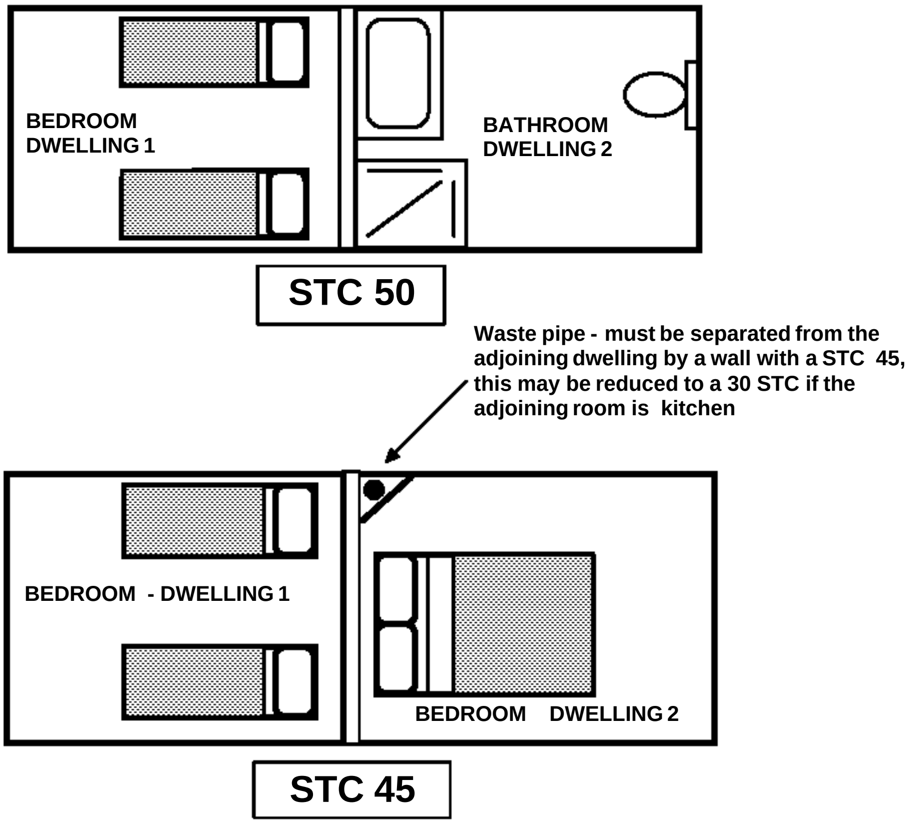
**Table 3.8.6.1**

**REQUIRED STC AND SOUND IMPACT LEVELS FOR SEPARATING WALLS**

| SEPARATING WALL - LOCATION AND PENETRATIONS | | IMPACT SOUND LEVEL (As per Table 3.8.6.2) | STC LEVEL (As per Table 3.8.6.3) |
|---|---|---|---|
| **TYPE A** | Between a bathroom, *sanitary compartment*, laundry or kitchen and a *habitable* room (other than a kitchen) in an adjoining Class 1 building (dwelling) (see Figure 3.8.6.1). | **YES** | **50** |
| **TYPE B** | In all other cases to those listed as Type A. (See Figure 3.8.6.1) | **NO** | **45** |
| **SOIL AND WASTE PIPES**<br>A waste pipe or other penetration that serves or passes through a separating wall between houses -<br>(a) if the adjacent room is a *habitable room* (other than a kitchen); or | | **NO** | **45** |
| (b) if the room is a kitchen or any other room. | | **NO** | **30** |

**Figure 3.8.6.1**

**REQUIRED STC LEVELS - PLAN VIEW**




**3.8.6.3 General installation requirements for walls**

(a) To achieve the appropriate STC and impact sound level, walls must -

(i) be installed with the appropriate requirements in (b) to (f); and

(ii) at the junction of sound insulated walls with perimeter walls and roof cladding be sealed in accordance with any relevant detail in Figure 3.8.6.3.

(b) Masonry units must -

(i) be laid with all joints filled solid, including those between the masonry and any adjoining construction; and

(ii) not be chased for services.

(c) Concrete slabs

Joints between concrete slabs wall units and any adjoining construction must be filled solid.

(d) Plasterboard

(i) If one layer is *required* under this Part, then joints must be staggered on opposite faces; and

(ii) if 2 layers are *required*, the first layer must be fixed according to (i) and the second layer must be fixed to the first layer with nails, screws or adhesive so that the joints do not coincide with those of the first layer; and

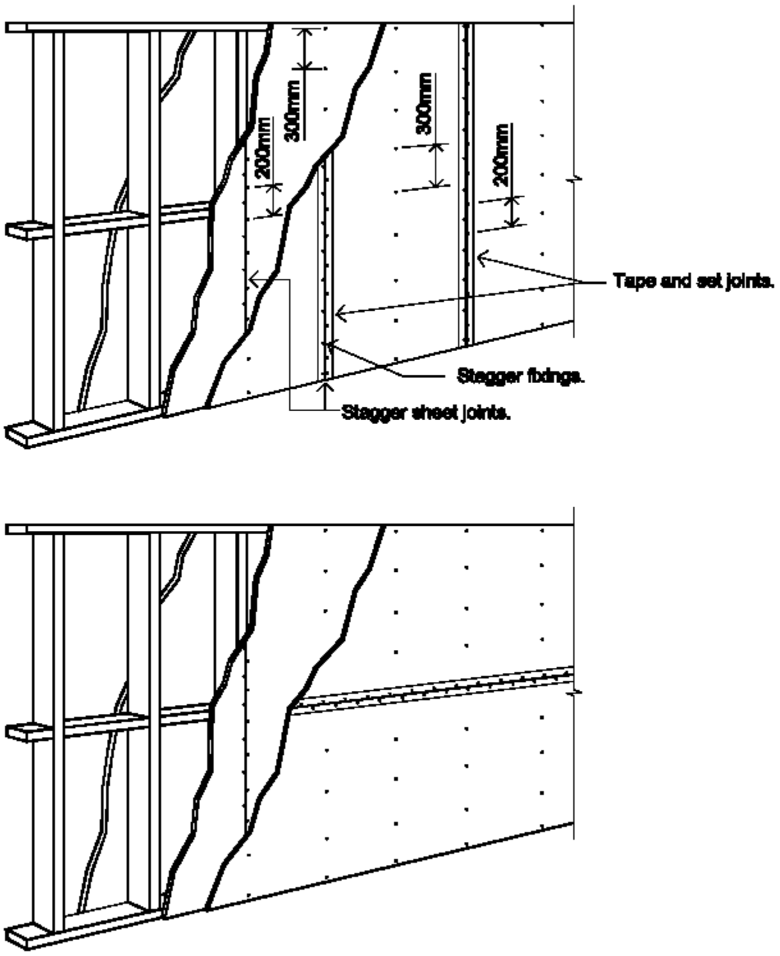
(iii) joints between sheets or between sheets and any adjoining construction must be taped and filled solid; and

(iv) fire-protective grade plasterboard (when nominated) must be the special grade manufactured for use in *fire-resisting* construction.



**Figure 3.8.6.2**

**TYPICAL INSTALLATION OF PLASTER SHEETS FOR SOUND INSULATION**



(e) Steel studs and perimeter members:

(i) The section of steel must be not less than 0.6 mm thick; and

(ii) studs must be not less than 63 mm in depth unless another depth is listed in the Table; and

(iii) studs must be fixed to steel top and bottom plates of sufficient depth to permit secure fixing of the plasterboard; and

(iv) all steel members at the perimeter of the wall must be securely fixed to the adjoining structure and bedded in resilient compound or the joints must be caulked so that there are no voids between the steel members and the wall.

(f) Timber studs and perimeter members:

(i) Studs must be fixed to top and bottom plates of sufficient depth to permit secure fixing of the plasterboard; and

(ii) noggings and like members must not bridge between studs supporting different wall leaves; and

(iii) all timber members at the perimeter of the wall must be securely fixed to the adjoining structure and bedded in resilient compound or the joints must be caulked so there are no voids between the timber members and the wall.



### 3.8.6.4 Soil and waste pipes

If a soil or waste pipe serves or passes through a *separating wall* then-

(a) a door or panel providing access to the pipe must not open into any *habitable room* (other than a kitchen); and

(b) an access door or panel in any other part must be firmly fixed so as to overlap the frame or rebate of the frame by not less than 10 mm, be fitted with a sealing gasket along all edges and constructed of -

(i) wood, plasterboard or blockboard not less than 38 mm thick; or

(ii) compressed fibre reinforced cement sheeting not less than 9 mm thick; or

(iii) other suitable material with a mass per unit area not less than 24.4 kg/m$^2$.

**Explanatory Information:**

The wall configurations shown in Tables 3.8.6.2 and 3.8.6.3 are typical examples. Other proprietary methods are available for meeting the STC and sound impact levels required by Table 3.8.6.1.

**Table 3.8.6.2**

**CONSTRUCTION OF WALLS TO: (A) REDUCE IMPACT SOUND; AND (B) ACHIEVE A 50 STC RATING**

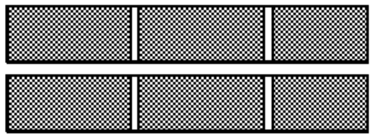
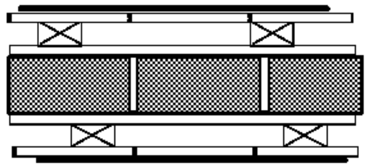
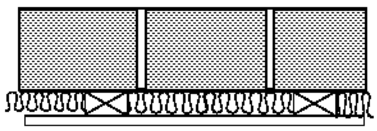
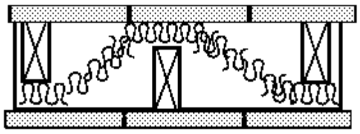
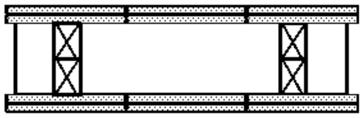
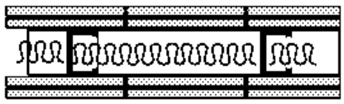
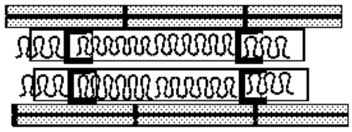
| WALL CONSTRUCTION TYPE | DESIGN DIAGRAM - PLAN VIEW |
|---|---|
| **CAVITY BRICKWORK**<br>2 leaves 90mm brick masonry with-<br>(a) all joints filled solid with mortar; and<br>(b) an air space not less than 40mm between the leaves; and<br>(c) the leaves connected only by ties in accordance with AS 3700 and wall tie spacing details as set out in Part 3.3. |  |
| **SINGLE LEAF BRICKWORK**<br>80mm thick brick masonry with-<br>(a) each face rendered 13mm thick; and<br>(b) 50x12mm thick timber battens at not more than 610mm centres fixed to each face but not recessed into the render; and<br>(c) one layer of 12mm thick softboard nailed to the battens; and<br>(d) 6mm thick medium density hardboard adhesive-fixed to the softboard. |  |
| **CONCRETE BLOCKWORK**<br>190mm thick concrete block masonry with-<br>(a) each face of the blocks fitted with 50x50mm timber battens, spaced at not more than 610mm centres, screw-fixed into resilient plugs with rubber inserts;<br>(b) the space between the battens completely filled with mineral or glass wool blanket or batts not less than 50mm thick; and<br>(c) the outer face of the battens finished with plasterboard not less than 10mm thick. |  |
| **TIMBER FRAMED WALLING**<br>70x45mm F5 timber staggered studs at 300mm centres on 120x35mm F5 timber plates with-<br>(a) one layer of 16mm fire protective grade plasterboard on both faces; and<br>(b) 50 mm glass fibre batts. |  |
| **TIMBER FRAMED WALLING**<br>70 x 45 mm F5 timber double studs at 450 - 600mm centres with two layers of 13mm fire protective grade plasterboard on both faces. |  |
| **STEEL STUD WALLING**<br>64mm metal studs (0.75mm BMT) clipped in 92mm metal tracks at 600mm centres-<br>(a) two layers of 13mm fire protective grade plasterboard to each side with;<br>(b) 50mm glasswool cavity batts. |  |
| **STEEL STUD WALLING**<br>64 mm metal studs (0.75 mm BMT) at 600mm centres in separate frames with no mechanical links-<br>(a) two layers of 13mm fire protective grade plasterboard to each side with;<br>(b) 50mm glasswool cavity batts. |  |

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**Table 3.8.6.3**

**STC RATINGS APPLICABLE TO CONSTRUCTION**

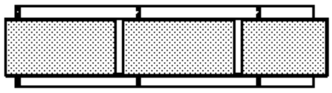
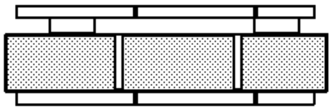
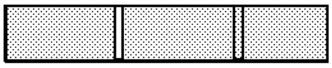
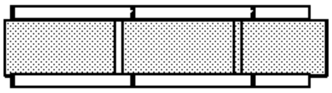
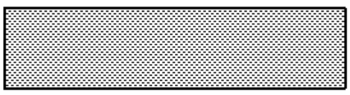
| WALL CONSTRUCTION TYPE | STC | DESIGN DIAGRAM - PLAN VIEW |
|---|---|---|
| **CLAY BRICKWORK** | | |
| (a) 110 mm thick in one or more leaves and with a mass per unit area of not less than 290 kg/m$^2$ | **45** |  |
| (b) 80 mm thick, of semi-dry-pressed bricks and rendered 13 mm on one side, the mass per unit area of the unrendered wall being not less than 215 kg/m$^2$ | **45** |  |
| **CALCIUM SILICATE BRICKWORK** | | |
| (a) 90 mm thick calcium silicate brick with one layer of 10 mm fire protective grade plasterboard on each side. | **45** |  |
| (b) 90 mm thick calcium silicate brick with one layer of 10 mm fire protective plasterboard and one layer of fire protective plasterboard on metal furring channels | **45** |  |
| **CONCRETE BLOCKWORK** | | |
| (a) 90mm solid units (or thicker)<br>Material density 2200 kg/m$^2$ | **45** |  |
| (b) 110mm solid units (or thicker)<br>Material density 2200 kg/m$^2$<br>Material thickness - 83mm min.<br>10mm painted plasterboard or 12mm painted render on each face | **45** |  |
| **CONCRETE WALL** | | |
| In-situ concrete- 125 mm thick and with a density of not less than 2200 kg/m$^3$ | **45** |  |

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**Table 3.8.6.3 (Continued)**

**STC RATINGS APPLICABLE TO CONSTRUCTION**

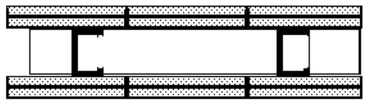
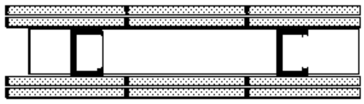
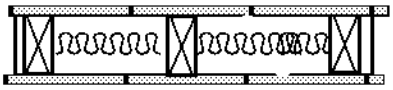
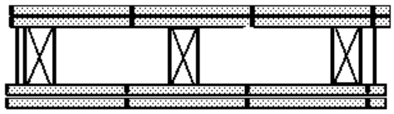
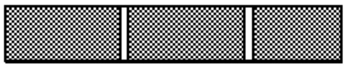
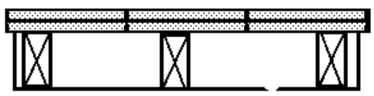
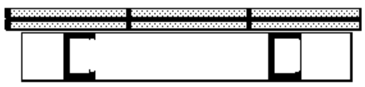
| WALL CONSTRUCTION TYPE | STC | DESIGN DIAGRAM - PLAN VIEW |
|---|---|---|
| **STEEL STUD WALLING** | | |
| (a) with 2 layers of 16 mm thick fire-protective grade plasterboard fixed to each face | **45** |  |
| (b) with 2 layers of 13 mm plasterboard on both sides of 75 mm studs | **45** |  |
| **TIMBER STUD WALLING** | | |
| 70 x 45mm timber studs at 450 - 600mm centres with<br>(a) one layer of 16mm fire protective grade plasterboard on one face<br>(b) 50mm glass fibre batts, and<br>(c) one layer of 16mm fire protective grade plasterboard on metal resilient channel | **49** |  |
| 70 x 45mm timber studs at 450 - 600mm centres with two layers of 16mm fire protective grade plasterboard on both sides | **46** |  |
| **DUCTS OR OTHER CONSTRUCTION SEPARATING SOIL AND WASTE PIPES FROM UNITS** | | |
| **MASONRY-** | | |
| Not less than 90mm thick | **30** |  |
| **PLASTERBOARD-** | | |
| (a) 2 layers of plasterboard each 10 mm thick, fixed to timber studs not less than 75 mm x 50 mm and spaced at not more than 400 mm centres | **30** |  |
| (b) 2 layers of plasterboard each 13 mm thick, one on each side of steel studs not less than 50 mm deep and spaced at not more than 400 mm centres | **30** |  |

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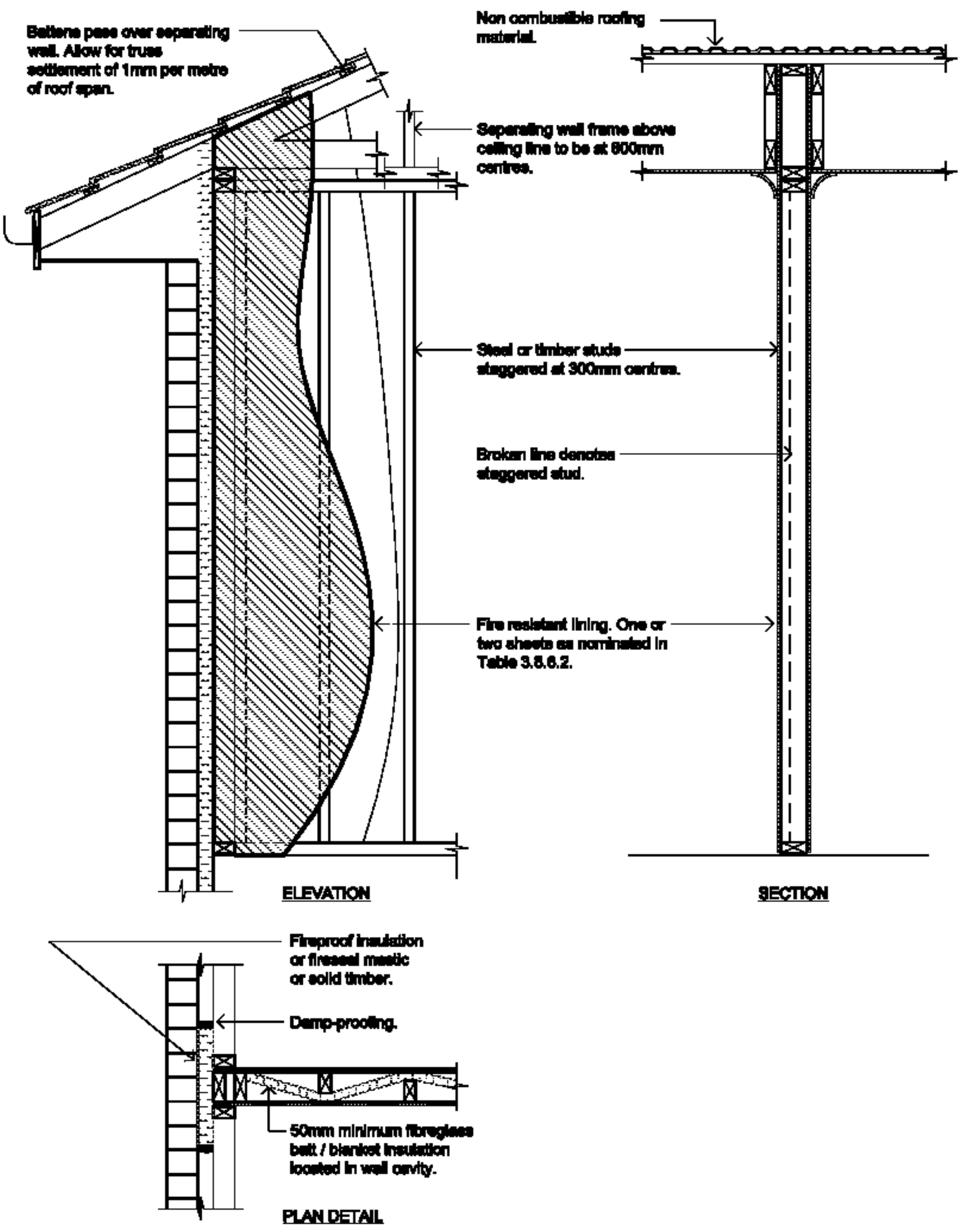
Figure 3.8.6.3

SOUND INSULATION BETWEEN UNITS - DOUBLE STUD WALL CONFIGURATION



# PART 3.9

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# SAFE MOVEMENT AND ACCESS

# PART 3.9 CONTENTS



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# PART 3.9.1 STAIR CONSTRUCTION

**Appropriate performance requirements:**
Where an alternative stair system is proposed to that described in Part 3.9.1, that proposal must comply with the safe movement and access performance requirement P2.5.1 in Section 2.



## Definitions

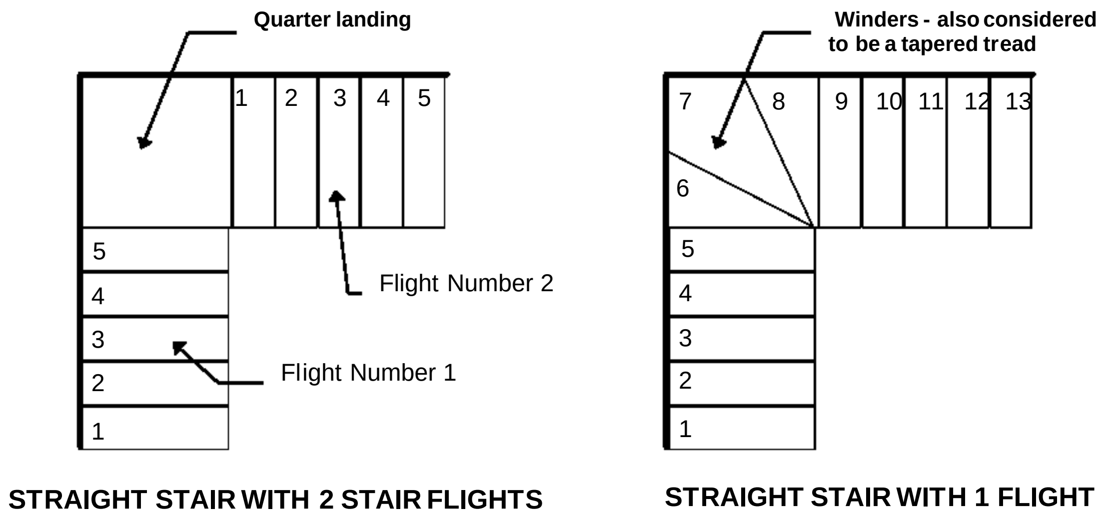
**3.9.1** The following definitions are used in this Part:

**Flight** means that part of a stair that has a continuous series of treads, (including winders located within a straight stair) between landings, see Figure 3.9.1.1.

**Explanatory Information:**
A stair flight is the area of a stair that has a continuous slope created by the nosing line of treads. The length of a stair flight is limited to restrict the distance a person could fall down a stair. Quarter landings with no winders, as shown in Figure 3.9.1.1 are considered sufficient to halt a persons fall and therefore are considered for the purposes of this document not to be part of the stair flight.

**Figure 3.9.1.1**

**IDENTIFICATION OF STAIR FLIGHTS - Plan view**




**Going** means the horizontal dimension from the front to the back of a tread less any overhang from the next tread above (see Figure 3.9.1.2).

**Landing** means a horizontal area at the top or between two flights of a stairs.

**Riser** means the height between consecutive treads.

**Spiral stair** means a stair with a circular plan, winding around a central post with steps that radiate from a common centre or several radii, see Figure 3.9.1.4.

**Tapered tread** means a stair tread, such as a winder, with a walking area that grows smaller towards one end.

**Winders** treads within a straight stair flight that are use to change direction of the stair, see Figure 3.9.1.1.

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## Acceptable construction practice

### 3.9.1.1 Application

Compliance with the acceptable construction practice provisions of Part 3.9.1 for stairs used in Class 1 and 10 buildings satisfies performance requirement P2.5.1, provided the stair complies with the appropriate structural requirements of the *Housing Provisions*.

### 3.9.1.2 General requirements

(a) Stairs serving *habitable rooms* must comply with 3.9.1.3 and 3.9.1.4.

(b) Stairs serving non-habitable rooms

Stairs serving non-habitable rooms, such as attics, storerooms and the like that are not used on a regular or daily basis, must be constructed in accordance with -

(i) the provisions of this Part; or

(ii) AS 1657 - Fixed platforms, walkways, stairways and ladders.

### 3.9.1.3 Stair construction

Stairs to must be constructed in accordance with the following:

(a) Each *flight* must have not more than 18 risers; and

(b) the nominal dimension of *goings* and *risers* of a stair must be constant throughout each stair *flight*; and

(c) treads must be of solid construction (not mesh or other perforated material) if the stairway is more than 10m high or connects more than 3 storeys.

(d) stepped quarter landing areas, where installed, must not have more than 3 *winders*; and

(e) the *riser* opening must not allow a 125mm sphere to pass through between the treads; and

(f) *spiral stairs* must not be more than 1m wide (see Figure 3.9.1.4).

STATE AND TERRITORY VARIATIONS

**3.9.1.3 is amended by adding the following clause in New South Wales.**

(f) Treads must have a non-slip finish or a suitable non-skid strip near the edge of the nosings.

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### 3.9.1.4 Riser and going dimensions

The *riser* and *going* dimensions for each stair *flight* must comply with the following:

(a) The *going* (G), *riser* (R) and slope relationship quantity (2R+G) must be in accordance with Figure 3.9.1.2.

(b) The point for measurement of the *going* (G) in the slope relationship quantity as described in Figure 3.9.1.3 must be as follows:

- (i) For *tapered treads* (other than treads in a *spiral stair*) -
  - (A) not more than 1m wide, the middle of the unobstructed width of the stair; and
  - (B) 1m or more in width, 400mm from the unobstructed width of each side of the stair, see Figure 3.9.1.3.
- (ii) For treads in *spiral stairs*, the point seven tenths of the unobstructed distance from the face of the centre pole or support towards the handrail side, see Figure 3.9.1.4.

**Figure 3.9.1.2**

**STAIR RISER AND GOING DIMENSIONS**

| STAIR TYPE | RISER (R) (see Figure below) | | GOING (G) (see Figure below) | | SLOPE RELATIONSHIP (2R+G) | |
|---|---|---|---|---|---|---|
| | Max | Min | Max | Min | Max | Min |
| Stairs (other than spiral) | 190 | 115 | 355 | 240 | 700 | 550 |
| Spiral | 220 | 140 | 370 | 210 | 680 | 590 |

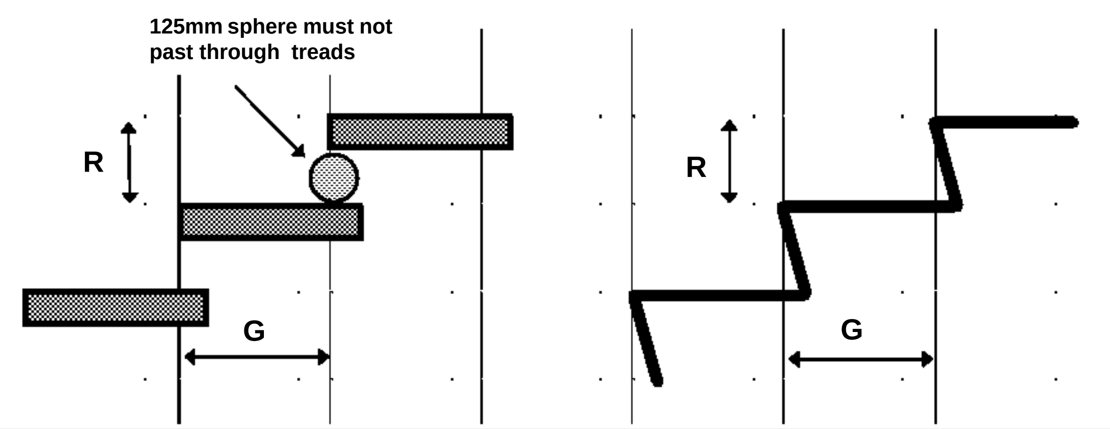

**Figure 3.9.1.3**

**MEASUREMENT OF SLOPE RELATIONSHIP - Plan view**

**Diagram a.** **Stair with 2 flights**

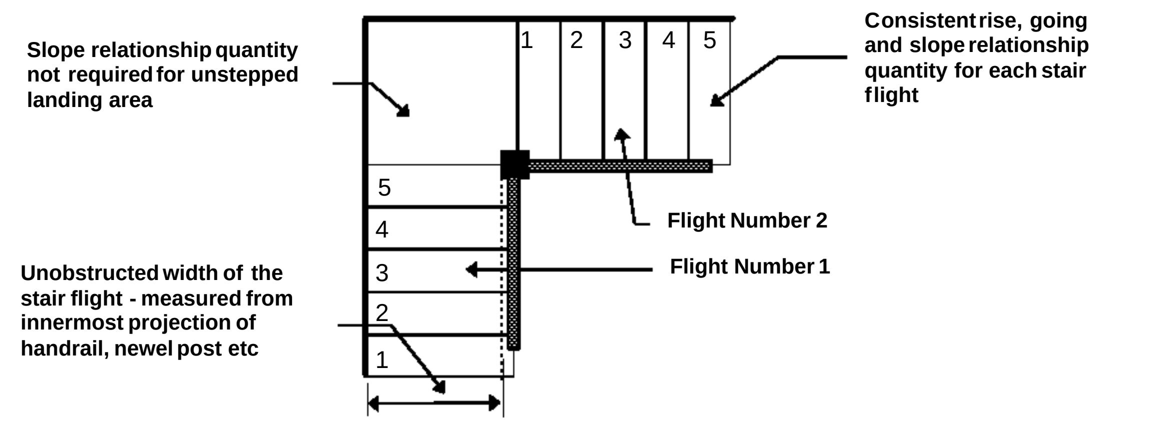


**Diagram b.** **Tapered treads - less than 1m wide**

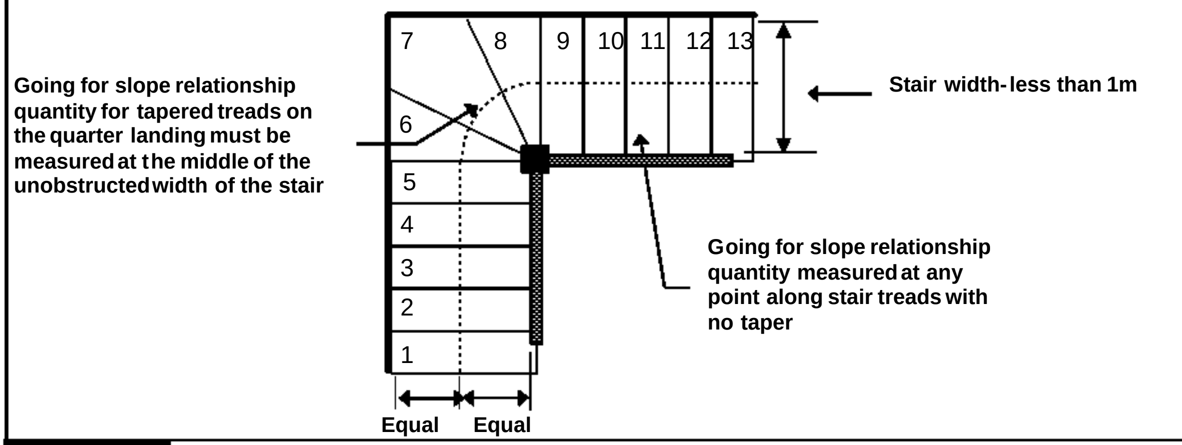


**Diagram c.** **Tapered treads - 1m or more in width**

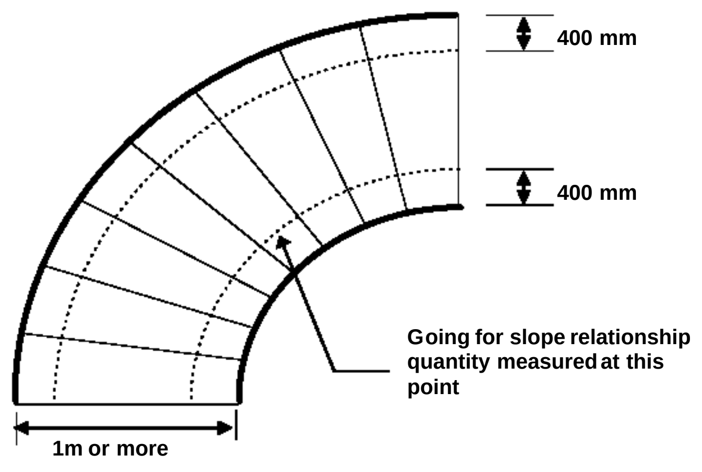


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Figure 3.9.1.4

SPIRAL STAIRS

Note: Sprial stairs must not have an unobtructed width of more than 1000mm wide.

Diagram a. Measurement for slope relationship

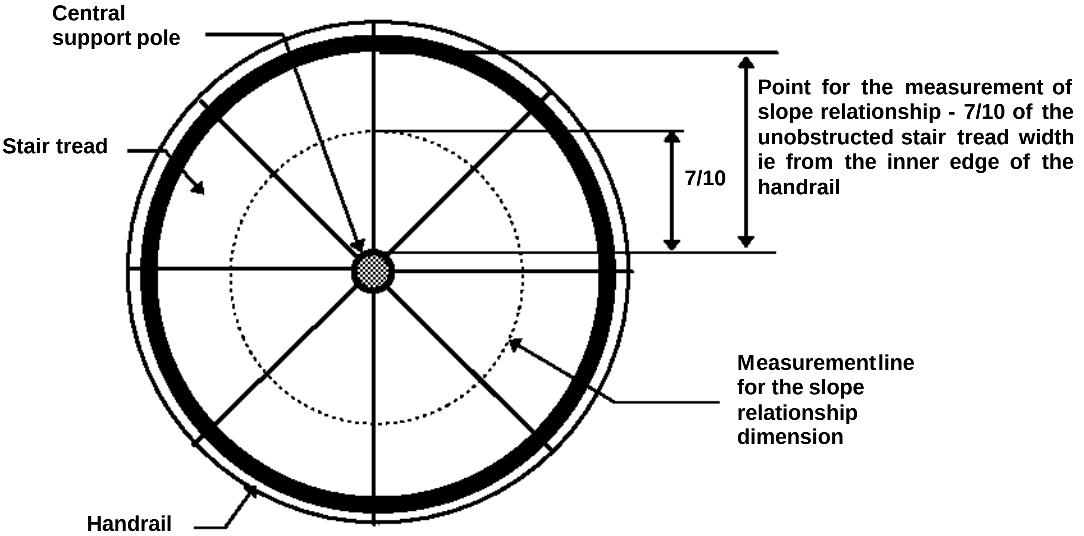
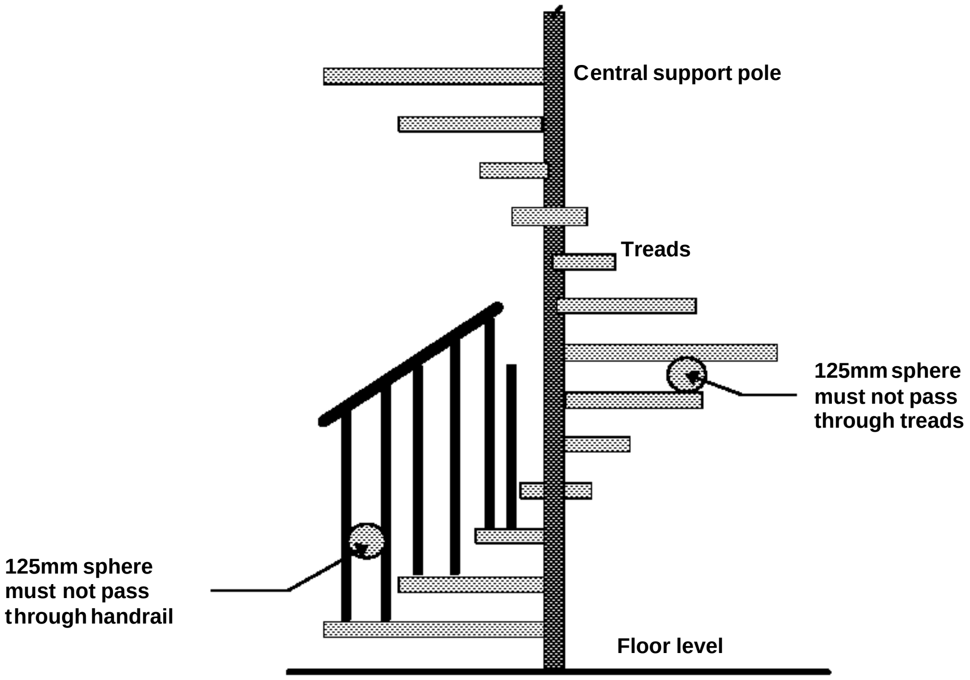



Diagram b. Measurement for openings in stairs (125mm sphere measurement areas)



**Explanatory Information:**

**1. Guidance on handrails and stair head heights**

To ensure a stair is negotiated comfortably the following dimensions should also be considered:

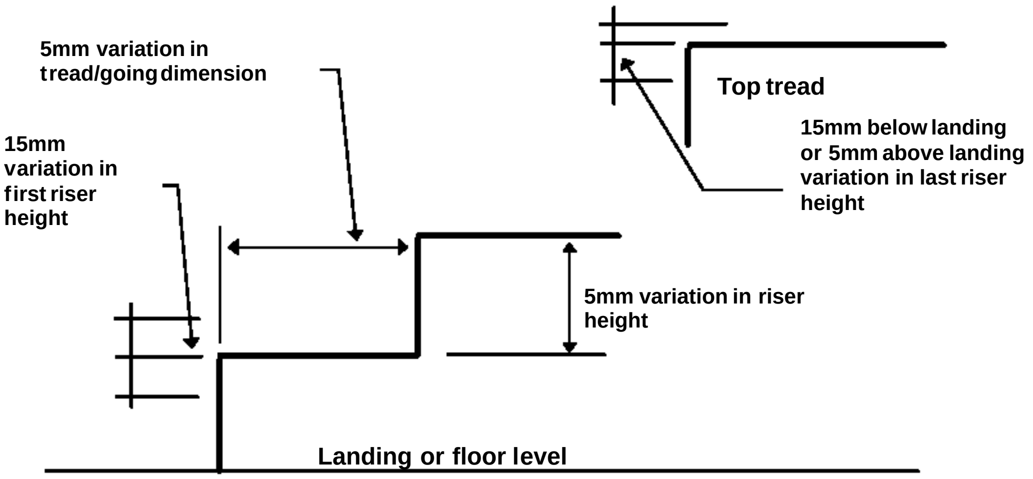
a. Head height: A minimum head of height of 2000mm should be obtained from the nosing line, with reduced clearances within a 250mm from the top perimeter of the this area to allow for access to attics etc.

b. Hand rails should be at least 25mm from the wall.

**2. Tolerance values**

The following tolerance value to the nominal dimension in Figure 3.9.1.2 may be applied where conditions such as movement of materials due to atmospheric moisture changes (ie cupping of timber stair treads) or change in adjacent floor covering specifications effect finished stair dimensions. They should not be applied to allow for poor construction practice.

**Diagram a. Suitable tolerance values for stair dimenisions**

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# PART 3.9.2 BARRIERS

**Appropriate performance requirements:**

Where an alternative barrier system is proposed to that described in Part 3.9.2, that proposal must comply with the following performance requirements in Section 2 -

1. structural requirement P2.1.1; and
2. barrier requirement P2.5.2.



## Definitions

**3.9.2** For the purposes of this Part:

**Barrier** includes a handrail, balusters, wall or other building element able to prevent people falling through.

## Acceptable construction practice

### 3.9.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.9.2 for *barrier*s installed in Class 1 and 10 buildings satisfies performance requirement P2.5.2.

### 3.9.2.2 Requirements for barriers

A continuous *barrier* must be provided along the side of any roof to which public access is provided, any stairway or ramp, any floor, corridor, hallway, balcony, verandah, *mezzanine*, access bridge or the like and along the side of any path of access to a building, if-

(a) it is not bounded by a wall; and

(b) any level is more than 1m above the adjoining floor or finished ground level (see Figure 3.9.2.3).

### 3.9.2.3 Barrier construction

(a) The height of a barrier must be in accordance with the following:

  (i) The height is not less than 865mm above the nosings of the stair treads or the floor of a ramp.

  (ii) The height is not less than-

    (A) 1m above the floor of any access path, balcony, landing or the like (see Figure 3.9.2.1); or

    (B) 865mm above the floor of a landing to a stair or ramp where the balustrade is provided along the inside edge of the landing and does not exceed a length of 500mm.

(b) A transition zone may be incorporated where the *barrier* height changes from 865 mm on the stair flight or ramp to 1 m at the landing, see Figure 3.9.2.2.

(c) Openings in a *barrier*s (including decorative *barrier*s) must be constructed so that any opening does not permit a 125mm sphere to pass through it and for stairs, the space is tested above the nosing line.

(d) A *barrier* must be designed to take loading forces in accordance with AS 1170.1.

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**STATE AND TERRITORY VARIATIONS**

**Delete 3.9.2.3 and insert Qld 3.9.2.3 as follows:**

**Qld 3.9.2.3 Barrier construction**

(a) The height of a balustrade must be in accordance with the following:

(i) The height is not less than 865mm above the nosings of the stair treads or the floor of a ramp.

(ii) The height is not less than-

(A) for floors not more than 3 m above the ground, 865 mm above the floor of any access path, balcony, landing or the like; or

(B) for floors greater than 3 m above the ground, 1 m above the floor of any access path, balcony, landing or the like; or

(C) 865 mm above the floor of a landing to a stair or ramp where the balustrade is provided along the inside edge of the landing and does not exceed a length of 500 mm.

(b) A transition zone may be incorporated where the barrier height changes from 865mm on the stair flight or ramp to 1m at the landing, see Figure 3.9.2.2.

(c) An opening in a barrier (including a decorative barrier) must be constructed so that any opening does not permit a 125 mm sphere to pass through it and for stairs, the space is tested above the nosing line.

(d) For floors more than 3 m above the ground, any horizontal or near horizontal elements within the balustrade between 150 mm and 760 mm above the floor must not facilitate climbing.

(e) A barrier must be designed to take loading forces in accordance with AS 1170.1.

**Figure 3.9.2.1**

**BARRIER CONSTRUCTION**

**Note:** For the purposes of this Figure a 125 mm sphere must not pass between rails or through the gap when tested above the nosing line.

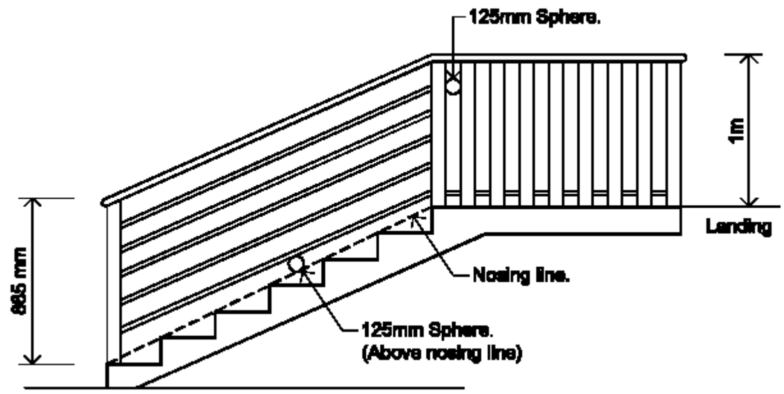


**Figure 3.9.2.2**

**TRANSITION ZONES**

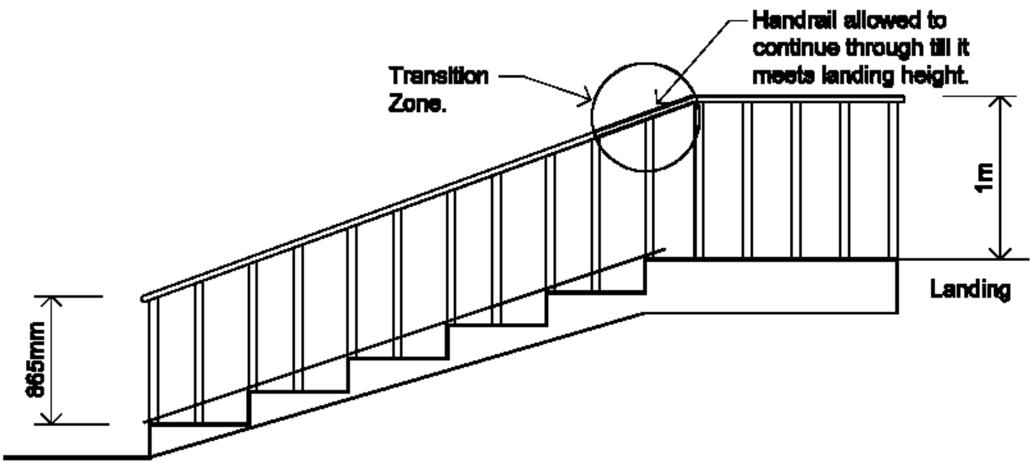




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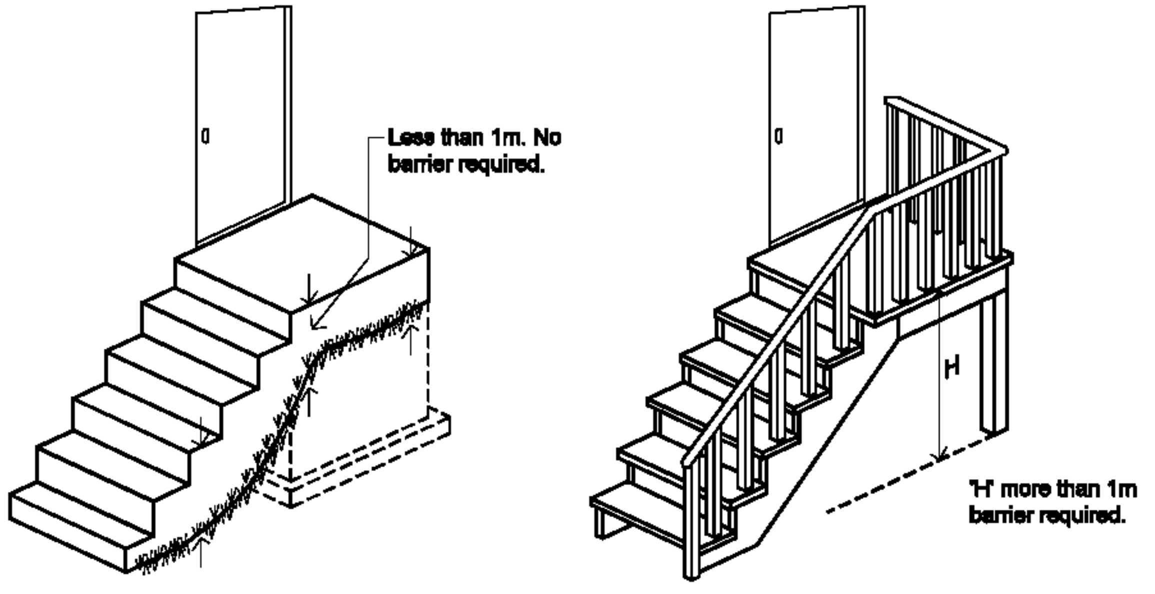
**Figure 3.9.2.3**

**BARRIERS - WHEN REQUIRED**



# PART 3.9.3 SWIMMING POOL ACCESS

**Appropriate performance requirements:**
Where an alternative swimming pool safety fence is proposed to that described in Part 3.9.3, that proposal must comply with the performance requirements P2.5.3 in Section 2.

**STATE AND TERRITORY VARIATIONS**

1. **3.9.3 does not apply in New South Wales.**
   **Note:** Restriction of access to swimming pools in New South Wales is regulated under the Swimming Pools Act 1992.

2. **3.9.3 does not apply in Queensland.**
   **Note:** Restriction of access to swimming pools in Queensland is regulated under the Building Act 1975.

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## A. Acceptable construction manual

**3.9.3.0** Performance requirement P2.5.3 is satisfied if a *swimming pool* associated with a Class 1 building, with a depth of water more than 300mm has safety fencing installed in accordance with the following manual:

(a) AS 1926.1 - Swimming pool safety.

## B. Acceptable construction practice

### 3.9.3.1 Application

Compliance with the acceptable construction practice provisions of Part 3.9.3 for *swimming pools* with a depth of water more than 300mm, installed on *allotments* associated with Class 1 buildings satisfies performance requirement P2.5.3.

### 3.9.3.2 Safety fencing location and construction

(a) Safety fencing must be located in accordance with one of the options listed in Figure 3.9.3.1.

(b) Safety fences and gates must comply with -

  (i) AS 1926.1 in regards to strength criteria; and

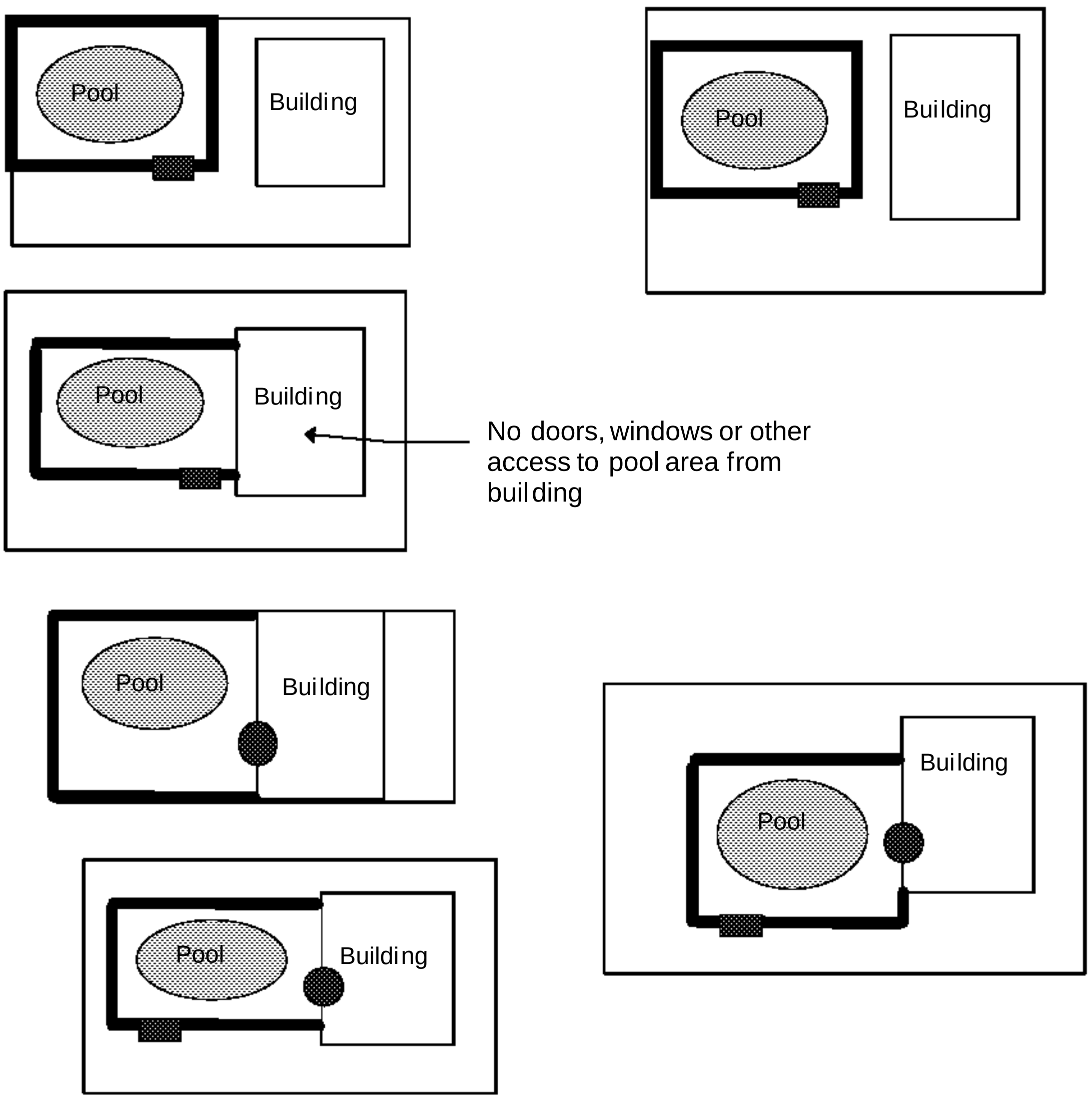
  (ii) the appropriate dimension requirements described in Figures 3.9.3.2 - 3.9.3.5.

**Figure 3.9.3.1**

**TYPICAL EXAMPLES OF SAFETY FENCING**

**Legend:**

- Gate complying with AS 1926.1
- Fence, retaining wall or other barrier complying with AS 1926.1
- Child resistant door or window complying with AS 1926.1
- Allotment boundary



**Explanatory information:**

Safety fencing should comprise of barriers or walls of sufficient height and designed and constructed without openings and footholds that would enable a young child to climb through or over the fence and provided with child-resistant self-closing and latching devices on gates and doors and if incorporating an external wall of a building any doors and openable windows to the pool area should be fitted with self-closing and latching devices that are child-resistant.

It should be noted that in NSW, Qld and NT restriction of access to *swimming pools* is regulated under other legislation. ACT, Qld, SA and Tas impose additional requirements for *swimming pools* effecting the design of pools and pool surrounds, drainage of *swimming pools*, water recirculation and inlet and outlet openings and skimmer boxes and electrical installations.

The provisions of AS 1926 Part 2 provide a number of options for the location of pool safety fencing. One option consists of enclosing the pool with isolation safety fencing completely separating the pool area from any other part of the allotment and any buildings. Alternatively the pool area should be separated from other parts of the allotment, any buildings and neighbouring allotments with barriers complying with the standards for safety fencing including the external wall of a building provided there is no access from the building to the pool area.

If access is provided from the building to the pool area any access door and window opening to the pool area must be protected with child-resistant doorsets and child-resistant openable portions of window.

Swimming pool safety fencing should be designed and constructed so as to be non-climbable by young children having regard to the height of the fence, any horizontal climbable members, openings and footholds in the fence and the operation of self-closing and latching gates.

Typical examples of satisfactory safety fencing are illustrated in AS 1926.2

The operation of self-closing and latching devices on gates and doors should allow the gate or door to close and latch from any position, from resting on the latching mechanism to fully open, in accordance with the conditions set out in AS 2820.

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**STATE AND TERRITORY VARIATIONS**

**See ACT 5, SA 4 and TAS 1 for additional requirements for swimming pool construction.**

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**Figure 3.9.3.2**

**SPACING OF ACCESSIBLE HORIZONTAL MEMBERS, PROJECTIONS OR INDENTATIONS IN FENCING**

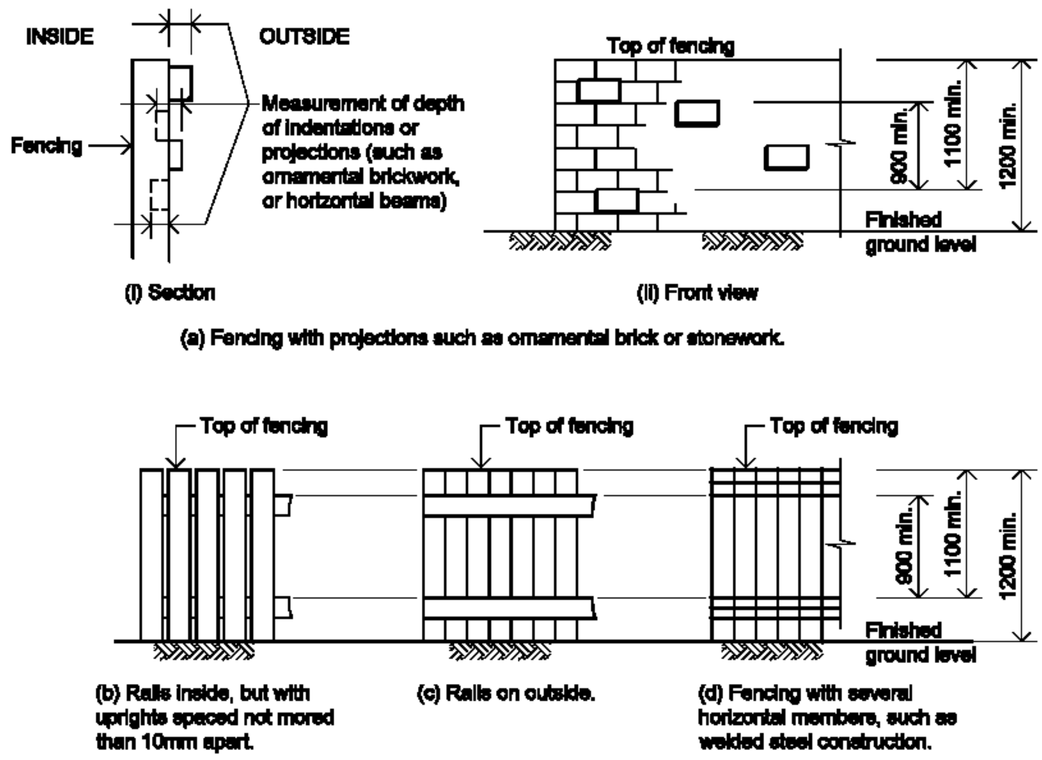



**Figure 3.9.3.3**

**CHAIN WIRE OR MESH FENCE**

**Note:** Fencing material with an aperture greater than 13mm, but less than 100mm

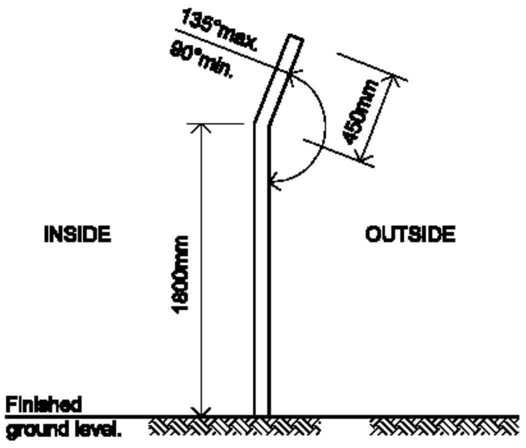


Figure 3.9.3.4

EFFECTIVE FENCING HEIGHT

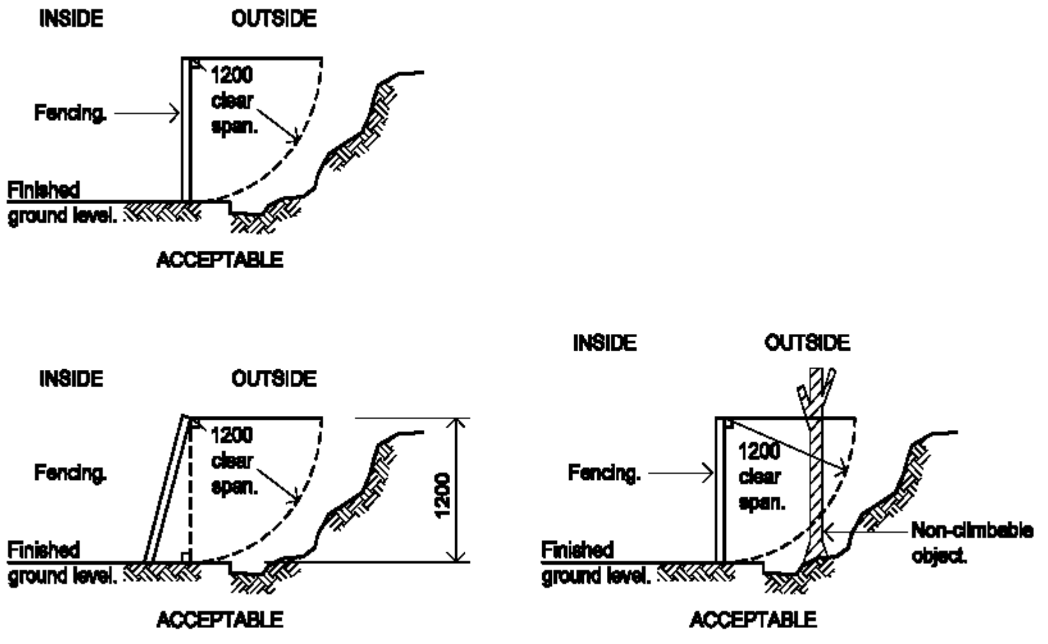
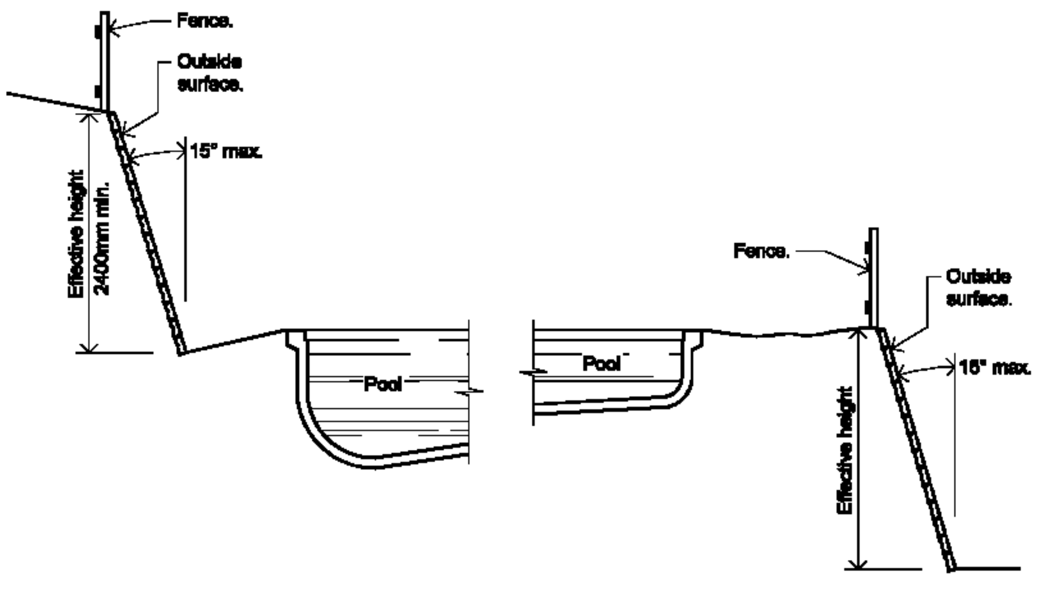



Figure 3.9.3.5

RETAINING WALLS AND OTHER SUCH BARRIERS



# PART 3.10

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# ADDITIONAL CONSTRUCTION REQUIREMENTS





SUPERSEDED

# PART 3.10 CONTENTS





**Explanatory information:**

These provisions have been introduced to address design requirements for increased structural loading conditions that may occur due to geographical, topographical or climatic conditions that are beyond the scope of the proceeding parts of the *Housing Provisions*.

These provisions are to be read in conjunction with the other relevant requirements of this code.

eg For masonry construction in Part 3.10.1.2, the walls will be required to be designed in accordance with AS 3700. However, the lintels, flashings and damp proof courses can be installed in accordance with Part 3.3.

# PART 3.10.1 HIGH WIND AREAS

**Appropriate performance requirements:**
Where an alternative method of constructing in high wind areas is proposed to that described in Part 3.10.1.0, that proposal must comply with the structural performance requirement P2.1 in Section 2.

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## Acceptable construction manuals

**3.10.1.0** Performance requirement P2.1 is satisfied if a building constructed in a *high wind area* complies with one or more of the following manuals:

(a) Masonry - AS 3700 Masonry Code.

(b) The Northern Territory Deemed-to-Comply Standards Manual.

(c) Timber -

(i) Timber Framing Manual W41C - 1993 (Timber Research and Development Advisory Council); or

(ii) Timber Framing Manual W50C - 1994; Timber Research and Development Advisory Council - Queensland; or

(iii) Timber Framing Manual W60C - 1992; Timber Research and Development Advisory Council - Queensland.

(d) Steel -

(i) AS 1250 - The use of steel in structures; or

(ii) AS 3623 - Domestic metal framing; or

(iii) AS 4100 - Steel framing.

(e) Glazing - external glazing is designed and installed in accordance with AS 1288.

**STATE AND TERRITORY VARIATIONS**

**Add Part 3.10.1.0 (f) in the Northern Territory.**

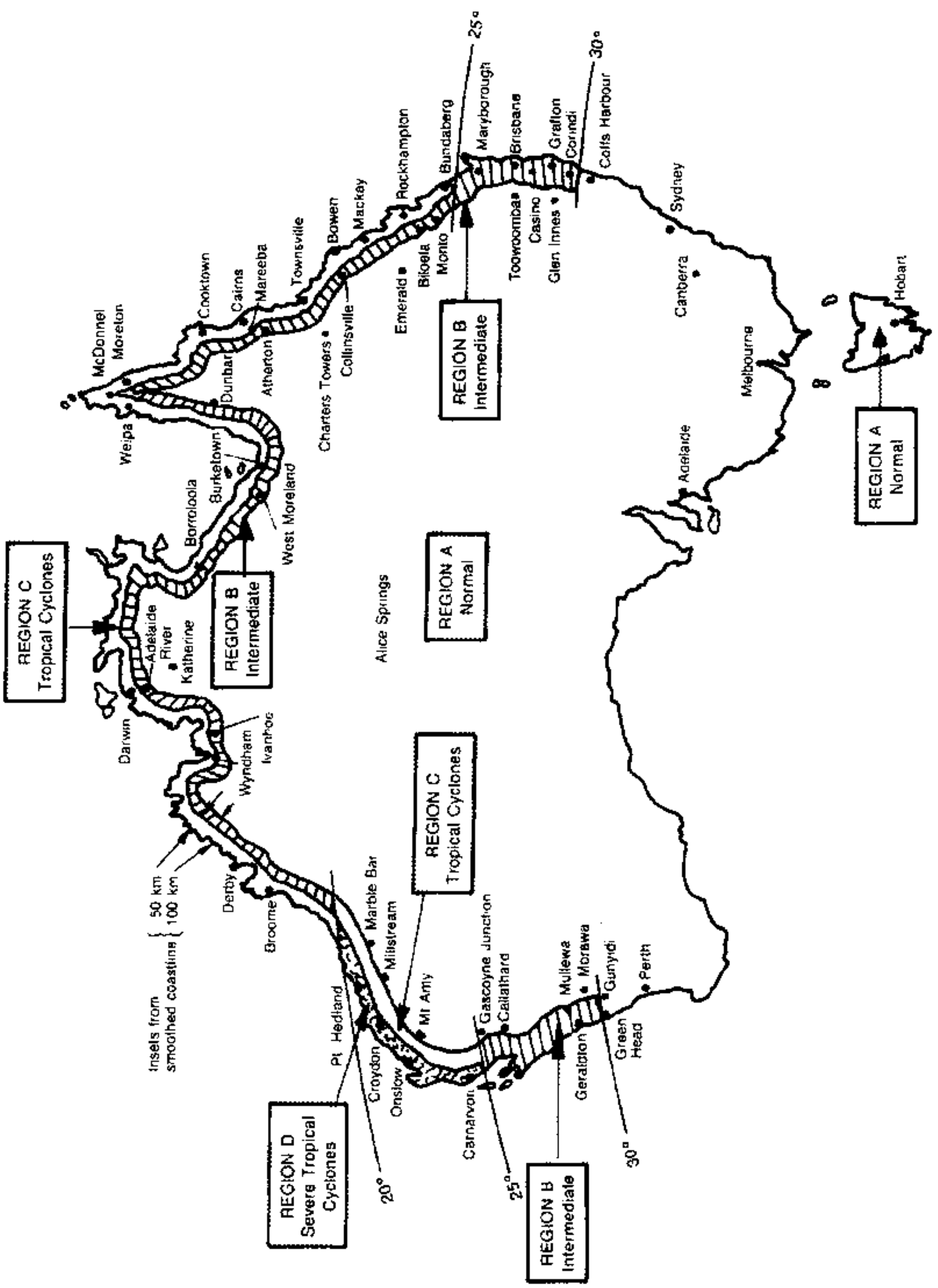
(f) Metal clad roofing

Test for strength - Metal roofing and its fitments should be capable of withstanding without failure, the test application of 10,000 cycles of working load from zero to that maximum at a rate of 3 Hz, followed by a static load test of 1.8 times the working load.

**Figure 3.10.1.4**

**CYCLONIC AREAS**

**Note:** High wind areas exist outside the cyclonic regions indicated on this map.



**Explanatory Information: Construction in high wind areas**

The intent of building construction in high wind areas is to ensure the structure has sufficient strength to transfer wind forces to the ground with an adequate safety margin to prevent the building being lifted, or slid off its foundations.

To resist these forces it is necessary to have:

- an anchorage system where the roof is connected by the walls to the foundations by a chain of connections; and
- a bracing system installed to prevent horizontal collapse due to wind forces; and
- continuity of the system where each structural element is interlocked to its adjoining structural element throughout the building.

**Anchorage**

Anchorage of the system is achieved by using a variety of proprietary connectors. Each connector must be capable of carrying the uplift force, because the ability of the building to resist the wind forces is directly related to its weakest link.

Acceptable construction manuals and practice to achieve these requirements are described in Part 3.10.1.

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# PART 3.10.2 EARTHQUAKE AREAS

**Appropriate performance requirements:**

Where an alternative design is proposed to that described in Part 3.10.2, that proposal must comply with the structural performance requirement P2.1 in Section 2.



## Definitions

**3.10.2** The following definitions are used in this Part:

**Acceleration coefficient** means an index related to the expected severity of earthquake ground motion, as determined under AS 1170.4 and described in Figure 3.10.2.

**Design category:** Domestic structures are separated into three earthquake design categories H1, H2 and H3 in order of increasing potential to be damaged by earthquake loads. The design category is given in Table 2.6 of AS 1170.4.

**Framing connector** means a manufactured connector system for timber joints formed from 1.2mm minimum thickness galvanised steel and punched to take nails.

## A. Acceptable construction manuals

**3.10.2.0** Peformance requirement P2.1 for Class 1 and 10 buildings constructed in areas with a seismic activity are satisfied if the building is constructed in accordance with the applicable construction manuals listed in Part 3.11.

**Explanatory Information:**

Most domestic structures are not required to be designed for earthquakes, because the construction system already in place for wind resistance is usually adequate for earthquake resistance.

Accordingly compliance with other acceptable construction details in the *Housing Provisions* are suitable for areas with an acceleration co-efficient below 0.12 provided the building is built in an area that is not considered to be complying with a structural *design category* of H3 as defined in AS 1170.4.

Class H3 are typically sites identified as having soft soil (having a soil profile with more than 5m of soft clay, loose sand, silt or uncontrolled fill) need to be designed in accordance with Part 3.11.

## B. Acceptable construction practice

### 3.10.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.10.2 for Class 1 and 10 buildings constructed in areas with seismic activity acceleration coefficient in excess of 0.11 satisfies performance requirement P2.1, provided -

(a) the soil profile of the site does not have more than 5m of soft clay, loose sand, silt or uncontrolled fill; and

(b) the buildings -

  (i) have a rise in storeys no greater than 1; and

  (ii) do not have -

    (A) a roof clad with concrete or terracotta tiles; or

    (B) masonry projections or overhangs, masonry parapets or unbraced masonry chimneys.

### 3.10.2.2 Construction requirements

Construction in earthquake areas must comply with the following:

(a) In locations with an *acceleration coefficient* of 0.11 or greater but less than 0.15, any Class 1 building must comply with 3.10.2.3; or

(b) In locations with an *acceleration coefficient* of 0.15 or greater, any Class 1 building must comply with 3.10.2.4.

(c) See Figure 3.10.2.1 for *acceleration co-efficient* design values.

**Explanatory Information:**

The principal requirement for structural detailing in domestic structures is that each of the system components are sufficiently connected together such that the forces generated by an earthquake are carried to the foundation.

Trusses, beams and the like should be restrained horizontally at their support, and framing connectors are sufficient.

Bracing requirements, in horizontal and vertical directions, are the same for wind loads.

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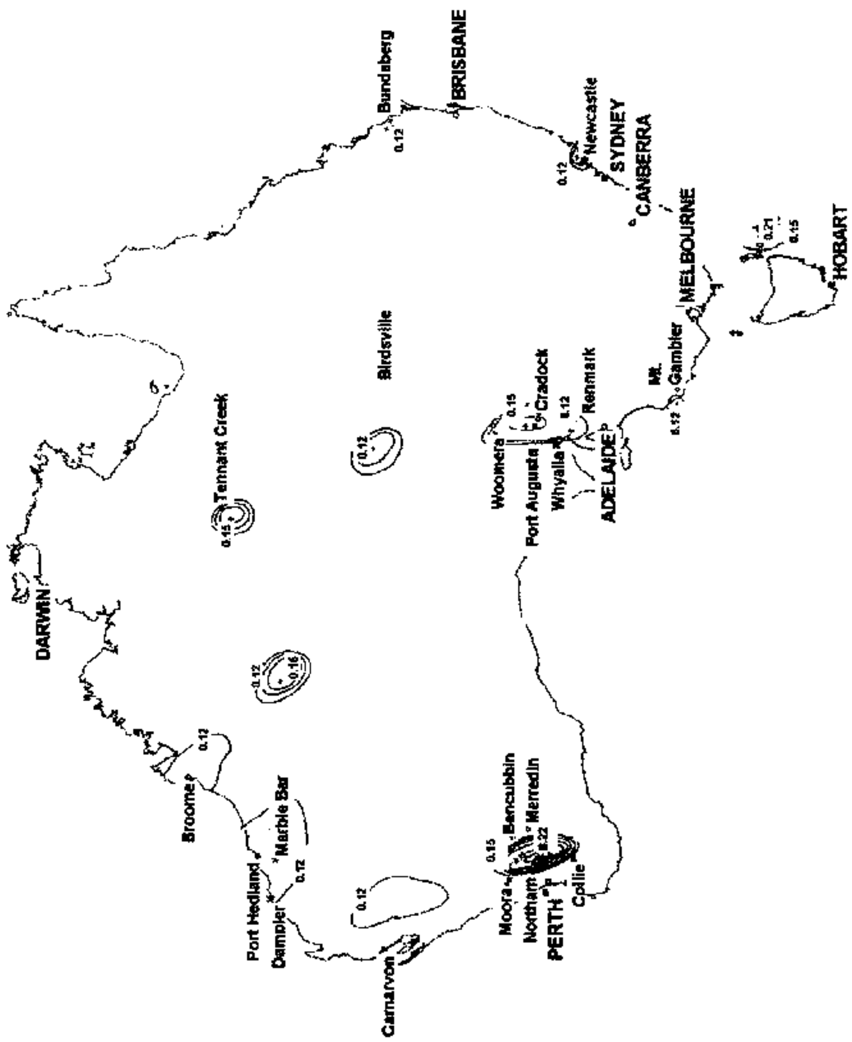
**Figure 3.10.2.1**
**ACCELERATION CO-EFFICIENT MAP OF AUSTRALIA**



**3.10.2.3** Construction for areas with an acceleration coefficient of 0.12 to 0.15 Buildings in areas with an *acceleration coefficient* of 0.12 to 0.15 must be constructed as follows:

(a) Foundations and footings

Footings must comply with the appropriate provisions of Part 3.2 and the additional requirements of this clause:

(i) Stumps must be steel, timber or reinforced concrete.

(ii) Bracing to stumps must be connected with galvanised M12 bolts or equivalent to comply with AS 1684-

(A) at intervals not exceeding 10m.

(B) at corner stumps - in two directions.

(C) to every stump projecting more than 650mm out of the ground.

(iii) Floor beams must be fixed to the top of stumps with two M10 diameter bolts or equivalent fixing.

(iv) Bottom plates of framed structures where fixed to a concrete raft or strip footing must be fixed with M10 bolts or masonry anchors at 1200mm maximum centres.

(v) Concrete strip footings must be continuously reinforced with two layers of reinforcement comprising two 12mm diameter bars (Grade 400Y) per layer and tied with R6 ligatures at centres not exceeding 2.5 times the depth of the footing.

(vi) Raft slabs must incorporate monolithic edge beams.

(b) Framed wall construction

Framing must comply with the appropriate provisions of Part 3.4 and the additional requirements of this clause:

(i) Metal framing must-

(A) comply with Part 3.4, AS 1538 or AS 1664; and

(B) have a minimum thickness of not less than 1.2mm thick (other than bracing); and

(C) have wall plates that are continuous between cross walls or spliced to maintain strength.

(ii) Timber framing-

(A) must be fixed with *timber framing connectors* nailed with a least three 2.8mm diameter x 30mm long nails to each fixing plate or the connector; and

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(B) constructed of seasoned timber, fixed with at least two 2.8mm diameter nails, machine nailed through the top or bottom wall plate into the stud; and

(C) wall plates must be continuous between cross walls or spliced to maintain strength.

(c) Unreinforced masonry construction

Unreinforced masonry must comply with the appropriate provisions of Part 3.3 and the additional requirements of this clause:

(i) Internal or *external walls* 4m in length or greater must be stiffened by cross walls, columns or bracing complying with AS 1170.4 and AS 3700; and

(A) cross walls must be tied to the internal leaf of cavity walls by fully bonding or by metal ties at every second course; and

(B) the mortar mix must be at least as strong as a 1:1:6; and

(C) masonry units must have good mortar adherence properties.

(ii) Bricks must -

(A) be laid on a full bed joint with full perpends; and

(B) when laid in the top two courses of internal walls and the internal leaf of *external walls* contain no perforations.

(iii) Reinforcement consisting of two R6 bars (Grade 250R), or two 3.15mm diameter bars (Grade 450W), must -

(A) be placed in both leaves of *external walls* in the course immediately under window sills and over door and window heads; and

(B) be galvanised when placed in the external leaf of an *external wall*; and

(C) extend a minimum of 300mm beyond any supporting cross walls or columns; and

(D) be spliced not less than 300mm.

(iv) Continuous reinforced brick bond beams must be installed, comprising two R6 bars (Grade 250R), or two 3.15mm diameter bars (Grade 450W), in each of the top three bed joints, constructed-

(A) on the internal leaf of all *external walls* and on all cross walls; and

(B) where the roof is pitched on the external leaf of an *external wall*, in that external leaf; and

(C) in cross walls, turned and lapped 300mm into the *external walls*.

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(viii) Top wall plates must be fixed by masonry anchors or equivalent fixing connected to the second top course of walls, at 1800mm maximum centres.

(d) Veneer on frame construction

Veneers that comprise an external leaf of masonry connected to internal walls of timber or metal framing must be fixed in accordance with AS 3700.

(e) Roof construction

Roof framing must comply with the appropriate provisions of Part 3.4: and

(i) roof bracing - to transfer all horizontal loads directly to cross walls; and

(ii) roof framing - fixed to the top wall plate using *timber framing connectors* nailed with at least three 2.8mm diameter x 30mm long nails to each fixing plate of the connector.



**3.10.2.4 Construction for areas with an acceleration coefficient of 0.15 or greater**

Buildings in areas with an acceleration coefficient of 0.15 or greater must be constructed as follows:

(a) Foundations and footings

Footings must comply with the appropriate provisions of Part 3.2 and the additional requirements of this clause:

(i) Stumps must be steel, timber or reinforced concrete.

(ii) Bracing to stumps must be connected with galvanised M12 bolts or equivalent to comply with AS 1684-

(A) at intervals not exceeding 8m; and

(B) at corner stumps - in two directions; and

(C) to every stump projecting more than 500mm out of the ground.

(iii) Floor beams must be fixed to the top of stumps with two M10 diameter bolts or equivalent fixing.

(iv) Bottom plates of framed structures where fixed to a concrete raft or strip footing must be fixed with M10 bolts or masonry anchors at 1200mm maximum centres.

(v) Concrete strip footings must be continuously reinforced with two layers of reinforcement comprising two 12mm diameter bars (Grade 400Y) per layer and tied with R6 ligatures at centres not exceeding 2.5 times the depth of the footing.

(vi) Raft slabs must incorporate monolithic edge beams.

(b) Framed wall construction

Framing must comply with the appropriate provisions of Part 3.4 and the additional requirements of this clause:

(i) Metal framing-

(A) complying with Part 3.4, AS 1538 or AS 1664; and

(B) have a minimum thickness of not less than 1.2mm thick (other than bracing); and

(C) wall plates must be continuous between cross walls or spliced to maintain strength.

(ii) Timber framing-

(A) must be fixed with *timber framing connectors* nailed with a least three 2.8mm diameter x 30mm long nails to each fixing plate or the connector; or

(B) constructed of seasoned timber, fixed with at least two 2.8mm diameter nails, machine nailed through the top or bottom wall plate into the stud; and

(C) wall plates must be continuous between cross walls or spliced to maintain strength.

(c) Veneer on frame construction

(i) Veneers that comprise an external leaf of masonry connected to internal walls of timber or metal framing must be fixed in accordance with AS 3700.

(ii) Timber framing-

(A) wall plates-

(aa) fixed to transfer lateral loads between frames of *external walls* and frames of internal walls; and

(bb) F8 grade timber minimum dimensions 100x 50mm where cross walls are spaced at not greater than 4800mm centres; and

(B) *external walls* must be fixed to supporting cross walls at or near top wall plate level by at least two *framing connectors* with at least three 2.8mm diameter nails to each plate of the connector or by bolting the frames together with M10 minimum diameter bolts.

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(iii) Metal framing-

(A) wall plates must-

(aa) be fixed to transfer lateral loads between frames of *external walls* and frames of internal walls; and

(bb) have a minimum dimensions 78x31x1.2mm where cross walls are spaced at not greater than 5500mm centres, and stiffened by an additional 75x78x1.6mm plate where the span exceeds 3500mm; and

(B) *external walls* must be fixed to supporting cross walls at or near top wall plate level by at least two *timber framing connectors* or by bolting the frames together with M 10 minimum diameter bolts.

(iv) *External walls* must be fixed to the frame with 100x100mm galvanised steel mesh.

(v) Masonry veneer must not be placed over openings or in gables.

(d) Roof construction

Roof framing must comply with the appropriate provisions of Part 3.4; and

(i) roof bracing - to transfer all horizontal loads directly to cross walls; and

(ii) roof framing - fixed to the top wall plate using *timber framing connectors* nailed with at least three 2.8mm diameter x 30mm long nails to each fixing plate of the connector.

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# PART 3.11

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# STRUCTURAL DESIGN MANUALS

# PART 3.11 CONTENTS





**Explanatory information:**

This Part of the *Housing Provisions* contains a list of deemed-to-satisfy codes (acceptable construction manuals) that can be used to design building elements using engineering principles.

These provisions can be used in conjunction with both the performance requirements (listed in Section 2) and the deemed-to-satisfy provisions (listed in Section 3 - Parts 1-11). This combined approach is acceptable and meets the requirements of the *Housing Provisions*.

# PART 3.11 STRUCTURAL DESIGN MANUALS

**Appropriate performance requirements:**
Where it is proposed to use an alternative structural design code to that described in Part 3.11.1, that proposal must comply with the structural performance requirement P2.1 in Section 2.



## Acceptable construction manuals

### 3.11.1 Application

Compliance with the provisions of this Part for the construction of Class 1 and 10 buildings satisfies performance requirement P2.1 provided the building is designed and built in accordance with-

(a) 3.11.2; or

(b) the relevant provisions of other Parts of Section 3 of the Housing Provisions relating to structural elements; or

(c) a combination of (a) or (b).

### 3.11.2 Acceptable structural design manuals

A Class 1 and 10 building must be designed -

(a) to resist the loads determined in accordance with the appropriate aspects of the design codes described in 3.11.3; and

(b) in accordance with the appropriate structural design code listed in 3.11.4.

### 3.11.3 Loading requirements

A Class 1 and 10 building must be designed to resist loads as determined in accordance with the following appropriate design codes:

(a) Dead and live loads and load combinations - AS 1170.1.

(b) Wind loads - AS 1170.2 or AS 4055.

(c) Snow loads - AS 1170.3 .

(d) Earthquake loads - AS 1170.4.

### 3.11.4 Structural design manuals

The design of buildings or structural elements in a building must be in accordance with one, or any combination of, the following codes:

(a) Steel construction

(i) AS 1250 - The use of steel in structures.

(ii) AS 1538 - Cold formed steel structures.

(iii) AS 3623 - Domestic metal framing.

(iv) AS 4100 - Steel structures.

(b) Aluminium construction

AS 1664 - Rules for the use of aluminium structures.

(c) Timber construction

AS 1720.1 - Timber structures code.

(d) Footings

(i) AS 2870 - Residential slabs and footings.

(ii) AS 3600 - Concrete structures.

(e) Piling

AS 2159 - Piling - Design and information.

(f) Concrete construction (including reinforced and prestressed concrete)

AS 3600 - Concrete structures.

(g) Masonry (including masonry-veneer, unreinforced masonry and reinforced masonry)

AS 3700 - SAA Masonry code.

(h) Composite steel and concrete

AS 2327.1 - Composite construction in steel and concrete.

(i) Glass installations

AS 1288 - Glass in buildings - Selection and Installation.

(j) Earthwall construction

NBTC Bulletin 5, Edition 4.

(k) Structures for primary production purposes in rural areas.

AS 2867 - Farm structures - General requirements for structural design.





SUPERSEDED

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# APPENDIX A

# STATE AND TERRITORY ADDITIONS

Australian Capital Territory

New South Wales

Northern Territory

Queensland

South Australia

Tasmania

Victoria

Western Australia

# APPENDIX A - STATE AND TERRITORY ADDITIONS



## CONTENTS



**Continued next page**

## CONTENTS (continued)



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SUPERSEDED

# AUSTRALIAN CAPITAL TERRITORY ADDITIONS

## Application of Australian Capital Territoryadditions

This Appendix contains the BCA Housing Provisions that have been varied and additional provisions for application in the Australian Capital Territory as follows:



## STRUCTURE

### ACT 1 - ACCEPTABLE FOOTING SYSTEM

**ACT1.1- ACCEPTABLE CONSTRUCTION PRACTICE**

**ACT 1.1.1 Application**

The footing system described in Figure ACT 1.1 are acceptable for use provided the following conditions are applied:

(a) The building is single storey brick veneer or timber construction; and

(b) the site is class A, S or M; and

(c) any fill is installed -

(i) in accordance with Part 3.2; and

(ii) when installed the fill does not effect the brick walls; and

(d) the concrete complies with Part 3.2; and

(e) the site is prepared in accordance with Part 3.2.

**ACT 1.1.2 Acceptable alternatives wall heights (“h” in Figure ACT 1.1)**

(a) For a wall height between 450 and 750mm a 230mm double width masonry walls is acceptable.

(b) For a wall height between 750 and 1200mm, double width masonry walls with a 75mm cavity, reinforced with Y12 bars at 400mm centres horizontally, with the cavity filled with 20Mpa well compacted grout.

(c) For a wall height over 1200mm the wall and footing must be tied to the slab and designed by a *professional engineer.*

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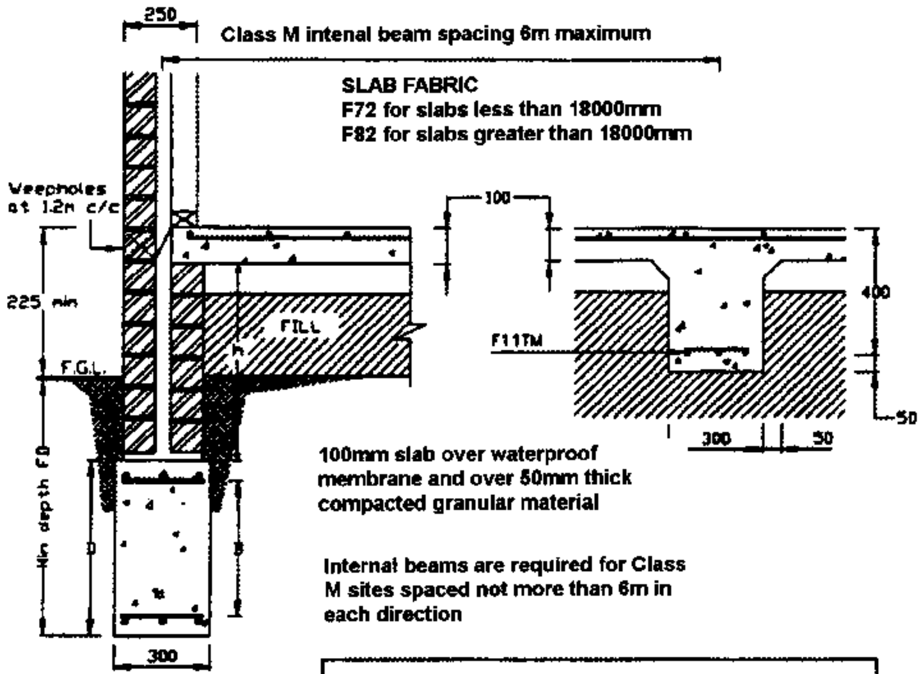
**Figure ACT 1.1**

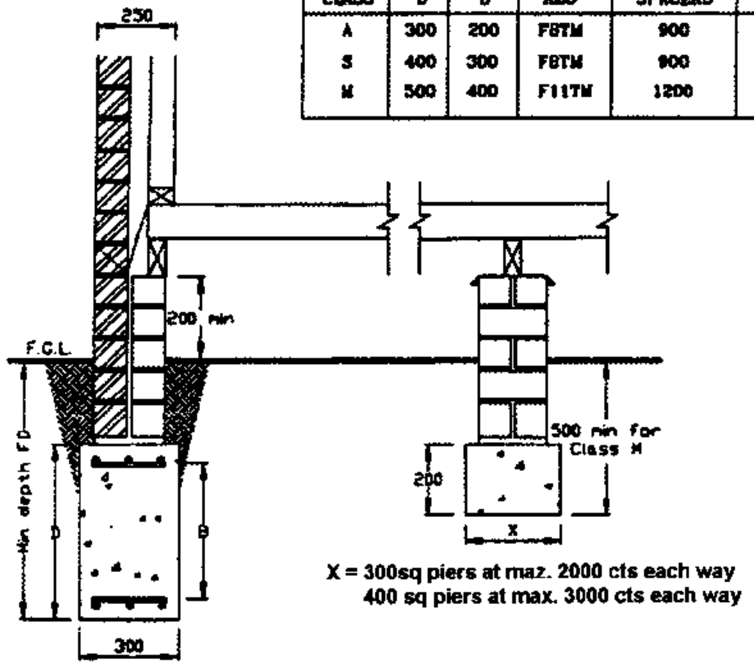
**ACCEPTABLE FOOTING CONSTRUCTION**

FIGURE 1




| FOOTING DETAILS | | | | | |
|---|---|---|---|---|---|
| CLASS | D | B | REO | SPACERS | MIN. FD |
| A | 300 | 200 | F8TM | 900 | - |
| S | 400 | 300 | F8TM | 900 | 500 |
| M | 500 | 400 | F11TM | 1200 | 600 |

FIGURE 2



# HEALTH AND AMENITY

## ACT 2 - HAZARDOUS MATERIALS

### ACT2.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to safeguard people from illness resulting from exposure to asbestos building materials during removal and disposal.

**Functional Statement**

Asbestos building material shall be removed and disposed of in a safe manner.

**Performance Requirement**

When asbestos-based material in any form or in any mixture thereof, or any material containing loose asbestos including asbestos fluff insulation, asbestos sheeting, lagging, fire protection and the like is removed, it must be handled and disposed of safely.

### ACT2.2 ACCEPTABLE CONSTRUCTION PRACTICE

The requirements of ACT P2 are satisfied when asbestos-based materials handled and disposed of in accordance with the Worksafe Australia Code of Practice and Guidance Notes.

## ACT 3 - CONTROL OF LITTER ON BUILDING SITES

### ACT 3.1 PERFORMANCE PROVISIONS

**Objective**

The objective of this provision is to prevent wind blown litter from building sites fouling roads and public land.

**Functional Statement**

Building litter must be prevented from spreading around the site and beyond the site boundary.

**Performance Requirement**

Sufficient containers must be provided on building sites to store building waste that is likely to become windblown.

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### ACT3.2 ACCEPTABLE CONSTRUCTION PRACTICE

The requirements of ACT P3 are satisfied by:

On site building waste that is stored in suitable size plastic or metal bins and removed from the site at regular intervals.

**Note**: Building Waste includes: plastic containers and plastic and paper wrappings or any waste that can be carried by wind.

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## ACT 4 - WASTE MANAGEMENT

### ACT4.1 PERFORMANCE PROVISIONS

**Objective**

The objective of this provision is to safeguard people from injury caused by infection or contamination from solid waste.

**Functional Statement**

Buildings must be provided with space and facilities for the collection, and safe hygienic holding prior to disposal of solid waste arising from the intended use of the building.

**Performance Requirement**

Where provision is made within buildings for the collection and temporary holding of solid waste. The design shall accommodate screening, volume of waste, disposal, logistics and access

### ACT4.2 ACCEPTABLE CONSTRUCTION PRACTICE

The requirements of ACT P4 are satisfied by garbage facilities that are designed and constructed in accordance with the ACT Waste Management Design Guide.

## ACT5 - ENERGY EFFICIENCY

**Limitation:**

ACT 5 applies to Class 1 buildings only.

### ACT5.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to facilitate efficient use of energy in buildings.

**Functional Statement**

Buildings must be designed to ensure efficient energy use.

**Performance Requirement**

A building including carpets and internal fittings must achieve an annual energy consumption rate for heating and cooling not greater than 255 Megajoules/m based on the ACT climate zone.

> **Limitation:**
>
> ACT P5 applies to Class 1 buildings only.



## ACT5.2 ACCEPTABLE CONSTRUCTION PRACTICE

### ACT 5.2.1 - Energy efficiency

The requirements of ACT P5 are satisfied by:

(a) A building that achieves an ACT House Energy Rating of 4 Stars as assessed by an accredited ACT House Energy Assessor or;

(b) by any other assessment method, satisfying P5; and

(c) an addition-

- (i) complying with P5 or (a); or
- (ii) fully insulated in accordance with ACT Table 1 and the floor is concrete; or the timber floor has an R rating of 1 including carpets.

**ACT Table 1**
**MINIMUM INSULATION MATERIAL**

| |
|---|
| Roofs |
| (a) R3 insulation material in the ceiling space; or |
| (b) R2 insulation material in exposed raked ceiling (concession) |
| Walls |
| R1.5 insulation material in the external wall space |

### ACT 5.2.2 Exemptions

The requirements of this Part do not apply to the following types of construction:

(a) cavity brick, earthwall construction, ashlar stone or other masonry walls which have a thickness (excluding any cavity) of not less than 180 mm do not require wall insulation.

(b) Class 10 structures forming part of a Class 1 building.

(c) Moveable dwellings and mobile homes where their form of prefabricated construction does not readily permit achievement of optimal insulation requirements.

(d) A ceiling or underfloor space to an addition where unrestricted access for the installation of insulation will be available after the completion of construction.

**ACT 5.2.3 Fire resistance of insulation materials**

When tested in accordance with AS 1530.3 a thermal insulation material must have a *Spread-of-Flame Index* of 0 and a *Smoke-Developed Index* not greater than 4.

## ACT 6 - Swimming pool construction



**Application:**

This requirement is to be applied in conjunction with Part 3.9.3

**ACT 6.1 Swimming pool construction**

Indoor or outdoor permanent bathing, wading and *swimming pools* must-

(a) where the capacity of the pool exceeds 10 $m^3$-

(i) be of the recirculation type in which the water circulation is maintained through the pool by pumps, the water drawn from the pool being clarified and disinfected before being returned to the pool;

(ii) have an outlet sump with antivortex cover or grating and have a skimming weir or overflow gutter or channel at high water level; and;

(iii) have means of egress provided in the form of ladders, steps in the floor of the pool or a ramp;

(b) be capable of being completely emptied and any discharge or overflow and pool backwash filter must be connected to the sewer drainage system;

(c) be watertight with smooth surfaces of non-absorbent, non-slip material, light in colour and with rounded corners to facilitate cleaning;

(d) have surrounding concourses graded away from the pool.

**ACT 6.2 Electrical installations**

Electrical installations and equipment associated with swimming pools must comply with AS 3000 SAA Wiring Rules (in particular Section 6).

# OTHER LEGISLATION AFFECTING BUILDINGS

In addition to the requirements of the ACT Building Act 1972 and the ACT Building Code, administered by ACT Building Electrical and Plumbing Control, (BEPCON) builders and designers should be aware of other legislation which contains building requirements.

The following is a list of some of the other relevant legislation:

**1. Health Legislation**

Public Health (General Sanitation) Regulations (ACT Health)

**2. Environmental Control and Emission Standards**

Air Pollution Act 1984 (Department of Urban Services) (DUS)
Noise Control Act 1988 (DUS)
Water Pollution Act 1984 (DUS)

**3. Occupational Health and Safety**

ACT Demolition Code of Practice (Chief Minister's Department) (CMD)
Occupational Health and Safety Act 1989 (CMD)

**4. Public Housing**

Housing Assistance Act 1987 (ACT Housing Trust))

**5. Scaffolding and Temporary Works**

Scaffolding and Lifts Regulations (CMD)

**6. Urban Design Standards, Land Title and Tenure**

ACT (Planning and Land Management) Act 1988 (National Capital Planning Authority) (NCPA)
Buildings (Design and Siting) Act 1964 (DUS)
City Area Leases Act 1936 (For leases before the Land Act commenced) (DUS)
Common Boundaries Act 1981 (DUS)
Land (Planning and Environment) Act 1991 (DUS)
Leases (Special Purposes) Act 1925 (For leases before the Land Act commenced) (DUS)
National Land Ordinance 1989 (NCPA)
Unit Titles Act 1970 (DUS)

**7. Utility Services and Urban Infrastructure**

Canberra Sewerage and Water Supply Regulations (ACT Building Electrical & Plumbing Control) (BEPCON)
Electricity Act 1971 (BEPCON)
Gas Act 1992 (AGL, Dangerous Goods Inspectorate)
Protection of Lands Act 1937 (DUS)
Roads and Public Places Act 1937 (DUS)

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# NEW SOUTH WALES ADDITIONS

**New South Wales has no additional variations to the Housing Provisions.**

# NORTHERN TERRITORY ADDITIONS

**The Northern Territory has no additional variations to the Housing Provisions.**

# QUEENSLAND ADDITIONS

## Application of Queensland variations

This Appendix contains the BCA Housing Provisions that have been varied and additional provisions for application in Queensland as follows:

## HEALTH AND AMENITY



### QLD1 - CONSTRUCTION IN SANITARY COMPARTMENTS

#### QLD1.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to enable unconscious occupants of *sanitary compartments* to be removed from the compartment.

**Functional Statement**

A *sanitary compartment* is to have sufficient space or other means to permit an unconscious occupant to be removed from the compartment.

**Performance Requirement**

A *sanitary compartment* must be constructed with sufficient space or other means to enable an unconscious occupant to be removed from the compartment.

#### QLD1.2 ACCEPTABLE CONSTRUCTION PRACTICE

**Qld 1.2.1 Application**

Compliance with the acceptable construction practice provisions of Qld 1.2 for the construction of *sanitary compartments* satisfies performance requirement Qld 1.1.

**Qld 1.2.2 Construction of sanitary compartments**

(a) *Sanitary compartments* must have doors and partitions that separate adjacent compartments and extend-

(i) from floor level to the ceiling in the case of a unisex facility; or

(ii) to a height of not less than 1500mm above the floor if primary school children are the principal users; or

(iii) 1800mm above the floor in all other cases.

(b) The door to a fully enclosed *sanitary compartment* must -

(i) open outwards; or

(ii) slide; or

(iii) be readily removable from the outside,

unless there is a clear space of at least 1.2 m between the closet pan within the *sanitary compartment* and the nearest part of the doorway.

## QLD2 - FLASHING OF NARROW SPACES AND VERMIN CONTROL

### QLD2.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to safeguard people from injury and illness resulting from the creation of hazardous spaces between buildings.

**Functional Statement**

The space between buildings must not allow hazardous conditions to arise due to vermin and weather.

**Performance Requirement**

Spaces between buildings on adjoining sites which are narrower than 600 mm must be sealed off and flashed over to prevent the entrance of weather and vermin.

### QLD2.2 ACCEPTABLE CONSTRUCTION PRACTICE

**Qld 2.2.1 Control of vermin**

Buildings must be constructed to prevent the entry of vermin in accordance with Part 17 (Vermin Control) of the Health Regulation 1996.

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# SAFE MOVEMENT AND ACCESS

## QLD 3 SWIMMING POOL ELECTRICAL CONDUCTOR

### QLD 3.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to safeguard people from electrical shock in a *swimming pool.*

**Functional Statement**

A *swimming pool* is to be constructed with safeguards to prevent electrical shocks.

**Performance Requirement**

Where an inground *swimming pool* is constructed with metallic reinforcing, an electrical conductor must be provided to reduce the risk of electrical shocks for users of the pool.

## QLD3.2 ACCEPTABLE CONSTRUCTION PRACTICE

### Qld 3.2.1 Application

Compliance with the acceptable construction practice provisions of Qld Part 3.2 for the construction of inground *swimming pools* with metallic reinforcing satisfies performance requirement 3.1.

### Qld 3.2.2 Construction of inground swimming or spa pools

Where an in-ground *swimming pool* is constructed with metallic reinforcing, the means for attaching an electrical conductor to the reinforcing must-

(a) be incorporated at the time of construction; and

(b) be positioned for use without causing damage to the pool; and

(c) be in accordance with the requirements of the relevant statutory electricity supply authority; and

(d) where the connecting facility is below ground level, have its location clearly marked on the structure or shown on approved plans.

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# SOUTH AUSTRALIA ADDITIONS

## Application of South Australian variations

This Appendix contains the BCA Housing Provisions that have been varied and additional provisions for application in South Australia as follows:



## SA ACCEPTABLE CONSTRUCTION MANUAL

### SA 1 Application

Compliance with the deemed-to-satisfy provisions of the South Australian Housing Code 1996 for Class 1a and Class 10a buildings satisfies the performance requirements in Section 2 as modified by any variations and additions for South Australia.

## FIRE SAFETY

**Limitation:**

SA 2 applies to a Class 1b building.

### SA 2 - Emergency lighting

### SA 2.1 PERFORMANCE PROVISIONS

**Objective**

The fire safety objective is to safeguard people from illness or injury due to inadequate lighting in paths of travel to exits; and

**Functional Statement**

A building is to be provided with adequate lighting to identify exits and paths of travel to an exit.

**Performance Requirement**

A level of illumination at floor level, adequate for safe evacuation in an emergency must be provided in a building, appropriate to the building use, building floor area and the travel distance to an exit.

### SA 2.2 ACCEPTABLE CONSTRUCTION PRACTICE

An emergency lighting system must be installed in a Class 1b building in every passageway, corridor, hallway, or the like, leading to a required stairway or exit.

# HEALTH AND AMENITY

## SA 3 - Wet areas

### SA 3.1 PERFORMANCE PROVISIONS

**Objective**

As per Section 2 Objectives for wet areas.

**Functional Statement**

As per Section 2 Functional Statement for wet areas.

**Performance Requirement**

In wet areas, floors must be installed in a manner that will prevent accumulation of surface water which could create unhealthy or hazardous conditions.

### SA 3.2 ACCEPTABLE CONSTRUCTION PRACTICE

#### SA 3.2.1 Application

Compliance with the acceptable construction practice provisions of Part 3.8.1 and SA 3.2 for wet areas in Class 1 and 10 buildings satisfies performance requirements P 2.4.1 and SA P.3.1 provided the wet area -

(a) is protected in accordance with the appropriate requirements of 3.8.1.3 and 3.8.1.6 and SA 3.2.3, SA 3.2.4, SA 3.2.5 and SA 3.2.6.

(b) complies with the appropriate details described in Figures 3.8.1.5 to 3.8.1.11.

#### SA 3.2.2 Wet areas

In addition to the requirements of 3.8.1.2 the following parts of a building must be protected against the effects of water:

(a) The floor of a bathroom (other than in a shower area as defined in Figures 3.8.1.1 and 3.8.1.2), laundry or sanitary compartment.

(b) The walls (including corner junctions) -

  (i) of a bathroom (other than in a shower area as defined in Figures 3.8.1.1 and 3.8.1.2) or laundry, to a height of 100 mm above the floor; and

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(ii) of a sanitary compartment to a height not less than 90 mm above the floor.

**SA 3.2.3 Protection of shower floors in wet areas**

In addition to the requirements of 3.8.1.4, where the floor outside the shower is not drained into the shower trap, a floor trap shall be provided.

**SA 3.2.4 Protection of walls in wet areas**

(a) In addition to the requirements of 3.8.1.5, wet area walls as defined in SA 3.2.2(b) must be water resistant.

(b) In masonry veneer and framed construction, bathroom walls (other than in a shower area) must be lined up to 1200 mm above floor level with water resistant grade lining.

(c) In masonry veneer and framed construction, laundry walls must be lined with water resistant grade lining from floor level, to 75 mm above, and 75 mm each side of automatic washing machine outlets.

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**SA 3.2.5 Protection of floors in wet areas other than a shower area**

(a) Wet area floors as defined in 3.2.2(a) must be water-resistant and consist of a water-resistant finish suitably attached to a water-resistant substrate.

(b) The floor of a bathroom or laundry, must be graded at not less than 1:80 to a floor trap or to a shower set-down containing a floor trap.

(c) The floor of a sanitary compartment need not be graded and drained unless a hand basin is installed.

**SA 3.2.6 Ventilation under built-in bath**

The enclosed space under a metal bath or spa must be ventilated by-

(a) two vent tiles; or

(b) an external wall cavity; or

(c) a ventilated under-floor space.

# SAFE MOVEMENT AND ACCESS

## SA 4 SWIMMING POOL SAFETY

**Limitation:**

SA 4 only applies to a *swimming pool* associated with a Class 1 building with a depth of water more than 300mm.



### SA 4.1 Performance Provisions

**Objective**

As per Section 2 Objective 2.5.3.

**Functional Statement**

A *swimming pool* must not allow a young child to be entrapped or injured due to suction by pump intakes.

**Performance Requirement**

Pump intakes to *swimming pools* must have such dimensions and safety protection measures so as to prevent injury to a young child due to entrapment by suction.

### SA 4.2 ACCEPTABLE CONSTRUCTION PRACTICE

#### SA 4.2.1 Application

Compliance with the acceptable construction practice provisions of SA 4.2.2 for swimming pool pump intakes satisfies performance requirement SA 4.1.

#### SA 4.2.2 Pump Intakes

A swimming pool water recirculation and filtration system must comply with AS 1926.3 and have at least two pump intakes not less than 800 mm apart.

## SA 5 ACCESS FOR PEOPLE WITH DISABILITIES

**Limitation:**

SA 5 applies to Class 1 buildings when a development of 20 or more sole occupancy units is undertaken on an allotment.

## SA 5.1 PERFORMANCE PROVISIONS

### Objective

Provide, as far as is reasonable, people with safe equitable and dignified access to a degree necessary to-

(a) buildings; and

(b) the services and facilities within.

### Functional Statement

A building to a degree necessary is, as far as is reasonable, to provide safe, equitable and dignified access for people to the services and facilities within.

### Performance Requirement

Buildings and immediate surrounds must have appropriate features to a degree necessary to enable people with disabilities to safely and equitably-

(a) negotiate the route from the road boundary to and within the building using a wheelchair; and

(b) have access to spaces within the building, including facilities required under P2.4.3.

## SA 5.2 ACCEPTABLE CONSTRUCTION PRACTICE

### SA 5.2.1 Application

Compliance with the acceptable construction practice provisions of Part SA 5.2 for access for people with disabilities satisfies performance requirement SA 5.1.

This part applies to certain Class 1 buildings where access is required under Clause SA 5.2.2.

### SA 5.2.2 Access to buildings

Whenever 20 or more sole occupancy units including Class 1 buildings are constructed on an allotment, access must be provided to and within one sole occupancy unit or 5% of the sole occupancy units, whichever is the greater.

### SA 5.2.3 Parts of buildings to be accessible

(a) Access for people with disabilities must be provided from the entrance doorway to areas normally used by the occupants. A path of travel providing required access must not include a stairway or other impediment which would prevent a person in a wheelchair using it.

(b) Access, finishes and fittings must comply with the provisions of AS 1428.1.

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## SA 6 - ACCESS FOR INSPECTION AND MAINTENANCE

### SA 6.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to safeguard people from injury and illness resulting from the creation of hazardous spaces between buildings.

**Functional Statement**

The space between buildings must not allow hazardous conditions to arise due to accumulation of rubbish that cannot be readily removed.

**Performance Requirement**

The space between buildings must be sufficient to allow access for inspection and maintenance to avoid hazardous conditions arising due to accumulation of rubbish that could-

(a) bridge termite barriers; or

(b) harbour vermin; or

(c) create a fire hazard.

### SA 6.2 ACCEPTABLE CONSTRUCTION PRACTICE

**SA 6.2.1 Application**

Compliance with the acceptable construction provision of SA 6.2 for acceptable separation between buildings for Class 1 and 10 buildings satisfies performance requirement SA 6.1.

**SA 6.2.2 Minimum separation between buildings**

Unless the space between external columns is not infilled, every part of an *external wall* of a building must be not less than 600 mm from-

(a) any boundary of the allotment, unless that wall is on or abutting that boundary; or

(b) the *external wall* of any other building on the same allotment, unless the two buildings are abutting.

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# TASMANIA ADDITIONS

## Application of Tasmanian variations

This Appendix contains the BCA Housing Provisions that have been varied and additional provisions for application in Tasmania as follows:

## FIRE SAFETY

**Limitation:**

Tas 1 does not apply to-

1. roof coverings or canopies of PVC, Acrylic, Polycarbonate and GRP sheeting over a balcony, verandah, carport, covered way, swimming pool, barbecue area, or similar open structure attached to a Class 1 building; or
2. Class 1 buildings on land zoned Rural (except Rural Residential) in the Municipality's or City's sealed Planning Scheme, Effective Interim Order, or Special Planning Order if situated at a distance of not less than 30 m from a wooden building or the allotment boundary or not less than 15 m from other buildings; and
3. where in accordance with (b) a roof is covered with wood shingles or shakes, the shingles or shakes are underlaid with a material having a *Flammability index* not greater than 2.

### TAS 1 - NON -COMBUSTIBLE ROOF COVERINGS

### TAS 1.1 PERFORMANCE PROVISIONS

**Objective**

The fire safety objective is to prevent the spread of fire from air-borne embers.

**Functional Statement**

Protect Class 1 buildings from air-borne embers.

**Performance Requirement**

A Class 1 building must be protected from the spread of fire from air-borne embers from other property by the provision of a *non-combustible* roof covering.

### TAS 1.2 ACCEPTABLE CONSTRUCTION PRACTICE

**Tas 1.2.1 Non-combustible roofing**

A roof covered with any of the following materials satisfies the performance requirements of Tas 1.1 -





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(a) metal sheeting or tiles;

(b) slates;

(c) terracotta or cement roofing tiles;

(d) cement fibre sheeting or shingles;

(e) asphalt shingles except on buildings with *rise in storeys* exceeding 2;

(f) built-up roofing covered with *non-combustible* material; or

(g) concrete, granolithic, terrazzo, cement mortar, or other similar *non-combustible* materials.



# HEALTH AND AMENITY

## TAS2 - SWIMMING POOL WATER RETICULATION AND FILTRATION

**Limitation**

Tas 2 does not apply to a *swimming pool* associated with a Class 1 building if the depth of water is less than 300mm and the volume of the pool does not exceed 15m$^3$.

### TAS 2.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to safeguard people from illness or injury arising from the use of a *swimming pool*.

**Functional Statement**

*Swimming pools* must provide for the health and safety of swimmers and others.

**Performance Requirement**

*Swimming pools* must be provided with an adequate water recirculation, disinfection and filtration system which is suitable and safe to use.

### TAS 2.2 ACCEPTABLE CONSTRUCTION PRACTICE

**Tas 2.2.1 Application**

Compliance with the provisions of Tas 2.2 for a *swimming pool* associated with a Class 1 building with a depth of water more than 300mm and volume exceeding 15m$^3$ satisfies performance requirement Tas 2.1.

**Tas 2.2.2 Water recirculation and filtration system**

A water recirculation, disinfection and filtration system in a *swimming pool* must provide for -

(a) the inlet and outlet openings for the purpose of water recirculation to be so located that water movement is continuous from inlet to outlet;

(b) the inlet and outlet openings, and skimmer boxes where provided, to comply with AS 1926.3;

(c) the recirculation of water to be so designed that the pool contents are recirculated not less than once-

(i) in 6 hours for an outdoor *swimming pool*; or

(ii) in 4 hours for an indoor *swimming pool*; and

(d) the water filtration rates to not exceed 12 250 L/m$^2$ of sand filter bed per hour, or an equivalent rate in other filter media.

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# VICTORIA ADDITIONS

## Application of Victorian variations

This Appendix contains the BCA Housing Provisions that have been varied and additional provisions for application in Victoria as follows:

## HEALTH AND AMENITY

### VIC 1 THERMAL INSULATION



**Limitation:**

VIC 1 applies to Class 1 buildings.

### VIC 1.1 PERFORMANCE PROVISIONS

**Objective**

The objective is to prevent undue loss of energy from a residential building

**Functional Statement**

A residential building is to be designed to achieve conservation of energy used for internal heating or cooling.

**Performance Requirement**

A residential building must have a reasonable level of thermal insulation to conserve energy used for internal heating and cooling.

### VIC 1.2 ACCEPTABLE CONSTRUCTION PRACTICE

**Vic 1.2.0 Definitions**

The following definition is used in this Part:

**R** or **R value** means the thermal resistance of an element of the building measured in $m^2K/W$.

**Vic 1.2.1 Application**

Compliance with the provisions of Vic Part 1.2 for thermal insulation in Class 1 buildings satisfies performance requirement Vic 1.1.

**Vic 1.2.2 Exemption**

Vic 1.2.3(a) does not apply to-

(a) concrete panels, cavity brick, earth wall construction, ashlar stone or other masonry walls which have a thickness (excluding any cavity) of not less than 180 mm if the floor of the building is concrete or masonry in direct contact with the ground; or

(b) windows, vents and other similar openings in walls, roofs and ceilings.

**Vic 1.2.3 Provision of thermal insulation**

(a) The building must-

(i) for the elements nominated in Vic Table 1, comply with all the *R Values* of option A or all the *R Values* of option B; or

(ii) achieve a House Energy Rating of at least 3 stars and at least equivalent to that which would be achieved using option A or B of Vic Table 1, as assessed by-

(A) a registered building practitioner accredited in the use of Energy Victoria's House Energy Rating; or

(B) Energy Victoria.

**Vic Table 1**
**MINIMUM OVERALL R VALUES**

| Element | Option A | Option B |
|---|---|---|
| Roof or ceiling | *R*2.2 | *R*2.2 |
| External wall | *R*1.3 | *R*1.7 |
| Ground Floor | *R*1.0 | *R*0.7 |

**Note:** For the purposes of this Table a wall which separates a Class 1 building from a Class 10a building is regarded as an *external wall*.

(b) **Deemed R Value** - An element described in Vic Table 2 is deemed to have the *R value* nominated in the Table adjacent to the description of the element.

**Vic Table 2**
**R VALUES FOR COMMON ELEMENTS**

| Description of element | R value |
|---|---|
| **Roofs or ceilings** | |
| Tiled or metal pitched roof, *R*2.5 bulk insulation between ceiling joists, lined ceiling | *R*2.4 |

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**Vic Table 2 (continued)**

| Description of element | R value |
|---|---|
| Metal deck roof, *R*2.0 bulk insulation installed between rafters, rfl as a vapour barrier, ceiling lining on underside of rafters | *R*2.2 |
| Metal deck roof, *R*2.0 bulk insulation installed between roof battens, rfl as a vapour barrier, ceiling lining on top of exposed rafters | *R*2.2 |
| Tiled roof, rfl as sarking and insulation, *R*2.0 bulk insulation installed between counter battens, optional rfl as a vapour barrier, ceiling lining on top of exposed rafters | *R*2.2 |
| **External walls** | |
| Brick/masonry veneer with *R*1.5 bulk insulation between the studs, lined internally | *R*1.7 |
| Brick/masonry veneer with *R*1.0 foam board fixed over the face of the studs, lined internally | *R*1.7 |
| Brick/masonry veneer with double sided rfl fixed to external face of studs, lined internally | *R*1.3 |
| Weatherboard/fibrecement cladding, *R*1.5 bulk insulation between studs, lined internally | *R*1.7 |
| Weatherboard/fibre-cement, double sided perforated rfl dished between studs lined internally | *R*1.3 |
| Cavity brick with *R*0.8 foam board in cavity | *R*1.3 |
| 150 mm concrete panel with *R*1.0 foam board and lined internally | *R*1.3 |
| **Floors** | |
| Concrete/masonry on ground | *R*1.5 |
| Timber framed floor, enclosed perimeter | *R*1.0 |
| Timber framed floor, unenclosed perimeter, 20 mm foam board fixed to the underside of floor joists | *R*1.0 |
| Timber framed floor unenclosed perimeter | *R*0.7 |

**Note:** For the purposes of this Table an enclosed perimeter may incorporate sub-floor ventilation at the rate of approximately 7300 $mm^2$/m.

## Vic 1.2.4 Chimneys and flues

Chimneys and flues from open solid fuel-burning appliances must be provided with a damper or flap.

## Vic 1.2.5 Installation of reflective foil laminate

Installation of reflective foil laminate (rfl) must comply with AS/NZS 4200.2.





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# SPECIAL REQUIREMENTS FOR CERTAIN BUILDINGS AND COMPONENTS

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In addition to any applicable provisions of the Building Act 1993, the Building Regulations 1994 and this Code, there are a number of technical building design and construction requirements of which practitioners should be aware. The following is a list of some of these:

**1. Accommodation - Residential (boarding houses, guest houses, hostels, motels)**

1.1 Approval authority: Municipal council

1.2 Relevant legislation: Health Act 1958, Health (Prescribed Accommodation) Regulations 1990

**2. Accommodation - Supported Residential Services**

2.1 Approval authority: Department of Human Services

2.2 Relevant legislation: Health Services Act 1988, Health Services (Residential Care) Regulations 1991

2.3 Design codes: Residential Care Design Guidelines

**3. Alpine Resorts - approval of construction**

3.1 Approval authority: Alpine Resorts Commission

3.2 Relevant legislation: Alpine Resorts Act 1983

**4. Crown land - construction approval**

4.1 Approval authority: Crown Land and Assets Division, Department of Natural Resources and Environment

4.2 Relevant legislation: Crown Land (Reserves) Act 1978

**5. Electrical installations**

5.1 Approval authority: State Electricity Commission or local supply authority in some metropolitan areas

5.2 Relevant legislation: Electricity Industry Act 1993, State Electricity Commission Act 1958, Electric Light and Power Act 1958, SEC Wiring Regulations 1992

5.3 Design codes: SAA Wiring Rules, AS 3000/3013

**6. Fences - (dividing fences)**

6.1 Relevant legislation: Fences Act 1968

6.2 Appeal body: Magistrates' Court

**7. Fire prevention in existing buildings**

7.1 Authority: Municipal council

7.2 Relevant legislation: Building Act 1993, Building Regulations 1994, Health Act 1958

7.3 Design codes: Guidelines for achieving fire safety when recycling a building, AUBRCC 1992

7.4 Appeal body: Building Appeals Board (Building Act only)

**8. Gas installations**

8.1 Approval authority: Gas and Fuel (Gascor)

8.2 Relevant legislation: Gas industry Act 1994, Gas and fuel Corporation (Gas installation) Regulations 1992

8.3 Design codes: Gas Installation Code AG601 1992

**9. Historic buildings**

9.1 Approval authority: Historic Buildings Council

9.2 Relevant legislation: Historic Buildings Act 1981

**10. Movable dwellings (in caravan parks)**

10.1 Approval authority: Municipal council

10.2 Relevant legislation: Caravan Parks and Movable Dwellings Act 1988; Caravan Parks and Movable Dwellings (Registration and Standards) Regulations 1993.

10.3 Appeals body: Caravans Parks Committee c/o Office of Local Government, Department of Infrastructure

**11. Occupational health and safety**

11.1 Approval authority: Health and Safety Organisation

11.2 Relevant legislation: Occupational Health and Safety Act 1985, Occupational Health and Safety (Lead Control) Regulations 1988, Occupational Health and Safety (Asbestos) Regulations 1992, Dangerous Goods Act 1985, Dangerous Goods (Explosives) Regulations 1988, Dangerous Goods (Transport) Regulations 1987, Dangerous Goods (Storage and Handling) Regulations 1989, Dangerous Goods (Liquefied Gases Transfer) Regulations 1987, Health Act 1958.

11.3 Design codes: Various codes of practice published by the Authority

**12. Planning controls**

12.1 Approval authority: Municipal council, in some cases the Minister for Planning and Local Government

12.2 Relevant legislation: Planning and Environment Act 1987

12.3 Design codes: Planning schemes

12.4 Appeal body: Administrative Appeals Tribunal

**13. Radiation safety**

13.1 Approval authority: Radiation Safety Unit, Public Health Division, Department of Human Services

13.2 Relevant legislation: Health Act 1958, Health (Radiation Safety) Regulations 1994.

13.3 Design codes: AS 2398-1980 Fixed Diagnostic X-ray Equipment - Design Construction and Installation, other Australian standards and codes of practice

**14. Sanitary plumbing, water supply and sewerage**

14.1 Approval authority: Melbourne Water in metropolitan area, sewerage and water supply authorities in country areas

14.2 Relevant legislation: Water Act 1989, Victoria Water Supply and Sewerage Plumbing Regulations 1994

14.3 Design codes: AS 3500 National Plumbing and Drainage Code 1990

**15. Septic tank installations**

15.1 Approval authority: Municipal council, Environment Protection Authority (discharge > 5000 l/day)

15.2 Relevant legislation: Environment Protection Act 1970

15.3 Design codes: Septic Tanks Code of Practice 1990

**16. Subdivision of buildings**

16.1 Approval authority: Municipal Council

16.2 Relevant legislation: Subdivision Act 1988

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# WESTERN AUSTRALIA ADDITIONS

**Western Australia has no additional variations to the Housing Provisions.**





SUPERSEDED

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# INDEX • SYMBOLS AND ABBREVIATIONS





SUPERSEDED

# INDEX (TO DEEMED TO COMPLY PROVISIONS)



## A



## B



## C

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## O



## P



## Q

## R



## S



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# ABBREVIATIONS AND SYMBOLS

Abbreviations and Symbols used in the *Housing Provisions* include:

## ABBREVIATIONS

| | |
|---|---|
| ABCB | Australian Building Codes Board |
| AISC | Australian Institute of Steel Construction |
| ALGA | Australian Local Government Association |
| AS | Australian Standard |
| ASTM | American Society for Testing and Materials |
| BCA | Building Code of Australia |
| BCC | Building Codes Committee |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DBC&E | CSIRO Division of Building, Construction and Engineering |
| FRL | Fire Resistance Level |
| GRP | glass fibre reinforced polyester |
| ISO | International Organisation for Standardisation |
| MIMS | mineral insulated metal sheathed [cable] |
| NATA | National Association of Testing Authorities |
| NBTC | CSIRO National Building Technology Centre |
| PVC | polyvinyl chloride |
| SSL | Scientific Services Laboratory |
| STC | Sound Transmission Class |
| UPVC | unplasticised polyvinyl chloride |

## SYMBOLS (SI UNITS)

$^{o}$C -degree(s) Celsius
K - kelvin(s)
kg - kilogram(s)
kg/m - kilogram(s) per metre
kg/m$^2$ - kilogram(s) per square metre
kg/m$^3$ - kilogram(s) per cubic metre
kPa - kilopascal(s)
kW/m$^2$ - kilowatt(s) per square metre
L - litre(s)
L/s - litre(s) per second
L/s.m$^2$ - litre(s) per second square metre
lx - lux
ø - diameter

F - in relation to steel members means steel fabric

m - metre(s)
m$^2$ - square metre(s)
m$^3$ - cubic metre(s)
m/s - metre(s) per second
m$^3$/s - cubic metre(s) per second
mm - millimetre(s)
mm$^2$ - square millimetre(s)
um - micrometer
mW - megawatt(s)
N - newton(s)
Pa - pascal(s)

> - greater than

< - less than

$\leq$ - equal to or less than

$\geq$ - equal to or more than

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# HISTORY OF AMENDMENTS

This tab is reserved for “history of amendments”.



SUPERSEDED